4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action, Alternative A, and the No Action Alternative. Both action alternatives would require an area of about 2,600 acres to be permitted; this acreage would include the leased coal lands (1,440 acres for Proposed Action or 1,482 acres for Alternative A), which would be mined, and an adjacent strip of land that would be used for soil stockpiles, roads, sediment ponds, etc. (see Figure 2.4), but would not be mined. Thus, the environmental consequences of implementing either the Proposed Action or Alternative A are generally the same.

Surface mining and reclamation have been ongoing in the PRB for dozens of years. Certain measures that SMCRA and/or Wyoming statutes require that would reduce impacts are included as part of the Proposed Action, as discussed in Chapter 2. Some of these measures are also described in this section. The BLM and USFS also attach special coal stipulations to all leases (Appendix D). In addition, WDEQ technically reviews all mine permit application packages to ensure that the mining and reclamation plans comply with all state permitting requirements and that the proposed coal mining operation will comply with the performance standards of the OSM-approved Wyoming program (see Section 1.2). Appendix B presents a list of federal and state permitting requirements that would be necessary prior to mining. These regulations are designed to ensure mitigation of impacts from surface coal mining. The following impact assessment considers these measures.

Section 4.1 analyzes the direct and indirect impacts associated with leasing and mining the LBA tract under the Proposed Action and Alternative A. Section 4.2 presents the probable environmental consequences of the No Action Alternative (not issuing a lease for the tract). Section 4.3 discusses regulatory compliance, mitigation, and monitoring in terms of what is required by federal and/or state law (and is therefore part of the Proposed Action and alternatives) and any additional mitigation and monitoring that may be required. Section 4.4 summarizes the residual effects of the Proposed Action and Alternative A. Section 4.5 discusses the cumulative impacts that would occur if these lands were mined when added to other past, present, and reasonably foreseeable future actions. An evaluation of the ENCOAL Plant and the Two Elk power plant are included as cumulative impacts because it is the position of the proponents of these projects that the plants will be built whether or not the LBA tract is leased, and regardless of who leases it. Therefore, the impacts of these two proposals are independent of the actions being analyzed in this EIS. Section 4.6 analyzes the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. Section 4.7 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the proposed project.

4.1 DIRECT AND INDIRECT IMPACTS

Impacts can be beneficial or adverse, can be a primary result of an action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long-term [i.e., lasting many years following mining and reclamation]) or temporary and of short duration (short-term [i.e., lasting only a few years following mining and reclamation]). Impacts can vary in degree from a slightly discernable change to a total change in the quality of the human environment. A negligible impact is an impact that may produce a change in the environment--this change may even be substantial--but would not necessarily be considered beneficial or adverse. For instance, surface mining will cause a very substantial change to the soils in the mined area; however, this change would not necessarily cause an impact on the quality of the human environment. A moderate impact would produce a modest change to the quality of the

human environment, and a significant impact would result in substantial change in the quality of the human environment.

4.1.1 Topography and Physiography

Surface coal mining would permanently alter the topography of the LBA tract. Topsoil would be stripped from the land, overburden would be blasted and stockpiled or directly sidecast into the already mined pit, and a seam of coal would be removed. The existing topography on the LBA tract would be substantially changed during mining. A 150- to 250-ft highwall would exist in the active pit, with large volumes of spoil and topsoil stockpiled for later reclamation. Trussler Creek would be diverted into a temporary channel. A direct, long-term impact would be topographic moderation. The restored land surface would contain fewer topographic features, but the basic drainage network would be retained. Following reclamation, the original surface elevation would be approximately 10 ft lower, due to removal of the coal. (The removal of 60 ft of coal would be partially offset by the overburden swelling that occurs when the overburden is blasted and removed.) The land surface would be restored to the approximate original contour; however, the terrain would be slightly flatter.

Direct adverse impacts resulting from this topographic moderation would include a reduction in microhabitats (i.e., cutbank slopes) for some wildlife species and a reduction in habitat diversity, particularly slope-dependent shrub communities and associated habitat. A potential indirect impact may be a reduction in big game carrying capacity. Direct beneficial impacts resulting from the lower and flatter terrain would include reduced water runoff and increased infiltration, resulting in a minor reduction in peak flows which may indirectly decrease erosion, increase vegetative productivity, and potentially accelerate recharge of groundwater. The approximate original drainage pattern would be restored, and stock ponds and playas would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

4.1.2 Geology and Minerals

Mining would remove an average of 207 ft of overburden and 60 ft of coal over about 1,440 acres under the Proposed Action, or 1,482 acres under Alternative A. The replaced overburden would be a relatively homogenous (compared to the premining layered overburden), partly recompacted mixture averaging about 232 ft deep. Approximately 144 million tons of coal would be mined under the Proposed Action, compared to 149 million tons under Alternative A.

The geology from the base of the coal to the land surface would be subject to considerable long-term change on the LBA tract under either action alternative. The subsurface characteristics of these lands would be radically changed by mining. The replaced overburden (spoil) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shales that currently exist. The resulting physical characteristics would also be significantly altered.

The development of other minerals potentially present on the LBA tract would not occur during mining; however, development of these resources could occur following mining. Coal bed methane associated with the removed coal would be irretrievably lost.

4.1.3 Soils

Consequences to soils from mining the LBA tract would include changes in the physical, biological, and chemical properties. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, and chemical composition. The soils would be much more uniform in type, thickness, and texture. However, the replaced topsoil would support a stable and productive

vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Surface coal mining would directly impact 1,440 acres of soil on the LBA tract (1,482 acres for Alternative A) by increasing near-surface bulk density, which would then indirectly influence infiltration and runoff. The soils would tend to become more uniform in type, thickness, and texture (e.g., clayey and sandy soils may get mixed, resulting in a sandy clay loam). This uniform mixture would then be redistributed to a fairly even depth of about 29 inches. The chemical make-up and soil nutrient distribution would be more uniform in the mixed soils, resulting in more uniform vegetative productivity on the reclaimed land. Direct biological impacts would include a long-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts, particularly if the soil is stockpiled before placement.

Following reclamation, soil loss due to steep topography may decrease on the LBA tract as a result of the topographic moderation. Soil losses during mining would be minimal; sediment control structures would trap eroded soil and revegetation would reduce wind erosion. Both of these measures are required by state regulations and are therefore considered part of the Proposed Action.

4.1.4 Air Quality

The WDEQ/AQD has issued Bluegrass an air quality Permit to Construct for the North Rochelle Mine. Bluegrass is authorized to mine at a maximum rate of 20 million tons per year, but the actual production rate would depend on market conditions and contracts. As stated in Section 2.1.1, anticipated annual production on the LBA tract would be 15 million tons per year. Bluegrass's permit was based on the results of computer modeling that predicted no violation of air quality standards and demonstrated that emissions would have no significant cumulative effect when added to emissions from neighboring mines at currently permitted production rates. Bluegrass would mine the LBA tract and their existing lease (North Rochelle Mine) using the same equipment with similar emission control methods. The overburden and coal thickness on the LBA tract are similar to the existing lease. Bluegrass does not propose to increase production above the currently permitted maximum rate, but acquisition of the LBA tract would allow production to be extended for 10 years. As a result, there would not be an increase in direct and indirect impacts to air quality, but there would be a continuation of the existing permitted impacts. If North Rochelle acquires the LBA tract, they will have to amend their air quality permit to include the LBA tract prior to mining the tract.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mine. During the time the LBA tract is mined, the elevated TSP levels in the vicinity of the mining operation would continue, as would the elevated concentrations of gaseous emissions due to fuel combustion. Compliance with all state and federal air quality standards would be attained. As with current operations, mining would occur near Highway 450, Highway 59, and Reno County Road, making dust visible to the public. Mitigation measures discussed in Section 4.3.4 would minimize this impact.

Impacts from the Proposed Action and Alternative A would not be substantially different, except that a slightly larger area would be mined under Alternative A. Bluegrass would use conveyors to move coal from the pit area, so dust emissions should remain relatively constant. Blasting is not a major source of emissions at PRB mines (PM_{10} emission inventories show that overburden and coal blasting comprise less than 1% of the total emissions). Overburden removal, wind erosion, and coal haul roads generate the majority of dust.

The nearest Class I area is located approximately 80 mi east at Wind Caves National Park in

southwestern South Dakota, and no impacts on air quality are expected to occur there from mining this LBA tract.

4.1.5 Water Resources

Surface Water

Continuous changes in runoff characteristics and sediment discharges would occur during mining of the LBA tract because of changes in the location of diversions and the destruction and reconstruction of drainage channels as mining progresses. Sediment discharges could reach high values on the disturbed area because of scour and erosion. However, both state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. Therefore, the sediment would be deposited before leaving the permit area. However, sediment produced by large storms (i.e., greater than the 10-year, 24-hour storm) could adversely impact downstream areas. Downstream impacts from large storms could increase if sedimentation ponds were full of water and sediment at the time of large storm, or if excessive runoff caused a dam failure. However, some sediment ponds would be designed for 25-year, 24-hour storms and 100-year, 24-hour storms. WDEQ would also require a monitoring program to assure that ponds would always be capable of holding at least 1 year's sediment accumulation.

Runoff would increase on the LBA tract due to loss of soil structure. However, soil structure would gradually reform over time, and vegetation (after successful reclamation) would retard surface flows and control runoff at approximately premining levels. The decrease in average slope of the reclaimed land would increase infiltration and reduce peak flows.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the LBA tract would approximate premining conditions. However--because of the relocation of drainages--flow and sediment discharge from the subbasins within the tract would vary from their present locations and characteristics. The impacts described above would be similar for both the Proposed Action and Alternative A.

Groundwater

Mining of the LBA tract would primarily impact groundwater resources in two ways: 1) Mining would remove the coal aquifer and the overburden aquifer on the mined land and replace them with unconsolidated overburden (spoils); and 2) water levels in the coal aquifer adjacent to the mine would continue to be depressed as a result of seepage and dewatering from the open cut on the LBA tract.

Mining the LBA tract would remove the overburden aquifer on 1,440 acres (Proposed Action) or 1,482 acres (Alternative A). This aquifer would be replaced by spoil made up of the mixed shale, siltstone, and sandstone of the existing Wasatch Formation.

Rahn (1976) found that the permeability of a replaced spoil aquifer depends on the method of its emplacement. Replaced strip mine spoil is composed of a nonhomogeneous mixture of clay- to gravel-sized grains. Where the spoil has been placed by a dragline, this material is loosely compacted. Frequently, the coarsest grains roll down the spoil piles and form a layer of coarse rubble at the base. This results in a relatively permeable aquifer with a zone of higher permeability at the base. Spoil material emplaced by trucks, bulldozers, and/or scrapers, on the other hand, is more compacted and has lower permeability. Rahn (1976) reported an average permeability of 450 gallons per day per square foot (gal/day/ft^2) for spoils placed by dragline compared to 4 gal/day/ft^2 for spoils placed by bulldozer/scraper. He concluded that, all other things being equal, dragline-placed spoils have a permeability several times greater than that of the

natural aquifer, whereas bulldozer/scraper-placed spoils have a permeability about the same as the natural aquifer.

Proposed mining of the LBA tract would involve a combination dragline and truck-shovel operation. Therefore, the permeability of the replaced spoil could probably be greater than or equal to that of the undisturbed overburden.

The coal aquifer, which averages 60 ft in thickness and is a principal source of groundwater in the area, would be permanently removed on the LBA tract by mining.

Mining of the LBA tract should not increase the areal extent of current and anticipated drawdowns in the coal aquifer (see Section 4.5.5) because the LBA tract does not extend the area of coal removal farther west than the existing West Black Thunder lease and the rate of production is not anticipated to increase beyond that already permitted, but it would extend the duration of the drawdown for 11 years. The applicant would be required to conduct detailed groundwater modeling to predict the extent of water drawdown in the coal and overburden aquifers owing to the mining of the LBA tract. The applicant would also be required to drill monitoring wells to verify the validity of the modeling predictions. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Wyoming State Engineer's Office records indicate a total of 282 water wells occur within 3 mi of the LBA tract. The majority (232) are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the 50 noncoal-related wells, 15 are permitted for stock watering purposes and one is permitted for domestic use. This well is shallow and completed within the Quaternary alluvium of Boss Draw approximately 3 mi south of the LBA tract. The remaining noncoal-related wells are monitoring wells owned by either the USFS or the Water Resources Research Institute of the University of Wyoming. The majority of these wells will likely be impacted (either direct removal of the well or indirectly by water level drawdown) by approved mining operations occurring at North Rochelle and the adjacent mines. In compliance with SMCRA and Wyoming regulations, Bluegrass would be required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining, water of equivalent quantity and quality; this mitigation is thus part of the Proposed Action. The most probable source of replacement water would be one of the aquifers underlying the coal.

At the permitted production level, the North Rochelle Mine would require a maximum of about 272,000 gal of water per day. Of this, 14,000 gal would be potable water, 8,000 gal would be utility water, and 250,000 gal would be for dust control. Most of this water would be supplied by an existing well tapping the Tullock Aquifer at a depth of 1,200-2,000 ft. Bluegrass has an appropriation of 250 gal per minute (gpm) for this well from the Wyoming State Engineer's Office. Some water for dust control would come from inflow to the mine pit. Mining of the LBA tract would extend the life of the North Rochelle Mine by 11 years which would result in additional water being withdrawn from the Tullock Aquifer, but this additional water withdrawal would not be expected to extend the water level drawdown over a significantly larger area because of the discontinuous nature of the sands in the aquifer.

Coal removal is unlikely to affect the underlying Tongue River-Lebo and Tullock Aquifers because there is a relatively impermeable layer underlying the coal (Figure 3.6). The Tullock Aquifer would be impacted due to water withdrawal from the existing well at the mine; however, there would be no direct impacts to municipal wells (i.e., in Gillette and Wright) completed in the Tullock Aquifer as a result of pumping water from the well because of the discontinuous nature of water-bearing sands in the Tullock Aquifer. Indirect effects of mining the LBA tract on the Tullock and Tongue River-Lebo aquifers would be the use of

municipal water by North Rochelle employees who would live in the two communities for 10 additional years.

Once reclamation takes place, the hydraulic head in the various aquifers would start to recover. Recovery in the Tullock Aquifer, for which the decline in head represents a loss of pressure, should occur rapidly, with only an insignificant amount of decline remaining after a few months. The coal and spoil aquifers, on the other hand, would take much longer to recover. As mining progresses and spoils are placed in the mined-out pit, groundwater would begin to seep into the spoils from the sides of the pit and percolate down through the spoils from precipitation. Because groundwater moves very slowly through the coal and spoils (only tens of feet per year), it may take as long as 100 years for the water level in the entire spoil aquifer to reach premining levels. However, based on the backfill monitoring data that is currently available, it is likely that by the time surface reclamation is completed and the LBA tract is restored to rangeland, sufficient saturated material would be present to supply a stock well, particularly in the areas that were first mined. The clinker east of the existing North Rochelle lease is saturated, and could provide a good source of recharge to the reclaimed spoils in this area.

As the overburden is broken up during removal and replaced during reclamation, fresh spoil surfaces are exposed to groundwater that moves through the reclaimed spoils. Rahn (1976) and Van Voast (1978) have found that groundwater in spoil contains more calcium, sulfate, magnesium, manganese, and TDS than premining groundwater. TDS in the spoil water on the mined LBA tract may increase from the premining range of 800-3,900 mg/liter to a postmining range of 1,500-5,000 mg/liter. However, the postmining TDS concentrations would still be suitable for anticipated postmining land use (livestock water).

A study conducted for the adjacent Rochelle Mine (OSM 1982) showed that it would take the equivalent of five pore volumes (totally saturated soil conditions) of water moving through all of the spoils to dissolve all of the newly exposed minerals and restore premining water quality in the entire mined and reclaimed area. This study indicated that this process would take more than 11,000 years for the entire mined out area, although premining water quality would be reached along the edges of the mined out area more quickly and would gradually move in toward the center. Another study in North Dakota estimated that only one pore volume of water must leach the spoil before the dissolved solids concentration in the water would be comparable to premining conditions (USGS 1987).

Trace metals within the spoils would not be dissolved because the groundwater has a near neutral pH. Overburden analyses have shown that pH reduction occurs only in isolated zones where carbonaceous materials are present. Most of the overburden in this area contains an abundance of calcite (OSM 1982). During removal and replacement of the overburden, the isolated zones of carbonaceous material would be mixed with the rest of the overburden. The abundant calcite should neutralize this carbonaceous material and the pH of the overburden should remain near neutral.

As the groundwater moves westward out of the spoil, it would gradually improve in quality. Because groundwater moves slowly, ion exchange would occur between the groundwater and the aquifer matrix and ions would become adsorbed to the fine particles in the aquifer. Also, some dilution would occur as the plume of groundwater from the spoils dissipates and is mixed with groundwater from the undisturbed aquifer. Groundwater quality of these adjacent unmined lands would not be lowered to a level unacceptable for current uses (livestock watering).

Mining and reclamation on the LBA tract would have little, if any, effect on recharge. Scoria, the principal source of recharge to the coal aquifer, would not be disturbed. Recharge through the

spoils would be equal to or slightly greater than the recharge that occurs now through the overburden. The process of blasting, removing, and replacing this overburden would break up the more consolidated overburden material, which increases the permeability of that material. Because the permeability of the coal is dependant on secondary features (such as fractures) rather than intergranular openings as in the overburden and spoil, it is difficult to accurately compare permeability. Nevertheless, it appears that the permeability of the spoil would be greater than that of the undisturbed coal.

4.1.6 Alluvial Valley Floors

No designated alluvial valley floors exist in the LBA tract, and no direct, indirect, or cumulative impacts are anticipated to off-site alluvial valley floors.

4.1.7 Wetlands

All existing wetlands on the LBA tract would be destroyed by mining operations; however, U.S. Army Corps of Engineers' requirements to replace all impacted wetlands would mitigate this loss, so environmental impacts would be insignificant.

4.1.8 Vegetation

Mining of the LBA tract would progressively remove the native vegetation on 1,440 acres (Proposed Action) or 1,482 acres (Alternative A). Short-term indirect impacts associated with this vegetation removal would include increased erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat carrying capacity for some wildlife species as a result of reduced species diversity, particularly big sagebrush, on reclaimed lands.

Reclamation and revegetation of this land would occur concurrently with mining. Estimates of the time elapsed from topsoil stripping through reseeding of 1-year's operation are 3-9 years. A maximum of about 35% of the permit area would be removed from livestock production at any one time due to mining; grazing restrictions prior to mining and during reclamation would increase this to as much as 100% of the permit area (see Section 4.1.11, Land Use). This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within several years following disturbance.

Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. Estimates for the time it would take to restore sagebrush to premining density levels range from 20 to 100 years. An indirect impact of decreased big game habitat carrying capacity would be associated with this vegetative change. However, a diverse, productive, and permanent vegetative cover would be established on the proposed lease land within about 10 years following reclamation. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. About 175 acres of surface disturbance would occur per year of mining on the LBA tract at the proposed rate of production, and by the time mining ceases, approximately 70% of the disturbed land would have been reseeded. The remaining 30% would be reseeded during the following 2-3 years. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures (to be preapproved by WDEQ with USFS input). The majority of these species would be native to the LBA tract. The reclamation plan would also include steps to control site invasion by weedy species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land. However, grassland vegetation would be the dominant community following reclamation. It must also be kept in mind that the majority of surface ownership on the LBA tract is private (see Figure 3.19), and the private landowners would

have the right to manipulate the vegetation on their lands as they desire, once the reclamation bond is released.

The climatic record for the western U.S. suggests that a severe drought could occur at least once during the life of the mine. Such a drought would severely hamper revegetation efforts during the drought year, since lack of sufficient moisture would reduce germination and could damage newly established plants. Even-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect revegetation efforts. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum slope would be comparable to premining slopes--about 25-30%; however, the average reclaimed slope would be less than the average premining slope. This slight flattening of the topography would inhibit the reestablishment of the site-specific slope-associated shrubland communities, but it also would reduce surface water runoff (and consequently erosion) and increase infiltration (and therefore, soil moisture availability to plants), which would benefit grassland establishment and productivity.

Following reclamation, the LBA tract would be a mixed prairie grassland with graminoid/forb-dominated riparian areas, and the overall species diversity would be reduced, especially for the shrub component. The amount of playa grassland to be restored has not yet been determined, but at least partial restoration would occur. Playas with wetland characteristics will fall under the jurisdiction of the U.S. Army Corps of Engineers. Detailed wetland mitigation plans would be developed at the permitting stage to ensure no net loss of wetlands on the project area.

The decrease in plant diversity would not seriously affect productivity of the reclaimed areas, regardless of the alternative selected, and the proposed postmining land use (wildlife habitat and rangeland) would be achieved, even with the changes in vegetative species composition and diversity.

4.1.9 Wildlife

Local wildlife populations would be directly and indirectly impacted by mining the LBA tract. These impacts would be both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). During mining, many species of wildlife would be displaced to other areas. When animals are displaced, they may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, displaced animals suffer from increased competition with other animals and are less likely to survive and reproduce. Unfortunately, these consequences are difficult to quantify and are also influenced by other factors such as weather, especially annual rainfall and snow depths.

Big game would be directly affected by mining activities from road kill resulting from continued vehicular traffic. Indirect impacts of surface coal mining on wildlife include temporary habitat loss, displacement, and harassment. During mining, animals would be displaced from the LBA tract. Alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA tract after mining and reclamation. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would generally be permanent. The reduction in food and cover would displace big game to adjacent ranges. Habitat loss would be incremental, occurring over

several years and allowing for gradual changes in big game distribution patterns. Big game residing in adjacent areas may be impacted by increased competition with displaced animals. However, since no crucial big game habitat occurs on the LBA tract, impacts would be insignificant.

Noise, dust, and associated human presence would also cause some localized avoidance of foraging areas adjacent to mining activities on the LBA tract. However, big game animals are highly mobile and can move to undisturbed areas if movements are not restricted (i.e., appropriate fencing materials are used). In addition, big game species have continued to occupy areas adjacent to active mine operations, suggesting that they become habituated to many such disturbances.

An additional adverse impact to pronghorn would be barriers to movement created by additional fences, spoil piles, and pits related to mining the LBA tract. To the extent possible, fencing would be designed to permit pronghorn antelope passage, but in some areas, the hazard would remain. During severe winter storms, pronghorn may not be able to negotiate these barriers, and some mortality could occur.

Site-specific impacts to pronghorn resulting solely from mining the LBA tract would not be significant, as no crucial pronghorn habitat is present. Mule deer, elk, and white-tailed deer would not be impacted, given their infrequent use of these lands and the availability of other areas.

Direct losses to small mammals would be higher than for other wildlife since the mobility of small mammals is limited and many would retreat into burrows when disturbed. Mammals such as coyotes, rabbits, etc., would be temporarily displaced to other habitats by mining and would return following reclamation. Populations of less mobile animals (such as mice) would decline during mining. However, these animals generally have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly.

Mining of the LBA tract would eliminate potential sage grouse habitat. However, very few sage grouse have been observed using the LBA tract during annual wildlife monitoring surveys, and no leks have been located on or near the LBA tract (see Figure 3.14) (Triton Coal Company 1996).

It is unlikely that raptor populations would be deleteriously impacted by mining the LBA tract. However, individual birds may be impacted. Two historical golden eagle nest sites and two historical ferruginous hawk nest sites occur within the LBA tract permit boundary (see Figure 3.15). All of these nests have been inactive for several years and are now listed as being destroyed (Triton Coal Company 1996). Several other raptor nests (both intact and former) occur in close proximity to the LBA tract. Mining-related disturbance could cause these raptors to abandon these nests. Before Bluegrass could mine the LBA tract, they would have to prepare a raptor mitigation plan as part of the revised mining plan (which would be reviewed and approved by the USFWS). Any nests that would be impacted by mining operations would have to be relocated in accordance with that plan. Prior to the disturbance of any raptor nest, special purpose permits would have to be secured from the USFWS and WGFD. All active raptor nests within the mine permit area would be protected further by buffer zones. Mine-related disturbances are not allowed to encroach the near vicinity of any active raptor nest from March until hatching and disturbances near raptor nests containing nestlings is strictly limited to prevent danger to, or abandonment of, the young. These required mitigation measures are part of the Proposed Action.

Foraging habitat for raptors would be reduced until revegetation successfully attracts small mammals, which serve as their prey. The following required measures (which are part of the Proposed Action) would also ensure that site-specific impacts would be minimized: All power lines would be made raptor safe (Avian Power Line Interaction Committee 1994), and successful

revegetation would support substantial rodent (prey) populations.

Annual monitoring by other area mines has not documented any apparent declines in area eagle or hawk populations due to mining activities. Raptor sitings are common; however, reproductive rates are presently depressed in the area according to monitoring conducted by the WGFD, the BLM, and the USFS, and populations may be decreasing.

Mountain plover habitat would be impacted by mining the LBA tract. Mountain plover surveys, conducted in accordance with USFWS guidelines, would be required as part of the WDEQ permitting process. If plover habitat is identified on these lands, a habitat recovery and replacement plan would be required as part of the mine permit application. This plan, which would have to be approved by the USFWS, would be expected to reduce potential impacts to an acceptable level.

No other MBHFI regularly use the LBA tract, and raptors are the only MBHFI that breed in the area (Triton Coal Company 1996); therefore, mining would have negligible impacts on these species.

Disturbance of numerous stock ponds on the LBA tract would impact waterfowl which utilize the ponds for resting and feeding during migration. The creation of sedimentation ponds would partially mitigate this impact. WDEQ and the U.S. Army Corps of Engineers would also require creation of wetlands during reclamation which would minimize impacts. The LBA tract currently has limited value for waterfowl production.

Resident songbirds would have to compete for available adjacent territories and resources as their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would be higher when habitat disturbance coincides with egg incubation and rearing of young. These effects would be short-term for grassland species but would last longer for shrub-dependent species. Several required measures would minimize these impacts. A diverse seed mixture with shrub groupings would provide food, cover, and edge effect, and cottonwood plantings would produce perching and nesting sites.

USFS Region 2 sensitive species habitat may be directly or indirectly impacted by changing the surface character of the LBA tract. Potential impacts may be either short-term (prior to reclamation) or long-term (persisting beyond successful completion of reclamation). When the lessee files an application for a surface mining permit, and prior to any habitat manipulation actions, these sensitive species will be evaluated in a Biological Evaluation.

4.1.10 Threatened, Endangered, and Candidate Species

Mining the LBA tract would not be expected to jeopardize the existence of any T&E species. No known critical habitat for T&E species exists on the LBA tract.

There are no prairie dog colonies on the LBA tract and surveys of nearby towns have produced no evidence of black-footed ferrets (see Figure 3.16). Bald eagles could potentially nest or roost on the LBA tract; however, there are no concentrated food sources for eagles on the LBA tract and the loss of any potential foraging habitat would be short-term. Peregrine falcon nesting habitat does not exist on the LBA tract, and there are no concentrated food sources for peregrines on the LBA tract. Suitable habitat for Ute lady's tresses is potentially present on the LBA tract (however, no Ute lady's tresses have been found on surveys of the adjacent permit areas), and surveys would be required prior to any mining activity. If any plants are found, development of a USFWS-approved mitigation plan would be required prior to mining. Mountain plover habitat potentially occurs on the LBA tract, but no plovers have been documented. Surveys for plovers would be required prior to any mining activity and if any plovers are found, development of a USFWS-

approved mitigation plan would be required prior to mining. No recent sightings of swift fox have been reported on or near the LBA tract; however, much of the PRB is potential swift fox habitat.

4.1.11 Land Use and Recreation

The major adverse environmental consequences of the Proposed Action or Alternative A on land use would be the reduction of livestock grazing, loss of wildlife habitat, curtailment of oil and gas development, and short-term loss of public land available for recreation activities on about 1,440 acres (Proposed Action) or about 1,482 acres (Alternative A) during active mining. Wildlife (particularly big game) and livestock (cattle and sheep) use would be displaced while the tract is being mined and reclaimed.

Oil and gas leases on the LBA tract could not be developed in areas where active mining is occurring. However, areas not being mined, or areas which are reclaimed after mining, could be drilled while mining and/or reclamation is occurring in adjacent areas. Coal bed methane resources on the LBA tract would be lost when the coal is removed.

Hunting on the LBA tract would be eliminated during construction, mining, and reclamation; however, the LBA tract is not currently utilized to any significant extent and the vast majority of the tract surface is privately owned (see Figure 3.19). Following reclamation, the land would be suitable for grazing and wildlife use, which are the historic land uses. Following reclamation bond release, management of the privately owned surface would revert to the private surface owner.

4.1.12 Cultural Resources

Cultural resources will be impacted by mining, but adverse impacts will be mitigated through data recovery and/or avoidance of significant properties. A total of five prehistoric, historic, and multicomponent (consisting of both prehistoric and historic components) sites has been recorded within the LBA tract. All of the currently recorded sites are not presently considered eligible for inclusion on the NRHP; however, formal SHPO consultation is required for concurrence with this evaluation. Class III surveys would be required for the uninventoried lands prior to mining; Class I reconnaissance to confirm the evaluation of unconcurred sites would also be required to comply with legislation. If eligible cultural properties are identified within the LBA tract and they cannot be avoided, a data recovery program would be implemented.

Cultural resources adjacent to the mine area may be impacted as a result of increased use of the area. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits.

4.1.13 Native American Concerns and Trust Resource Issues

No sites of Native American religious or cultural importance are known to occur on the LBA tract; if such sites or localities are identified at a later date, they will be taken into consideration.

4.1.14 Paleontological Resources

No unique or significant paleontological resources have been identified on the LBA tract, and the likelihood of encountering significant paleontological resources is small. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area shall stop and measures taken to assess and protect the site (see Appendix D).

4.1.15 Visual Resources

Visual impacts would be evident during mining; however, mining activity on the LBA tract would not be visible from any major travel routes and would be partly concealed by surrounding terrain.

Mining would affect landscapes classified by USFS as "common", and the landscape character would not be significantly changed following reclamation.

After reclamation, reclaimed terrain would be almost indistinguishable from the surrounding terrain. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the south and west, and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would be distinguishable from the surrounding undisturbed terrain only to somebody very familiar with landforms and vegetation.

4.1.16 Noise

Noise levels on the LBA tract would be increased considerably by mining activities such as blasting, crushing, conveying, rail car loading, scraping, and hauling. The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 A-weighted decibels (dBA) prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) which determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. Explosives would be used during mining to fragment the overburden and coal and facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 dbA at the location of the blast. At a distance of approximately 1,230 ft, the intensity of this blast would be reduced to 40 dBA. Since the nearest occupied dwelling is more than 4,000 ft away from the LBA tract, there should be no significant noise impacts.

Because of the remoteness of the site and because mining has already been permitted in the area, noise would have little off-site effect. Wildlife in the immediate vicinity of mining may be adversely affected; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to increased noise associated with active coal mining. After reclamation is completed, noise would return to premining levels.

4.1.17 Transportation Facilities

No new or reconstructed transportation facilities will be required under the Proposed Action or Alternative A. Essentially all of the coal mined on the LBA tract would be transported by rail. Leasing the LBA tract would extend the length of time that coal is shipped from the permitted North Rochelle Mine. No active pipelines currently cross the LBA tract, and any relocation of utility lines would be handled according to specific agreements if the need arises. The Wyoming Department of Transportation routinely monitors traffic volumes on area highways, and if traffic exceeds design standards, improvements are made. Burlington Northern, Santa Fe, and Union Pacific have upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the southern PRB with or without the leasing of the proposed LBA tract.

4.1.18 Socioeconomics

Leasing and subsequent mining of the LBA tract would not create additional jobs if mined as a maintenance tract, but would extend the life of an already permitted operation by 10 years. Leasing and mining the LBA tract as a production maintenance tract would not be expected to alter current employment levels. Coal prices are projected to remain relatively constant throughout the life of the mine (Wyoming State Geological Survey 1996), and the total direct fiscal benefit to the State of Wyoming from coal mining (taxes and royalties) has been estimated at $1.10/ton of coal mined (University of Wyoming 1994). Thus, the sale of 134 million tons of coal under the Proposed Action would generate $147 million to the state or $153 million under Alternative A. Assuming a price of $4.00 per ton and 93% recovery of the coal, the market value of the coal would be about $536 million for the Proposed Action ($556 million for Alternative A). Estimated economic multiplier for determining the

total economic impact to the local area (i.e., direct, indirect, and induced effects) range from 1.473467 (University of Wyoming 1994) to 1.796 (Campbell County Economic Development Corporation 1993). Applying an average economic multiplier of 1.5 to these revenues, the total economic impact from leasing and subsequent mining of the LBA tract would be about $804 million (Proposed Action) or $834 million (Alternative A). These economic impacts would benefit the local and regional economies.

4.2 NO ACTION ALTERNATIVE

Impacts on the existing North Rochelle lease and adjacent existing leases would be similar to those described in the preceding pages on topography and physiology, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, USFS Region 2 Sensitive Species, T&E species, land use and recreation, cultural resources, Native American concerns and trust resource issues, paleontological resources, visual resources, noise, transportation, and socioeconomics (see Table 2.5). The general nature and magnitude of cumulative impacts as summarized in Table 2.7, which would occur from implementation of the Proposed Action or Alternative A, would not be substantially different under the No Action Alternative. However, coal removal and the associated disturbance and impact would not occur on the 1,440 to 1,482 acres included in the Proposed Action or Alternative A, respectively. A portion of the surface of the LBA tract would probably be disturbed due to overstripping to allow coal to be recovered from the existing contiguous North Rochelle and Black Thunder coal leases. The economic impacts that would be derived from mining the LBA tract during an additional 10 years of mine operation would be lost. Without the LBA tract, operations at the North Rochelle Mine would end in 2010, when the existing lease is mined out and reclaimed. Not leasing this delineated suitable tract at this time may also result in a bypass of this federal coal.

4.3 REGULATORY COMPLIANCE, MITIGATION, AND MONITORING

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. Mitigation and monitoring measures that are required by regulation are considered part of the Proposed Action and the alternatives. If impacts that are not mitigated by the existing required mitigation measures are identified during the coal leasing stage, then BLM or USFS can include additional mitigation measures as stipulations on the lease. No mitigation or monitoring measures beyond those required by SMCRA and state law have been identified as necessary for the North Rochelle LBA tract at this time. To illustrate the types of mitigation and monitoring measures that are required by SMCRA and state law, some of these measures are summarized in the resource discussions in this section.

4.3.1 Topography and Physiography

Given the WDEQ-mandated requirement to restore the postmining topography to the approximate original contour, no additional mitigation measures are recommended to address potentially adverse impacts.

4.3.2 Geology and Minerals

A WDEQ permit application requirement includes a conduct of a drilling and sampling program to determine overburden geochemistry and reclamation suitability. If unsuitable overburden is present, the applicant would be required to design the mine and reclamation plan to minimize any adverse impacts. These measures typically include mixing and/or selective placement of spoil. No additional mitigation measures are recommended.

4.3.3 Soils

Sufficient suitable overburden material exists on adjacent mines and is assumed to exist on the LBA tract. Selective placement of at least 5 ft of suitable overburden on the surface prior to replacing topsoil is assumed. With an anticipated 29 inches of topsoil available on the LBA tract, the top 7 ft of regraded surface material should meet WDEQ suitability guidelines for vegetation root zones. Monitoring of revegetation growth with corresponding application of appropriate soil amendments would ensure successful reclamation. These measures are required and are thus part of the Proposed Action. No additional mitigation or monitoring will be needed.

4.3.4 Air Quality

Current air quality regulations and regulatory practices are designed for, and have been historically demonstrated to be effective in, protecting ambient air from degradation from air pollutants generated from surface mining. Before the LBA tract could be mined, even as an extension of an approved operating permit, the existing air quality permit must be amended and approved by WDEQ. This additional modeling is expected to verify the previous analysis because there are no proposed changes in mining methods or rates under either action alternative.

The mitigation of impacts to air quality would be achieved through a combination of five regulatory activities: 1) dispersion modeling of mine plans for annual average particulate pollution impacts on ambient air; 2) use of particulate pollution control technologies; 3) use of specific work practices to minimize windborne fugitive particulate emissions; 4) on-site air quality monitoring to demonstrate compliance with ambient air quality standards; and 5) on-site compliance inspections of mining actives by state regulatory inspectors. Surface mines must comply with all five aspects of modeling, pollution control, pollution prevention, and compliance inspection as conditions for obtaining and maintaining an air quality operating permit.

Potential air pollution is further mitigated at the source by the requirement that facilities utilize EPA- and state-mandated Best Available Control Technology (BACT). In the case of surface coal mining, BACT involves the use of fabric filtration or wet scrubbing of coal storage silo and conveyor vents to mitigate generation of particulates in ambient air. WDEQ also specifies certain other methods for mitigating windborne fugitive emissions of particulates, including watering or chemical dust suppression of haul roads and exposed soils, containment of truck dumps and primary crushers, covering of conveyors, and prompt revegetation of exposed soil. Such measures are estimated to be 50-60% effective in mitigating windborne fugitive particulate emissions from roads and exposed land (WDEQ 1979). These are regulatory requirements and are therefore considered part of the Proposed Action.

WDEQ has also instituted local ambient air quality monitoring as a requirement for obtaining an air quality permit. Each mine in the PRB is required to install, maintain, and operate a certified ambient (off-site) monitor for PM_{10}, and to submit monitoring data to WDEQ as a measure of compliance with ambient air quality standards. Specific compliance with both air quality regulations and operating permit requirements is further assured through the mine site inspection activities conducted by WDEQ.

No additional mitigation measures would be necessary.

4.3.5 Water Resources

The cumulative hydrologic impacts associated with mining the LBA tract would be evaluated by the WDEQ based on site-specific data before the tract could be mined. Detailed mitigation plans would be developed at that time.

A WDEQ-required mitigation measure obligates the coal mine to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water

of equivalent quantity and quality. This measure should adequately minimize potential impacts occurring to groundwater resources. WDEQ-required sedimentation ponds would adequately mitigate surface water impacts. Extensive surface and groundwater monitoring would also be required as part of the mine permitting procedures. Since these measures are required by state and federal law, they are considered part of the Proposed Action. No additional mitigation or monitoring measures have been identified.

4.3.6 Alluvial Valley Floors

A detailed study to identify alluvial valley floors is required by WDEQ prior to mine permitting. If any alluvial valley floors are identified, a detailed mitigation plan would be developed and approved by WDEQ prior to mining.

4.3.7 Wetlands

A detailed study to identify jurisdictional wetlands is required by the U.S. Army Corps of Engineers prior to mine permitting. If any jurisdictional wetlands are identified, a detailed mitigation plan would be developed at that time.

4.3.8 Vegetation

Continued higher-than-normal levels of erosion and undesirable plant species invasion are likely and normal on areas being reclaimed prior to the successful establishment of the desired species. A detailed reclamation plan would be prepared and approved by WDEQ prior to mining. This plan would provide specific measures to minimize erosion on reclaimed areas (i.e., mulching and the use of cover crops). Weed infestation would be chemically and mechanically controlled. Reduced species diversity on reclaimed areas, compared with premining diversity, is typical and would be mitigated to a large extent by the use of diverse and predominantly native species in permanent reclamation seed mixtures.

Although the reduction in topographic diversity would decrease the potential for vegetative diversity, a number of reclamation methods required in the reclamation plan would, at least partially, offset impacts to wildlife habitat diversity on the reclaimed areas. Community diversity within the postmine vegetation types would also be enhanced by direct hauling of topsoil, selective planting of shrubs in riparian areas, planting of sagebrush, creation of depressions and rock piles, and special planting procedures around rock piles.

WDEQ also requires posting of a reclamation performance bond. This bond is held for a minimum of 10 years to assure that the operator faithfully performs all required reclamation. No additional mitigation measures would be necessary.

4.3.9 Wildlife

Numerous mitigation measures are required by federal and state statutes to be incorporated into the mining and reclamation plans to minimize wildlife impacts. Required mitigation measures are considered to be part of the Proposed Action. These measures generally include: 1) restoring the premining topography to the maximum extent possible; 2) planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife; 3) designing fences to permit wildlife passage; 4) raptor-proofing power transmission poles; 5) creating artificial raptor nest sites; 6) placing rock clusters and creating shallow depressions to add topographic diversity in reclamation; 7) reducing vehicle speed limits to minimize wildlife mortality; and 8) instructing employees not to harass or disturb wildlife.

The applicant would also be required to prepare a raptor mitigation plan, which must be reviewed by the USFWS. Additionally, the mining operations are required to conduct extensive wildlife monitoring surveys, both before and during mining. No additional mitigation measures would be necessary.

4.3.10 Threatened, Endangered, and Candidate Species

The required mitigation and monitoring practices described above would ensure protection of any previously unreported T&E species. USFWS-approved surveys would be conducted for Ute lady's tresses and mountain plovers prior to surface-disturbing activities. If prairie dogs invade the LBA tract, ferret searches would be conducted prior to surface disturbance. The results of such surveys would be reviewed by USFWS and by the USFS on affected federal surface before mining could proceed. Employees would be instructed to avoid disturbing bald eagles, and revegetation would restore the disturbed foraging areas. All power lines would be made raptor safe. These measures are required by state or federal law and are therefore considered part of the Proposed Action. No additional mitigation measures have been identified at this time.

4.3.11 Land Use and Recreation

Campbell County's public recreation facilities are some of the most extensively developed in the Rocky Mountain Region, and use by young, recreation-oriented residents is high. The relatively strong financial position of the county recreation program appears to assure future recreation opportunities for residents regardless of the development of the LBA tract or any other specific mine. Outdoor recreational opportunities should not be significantly impacted as a result of leasing and subsequent mining of the LBA tract. Converse County's financial position and recreational facilities are not as good as Campbell County's.

Since the majority of land to be impacted is private, no mitigation measures for the loss of public access during mining is recommended. Likewise, no mitigation is recommended for the loss of livestock grazing and wildlife habitat during mining.

4.3.12 Cultural Resources

Direct impacts to cultural resources would be mitigated following procedures specified in 36 CFR 800. As part of the permitting process, Class I and Class III inventories would be conducted on all state and federal lands and on private lands affected by federal undertakings unless landowner denial for access is documented in writing. All resources identified in these surveys would be evaluated for eligibility to the NRHP in consultation with the BLM and SHPO. Eligible or listed sites identified would be avoided, as would areas with high potential for significant cultural deposits. If any NRHP (eligible or listed) prehistoric sites found within the area cannot be avoided, a data recovery program would be implemented. Mining activities would be field-checked occasionally by a qualified BLM archaeologist. If historic or prehistoric materials are discovered during mining operation, appropriate BLM and USFS personnel would be notified immediately (see Appendix D). These required measures are part of the Proposed Action.

Potential impacts to cultural resources would be reduced through informing all personnel of the importance of the resources and the regulatory obligations to protect such resources. All personnel would be instructed that collection of cultural materials on public lands is prohibited.

4.3.13 Native American Concerns and Trust Resource Issues

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.14 Paleontological Resources

No mitigation measures are recommended, beyond what is required by state and federal law. If potentially significant paleontological resources are discovered during surface-disturbing activities, those activities will be suspended and the resource will be evaluated (Appendix D).

4.3.15 Visual Resources

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.16 Noise

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.17 Transportation Facilities

No mitigation measures are recommended, beyond what is required by state and federal law.

4.3.18 Socioeconomics

No mitigation measures are recommended, beyond what is required by state and federal law.

4.4 RESIDUAL IMPACTS

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain following mining and reclamation.

4.4.1 Topography and Physiography

Topographic moderation would be a permanent consequence of mining. The secondary impacts to wildlife habitat diversity would also be considered permanent.

4.4.2 Geology and Minerals

Geology from the base of the coal to the surface would be subject to significant, long-term change.

4.4.3 Soils

Soil-forming processes would be disturbed by mining, resulting in long-term alteration of soil characteristics and, consequently, taxonomic classifications of the soils.

4.4.4 Air Quality

No residual impacts to air quality would occur following mining.

4.4.5 Water Resources

The coal aquifer would be permanently removed in the area being mined. After mining, it would take an estimated 100 years for the water in the restored overburden (spoil) aquifer to reach premining levels. The reduction in water quality in the spoils would also be long-term, but, in general, the water would be suitable for premining uses.

4.4.6 Alluvial Valley Floors

No residual impacts to alluvial valley floors would occur following mining.

4.4.7 Wetlands

No residual impacts to wetlands would occur following mining.

4.4.8 Vegetation

A reduction in slope-dependent shrub communities would be a permanent consequence of mining, and reclaimed vegetative communities may never completely match the surrounding native plant community.

4.4.9 Wildlife

Although the LBA tract would be reclaimed to as near original condition as possible, there would be some residual impacts. The topographic moderation would result in a permanent loss of habitat diversity and a decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species.

4.4.10 Threatened, Endangered, and Candidate Species

No residual impacts to T&E or candidate species are expected.

4.4.11 Land Use and Recreation

No residual impacts to land use and recreation are expected.

4.4.12 Cultural Resources

Even with well-organized mitigation plans and associated procedures, impacts are unavoidable. It is neither possible nor practicable to mitigate all sites; thus, unmitigated sites will be permanently lost.

4.4.13 Native American Concerns and Trust Resource Issues

No residual impacts to Native American concerns and trust resource issues are expected.

4.4.14 Paleontological Resources

No residual impacts to significant paleontological resources are expected.

4.4.15 Visual Resources

No residual impacts to visual resources are expected.

4.4.16 Noise

No residual impacts are to noise are expected.

4.4.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.4.18 Socioeconomics

No residual impacts to socioeconomics are expected.

4.5 CUMULATIVE IMPACTS

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section summarizes the cumulative impacts that are occurring as a result of existing development in the area, and discusses the change in cumulative impacts that would occur as a result of adding the mining of the LBA tract to other past, present and reasonably foreseeable development in this area.

Important points to keep in mind include: 1) the total areas of all mines would not be disturbed at once; 2) the number of acres, type of vegetation, etc., disturbed would vary from year to year; 3) the impacts to groundwater would vary as mining progresses through each permit area (depending on saturation, how close the next mine pit is, etc.); and 4) the intensity and extent of coal bed methane development is highly speculative. It is thus not feasible to precisely determine or quantify cumulative impacts at any given time or place.

Wyoming coal production has increased 2.5 times in the last 15 years, from 94.0 million tons in 1980 to 236.9 million tons in 1994, according to records of the Wyoming State Inspector of Mines. 1995 coal production from Campbell and Converse Counties was approximately 246.5 million tons, according to the Wyoming State Geological Survey (Wyoming State Geological Survey 1996). Coal production in 1996 from mines operating in Campbell and Converse Counties (excluding Dave Johnson) is estimated at 256.7 million tons (Gillette News Record, January 12, 1997).

Campbell and Converse Counties produce 85-95% of Wyoming coal each year. The increasing state production is primarily due to increasing sales of inexpensive low-sulfur PRB coal to electric utilities who must comply with requirements of the 1990 Clean Air Act Amendments. These electric utilities account for most of Wyoming's coal sales. Increases in demand for electricity will probably result in a continuing demand for federal coal from Wyoming's PRB (BLM 1996g).

In 1996, the BLM completed a report titled *Coal Development Status Check Powder River Federal Coal Region Montana & Wyoming* (BLM 1996f). This report documents actual cumulative mineral development impacts in the PRB during the last 15 years and compares them with the cumulative mineral development impacts predicted in previously prepared regional EISs. In Wyoming, the status check compares actual development in Campbell and Converse Counties with the predictions in the Eastern Powder River Coal FEIS (BLM 1979) and the Powder River Coal FEIS (BLM 1981). A primary conclusion reached in the status check was that regional coal production levels are within predicted coal production levels, except for the southern group of mines, where production has exceeded predictions. The Wyoming status check also considers predictions that were made in *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin* (Martin et al. 1988). The status check is thus incorporated by reference into this EIS.

Oil and gas production generally has decreased in Wyoming's PRB since the 1981 regional EIS was prepared. In recent years, more wells have been plugged annually than have been drilled. The exception to this trend is the current interest in developing shallow coal bed methane resources just west of the coal mines. Since 1992, the BLM has prepared four EAs analyzing coal bed methane development projects in this area. An EIS for coal bed methane development south of Gillette (Figure 3.5) is in preparation and an EA for coal bed methane development north of Gillette was mailed to the public in December 1996 because companies are proposing new coal bed methane projects or additional drilling in existing fields. The proximity of the coal bed methane development to the coal mines creates the potential for overlapping impacts to groundwater. Only about half of the oil and gas rights in the area of current coal bed methane development interest are federal, with the remainder being private and state. Coal bed methane wells are being drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. Federal approval of drilling on federal oil and gas leases in new project proposals north of Gillette is now proceeding; however, drilling on federal leases south of Gillette is currently awaiting completion of the EIS.

Other mineral development levels in Wyoming's PRB are currently less than predicted in the regional EISs. In the 1970s, significant uranium development was anticipated in southwestern Campbell County and northwestern Converse County, but this development never materialized because the price of uranium dropped in the early 1980s. There are two active *in situ* uranium operations in Converse and Johnson Counties and two additional *in situ* operations are proposed, but there are no active uranium mines or mills. The price of uranium has increased significantly in the past year. This could result in an increase in *in situ* uranium production and mining in Wyoming. However, the State Geologist does not expect another uranium boom.

Scoria is quarried primarily by coal mines, but also by a few excavation and construction firms, for use as road surfacing material. Bentonite is mined in parts of Wyoming's PRB, but not in Campbell or Converse Counties.

There are currently 17 active surface coal mines and two inactive mines in Campbell and northern Converse Counties, Wyoming. The inactive mines are the Clovis Point/East Gillette Mine and the Rocky Butte Mine. The Clovis Point/East Gillette

Mine was active from October 1986 through February 1988 and July 1994 through June 1996, in order to produce coal to meet federal diligent development requirements, which have been met at this time. The Rocky Butte Mine is still in the developmental stage. The mines are located just west of the outcrop of the thick Fort Union coal beds, where the coal is at the shallowest depth. The proposed North Rochelle LBA tract is situated in the middle of a nearly continuous corridor of six coal mines in southern Campbell and northern Converse Counties, Wyoming. This southern corridor is approximately 24 mi long and 8 mi wide (see Figure 3.1). Four maintenance leases including about 8,900 acres of federal coal (Jacobs Ranch, West Black Thunder, North Antelope/ Rochelle, and Antelope) have been issued to mines in this southern group since decertification, which has resulted in a 33% increase in the acres of leased federal coal in this group of mines since 1990 (Figure 4.1). BLM is currently processing three maintenance leases including approximately 9,500 acres of federal coal in this group of mines (North Rochelle, Thundercloud, and Powder River). If these three maintenance leases are issued, the increase since 1990 in acres of leased federal coal in the southern group of mines would be 68%. Issuance of the 1,440-acre North Rochelle LBA tract under the Proposed Action (approximately 1,482 acres under Alternative A) would represent an increase of about 4% in acreage of leased federal coal in the southern group of mines.

In May of 1996, Evergreen Enterprises submitted a lease application for federal coal located north of the Jacobs Ranch Mine (Figure 4.1). This lease application is for a new mine start rather than for maintenance on an existing mine. Kennecott also submitted an application in February, 1997 for federal coal adjacent to their existing operations at the Antelope Mine. BLM has not yet begun processing either of these new lease applications, which must still be reviewed by the PRRCT. There is also a potential for development of coal bed methane resources in a large area west of the coal mines (see Figure 3.5).

It is possible that construction may commence in 1997 on three projects in the vicinity of the North Rochelle LBA: 1) North Rochelle Mine facilities and rail loop (see Section 2.1.2); the ENCOAL Plant, which will be located within the rail loop at the North Rochelle Mine (see Figure 3.23); and the Two Elk power plant, which will be located east of the Black Thunder Mine.

The ENCOAL Plant will consist of three 5,500 ton/day parallel modules with an associated 240 megawatt (MW) co-generation power plant. The power plant boiler will burn coal fines from the plant, as well as some minor purge gas streams, and will produce enough electricity to run the ENCOAL Plant and the North Rochelle mine. Excess electricity will be available for external sale. ENCOAL has submitted a request for amendment to the North Rochelle mining permit to WDEQ/LQD, since the ENCOAL Plant will be located within the rail loop at the North Rochelle Mine. ENCOAL is also pursuing a surface land exchange with the USFS because the proposed location for the ENCOAL facilities is on USFS surface. In addition, ENCOAL has filed a Permit Amendment Application with the Industrial Siting Division of WDEQ for the proposed LFC plant, and an air quality permit application with WDEQ/AQD. Other permits that will be obtained include a wastewater permit from WDEQ, a permit for a quantity of water from the Wyoming State Engineer's Office, and various construction and waste disposal permits from the state and county.

Two Elk would be a coal-fired power plant located about 3 miles northeast of the North Rochelle LBA and would generate 250 Mw. The plant would burn low Btu "waste coal" and coal fines as well

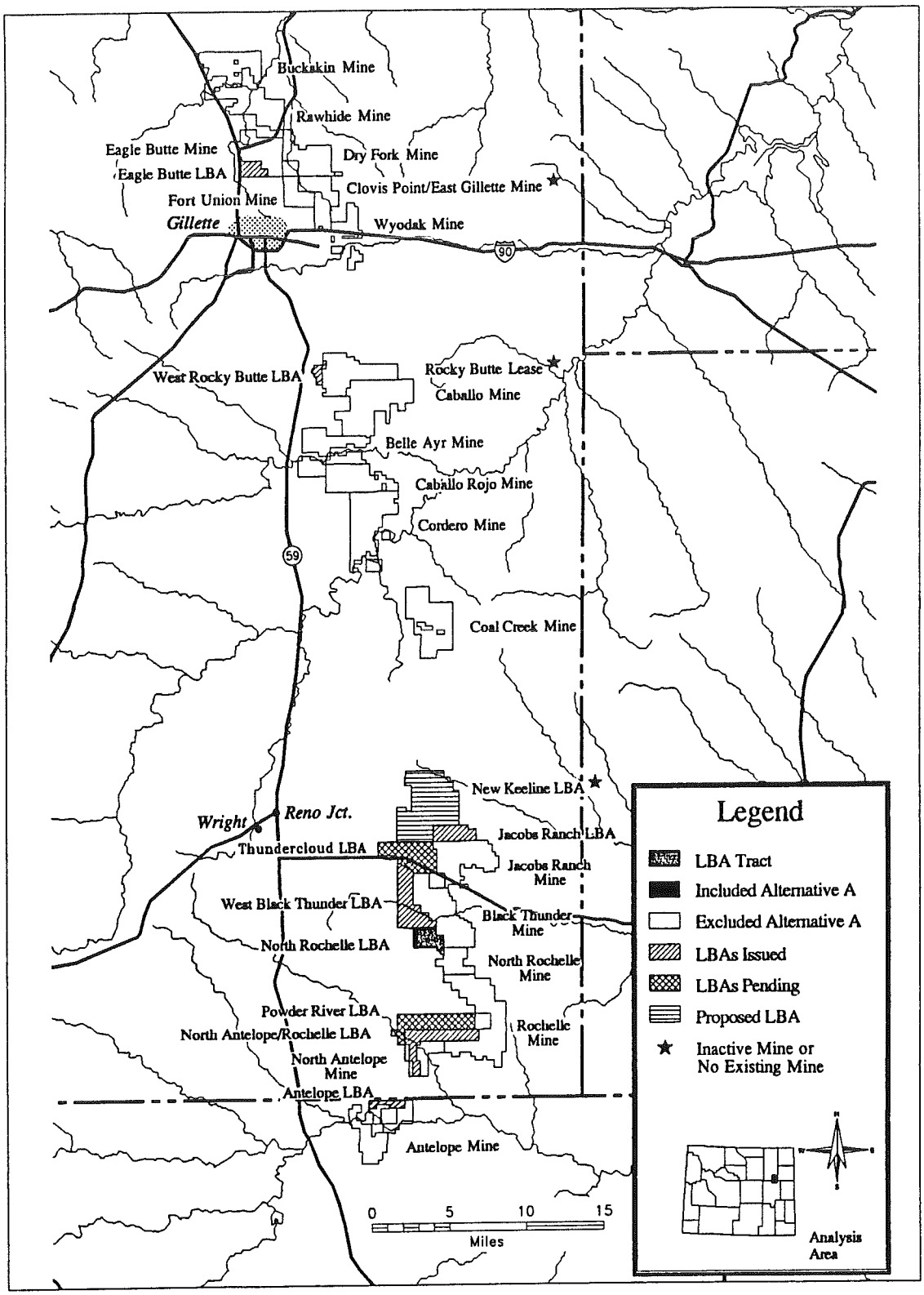

Figure 4.1 Existing and Proposed Federal Coal Leases.

as sub-bituminous coal in a pulverized coal boiler. This ability to burn low Btu waste coal and fines will allow the Two Elk plant to recover fuel values that might otherwise be lost, and thereby generate electric power more efficiently than existing coal-fired plants. Coal and waste coal will be transported from the mine to the power plant by direct truck haul on unpaved roads, and ash will be returned to the mine by enclosed, 4-wheel off-highway trucks. An application for an air quality Permit to Construct has been submitted to WDEQ but, as of April 1, 1997, has not been determined to be complete. No final decisions have been made as to how much water would be used, or where it would come from. Various scenarios for "wet" and "dry" operations are being evaluated at this time. Other permits that will be obtained include a wastewater permit from WDEQ and various construction and waste disposal permits from the state and county.

4.5.1 Topography and Physiography

Following surface coal mining and reclamation, topography will be modified in an elongated corridor east of and paralleling Highway 59 from just north of Gillette, Wyoming, south for about 75 mi. The topography in the PRB is characterized by relatively flat or rolling topography. After reclamation, these characteristics will be emphasized in the reclaimed area. Premining features that were more topographically unique (e.g., steeper hills and gullies, rock outcrops, etc.) will generally be smoothed out. The reduction in topographic diversity may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large and mining activities are, in general, not located in habitats defined as crucial. The overall flattening and lowering of the topography would result in increased infiltration of surface water and reduced peak flows from the drainages. These changes would not be significant because the streams typically flow from west to east across the area rather than north to south along the entire corridor. Therefore, only a very small part of each stream's drainage area would be disturbed (see Section 4.5.5). Mining the North Rochelle LBA tract would increase the area of disturbance in the southern group of mines by about 4%.

4.5.2 Geology and Minerals

The PRB coal region encompasses an area of about 20,000 mi^2 and contains nearly 240 billion tons of sub-bituminous coal resources (BLM 1979). Campbell County has a total surface area of about 4,760 mi^2, of which approximately 4% is within current mine permit boundaries. Coal mining in this area disturbs about 2,000 acres annually with about 1,850 acres reclaimed annually (BLM 1996g). Mining and reclamation rates are expected to continue to increase through the year 2015, but the balance between reclamation and mining should remain about the same. A group of six mines, including North Rochelle and the LBA tract, exist in the southern portion of the PRB. Production of coal in the southern mine group began in 1977 at the Black Thunder Mine. The current maximum permitted production rate is 152 million tons per year from the six mines. An estimated 3 billion tons of leased coal underlies these six mines, and additional unleased deeper coal reserves are present adjacent to these mines. Approximately 52,000 acres are contained in the existing permit boundaries and will be disturbed--42,000 acres by mining and 10,000 acres by roads, railroads, facilities, temporary stockpiles, and other mine-related activities and structures. This represents approximately 20% of the analysis area (see Figure 3.1). Under the Proposed Action, annual coal production from the North Rochelle Mine and the LBA tract would be 15 million tons (304.1 million tons for the life of the mine) and surface disturbance would be 5,080 acres.

In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves, but a large percentage of the shallowest (hence, the most economical to recover) reserves. Removal of this coal is an irreversible and irretrievable impact. PRB coal was used to

generate electricity for the public in 19 states and Canada in 1995. The members of the public in those states benefit from the low utility rates related to the price of coal, clean air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal. Locally, continued sale of PRB coal helps stabilize municipal, county, and state economies.

4.5.3 Soils

The six existing southern mines as permitted would disturb approximately 52,000 acres throughout their combined lives (they would disturb about 800 acres annually during active mining). Assuming 10 years from initial disturbance to reclamation of a parcel of land for use by domestic livestock, a total of approximately 14,000 acres (12% disturbed by North Rochelle and LBA tract) would be unsuitable for such use at any given time during active mining. However, the replaced topsoil would support a stable and productive vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland). The total area of disturbance for the ENCOAL Plant would include 73 acres inside the North Rochelle mine rail loop, 45 acres for topsoil stockpiles, and 29 acres for a reservoir. Portions of this disturbance would be areas common with the mine. Total disturbance for North Rochelle mine facilities would be approximately 250 acres. Environmental concerns would be addressed in the North Rochelle mine permit issued by WDEQ/LQD.

4.5.4 Air Quality

According to current regulatory standards by which air quality is defined, surface mining and coal bed methane development in the PRB has not resulted in impacts to air quality that have exceeded federal or state standards.

The nearest Class I area is located approximately 80 mi east of the analysis area at Wind Cave National Park in southwestern South Dakota, and no impacts on air quality in excess of that permitted by regulation are known to have occurred in this area due to PRB mines.

WDEQ follows a modeling protocol which includes all mine-generated air pollutants from all nearby mines (within 2 mi) to determine impacts to ambient air quality. Known as the "Mine A/Mine B" modeling procedure, this model evaluates the total impacts of a given mining operation, including those impacts from and on neighboring mines. The protocol is restricted as a matter of state regulatory policy to evaluation of the average annual impacts ($<50\ \mu g/m^3\ PM_{10}$). If the LBA tract is leased under the Proposed Action or Alternative A, WDEQ would require that ambient air quality modeling be conducted that would consider all proposed mining at the North Rochelle, Black Thunder, and Jacobs Ranch Mines. It would not include the Antelope, North Antelope, or Rochelle Mines because these operations are more than 2 mi from the LBA tract.

Figure 4.2 is from the Black Thunder Mine's 1994 cumulative air quality modeling analysis for their revised operating permit. It illustrates the relatively minimal off-site particulate impact of mining on ambient air quality. The figure shows the calculated PM_{10} concentrations from mining Jacobs Ranch (top, right), Black Thunder (middle), and North Rochelle (bottom, right), and the rapid decay of PM_{10} concentrations with increased distance from the mining areas. This modeling effort demonstrates that, given the total extraction of 87 million tons of coal in the impact area, the 50 $\mu g/m^3$ annual average PM_{10} standard would not be exceeded for the modeled year (2011).

Based on predictive models conducted for PRB mines, mining operations do not have significant off-site particulate pollution impacts, even when production and pollution from neighboring mines are considered. However, this prediction has been based on the assumptions that mining activities are sufficiently removed from the permit boundaries

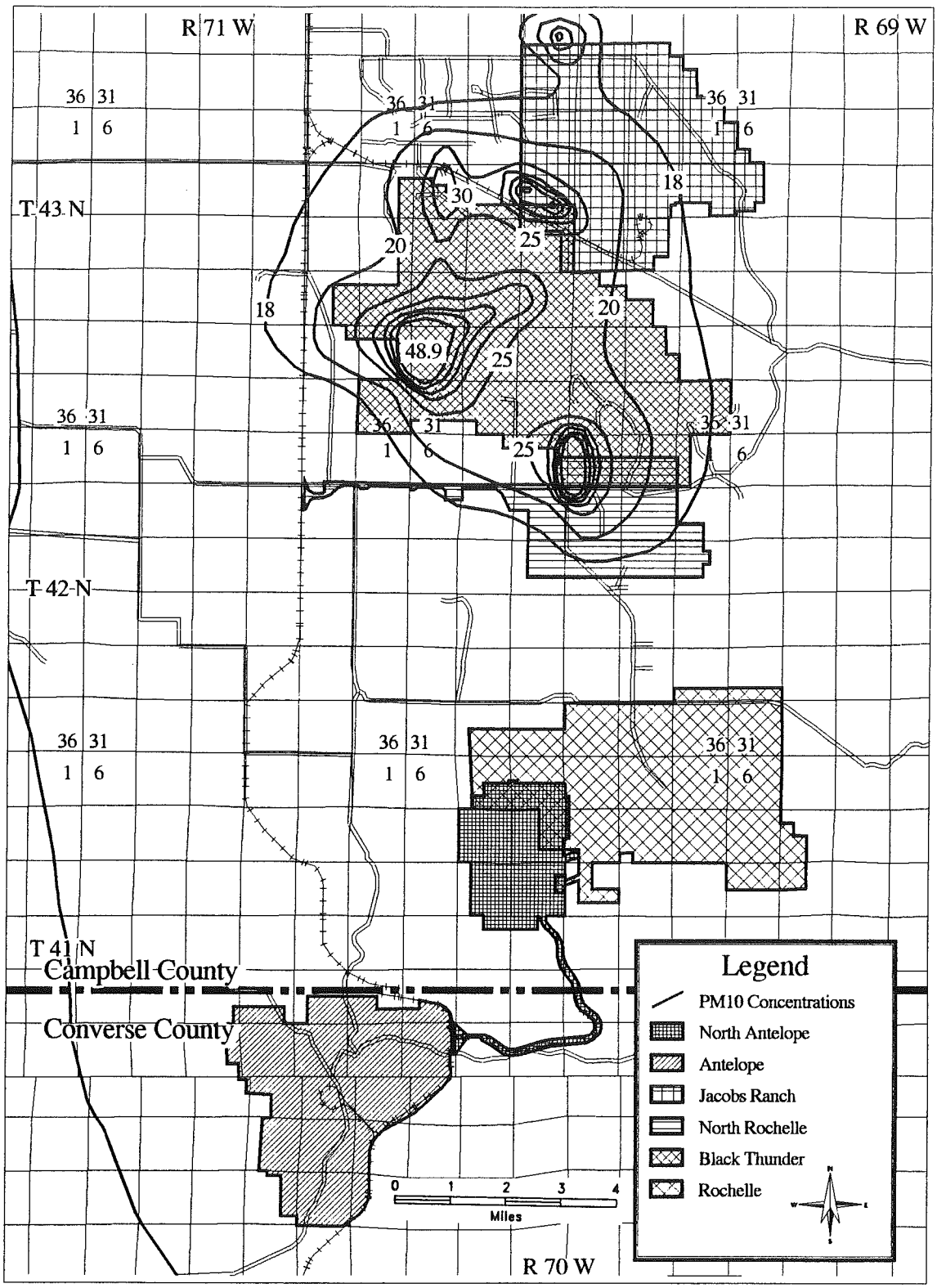

Figure 4.2 Modeled Annual Average PM_{10} Concentrations, Black Thunder Mine, Year 2011 (WDEQ 1994). Model Basis Includes 15 $\mu g/m^3$ Ambient PM_{10} Background Concentration.

and that neighboring mines are not actively mining in the immediate vicinity (within 0.6-2.5 mi). Previous modeling (BLM 1992a) has shown that incremental particulate pollution impacts decrease to insignificant levels (<1 $\mu g/m^3$ PM_{10} annual average) within 6 mi of active mining.

Dispersion modeling conducted by WDEQ shows that the maximum expected annual TSP concentration from the currently permitted North Rochelle, Black Thunder, and Jacobs Ranch Mines in the year 2000 would be around 55 $\mu g/m^3$ near North Rochelle's northern permit boundary (the year 2000 was modeled because the cumulative impact of the mines to air quality is expected to be greatest then). This is well within the state standard of 150 $\mu g/m^3$. Similar dispersion modeling will be required by WDEQ prior to mining the LBA tract.

An application for an air quality Permit to Construct for the ENCOAL Plant was submitted to WDEQ on November 20, 1996. Proposed emission limits include approximately 2,700 tons/year (TPY) of NO_x, 2,100 TPY of SO_2, 2,600 TPY of CO, 353 TPY of particulates, and 1,040 TPY of VOCs. The ENCOAL Plant will use Best Available Control Technology--the use of such technology is mandated by law. An air quality permit will not be issued unless the proposed facility is in compliance with air quality regulations. Modeling for air quality at the ENCOAL Plant must include mining at adjacent operating mines, including North Rochelle, which is presently permitted to mine at a maximum rate of 20 million tons per year.

Two Elk is anticipated to release 1,619 TPY of NO_x, 2,163 TPY of SO_2, 361 TPY of CO, 544 TPY of particulates, 43 TPY of non-methane total organic compounds, and 1.88 TPY of lead. An application for an air quality Permit to Construct has been submitted to WDEQ, but, as of April 1, 1997, has not been determined to be complete. Pollution controls for Two Elk will qualify as Best Available Control Technology, and Two Elk must be determined to be in compliance with applicable ambient air quality standards prior to issuance of an air quality permit. Modeling for Two Elk will consider mining at adjacent mines.

4.5.5 Water Resources

Surface Water

Changes in drainage patterns and surface disturbance are decreasing and will continue to decrease flows in most of the ephemeral and intermittent drainages exiting the mine sites. Development of coal bed methane resources in the area west of the mines would potentially increase surface flow in some drainages. The EIS being prepared to analyze the impacts of coal bed methane development south of Gillette (see Figure 3.5) estimates that a maximum average surface discharge of 20 gpm from 423 wells distributed to 80 discharge points would result in a maximum discharge of approximately 0.22 cfs. This increased flow represents 20-100% of the 2-year, 24-hour flood flows from 1 square mile. Since the coal bed methane-produced water is of relatively good quality, it is sometimes diverted by the surface landowner into reservoirs for livestock use, which would reduce the amount of coal bed methane-produced water that would ultimately reach the major channels.

The USGS has predicted that major streams in the PRB will exhibit increased runoff ranging from 0.4% in the Cheyenne River to 4.3% in Coal Creek due to cumulative disturbance as a result of existing surface coal mining (Martin et al. 1988). However, the USGS considered mining the existing North Rochelle lease at a rate of only 8 million tons per year. The increased mining rate at the North Rochelle Mine (15 million tons/year), the increased mining rates at adjacent mines, and the addition of previous and pending LBAs, including the North Rochelle tract, would increase this runoff figure. Coal bed methane development was also not considered in that analysis, but depending on the level of development, runoff could increase substantially in some of the area's streams. However, to date, water produced by

coal bed methane wells has typically been used for stock or other purposes by the surface landowners in the area of development. Drainage from all six southern mines combines in the Cheyenne River where Black Thunder Creek enters. The drainage area of the Cheyenne River basin at this point is approximately 2,430 mi^2. The entire area of disturbance from these six mines as currently permitted would impact approximately 2% of the drainage basin of the Cheyenne River, and this disturbance would occur over about 50 years. Planned LBAs and the New Keeline Mine would raise this disturbance acreage to roughly 3% of the Cheyenne River Drainage Basin.

Sediment yield should not increase significantly in area streams even with the addition of mining the pending and planned LBA tracts and the potential for coal bed methane development because, as discussed in Section 4.1.5, state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. The potential for cumulative adverse impacts to the Cheyenne River drainage is also minimal because it is typically dry for a substantial portion of the year.

Groundwater

The southern group of mines would use about 1,736 acre-ft of water per year for drinking, sanitation, washing equipment, and dust control. This water would come from deep wells and from seepage into the mine pits. The southern mines will pump an estimated 1,400 acre-ft per year from the pits and dewatering wells. There are currently no coal bed methane wells adjacent to the southern group of mines; however, in 1995, approximately 1,900 acre-ft of water was produced from 133 coal bed methane wells located about 20 mi northwest of this group of mines. This is about 14 acre-ft per well per year. As a result of pit dewatering and coal bed methane production, water levels in the coal could be lowered over as much as 800 mi^2, and water levels in the overburden could be lowered in as much as 200 mi^2. Impacts to wells completed in the overburden and coal aquifers could range from a slight lowering of the water level to completely drying up the well. Increased consumption from water supply wells in aquifers below the coal will lower water levels in those aquifers. However, drawdown in these deeper aquifers will not occur over wide areas because few wells are completed in these aquifers, the wells are generally more than a mile apart, and the sandstones in these aquifers are generally discontinuous and have limited areal extent. The water levels will gradually recover, as reclamation proceeds and coal bed methane reserves are depleted. Coal companies are required by state and federal law to replace any water sources that are interrupted, discontinued, or diminished. North of Gillette, a coal bed methane operator and local landowners have developed a water well mitigation agreement that can be used on a case-by-case basis as development proceeds. This same agreement is being used to some extent by operators in the assessment area.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB to provide hydrologic information necessary to perform required assessments. The resulting description of the cumulative effects of all current and anticipated mining (as of 1987) on the hydrologic system of the eastern PRB is presented in the *Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*, which is generally referred to as CHIA (Martin et al. 1988). This report details the potential cumulative groundwater impacts of surface coal mining in the area is incorporated by reference into this EIS.

The CHIA is currently being updated. As a result of the cooperative agreement between WDEQ, OSM, BLM, the State Engineer's Office, the University of Wyoming, and the Wyoming State Geological Survey, a water well database has been developed using data from the mines' monitoring wells. As a pilot project, this database is being used with a drawdown model, which was also developed under the cooperative agreement,

to predict cumulative drawdown as a result of currently approved mining at the North Rochelle, Black Thunder, and Jacobs Ranch mines. The results of this model analysis are not yet available.

In order for mining of the LBA tract to proceed, it must be permitted by WDEQ/LQD. As part of this process, the applicant must assess the probable hydrologic consequences of mining the LBA tract and the WDEQ/LQD must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside the permit area.

The cumulative hydrologic impacts associated with mining the LBA tract will be reevaluated by the WDEQ/LQD based on site-specific, current data before the tract can be mined. Each time a mine permit application or a revision is made, the WDEQ/LQD assesses cumulative hydrologic impacts based on site-specific information, which is targeted to determine the cumulative impacts of the applicant's mine or changes in the applicant's mining plan in combination with other mines or activities in the area.

Assessing cumulative groundwater impacts in this EIS will rely on a comparison of the predictions in the 1988 CHIA with monitoring information gathered since publication of the CHIA. Monitoring programs, which are required by WDEQ/LQD and administered by the mining companies, have been established in the Eastern PRB. Each mine is required to monitor groundwater levels in the coal itself as well as in shallower aquifers in the area surrounding their operations. There are also requirements for drilling monitoring wells in the backfill areas of the mines to record water level recovery.

The Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group which was formed in 1980, assembles and reports the annual hydrologic monitoring data that is collected by the coal mining companies operating in the eastern PRB of Wyoming. Members of GAGMO include most of the companies with operating or proposed mines in this area, WDEQ, Wyoming State Engineer's Office, BLM, USGS, and OSM.

Each year, GAGMO contracts with an independent firm to publish the results of the monitoring for that year. In 1991, GAGMO published a 10-year report, and in 1996 a 15-year report. The 15-year report summarized the water monitoring data collected from 1980 to 1995 in the Wyoming Powder River Basin (Hydro-Engineering 1996).

The major groundwater issues that have been identified related to surface coal mining are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with spoil material;
- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;
- the effects of the use of water from the subcoal Fort Union Formation by the mines; and
- changes in water quality as a result of mining.

The impacts of large-scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

The effects of replacing the coal aquifer and overburden with a spoil aquifer is the first major groundwater concern. The following discussion of recharge, movement, and discharge of water in the spoil aquifer is excerpted from the CHIA (Martin et al. 1988:24):

> Postmining recharge, movement and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the

same as in the Wasatch aquifer and the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

GAGMO data from 1990 to 1994 verifies that recharge is continuing in the backfill (Hydro-Engineering 1991a, 1992, 1993, 1994, 1995). Wells that have been drilled to monitor water levels in backfill indicate that recharge is occurring in reclaimed areas of the mines. The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill, and compare them with the 1980 water levels, as estimated from the 1980 coal water level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 89% of the backfill wells reported for that year. Over the past 3 years, water was present in approximately 92% of the backfill wells.

The cumulative size of the backfill area in the PRB would be increased by mining of the recently issued leases and the currently proposed LBA tracts. However, since reclamation is initiated concurrently with mining, and the monitoring data demonstrate that recharge of the backfill is occurring, it is not anticipated that additional significant impacts would occur as a result of any of these leasing actions. In the case of the North Rochelle Mine, mining began in 1990 and reclamation has begun, but a significant change in the cumulative impacts is not expected as a result of issuing the 1,440-acre North Rochelle LBA tract.

Clinker, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, is believed to be the major recharge source for the spoil aquifer, just as it is for the coal. However, not all clinker is saturated. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the spoil aquifer is not being disturbed by current mining. Clinker does not occur on the LBA tract.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 10-year and 15-year reports are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. These wells range from 9 ft to 420 ft in depth. The changes in water levels in the coal seams after 10 years and 15 years of monitoring are shown in Figures 4.3 and 4.4, respectively. These maps, which are taken from the GAGMO 10- and 15-year reports, show the area where actual drawdown in the coal seam is greater than 5 ft, in comparison with the predicted worst-case 5-ft drawdown derived from groundwater modeling done by the mines. Determination of the 5-ft drawdown contour is required as part of WDEQ/LQD's mine permitting process. Figure 4.4 shows that the actual drawdowns are within the mines' predicted worst-case drawdowns except in Area 2, which includes the Caballo, Belle Ayr, Caballo Rojo, and Cordero mines. Similarly, the actual 5-ft drawdown levels are within the CHIA's predicted cumulative drawdown level except in the group of mines in Area 2. This is due to overlapping coal bed methane and coal mining impacts. For the southern group of mines, the actual 15-year drawdown lies within the cumulative drawdown predicted by CHIA.

The 1988 CHIA predicted the approximate area of 5 ft or more water level decline in the Wyodak coal aquifer that would result from "all anticipated coal mining." "All anticipated coal mining" as referred to in the CHIA includes 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines were considered in the CHIA analysis (Martin et al.

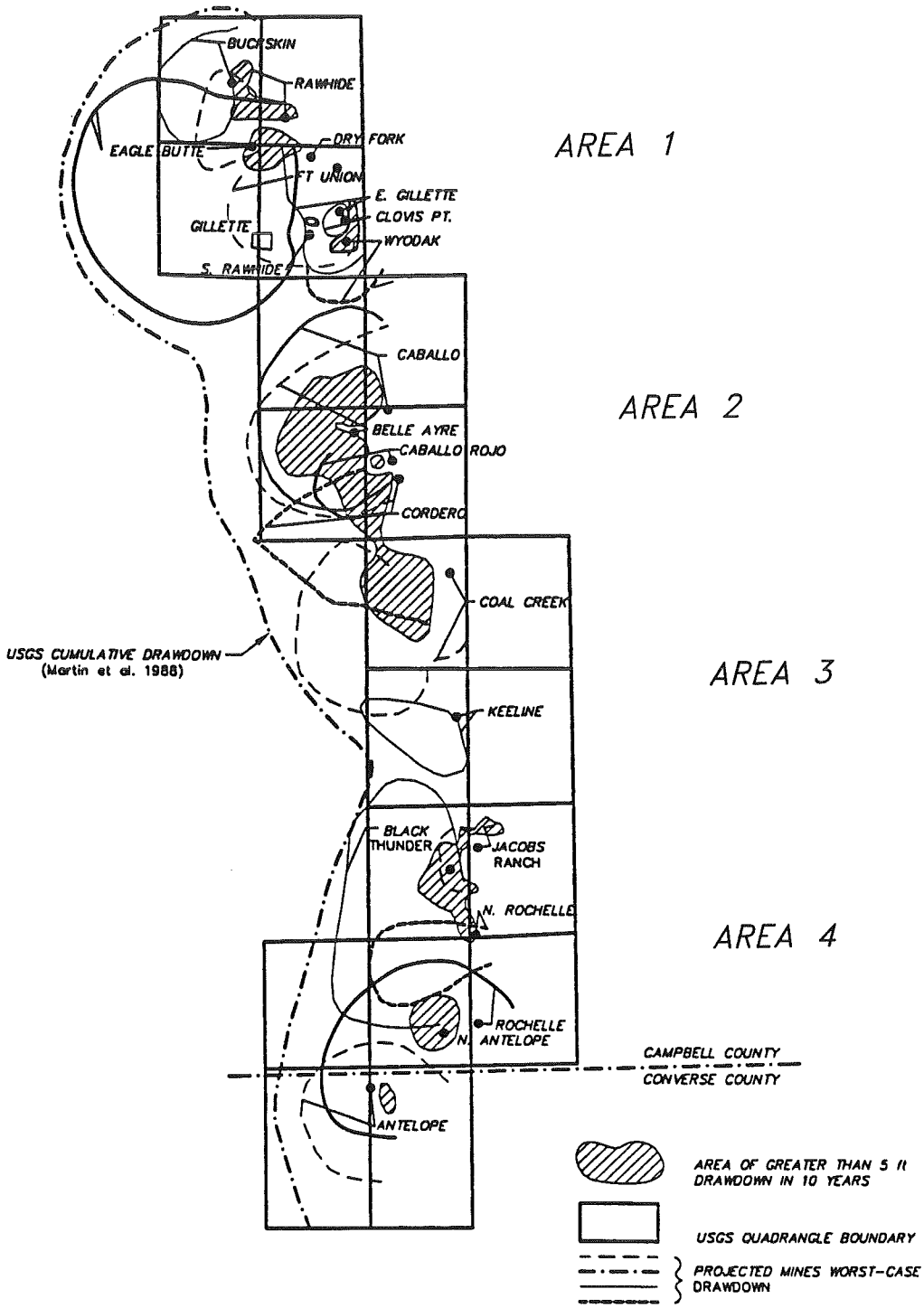

Figure 4.3 Comparison Between the 1990 Cumulative Drawdowns and the Mines' Worst Case and the USGS-predicted Cumulative Drawdowns (Modified from Hydro-Engineering [1991b]).

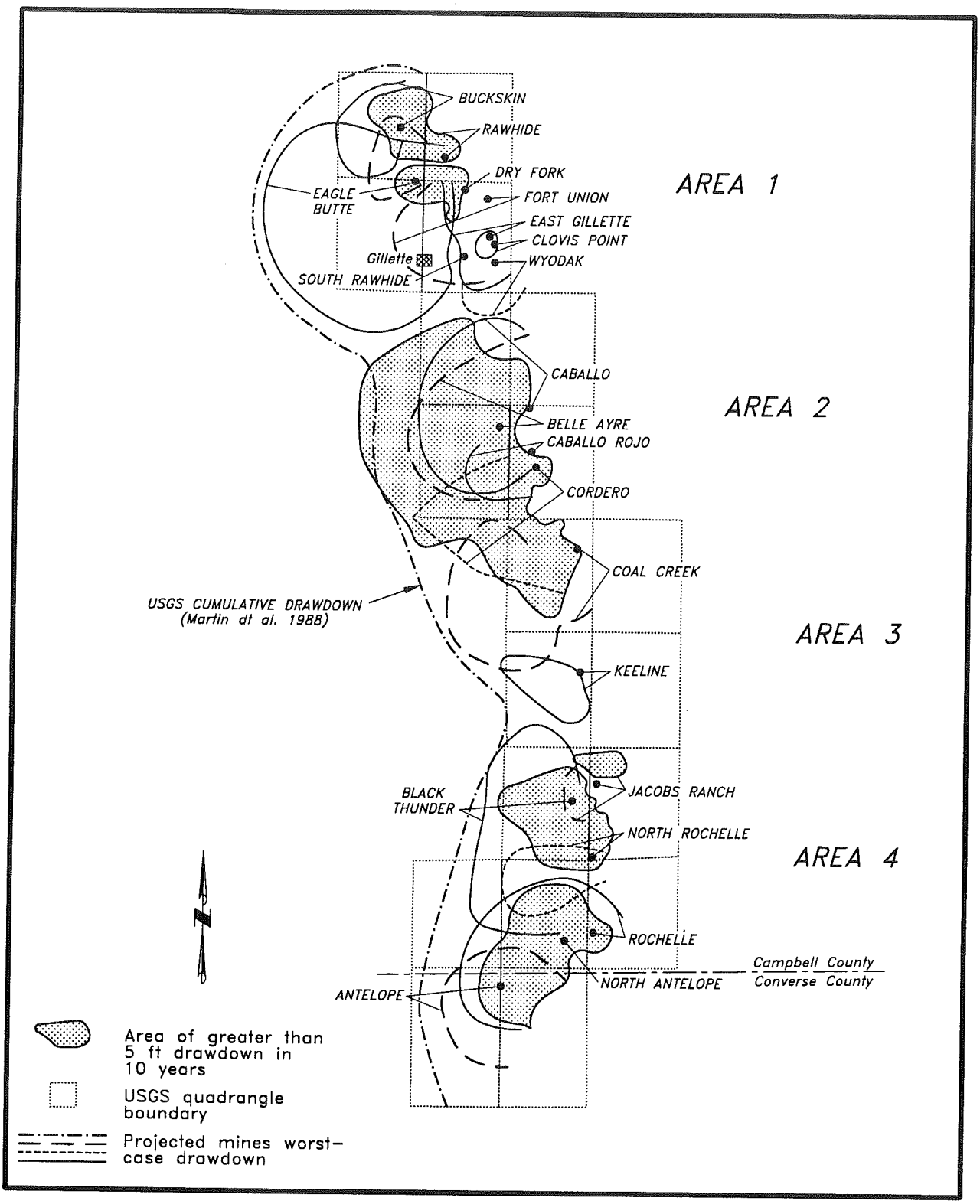

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Figure 4.4 Comparison Between the 1995 Cumulative Drawdowns and the Mines' Worst Case and the USGS-predicted Cumulative Drawdowns (Modified from Hydro-Engineering [1996]).

1988), but coal bed methane development was not anticipated at the time that analysis was prepared. The CHIA pilot study in preparation at this time does consider potential coal bed methane development in its analysis. The 1988 CHIA assumes that water supply wells completed in the coal may be affected as far away as 8 mi from mine pits as a result of the anticipated coal mining, but the effects at that distance were assumed to be minimal.

Wells in the Wasatch Formation were considered to be impacted by drawdown only if they were within 2,000 ft of a mine pit (Martin et al. 1988:29). Drawdown extends farther in the coal than in the shallower aquifers (Wasatch Formation, alluvium, and clinker) because the coal is a confined aquifer that is really extensive. The area in which the Wasatch Formation and alluvium experience a 5-ft drawdown would be smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous and of limited areal extent. Clinker is extensive east of the mines and aquifer pump tests at high rates in the clinker have shown very little drawdown because of its very high transmissivity.

Based on the above assumptions, the CHIA estimated that about 3,000 wells in the area would be subject to impact by current and anticipated mining in Wyoming's PRB. Of these, about 1,200 wells are outside the actual mine areas (i.e., will not be removed by mining). About 1,000 of these supply water for domestic or livestock uses, and about 200 supply water for other uses. The remaining 1,800 wells are used by coal mining companies: about 1,700 wells are monitor wells only, and the other 100 are used for water supply and/or dewatering at mine sites. All wells listed in Appendix E which are completed in the coal or shallower aquifers and are located within the USGS-predicted cumulative drawdown (see Figure 4.3) may potentially be subject to impact (i.e., water level decline).

Of the 1,200 water supply wells subject to impact in the CHIA, about 580 are completed in the Wasatch Aquifer, about 100 in the Wyodak Coal Aquifer, and about 280 in strata below the coal. There is no completion data available for the remainder of these wells (about 240).

The additional groundwater impacts that would be expected as a result of extending mining into the LBAs issued or proposed to date would be to extend the drawdown areas in the area surrounding the proposed new leases. The LBAs, in general, would not bring mining operations substantially closer to one another, so there would not be any substantial increase in overlapping, or cumulative, drawdown area between mines. In the case of the North Rochelle LBA, mining operations may occur closer to Black Thunder operations for a longer period of time. The actual drawdown contours for the mines in the southern group with issued or proposed LBAs that would maintain their current operations are within the cumulative drawdown anticipated in the CHIA, and monitoring indicates that recharge has been occurring and is continuing to occur in the backfill in that area (GAGMO). Therefore, additional significant impacts in water level drawdown related to coal mining for the maintenance leases, including the North Rochelle LBA, are not anticipated. However, dewatering activities associated with reasonably foreseeable coal bed methane development has the potential to extend the drawdown in the coal aquifer over a larger part of the southern PRB.

Potential water level decline in the subcoal Fort Union Formation is the third major groundwater issue. According to the Wyoming State Engineer's records (1991), 14 mines held permits for 42 wells between 400 ft and 10,000 ft deep. The zone of completion of these wells was not specified, and not all of the wells were producing (for example, three of the permits were held by an inactive mine, and one of the wells permitted by the Black Thunder Mine has not been used since 1984).

Water level declines in the Tullock have been documented in the Gillette area. According to

Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water level declines in the subcoal Fort Union wells occur within 1 mi of the pumped wells (Crist 1991; Martin et al. 1988). The mine facilities in the PRB are separated by a distance of 1 mi or more, so little interference between mine supply wells would be expected.

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM commissioned a cumulative impact study of the subcoal Fort Union Formation to study the effects of mine facility wells on this aquifer unit (OSM 1984). Conclusions from all these studies are similar and may be summarized as follows.

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.

- In the Gillette area, water levels in this aquifer are probably declining because the city of Gillette and several subdivisions are utilizing water from the formation (Crist 1991). (Note: Gillette is using this water as a back-up source at this time.)

- Because large saturated thicknesses are available in this aquifer unit, generally 500 ft or more, a drawdown of 100 to 200 ft in the vicinity of a pumped well would not dewater the aquifer.

The mines adjacent to the proposed maintenance LBAs all have permits from the State Engineer for deeper wells. Extending the life of these mines with the LBAs would result in additional water being withdrawn from the Tullock. The additional water withdrawals would not be expected to extend the area of water level drawdown over a significantly larger area due to the discontinuous nature of the sands in the Tullock Aquifer.

According to the State Engineer's Office, the only permitted wells drilled below 1,000 ft in a 100 mi^2 area surrounding Wright are four wells permitted to the City of Wright. As discussed above, most of the water level declines in the subcoal Fort Union wells occur within 1 mi of pumped wells. The North Rochelle LBA, about 12 mi southeast of Wright, would not contribute significantly to any cumulative impact on the water supply for that town.

The fourth issue of concern with groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the spoil aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be larger in water from spoil aquifers than in water from either the Wasatch overburden or the coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly when the spoil materials were situated above the saturated zone in the premining environment. On the basis of studies done in North Dakota, it was estimated that at least one pore volume of water must leach the spoil before the dissolved solids concentration in the water would be similar to the premining dissolved solids concentration (USGS 1987). One pore volume of water is the volume of water which would be required to fill the pore space or open space in the spoils following reclamation. The time required for one pore volume of water to pass through the spoil aquifer is greater than the time required for the postmining groundwater system to re-establish equilibrium. According to the CHIA, estimates of the time required to reestablish equilibrium range

from tens to hundreds of years (Martin et al. 1988).

Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in spoil aquifers at 10 mines indicated that the quality of water in the spoil will, in general, meet state standards for use for livestock when recharge occurs (Martin et al. 1988). The major current use of water from the aquifers being replaced by the spoils (the Wasatch and Wyodak-Anderson Coal Aquifers) is for livestock because these aquifers are typically high in dissolved solids in their premining state (Martin et al. 1988).

According to monitoring data published by GAGMO (Hydro-Engineering 1991a, 1991b, 1992, 1993, 1994, 1995), average TDS values in backfill wells have ranged from 400 to 25,000 mg/l. Of the backfill wells reported in the 1993 annual GAGMO report (Hydro-Engineering 1993), TDS in 71% were less than 5,000 mg/L, TDS in 25% were between 5,000 and 10,000 mg/L, and TDS in 4% were above 10,000 mg/L. This data supports the conclusion that water from the spoils would generally be acceptable for its current use, which is livestock watering, before and after equilibrium is established. The incremental effect of all recent leasing on groundwater quality would be to increase the total volume of spoil and, thus, the time to reestablish equilibrium.

The ENCOAL Plant will apply to WDEQ/WQD for a wastewater permit in 1998, and did apply to the Wyoming State Engineer's Office for a quantity of water available decision in January 1997. The request is currently pending. They anticipate using approximately 800 gpm of groundwater and surface water, although final plans for the water supply have not been finalized. Two Elk has not yet decided how much water they will use or where it will come from. They are evaluating various scenarios for "wet" and "dry" operations at the present time.

4.5.6 Alluvial Valley Floors

No cumulative impacts to alluvial valley floors are expected to occur as a result of leasing and subsequent mining of the North Rochelle LBA tract.

4.5.7 Wetlands

No cumulative impacts to wetlands are expected to occur as a result of leasing and subsequent mining of the North Rochelle LBA tract.

4.5.8 Vegetation

Most of the land that is being or will be disturbed is grassland, sagebrush shrubland, or rough breaks and is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB, comprising 92% of the land in Campbell and Converse Counties. A small amount of dryland farming would be disrupted by mining. At the completion of mining, it is anticipated that all disturbed land will be reclaimed for grazing and wildlife habitat in the form of mixed grass prairie and sagebrush shrubland. Some of the minor community types, such as those occurring on scoria and rough breaks, will not be restored to premining levels.

In any given year, approximately 6,000 acres of land disturbed by mining activities at the six existing southern surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of the six southern mines (as now permitted), a total of about 52,000 acres would be disturbed. This is the total acreage contained in the mine permit boundaries, however, only about 35,500 acres are currently included in federal coal leases. If the North Rochelle LBA tract is leased, the area of disturbance in the southern group of mines would be increased by about 1,900 acres, or 4% (see Table 2.4). Almost all of this acreage would be native rangeland.

Several impacts to vegetation will occur as a result of existing, already-approved operations at these six mines. Most of the surface disturbance would occur in two vegetation types: mixed grass prairie (25%) and Wyoming big sagebrush (40%). All six mines plan to restore these two types to approximately their premining areal extent. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach premining levels. The big sagebrush component provides important wildlife habitat (particularly for mule deer, pronghorn, and sage grouse). The reduction in acreage of big sagebrush vegetation type would, therefore, reduce the carrying capacity of the reclaimed lands for mule deer, pronghorn, and sage grouse populations.

Although some of the less extensive native vegetation types (e.g., graminoid/forb riparian and forest-dominated riparian) would be restored during reclamation, most of the minor types (e.g., greasewood fans) would not. Consequently, community and species diversities would initially be lower on reclaimed lands. The shrub and tree components would take the longest to be restored to premining conditions. Replacement of mature trees with seedlings or saplings would, over the short term, reduce potential nesting sites for raptors and other bird species. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species reinvasion and shrub establishment on reclaimed lands should largely restore the species and community diversity on these lands to premining levels. The dryland crop and irrigated crop vegetation types would be completely restored following mining.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all eight vegetation types originally found in the area. However, the shrub component may be substantially reduced in areal extent. Shrubs are relatively unproductive for livestock, but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the LBA tract, are fairly typical for this region of eastern Wyoming.

4.5.9 Wildlife

Cumulative impacts to most wildlife will increase as additional habitat is disturbed. Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years due, in part, to surface-disturbing activities. Coal mining and gas exploration and development have been identified as potential contributors to the decline in their breeding habitat. Therefore, no surface occupancy and disturbance, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. These restrictions and stipulations have helped to protect important raptor and grouse habitat. Erection of transmission poles and planting of trees on reclaimed land will gradually replace raptor nesting and perching sites. There is little crucial habitat for waterfowl or fish on the mine sites. Small- and medium-sized animals will rapidly move back into the areas once reclamation is completed.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) have also impacted wildlife habitat in the area. The consequences of these developments have proven beneficial to some species and detrimental to others. Fencing has aided in segregation and distribution of livestock grazing, but sheep-tight woven wire fence has severely restricted antelope movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become overgrazed. The developed reservoirs provide waterfowl, fish, and amphibian habitat. Vegetation manipulations have included the removal or reduction of native grass-shrublands and replacement with cultivated crops (mainly alfalfa/grass hay), as well as a general reduction of shrubs (mainly sagebrush) in favor of grass. These changes have increased spring and summer

habitat for grazing animals, but have also reduced the important shrub component that is critical for winter range, thus reducing overwinter survival for big game and sage grouse. The reduction in sagebrush has been directly blamed for the downward trend in the sage grouse populations.

Significant cumulative impacts to pronghorn resulting from already-approved concentrated mining and related disturbance in the southern group of mines have been predicted as additional habitat is disturbed and barriers are created to seasonal and daily movements. Significant cumulative secondary impacts also have been predicted because of the increased human population resulting in more poaching, increased vehicle/pronghorn collisions, and increased disturbance, in general. Issuance of the LBA tract would contribute to these cumulative impacts on pronghorn. Since there is little use of the LBA tract by other big game species (mule deer, elk, and white-tailed deer), cumulative impacts to these species would be insignificant.

The area of active mining in the southern group of mines lacks relatively large numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country a few miles east of active mining in the Rochelle Hills, and past, present, and future mining is not impacting this raptor concentration. The creation of artificial raptor nest sites and raptor perches may ultimately enhance raptor populations in the mined area. On the other hand, where power poles border roads, perched raptors may continue to be illegally shot and continued road kills of scavenging eagles may result. Any influx of people into previously undisturbed land may also result in increased disturbance of nesting and fledgling raptors.

Cumulative impacts to waterfowl from already-approved mining, as well as the proposed LBA tract, would be insignificant because most of these birds are transient and most of the ponds are ephemeral. In addition, the more permanent impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation areas would provide areas for waterfowl during mining.

Direct habitat disturbance from already-approved mining, as well as the LBA tract, should not significantly affect regional sage grouse populations because few vital sage grouse wintering areas or leks have been, or are planned to be, disturbed. However, noise related to the mining activity could indirectly impact sage grouse reproductive success. Sage grouse leks close to active mining could be abandoned if mining-related noise elevates the existing ambient noise levels. Surface coal mining activity is known to contribute to a drop in male sage grouse attendance at leks close to active mining, and over time, this can alter the distribution of breeding grouse (Remington and Braun 1991). Because sage grouse populations throughout Wyoming have been declining over the past several years, this impact could be significant to the local population when evaluated with the cumulative impacts of all energy-related development occurring in the area.

The existing and proposed mines in the southern PRB would cumulatively cause a reduction in habitat for other mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. As a result, these species should respond quickly and invade suitable reclaimed lands as reclamation proceeds.

Cumulative impacts on fish habitat and populations would be minimal because local drainages generally have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish, and the larger impoundments and streams in the area which have fish populations would be restored following mining.

Additional discussions of cumulative impacts to wildlife from coal development and industrialization of the eastern PRB are discussed in BLM regional EISs for the area (BLM 1974,

1979, 1981, 1984b), and these documents are incorporated by reference into this EIS. The impacts predicted in these documents have generally not been exceeded.

Cumulative impacts to USFS Region 2 Sensitive Species will be evaluated in a Biological Evaluation specific to this group when the lessee files an application for a surface mining permit, prior to mine development.

4.5.10 Threatened, Endangered, and Candidate Species

The USFWS has evaluated potential impacts to T&E species on the existing permit areas and have, in general, determined that no adverse impacts would occur to protected species.

OSM prepared a biological assessment of the eastern PRB in 1982 which concluded that mining operations might affect bald eagles. Following requirements of the Endangered Species Act, OSM requested a biological opinion from the USFWS, which was expanded to include a commentary on black-footed ferrets and peregrine falcons (personal communication, March 4, 1982, with John G. Wood, USFWS Acting Area Director). The opinion stated that cumulative impacts would not be adverse for bald eagles or peregrines but might be adverse for ferrets. As a result, OSM requires ferret surveys within 1 year of surface disturbance, either as a commitment in the mine plan or as a permit stipulation. USFWS requirements also mandate surveys for Ute lady's tresses and mountain plovers in potential habitat prior to surface-disturbing activities. Any potential impacts to T&E species would then be mitigated. Thus, no significant cumulative impact to T&E species are projected, with or without the LBA tract.

4.5.11 Land Use and Recreation

In addition to reducing livestock grazing and wildlife habitat, surface coal mining also disrupts oil and gas development and limits access to public lands, although the majority of the surface area being mined is privately owned.

Cumulative impacts resulting from energy extraction in the PRB include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly pronghorn and mule deer), and loss of recreational access to public lands (particularly for hunters).

There are no recreation facilities, wilderness areas, etc., in the immediate vicinity of the existing southern group of mines, and the majority of the land is seldom used by the public except for dispersed recreation (e.g., hunting), off-road vehicles, and sightseeing. Hunting and other public access is generally limited inside of the mine permit areas for safety reasons. However, approximately 80% of this land surface is private and access is controlled by the landowner.

The increased human presence associated with the cumulative energy development in the PRB has likely increased levels of legal and illegal hunting. Conversely, the mines in the area have become refuges for big game animals during hunting seasons since they are often closed to hunting. Energy development-related secondary impacts to wildlife have and will continue to result from human population growth. Energy development has been the primary cause of human influx into the eastern PRB. Mining the LBA tract will not increase employment levels, but will increase the years of production at the existing mine.

The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced. This conflict between decreased habitat availability and increased recreational demand has had (or may have) several impacts: demand for hunting licenses may increase to the point that a lower success in drawing particular licenses will occur; hunting and fishing, in general, may become less

enjoyable due to more limited success and overcrowding; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and will continue to result in disturbance of wildlife during sensitive wintering or reproductive periods.

Campbell County's public recreation facilities are some of the most extensively developed in the Rocky Mountain Region, and use by young, recreation-oriented residents is high. The relatively strong financial position of the county recreation program appears to assure future recreation opportunities for residents regardless of the development of the LBA tract or any other specific mine. Converse County's recreational facilities are not as advanced.

4.5.12 Cultural Resources

In most cases, treatment of eligible sites is confined to those that would be directly impacted, while those that may be indirectly impacted receive little or no consideration unless a direct mine-associated effect can be established. The high population levels associated with coal development coupled with increased access to remote areas would result in increased vandalism both on and off mine property. Lands in which coal is strip-minable (shallow overburden) may contribute to the permanent unintentional destruction of segments of the archeological record.

A majority of the known cultural resource sites in the PRB have been recorded as a result of studies at existing and proposed coal mines. An average density estimate of 8.5 sites per mi^2 (640 acres) can be made based on inventories at existing mines in the area, and approximately 50% of these sites are typically eligible for the NRHP. Approximately 550 cultural resource sites will be impacted by already-approved mines, with an estimated 140 of these sites being eligible for nomination to the NRHP. Clearly, a number of significant sites, or sites eligible for nomination to the NRHP, have been or will be impacted by coal mining operations within the PRB. Ground disturbance, the major impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigation measures such as stabilization, restoration, or moving of buildings may cause adverse impacts to context, in-place values, and overall integrity. Additionally, loss of sites through mitigation can constitute an adverse impact by eliminating the site from the regional database and/or affecting its future research potential.

Beneficial results or impacts can also be expected from coal development. Valuable data are collected during cultural resource surveys. Data that would otherwise not be collected until some time in the future, or lost in the interim, are made available for study. Mitigation also results in the collection and preservation of data that would otherwise be lost.

4.5.13 Native American Concerns and Trust Resource Issues

No cumulative impacts to Native American traditional values or religious sites are expected to occur as a result of leasing and subsequent mining of the North Rochelle LBA tract.

4.5.14 Paleontological Resources

Impacts to paleontological resources as a result of the already-approved cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and will result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific

examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.5.15 Visual Resources

A principal visual impact in this area is the visibility of mine pits and facility areas. However, anyone likely to see these facilities would either be passing through the area or visiting it on mine-related business. Except from the air, the pits or the facilities are not visible from more than a few miles away. Issuance of the LBA tract would not change this impact.

After mining, the reclaimed slopes might appear somewhat smoother than premining slopes and there would be fewer gullies than at present. Even so, the landscape of the reclaimed mines would look very much like undisturbed landscape in the area.

4.5.16 Noise

Existing land uses within the PRB (e.g., mining, livestock grazing, oil and gas production, transportation, recreation) contribute to noise levels, but wind is generally the primary noise source. Mining on the LBA tract would not increase the number of noise-producing facilities within the PRB, but it would lengthen the time this particular noise source would exist and may augment the level of impacts to other resources (e.g., increased exposure of wildlife to noise impact, increased noise impacts to recreational users). Mining-related noise is generally masked by the wind at short distances, so cumulative overlap of noise impacts between mines is not likely.

Recreational users and grazing lessees utilizing lands surrounding active mining areas do hear mining-related noise; but this has not been reported to cause a significant impact. As stated above, wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to noise conditions associated with active coal mining.

Cumulative increases in noise from trains serving the PRB mines have caused substantial increases (more than 5 dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no significant adverse impacts have been reported as a result.

4.5.17 Transportation Facilities

No new cumulative impacts to transportation facilities are expected to occur as a result of leasing and subsequent mining of the North Rochelle LBA tract. The planned transportation facilities for North Rochelle will be built with or without the LBA tract, and employment levels will not change with the LBA tract, but the length of employment will be extended. North Rochelle traffic levels will be maintained for a longer period.

Construction workers at the ENCOAL Plant would be bused from Gillette and Wright to the project site, and the busing program may be extended to other communities if warranted and cost effective.

4.5.18 Socioeconomics

Because of all the energy-related development that has been occurring in and around Campbell County during the past 30 years, socioeconomic impacts are a major concern. Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Even though each of these basic industries are important, the extractive mineral industry has long been a vital part of Wyoming's economy. Many Wyoming communities depend on the mineral industry for much of their economic well being. The assessed valuation on total minerals produced in 1990 accounted for 91% of the state's total assessed valuation. Because most minerals are taxed a percentage of their assessed valuation, this makes the mineral industry a significant revenue base for

both local and state government in Wyoming (Department of Commerce Economic and Community Development Division, Energy Section 1992).

Coal production in the PRB is projected to reach a record high of 319 million tons in the year 2002 before declining to about 295 million tons in 2005 (BLM 1996a). Coal prices are projected to remain relatively constant throughout this period (BLM 1996e). By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and would support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

The North Rochelle mine is scheduled for construction beginning in the second quarter of 1997, and this would coincide with construction of the ENCOAL Plant. The North Rochelle construction peak (226 construction workers plus an operations workforce of 36) would occur in the fourth quarter of 1997, as the ENCOAL Plant would begin to build towards its projected third quarter 1998 peak of 1,560 workers (Planning Information Corporation 1997). Two Elk would begin in the third quarter of 1997 and, as currently planned, would have a peak workforce of 752 in the second quarter of 1998--one quarter before the ENCOAL Plant peak. If the three projects proceed as currently planned, the combined peak construction workforce would total an estimated 2,431 workers in the second quarter of 1998. The cumulative operations workforce for the ENCOAL Plant and North Rochelle would total an estimated 222 workers when both projects are operational. The Two Elk operations workforce estimates are not yet available. The percent of local hires for the three projects would be 22%, or a peak total of 569 local hires, whereas an estimated 1,862 non-local workers would be required during the peak construction quarter. Non-local population increases would peak at 2,900 in the second quarter of 1998, and most would reside in Campbell County. Increases in school enrollment would peak at an estimated 304 children in the fourth quarter of 1998. Cumulative housing demand in communities would peak in the second quarter of 1998 at 1,186 units, not including a proposed construction camp in Wright proposed by the ENCOAL Plant to house 500 single-status workers. Housing supply would be adequate to satisfy this demand.

If all three projects proceed as planned, cumulative construction-related sales and use tax revenues to local governments would total an estimated $12.5 million and the State of Wyoming would receive an estimated $17 million. Impact assistance payments would be $6.5-$7 million, and the incremental annual ad valorem tax revenues to the appropriate local government taxing entities could exceed $8 million in current dollars once the ENCOAL Plant and North Rochelle mine are operational, assuming current mill levies and excluding depreciation.

4.6 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The North Rochelle Mine would be able to produce coal at the anticipated production level for 26 years under the Proposed Action or Alternative A. As the coal is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would have approximately the original contour, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the LBA tract provides would be lost during mining and reclamation. During mining of the LBA tract, there would be a loss of native vegetation on 1,440 acres (Proposed Action) or 1,482 acres (Alternative A) with an accompanying disturbance of wildlife habitat and grazing land. However, it is estimated that the mine site would be returned to equivalent or better forage production capacity for domestic livestock within about 40 years after initial disturbance. Long-term

productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb antelope habitat, but the LBA tract would be suitable for antelope following successful reclamation. Reduced topographic diversity would make the area permanently less suitable for mule deer. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance and re-establishment of mature sagebrush habitat--which is crucial for antelope and sage grouse--could take even longer.

There would be a deterioration of the groundwater quality in the lease area because of mining; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. During mining, depth to groundwater would increase as much as 5 mi away from the pit in the coal aquifer. The water levels in the coal aquifer should return to premining levels at some distant time (possibly 70-100 years) after mining has ceased. There would be a temporary depletion of the quantity of groundwater when the pit intercepts the aquifer and the water is pumped out; however, there should be no permanent depletion after mining.

Mining operations and associated activities would degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, the long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists, there should be no long-term adverse impacts on recreation.

Both the Proposed Action and Alternative A would extend the life of the mine for 11 years, thereby enhancing the long-term economy of the region.

4.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The major commitment of resources would be the mining and consumption of 144 million tons (Proposed Action) or 149 million tons (Alternative A) of coal to be used for electrical power generation. Coal bed methane associated with this coal would also be irreversibly and irretrievably lost. It is estimated that 1-2% of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 1,440 acres (Proposed Action) or 1,482 acres (Alternative A) would be irreversibly changed. Soil formation processes, although continuing, would be irreversibly altered during mining-related activities. Newly formed soil material would be unlike that in the natural landscape.

Loss of life may conceivably occur due to the mining operation and vehicular and train traffic. On the basis of strip-mine accident rates in Wyoming as determined by the Mine Safety and Health Administration, fatal accidents occur at the rate of 0.02 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 2.76 per 200,000 man-hours worked. This potential loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine site would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological values would be irreversible and irretrievable.