

4 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action or Alternative 1 (the No-Action Alternative). The effect or impact a consequence will have on the quality of the human environment is also discussed. For instance, the consequence of an action may be to greatly increase the number of roads in an area. If the number of roads in an area is increased, opportunities for road-based recreation would be increased but opportunities for primitive recreational activities and solitude would be decreased. Evaluation of the impact would depend on an individual's (or a group's) preferred use of that area.

Portions of the LBA tract that are adjacent to existing leases at both the Belle Ayr and Caballo Mines will be disturbed under the current mining plans in order to recover the coal in the existing leases. If the Belle Ayr 2000 Tract as applied for is leased to an existing mine as a maintenance lease, the net area of surface disturbance would increase by 118 acres over the No Action Alternative. Table 4-1 shows the area to be mined and disturbance area for the existing Belle Ayr Mine (which represents the No-Action Alternative), and how the mine area would change under the Proposed Action.

Surface mining and reclamation have been ongoing in the Powder River Basin for over two decades. During this time, effective mining and reclamation technologies have been developed and continue to be refined. Mining and reclamation operations are regulated under SMCRA and Wyoming statutes. 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 operations comply with the performance standards of the DOI-approved Wyoming program. BLM attaches special stipulations to all coal leases (Appendix B), and there are a number of federal and state permit approvals that are required in order to conduct surface mining operations (Appendix A). The regulations are designed to ensure that surface coal mining impacts are mitigated. The impact assessment that follows considers all measures required by federal and state regulatory authorities as part of the Proposed Action and Alternatives.

Section 4.1 analyzes the direct and indirect impacts associated with leasing and mining the LBA tract under the Proposed Action. Section 4.2 presents the probable environmental consequences of the No-Action Alternative (Alternative 1, 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 No Action Alternative) and any additional mitigation and monitoring that may be required. Section 4.4 summarizes the residual effects of the Proposed Action. 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. The cumulative impact analysis includes a discussion of other projects

Table 4-1
Comparison of Existing and Proposed Disturbance Area and Mining Operations

	No Action Alternative (Existing Permit Area)	Added by Proposed Action
Federal Lease Area (Acres)	4,983.55	243.61
Increase in Lease Area	---	5%
Estimated Total Disturbance Area (Acres) ¹	8,441	118 ²
Increase in Estimated Disturbance Area	---	1.4%
Estimated Recoverable Coal Remaining as of 1/00 (Million Tons)	326.2	29
Increase in Estimated Recoverable Coal as of 1/00 (Percent)	---	9%
Notes: ¹	Total Disturbance Area = area to be mined + area disturbed for Mine facilities, access roads, haul roads, railroad facilities, stockpiles, etc.	
²	The 118 acres represent net acres of disturbance in addition to currently approved mining operations at the Belle Ayr and Caballo Mines.	

that are in progress or are proposed in the area of the LBA tract and that would occur independently of leasing the LBA tracts. These projects include: 1) construction and operation of the Two Elk power plant, which has been proposed east of the Black Thunder Mine; 2) construction of Wygen #1 power plant which has been proposed at the Wyodak mine site; 3) the construction of the proposed DM&E Railroad line, and 4) the ongoing development of CBM resources west of the area of active coal mining. 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 Action.

4.1 DIRECT AND INDIRECT IMPACTS OF ACTION ALTERNATIVES

Impacts can range from beneficial to adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation), or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27). Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificant following completion of reclamation.

4.1.1 TOPOGRAPHY AND PHYSIOGRAPHY

Surface coal mining would permanently alter the topography of the Belle Ayr 2000 Tract. Topsoil would be removed from the land and stockpiled or placed directly on recontoured areas. Overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the Belle Ayr 2000 Tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Bishop Road would be relocated. A direct, permanent impact would be topographic moderation. The restored land surface would contain gentler more uniform slopes, but the basic drainage network would be restored. Following reclamation, the average surface elevation would be approximately 30 - 40 feet lower due to removal of the coal. (The removal of the coal would be partially offset by the swelling that occurs when the overburden is blasted and removed.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the permit revision process.

Direct adverse impacts resulting from topographic moderation could include a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. A potential indirect impact may be a long-term reduction in big game carrying capacity. A direct beneficial impact of the lower and flatter terrain would

be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (see Section 4.1.3). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater. The approximate original drainage pattern would be restored. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

These impacts are occurring on the existing adjacent Belle Ayr Mine and Caballo Mine coal leases as coal is mined and mined-out areas are reclaimed. Portions of the Belle Ayr 2000 Tract have been or will be disturbed during already permitted mining of the adjacent leases. Under the Proposed Action, the area that would be permanently topographically changed would increase as shown in Table 4-1.

4.1.2 GEOLOGY AND MINERALS

Within the Belle Ayr 2000 Tract, mining would remove overburden and approximately 72 feet of coal on about 244 acres under the Proposed Action. The replaced overburden would be a relatively homogeneous and partially recompacted mixture (compared to the premining layered overburden). Approximately 29 million tons of coal would be mined under the Proposed Action.

The geology from the base of the coal to the land surface would be subject to permanent change on the Belle Ayr 2000 Tract under the Proposed 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 physical characteristics of the replaced overburden would also be altered.

Drilling and sampling programs are conducted by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in re-establishing vegetation or that may affect groundwater quality due to high concentrations of certain constituents such as selenium or adverse pH levels). As part of the mine permitting process, each mine operator develops a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. Each mine operator also develops backfill monitoring plans as part of the mine permitting process to evaluate the quality of the replaced overburden. These plans are in place for the existing Jacobs Ranch Mine and would be developed for the North Jacobs Ranch LBA Tract if it is leased.

Development of other minerals potentially present on the Belle Ayr 2000 Tract could not occur during mining; however, development of some of these resources could occur following mining. CBM resources that are not recovered prior to mining would be

irretrievably lost. The extent of the CBM resources in the tract is not known, however, Belle Ayr is currently conducting mining operations in close proximity to the Belle Ayr 2000 Tract on their adjacent existing lease. There are currently no producing oil or gas wells on the Belle Ayr 2000 Tract. One conventional oil exploration well was drilled on the Belle Ayr 2000 Tract, but it was a dry hole which never produced. There are four permitted CBM well locations on the Belle Ayr 2000 Tract, but these wells have not been drilled. As the surface owner, RAG Wyoming Land Company, Inc. has negotiated agreements with the oil and gas operator that would allow removal of any coal bed methane wells that are completed prior to mining.

4.1.3 SOILS

Under the currently approved mining and reclamation plan, Belle Ayr Mine is permitted to disturb the soil resources over the entire Belle Ayr 2000 Tract for the purpose of mining their existing adjacent coal leases. The Caballo Mine is permitted to disturb land on the east side of the Belle Ayr 2000 Tract for the purpose of mining their existing adjacent coal leases. Under the Proposed Action, approximately 118 additional acres would be disturbed for layback and overstrip to mine the Belle Ayr 2000 Tract. The reclaimed soils would have different physical, biological, and chemical properties than the premining soils. They would be more uniform in type, thickness, and texture. Average topsoil thickness would be a fairly uniform 25 inches. Soil chemistry and soil nutrient distribution would be more uniform, and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on the reclaimed land. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses (wildlife habitat, agricultural land, and rangeland).

Specific impacts to soil resources would include an increase in the near-surface bulk density of the reclaimed soil resources. As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation would potentially decrease runoff, which would tend to offset this potential increase in runoff due to decreased soil infiltration rates. The decrease in soil infiltration rates would not be permanent because revegetation and natural weathering action would form new soil structure in the reclaimed soils, and infiltration rates would gradually return to premining levels.

Direct biological impacts to soil resources would include a short-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement.

Sediment control structures are in place or would be built to trap eroded soil, revegetation would reduce wind erosion, and soil or overburden materials containing

potentially harmful chemical constituents (such as selenium) would be specially handled. These measures are required by state regulations and are considered part of the Proposed Action.

4.1.4 AIR QUALITY

The Belle Ayr Mine and the Caballo Mine both maintain active Air Quality permits with the WDEQ/AQD, and are in compliance with that permit. Belle Ayr's WDEQ/AQD Permit MD-397 was approved September 13, 1999 and allows the Belle Ayr Mine to produce up to 45 mmtpy of coal. All mines are required to implement dust control practices including bag houses, covered transfer points, sprinkling of water and addition of EPA-approved chemicals to haul roads, limiting disturbance areas, and contemporaneous reclamation, and to maintain air quality monitoring networks. The Belle Ayr Mine's dust monitoring network consists of three TSP stations and two PM₁₀ stations. Belle Ayr's annual monitoring data for the past three years and coal and overburden production are listed in Table 4-2.

As is shown in the table, the annual arithmetic average dust emissions from the Belle Ayr Mine were well below the permitted average of 50 $\mu\text{g}/\text{m}^3$ at the monitoring stations with coal production rates nearing 23 mmtpy. Under the Proposed Action, RAG proposes to maintain production levels at approximately 14.9 mmtpy, and no modification to the WDEQ/AQD permit would be necessary. Based only on coal production volumes, under the Proposed Action, dust emissions would be reduced. The Belle Ayr 2000 Tract has thinner overburden than the existing Belle Ayr leases which would result in a reduction of dust emissions due to less blasting and overburden handling. Additionally, the Belle Ayr 2000 Tract is located closer to the coal handling facilities at the Belle Ayr Mine than the coal in the existing Belle Ayr leases, resulting in shorter haul distances. If the Belle Ayr 2000 Tract is leased as applied for to the applicant, the life of Belle Ayr Mine would be extended by two to three years under the Proposed Action.

A surface coal mine is not a named facility under Wyoming's PSD regulations and therefore is not considered a "major emitting facility" unless it has the potential to emit 250 tons or more of any regulated pollutant. Fugitive dust emissions are not considered in determining potential to emit. Since the Belle Ayr Mine is a surface coal mine and its allowable point source PM₁₀ and truck dumping TSP emission rates are estimated to be 69.0 tpy at its maximum production rate of 45 mmtpy, the mine is not considered a major emitting facility and an increment analysis under PSD regulations is not required.

Blasting is not a major source of particulate emissions at Powder River Basin mines (PM₁₀ emissions inventories show that overburden and coal blasting comprise less than one percent of the total emissions). Overburden removal, wind erosion, and coal haul roads generate the majority of dust.

Table 4-2
Belle Ayr Mine
Historic Production and Air Quality Data

Year	Belle Ayr Production		Annual Arithmetic Average TSP Concentration, ($\mu\text{g}/\text{m}^3$)				Annual Arithmetic Average PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)		
	Coal (MMTPY)	Overburden (MMBCY)	BA-1	BA-3	BA-4	Ave	BA-5N	BA-5S	Ave
	1997	22.8	60.9	41	21	54	39	15	15
1998	22.7	59.0	35	13	43	30	14	14	14
1999	17.9	57.3	52	23	54	43	13	12	13

As discussed in Section 3.5, there is growing public concern over the releases of NO_x from blasting, which can form a low-lying orange cloud that can be transported by wind. At a WMA sponsored symposium held in Gillette to discuss this issue on January 12 and 13, 2000, experts from industry and government agencies discussed the issue and possible causes and solutions. Some of the possible solutions being explored are improved blasting techniques or explosives and reduced powder factors. A more detailed analysis of the gases that form the clouds is also planned, which may increase understanding of the causes of the problem and suggest possible solutions. Under the Proposed Action, NO_x emissions would not be expected to increase over the existing emissions at the Belle Ayr Mine. The truck and shovel operation would continue to be used, and larger cast blasting typically associated with dragline mines would not be employed. Currently, blasts at Belle Ayr Mine are small by Powder River Basin standards, rarely exceeding 200,000 pounds. Production of NO_x clouds at Belle Ayr Mine has been rare, and they have tended to be small and dissipate rapidly. NO_x clouds have caused concern in areas that are near residences and more populated areas. The closest residence to the Belle Ayr 2000 Tract is located more than 1.5 miles away, and prevailing winds do not blow in that direction.

The Belle Ayr Mine has existing safety procedures for blasting and potential NO_x clouds that involve restricting public access using perimeter fencing and security patrols. All WDEQ/LQD requirements for blasting are strictly adhered to including blasting signs, public notice and warnings prior to shots. Under current procedures for shots close to Bishop Road, the Belle Ayr Mine uses a wind sock to determine wind direction prior to each blast. If the wind direction is toward the road, the shot is delayed or postponed until conditions are favorable. The exception to this would be if safety conditions prevail, for example if a shot is loaded and lightning threatens. In this case, traffic is stopped at points distant enough to keep the traveling public safe from the blast and potential NO_x emissions. Prior to implementing this plan, RAG reviewed it with the

Campbell County Commissioners and published it in the newspaper. Because of the remote location of the Belle Ayr 2000 Tract, and the safety precautions in effect at the adjacent mines, NO_x emissions are not anticipated to be a public safety concern as a result of mining the Belle Ayr 2000 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 operations 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 maintained. As with current operations, dust would be visible to the public due to mining near the current Bishop Road, which would have to be relocated to recover all of the coal in the Belle Ayr 2000 Tract.

The nearest Class I area is Wind Cave National Park in southwestern South Dakota, which is located approximately 100 miles east and slightly south of the tract. Mines are not considered to be major emitting facilities in accordance with Section 24 of WDEQ/AQD Rules and Regulations. Therefore, mines are not required by the State of Wyoming to evaluate their impacts on that Class I area. However, BLM evaluates such issues for leasing. For this EA, regional air quality impacts are evaluated in the cumulative impacts section (Section 4.5).

4.1.5 WATER RESOURCES

4.1.5.1 GROUNDWATER

Mining the Belle Ayr 2000 Tract would contribute to the impact to groundwater quantity caused by surface coal mining in two ways: 1) Mining would remove the coal aquifers and any overburden aquifers on the tract and replace them with unconsolidated spoils; and 2) water levels in the coal and overburden aquifers adjacent to the mine would continue to be depressed as a result of seepage and dewatering from the open cut on the Belle Ayr 2000 Tract. The area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

Mining would remove the overburden and coal aquifers on the tract, which would be replaced by an aquifer composed of backfill. After reclamation, the backfill aquifer would eventually resaturate and the discharge to Caballo Creek would be similar to premining discharges from the coal and overburden aquifers, but not for many years.

The probable hydrologic consequences of mining at Belle Ayr are discussed at length in Section 3.5.8 of the WDEQ/LQD Permit #214. Monitoring programs used to assess the probable hydrologic consequences of mining by detecting changes in the hydrologic balance are discussed in Sections 2.6 and 5.3.

The Belle Ayr 2000 Tract is surrounded on three sides by existing coal leases. Groundwater impacts of mining the existing leases at the adjacent Belle Ayr and Caballo Mines have been estimated for the coal and overburden aquifers. The Belle Ayr Mine used the USGS groundwater flow model MODFLOW (McDonald and Harbaugh, 1988) to estimate drawdowns in the area of their existing leases. Drawdowns for the Belle Ayr Mine alone, as well as cumulative mining-induced drawdowns including Belle Ayr and adjacent mines were simulated. Drawdown contour maps were constructed and have been used to predict the probable hydrologic consequences of the Belle Ayr Mine. Appendix 3.5-7 of WDEQ/LQD Permit #214 describes the development and application of the groundwater model for the Belle Ayr Mine.

At the end of 1998, the predicted five-foot coal drawdown contour extends approximately three miles north, two miles west, and two and one-half miles south of the Belle Ayr Mine permit area. Life of mine predicted drawdowns in the Wyodak-Anderson coal aquifer are shown on Figure 4-1. At the end of mining, the model-predicted five-foot drawdown contour extends beyond the permit boundary approximately five miles to the north, four miles to the west, and a maximum of 5.7 miles to the south.

Model-predicted drawdowns in the overburden aquifer at the end of 1998 are essentially contained within the Belle Ayr Mine permit boundary. The maximum extent of overburden drawdown is predicted to occur at the end of mining in 2023. At its maximum extent, the five-foot drawdown contour is approximately 1.3 miles west of the Belle Ayr permit boundary.

4.1.5.2 SURFACE WATER

Draw No. 2, an ephemeral channel, is the only native surface water body on the Belle Ayr 2000 Tract. Surface water impacts resulting from the Proposed Action would be limited to infiltration/runoff rates.

The loss of soil structure would act to increase runoff rates on 118 additional acres of disturbance after reclamation. The general decrease in average slope in reclaimed areas, discussed in Section 4.1.1, would tend to counteract the potential for an increase in runoff. Soil structure would gradually reform over time, and vegetation (after successful reclamation) would provide erosion protection from raindrop impact, retard surface flows and control runoff at approximately premining levels.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the additional disturbance required to mine the Belle Ayr 2000 Tract would approximate premining conditions.

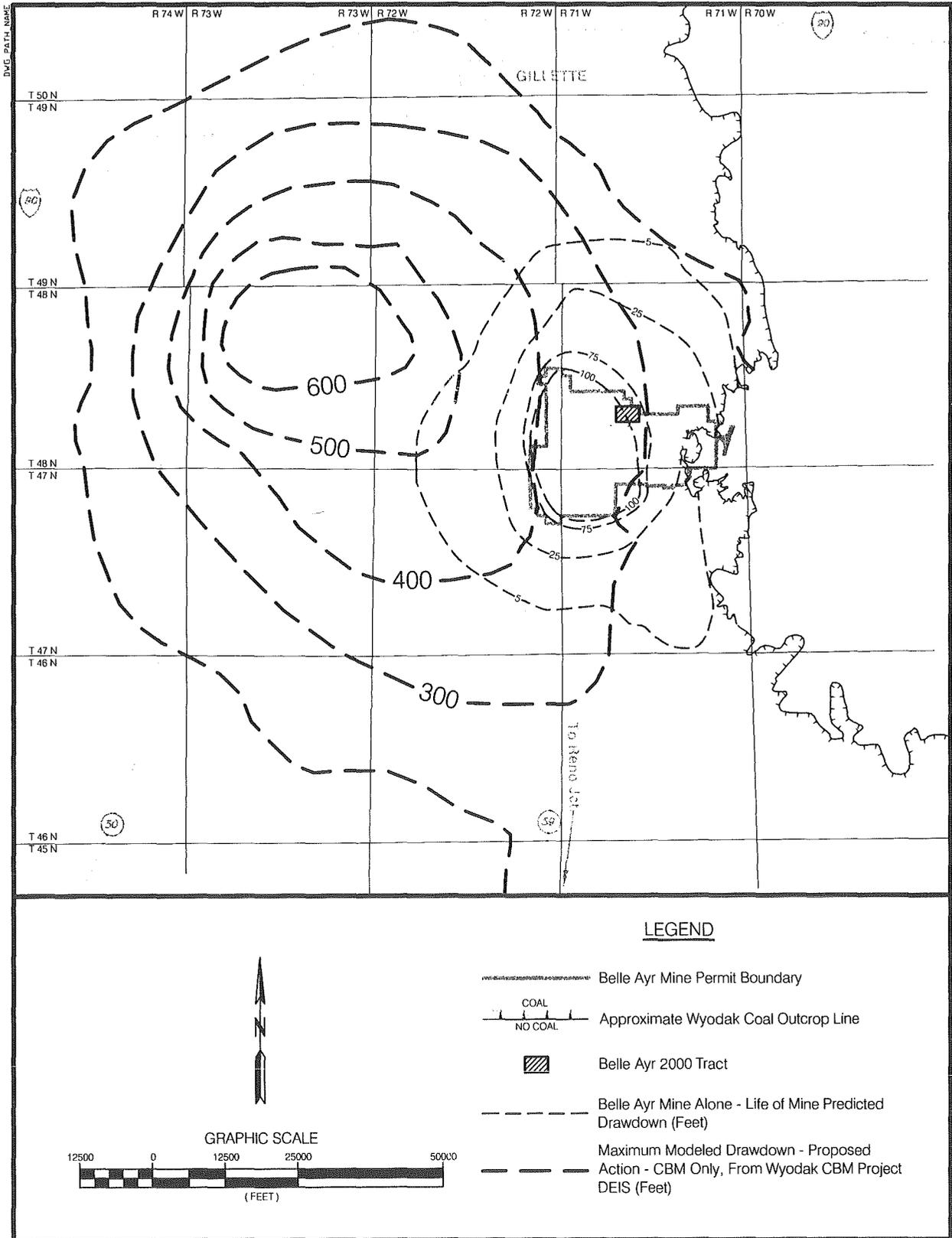


Figure 4 - 1. Life of Mine Predicted Drawdown with Maximum Modeled CBM Contours Superimposed.

4.1.6 ALLUVIAL VALLEY FLOORS

No alluvial valley floors are present on the 118 acres of additional disturbance area required to mine the Belle Ayr 2000 Tract, therefore, no direct, indirect, or cumulative impacts are anticipated as a result of mining the LBA Tract.

4.1.7 WETLANDS

No wetlands are present on the 118 acres of additional disturbance area required to mine the Belle Ayr 2000 Tract, therefore, no direct, indirect, or cumulative impacts are anticipated as a result of mining the LBA Tract.

4.1.8 VEGETATION

As stated previously, a portion of the Belle Ayr 2000 Tract will be disturbed by the Belle Ayr Mine and the Caballo Mine as a result of mining the existing leases. Under the Proposed Action, an additional 118 acres will be stripped of topsoil and vegetation. The premining vegetation cover at the Belle Ayr 2000 Tract is comprised of agricultural crested wheatgrass or hay. Short-term impacts associated with this vegetation removal would include increased soil erosion and habitat loss for grassland wildlife and livestock. However, grassland-dependent wildlife species and livestock would benefit from the increased grass diversity, cover and production of the post-mining vegetation that would more closely match native vegetation than the existing crested wheatgrass.

Reclamation, including revegetation of these lands, would occur contemporaneously, i.e., reclamation would begin once an area is mined. Estimates of the time that would elapse from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. No new life-of-mine facilities would be located on the LBA tract under the Proposed Action, in which the LBA tract would be mined as an extension of an existing mine. Wildlife use of the area would not be restricted throughout the operations.

Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (approved by WDEQ). The majority of the approved species are native to the Belle Ayr 2000 Tract area. Initially, the reclaimed land would be dominated by upland grassland vegetation which would have greater composition and diversity than the premining agricultural vegetation. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land

Under the Proposed Action, RAG would complete mining in the Belle Ayr 2000 Tract within three years. Reclamation should be completed on the LBA tract within four years following mining. Areas occupied by topsoil stockpiles or other mining related features would be reclaimed when the features are removed.

The reclamation plans for the existing mines include steps to control invasion by weedy (invasive nonnative) plant species. The reclamation plans for the LBA Tract would also include steps to control invasion from such species.

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

The potential impacts to threatened and endangered plant species are addressed in Appendix C.

4.1.9 WILDLIFE

Local wildlife populations are directly and indirectly impacted by mining. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. The indirect impacts are longer term and typically include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

These impacts are currently occurring on the surrounding existing leases as mining occurs. If the LBA tract is leased under the Proposed Action, the area of mining disturbance would be extended by 118 acres and mining operations would be extended by two to three years at the Belle Ayr Mine.

Under the Proposed Action, big game would be displaced from portions of the LBA tract to adjacent ranges during mining. Pronghorn would be most affected; however there is no crucial pronghorn habitat on the LBA tract. Mule deer and white-tailed deer would not be substantially impacted, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas. The displacement would be

incremental, occurring over several years and allowing for gradual changes in big game distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. The Belle Ayr 2000 Tract is surrounded on three sides by existing leases, however, and big game have continued to occupy areas adjacent to and within active mine operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

Road kills related to mine traffic would be extended in the area by up to three years.

After mining and reclamation, alterations in vegetative cover could cause an increase in carrying capacity and diversity from the preexisting crested wheatgrass pastureland or haymeadow. Changes in topography are not expected to be significant as the pre-mining topography is gently rolling. Sagebrush would gradually become established on the reclaimed land.

Medium-sized mammals (such as rabbits, coyotes, and foxes) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality. However, these animals would quickly rebound on reclaimed areas, as forage developed and small mammal prey species recolonized. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many retreat into burrows when disturbed. Therefore, populations of such prey animals as voles and mice would decline during mining. However, these animals have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly.

No sage grouse have been observed on or near the LBA tract during annual monitoring surveys for the adjacent Belle Ayr Mine, and there is no sage grouse habitat on the existing crested wheatgrass pastureland. Thus, mining is not expected to impact sage grouse populations. The nearest sage grouse lek to the Belle Ayr 2000 Tract is located more than three miles to the south and west.

Regional raptor populations will not be deleteriously impacted by mining the LBA tract. However, individual birds or pairs may be impacted. As noted in Section 3.10.4, no raptor nests are located on the Belle Ayr 2000 Tract. Mining activity could cause

raptors to abandon nests proximate to disturbance. The Belle Ayr and Caballo Mines have existing approved raptor mitigation plans. The existing Belle Ayr Mine raptor mitigation plan covers the Belle Ayr 2000 Tract. That plan, required and approved by USFWS and WDEQ/LQD, addresses the impacts of mining on nesting raptors. If the Belle Ayr 2000 Tract leased to an adjacent mine, the successful lessee would be required to revise the existing approved raptor mitigation plan to include the impacts of mining the Belle Ayr 2000 Tract. Foraging habitat for raptors would be reduced until revegetation can attract and support lagomorphs and small mammals, which serve as their prey. Raptors could be impacted by the construction or relocation of power lines, which can pose an electrocution hazard. The raptor mitigation plan includes provisions for protection from electrocution.

Displaced songbirds would have to compete for available adjacent territories and resources when their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would also occur when habitat disturbance coincides with egg incubation and rearing of young. Impacts of habitat loss would be short-term for grassland species. Longer term impacts for tree- and shrub-dependent species are expected to be minimal due to the lack of trees and shrubs on the LBA tract.

Mining the LBA tract would have a negligible effect on migrating and breeding waterfowl as habitat is not present on the Belle Ayr 2000 Tract. Sedimentation ponds created during mining would provide interim habitat for these fauna.

No fish habitat will be impacted on the proposed lease. No perennial streams or reservoirs occur on the area. The only fish present in the Belle Ayr Mine wildlife study area are common, widespread species. Portions of the ephemeral drainage that is disturbed during mining will be restored during reclamation.

The potential impacts to threatened and endangered wildlife species are discussed in Appendix C.

Few MBHFI depend on or regularly use the proposed lease. For the most part, mining will have negligible impacts on these species of concern. A plan to monitor MBHFI and a plan to mitigate potential impacts to MBHFI is included in the existing approved Belle Ayr Mine mining and reclamation plan and addresses the Belle Ayr 2000 Tract area.

4.1.10 LAND USE

Most of the Belle Ayr 200 Tract will be disturbed when the adjacent existing leases are mined as currently permitted. Under the Proposed Action, use of the land for mining purposes would be extended for approximately three years and 118 additional acres

would be disturbed. There are no producing oil and gas wells on the tract. There are four permitted CBM well locations on the Belle Ayr 2000 Tract, but these wells have not been drilled. As the surface owner, RAG Wyoming Land Company, Inc. has negotiated agreements with the oil and gas operators that would allow removal of any coal bed methane wells that are completed prior to mining.

There is no public land included in the Belle Ayr 2000 Tract. Public access to the tract is currently restricted for hunting or agricultural purposes. This would not change if the tract is leased and mined.

Following reclamation, the land would be suitable for agricultural or grazing and wildlife uses.

4.1.11 CULTURAL RESOURCES

The tract has undergone detailed cultural resource surveys and no sites eligible for the National Register of Historic places have been found on the Belle Ayr 2000 Tract. Ineligible cultural sites may be mined through.

No sites of Native American religious or cultural importance are known to occur on the Belle Ayr 2000 Tract. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

4.1.12 PALEONTOLOGICAL RESOURCES

No unique or significant paleontological resources have been identified on the Belle Ayr 2000 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 be taken to assess and protect the site (See Appendix B).

4.1.13 VISUAL RESOURCES

Mining activities are currently visible from Bishop Road. Mining activities on the Belle Ayr 2000 Tract would also be visible from the relocated Bishop Road.

Mining would affect landscapes classified by BLM as VRM Class IV, and landscape character would not be changed following reclamation. No unique visual resources have been identified on or near the Belle Ayr 2000 Tract.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the north; however, within a few years after reclamation is completed, the

mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

4.1.14 NOISE

Noise levels on the LBA tract would be increased somewhat by coal removal activities such as blasting, loading, and hauling. Since the Belle Ayr 2000 Tract would be mined as an extension of existing operations under the Proposed Action, no rail car loading would take place on the LBA tract. The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 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. The nearest occupied dwelling is over 1.5 miles away from the LBA tract.

Because of the remoteness of the site and because mining is already ongoing 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 mining and reclamation are completed, noise would return to premining levels.

4.1.15 TRANSPORTATION FACILITIES

No new transportation facilities would be required under the Proposed Action; however, Bishop Road would have to be relocated. Traffic to and from the Belle Ayr Mine would continue at existing levels for an additional two or three years. Essentially all of the coal removed would be transported by rail, and leasing the LBA tract would extend the length of time that coal is shipped from the permitted Belle Ayr Mine.

The active underground telephone line and overhead power line that cross the Belle Ayr 2000 Tract would have to be moved. Relocation of the phone line would be handled according to specific agreements between RAG and the telephone line owner. The overhead power line is owned by RAG and is used for mining purposes.

4.1.16 SOCIOECONOMICS

If the applicant is the successful bidder on the Belle Ayr 200 Tract, mining the tract would extend the life of the already permitted Belle Ayr Mine by two to three years.

Coal prices are currently projected to remain relatively constant throughout the life of the mine (WSGS 1999). Assuming a price of \$3.50 per ton, the revenue from the sale of the estimated 29 million tons of recoverable coal from the LBA tract would total \$101.5 million for the Proposed Action. Some of this money from the sale of this federal coal would be paid to federal, state and local governments in the form of taxes and federal production royalties, as discussed below.

The federal government would collect a royalty at the time the coal is sold. This royalty is 12.5 percent of the sale price of the coal. Using the above assumptions of recoverable coal and coal price, this would amount to approximately \$12.7 million. This money would be split equally between the state and federal governments. The federal government would also collect black lung and reclamation taxes based on the sale of the coal.

According to a study done by the University of Wyoming (UW 1994), the State of Wyoming received about \$1.10 per ton from the sale of Powder River Basin coal produced in 1991. The taxes and royalties included in this calculation were severance taxes, ad valorem taxes, sales and use taxes, and the state's share of federal royalty payments on production (discussed above). Under this scenario, the estimated total direct return to the State of Wyoming from the production of this federal coal, in current dollars, would be \$31.9 million under the Proposed Action. This figure includes half of the federal royalty discussed above.

The federal government also receives a bonus payment at the time the federal coal is leased. Bonus payments on the federal coal leases issued in the Powder River Basin since 1990 have ranged from 11.1 cents per ton to 38.3 cents per ton. This would represent a potential bonus payment range of \$3.2 million to \$11.1 million for the estimated federal coal tonnage included in the Belle Ayr 2000 Tract. The actual amount the federal government would receive would depend on the actual bonus bid if the tract is leased. The bonus payment would be payable over five years and would be divided equally with the State of Wyoming.

RAG does not anticipate that leasing and mining the Belle Ayr 2000 Tract would affect total employment at the Belle Ayr Mine. As a result, no additional demands on the existing infrastructure or services in the nearby communities would be expected because no influx of new residents would be needed to fill new jobs. The economic stability of the communities of Gillette and Wright would benefit by having the Belle Ayr Mine employees living in their communities employed for an additional 2 to 3 years.

Issues relating to the social, cultural, and economic well-being and health of minorities and low-income groups are termed Environmental Justice issues. In reviewing the impacts of the Proposed Action on socioeconomic resources, surface water and

groundwater quality, air quality, hazardous materials, or other elements of the human environment in this chapter, it was determined that potentially adverse impacts do not disproportionately affect Native American tribes, minority groups and/or low-income groups.

With regard to Environmental Justice issues affecting Native American tribes or groups, the general analysis area contains no tribal lands or Native American communities, and no treaty rights or Native American trust resources are known to exist for this area.

Implementing any of the alternatives would have no effects on Environmental Justice issues, including the social, cultural, and economic well-being and health of minorities and low income groups within the general analysis area.

4.1.17 HAZARDOUS AND SOLID WASTE

If Belle Ayr 2000 tract is leased as applied for, the wastes that would be generated in the course of mining the tract would be similar to the wastes that are currently being generated by the adjacent existing mining operations. Wastes generated by mining the LBA tract would be handled in accordance with the existing regulations using the procedures currently in use at the adjacent Belle Ayr and Caballo Mines.

4.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the Belle Ayr 2000 coal lease application would be rejected and the area contained in the application would not be offered for lease at this time. For the purposes of this analysis, the No-Action Alternative assumes that these lands would never be mined. However, the approved mining operations for the existing adjacent Belle Ayr and Caballo Mines would not be changed if this alternative is chosen. Because of the existing approved use of the majority of the Belle Ayr 2000 Tract as mining support, the major difference between the Proposed Action and the No Action Alternative lies in the removal of the coal included in the tract and the impact to an additional 118 acres of surface.

The impacts described on the preceding pages to topography and physiography, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, and transportation would occur on the existing Belle Ayr and Caballo coal leases under the No-Action Alternative.

The economic benefits that would be derived from mining the LBA tract during an additional two to three years of mining would be lost. Not leasing this tract at this time could result in a bypass of this federal coal if the lease is not sold while one of the

existing adjacent mines is still in operation and in a position to economically recover the coal included in the tract. As discussed in Chapter 2, coal production at the Belle Ayr Mine would be expected to decrease under the No Action Alternative because operations at the mine are moving into areas of increasing overburden thickness, and the capacity to remove overburden is limited by the capacity of the existing truck and shovel fleets. With this fixed overburden removal capacity, coal production at the Belle Ayr Mine would decline as the stripping ratio increases. RAG has recently announced layoffs and plans to reduce production in 2001 at the Belle Ayr and Eagle Butte Mines. Additional decreases in coal production could result in additional decreases in employment.

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. Measures that are required by regulation are considered to be part of the Proposed Action. These requirements, mitigation plans, and monitoring plans are in place for the No-Action alternative, as part of the current approved mining and reclamation plan for the existing Belle Ayr Mine, which includes all of the Belle Ayr 2000 Tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are summarized in Appendix D. Some of these mitigation and monitoring measures are also described in the resource discussions in Section 4-1 of this document.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. In general, the levels of mitigation and monitoring required for surface coal mining by SMCRA and Wyoming state law are more extensive than those required for other surface disturbing activities; however, concerns are periodically identified that are not monitored or mitigated under existing procedures. One issue of current concern is the release of NO_x from blasting, and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind. As a result of this concern, industry and agency representatives have met and discussed possible causes and solutions. These included improving blasting techniques or explosives, reducing powder factors and analyzing the composition of the NO_x clouds. These procedures are being evaluated. BLM is not involved in the regulation of blasting activities at the coal mines in the Powder River Basin; however, BLM supports the continuing efforts of the involved regulatory agencies to develop appropriate procedures and techniques to resolve this problem.

The BLM has not identified additional special stipulations, beyond those listed in Appendix B, that should be added to the BLM lease or areas where additional or increased monitoring measures are recommended.

4.4 RESIDUAL IMPACTS

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

Topographic moderation is a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

Geology from the base of the coal to the surface would be subject to significant, permanent change.

Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alterations.

The area where groundwater drawdowns and replacement of coal and overburden with spoils occur would be slightly increased under the Proposed Action compared to what would occur without the addition of the LBA tract. This would increase the time it would take for the postmining backfill in the area of the Belle Ayr Mine to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Water level and water quality in the backfill would be suitable to provide water to wells for livestock use, but would be different from premining conditions.

Reclaimed vegetative communities may never completely match the surrounding native plant community.

Because of the existing gently rolling topography and premining agricultural use of the Belle Ayr 2000 Tract, no residual impacts to wildlife are anticipated.

There would be no expected residual impacts to air quality; alluvial valley floors; wetlands; threatened, endangered, or candidate plant or animal species; land use; recreation; cultural resources; Native American concerns; paleontological resources; visual resources; noise; transportation facilities; or socioeconomics.

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 briefly summarizes the cumulative impacts that are occurring as a result of existing development in the area being mined and considers how those impacts would change if the Belle Ayr 2000 Tract is leased and mined and if other proposed development in the area occurs.

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 CBM development is somewhat speculative.

Since decertification of the Powder River Federal Coal Region in 1990, the Wyoming State Office of the BLM has held 13 competitive coal lease sales and issued 10 new federal coal leases containing approximately 2.64 billion tons of coal using the LBA process (Table 1-1). This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one satisfactory audit by the General Accounting Office.

The Wyoming BLM currently has pending applications for eight additional federal coal tracts, including the Belle Ayr 2000 Tract, containing about 2.3 billion tons of coal (Table 1-2). All eight of the applications are for maintenance tracts for existing mines, and all eight pending applications have been reviewed by the RCT and have been recommended for processing.

BLM also completed one exchange in the Powder River Basin, authorized by Public Law 95-554 in 2000. Under this exchange, EOG Resources (formerly Belco) received a federal lease for a 106-million ton portion of the Hay Creek Tract adjacent to the Buckskin Mine in exchange for the rights to a 170-million ton coal lease near Buffalo, Wyoming that is unmineable due to construction of Interstate Highway 90.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the Powder River Basin from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared Powder River Basin regional EIS's. Portions of the status check were updated prior to the 1997 and 1999 RCT public meetings in Casper, Wyoming and Billings, Montana.

Four of the previously prepared regional EIS's evaluated coal development in the Powder River Basin in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Statement, Eastern Powder River Coal, BLM, March 1979;

Final Environmental Impact Statement, Powder River Coal Region, BLM, December, 1981; and

Draft Environmental Impact Statement, Round II Coal Lease Sale, Powder River Region, BLM, January 1984.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*" (Martin, et al., 1988), which is frequently referred to as "the CHIA."

Since 1989, coal production in the Powder River Basin has increased by an average of 6.8 percent per year. The increasing production is primarily due to increasing sales of low-sulfur, low-cost Powder River Basin coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales.

The status and ownership of currently operational mines in Campbell and northern Converse Counties are shown in Table 4-3. There have been numerous changes in mine ownership during the last decade, and this has resulted in mine consolidations and mine closings within the basin.

The mines are located just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth. The mines in Campbell and Converse counties produce 85 to 95 percent of the coal produced in Wyoming each year. Table 4-4 summarizes predicted coal mining activity (from the 1979 and 1981 regional EIS's) with actual activity that has occurred since the EIS's were prepared.

Campbell and Converse counties' oil production decreased to 17.9 million barrels of oil in 1999 from 32.8 million barrels in 1992, a 45% decrease. The recent sharp increase in oil prices may help sustain current production rates. It is unclear if this increase in prices will be sustained long enough to result in an increase in oil production in the foreseeable future.

Natural gas production has been increasing, particularly in Campbell County, due to the

**Table 4-3
Status of Wyoming Powder River Basin Coal Mines**

1999 Mine	1994 Mine Operator	Coal Production ¹		1999 Mine Operator	Coal Production ¹		Status/Comments
		1993 Actuals ³	1994 Permitted ⁴		1999 Actual ³	2000 Permitted ⁴	
Buckskin	SMC (Zeigler)	11.18	24.0	Vulcan Coal	15.59	22.0	Active
Clovis Point	Kerr-McGee	0	4.0	Wyodak Resources	0	4.0	Mine shut down/leases relinquished or sold; facilities sold; Wyodak has AQD permit
Dry Fork	Phillips/WFA	3.28	15.0	WFA	1.22	15.0	Active
Eagle Butte	Cyprus-Amax	16.70	29.6	RAG Coal West, Inc.	17.42	35.0	Active
Fort Union	Fort Union Ltd	0.06	9.3	Kennecott/Kfx	0.03	9.4	Active
Rawhide	Carter (Exxon)	9.86	24.0	Peabody	0.81	24.0	Shut down
Wyodak	Wyodak Resources	3.03	10.0	Wyodak Resources	3.18	10.0	Active
NORTHERN MINE GROUP TOTALS		44.11	115.9		38.25	119.4	
Belle Ayr	Cyprus-Amax	15.59	25	RAG Coal West, Inc.	17.89	45	Active
Caballo/N. Caballo	Carter (Exxon)/ Western Energy	15.42	40	Peabody	26.47	40	Active/Caballo Mine + former Rocky Butte & West Rocky Butte leases
Cordero Rojo	Kennecott/Drummond	21.01	44	Kennecott	45.67	65	Active/Cordero + Caballo Rojo Mines
Coal Creek	ARCO	0.11	18	Arch	11.23	18	Active/Under Temporary Cessation of Operations
CENTRAL MINE GROUP TOTALS		52.13	127		101.26	168	
Antelope	Kennecott	7.29	12	Kennecott	22.69	30	Active
Black Thunder	ARCO	34.32	36	Arch	48.67	100	Active
Jacobs Ranch	Kerr-McGee	18.39	25	Kennecott	29.08	50	Active
N. Antelope/Rochelle	Peabody	32.94	50	Peabody	68.87	75	Active/North Antelope Mine + Rochelle Mine
N. Rochelle	SMC (Zeigler)	0.02	8	Vulcan Coal	8.17	35	Active/facilities constructed in 1998-99
SOUTHERN MINE GROUP TOTALS		92.96	131		177.48	290	
TOTALS FOR 3 MINE GROUPS		189.2	373.9		316.99	577.4	
¹	Actual production (million tons) on left, permitted production (million tons) on right.						
²	Source: Wyoming State Geological Survey <i>GEO-NOTES</i> , August 1994.						
³	Source: <i>COAL OUTLOOK SUPPLEMENT</i> , August 9, 1999 and Wyoming State Inspector of Mines <i>ANNUAL REPORT</i> for 1999.						
⁴	Source: Judy Shamley., WDEQ/AQD. Figures are permitted capacity as of October 1, 2000.						

Table 4-4
Coal Production and Development Levels
Campbell and Converse Counties, Wyoming

	Coal Production (Million Tons)	Number of Active Coal Mines	Number of Existing Power Plants	Number of Active Coal Enhancemen t Facilities	Direct Coal Employe ment	Average Price-NE Wyoming
1979 Predictions for 1990	174.3	15	2	1	3,889	na
1981 Predictions for 1990	318.4	37	3	1	11,900	na
Actual 1990	162.6	18	3	1	2,862	\$6.86
Actual 1994	216.9	19	4	1	3,126	\$5.62
Actual 1995	246.5	19	4	1	3,177	\$5.60
Actual 1996	261.1	18	4	2	3,274	\$5.40
Actual 1997	264.1	18	4	2	3,164	\$5.03
Actual 1998	297.5	16	4	2	3,348	\$4.73
Actual 1999	319.9	15 ¹	4	2	3,362	\$4.66
Existing Power Plants:	PP&L Dave Johnson, PP&L Wyodak, Black Hills Simpson #1, and Black Hills Simpson #2					
Proposed New Power Plants	NAPG Two Elk, Calpine and Black Hills Wygen #1					
Existing Coal Enhancement:	ENCOAL-Buckskin (inactive), KFx-Fort Union (active), and Wyodak Earthco (active)					

¹ Includes the Dave Johnson Mine, which is not included in Table 4-3.

Sources: 1979 and 1981 BLM Powder River Basin Regional EISs, Wyoming State Geological Survey Geo-notes-1996-99, and Wyoming State Inspector of Mines Annual Reports, 1990-99,

development of shallow CBM resources west of the coal mines. CBM exploration and development is currently ongoing throughout the Powder River Basin in Wyoming, and it is estimated that as of October 2000, there were more than 5,000 potentially productive wells in place. Since the early 1990s, the Wyoming BLM has completed numerous EAs and two EISs analyzing proposed CBM projects. The most recent EIS, the Wyodak CBM Project EIS, was completed in 1999. The Wyodak EIS project area included 3,600 square miles of mixed federal, state and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM is currently preparing an EA to analyze the impacts of drilling as many as 2,500 federal drainage protection wells within the Wyodak CBM project area. These wells would be drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases that are adjacent to and potentially being drained by wells drilled on private or state oil and gas leases. Wyoming BLM is also preparing an EIS to analyze the cumulative impacts of reasonably foreseeable CBM, conventional oil and gas, and other mineral development impacts within the Wyoming portion of the Powder River Basin. The EIS will analyze the potential impacts of proposed additional CBM development in the Wyoming portion of the basin and update the BLM planning documents in the area of CBM development interest. The regional coal EIS's (BLM 1974, 1979, 1981, 1984) and the Buffalo RMP (BLM 1985) analyzed oil and gas development, but did not anticipate that the oil and gas development would include production of CBM resources.

Under the current process for approving CBM drilling, CBM wells can be 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. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling on the federal leases can be authorized. Approximately 88% of the coal rights in the Wyodak CBM project area are federal, but only about half of the oil and gas rights in this area are federal. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBM on a piece of land to the owner of the oil and gas rights.

Other mineral development levels in the Wyoming Powder River Basin are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently two *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. There were three active *in situ* operations in the Powder River Basin in 1999, but one of them, located in southeastern Johnson County, has since ceased operations. Uranium production has been increasing in recent years, but is expected to decrease this year because prices are decreasing due to international purchases of Russian uranium from stockpiles and decommissioning of

uranium-based weapons (WSGS 2000).

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

The proposed Belle Ayr 2000 Tract is situated within a nearly continuous corridor of four coal mines (counting the Cordero/Rojo Complex as one mine) (see Figure 1-2). This central Campbell County mine corridor is approximately 20 miles long and eight miles wide. The current maximum permitted production rate for these five mines is 168 million tons per year (Table 4-3). Only one LBA, the West Rocky Butte LBA, including approximately 463 acres of federal coal, has been issued to mines in this central group since decertification. There is one other pending maintenance lease in the central group of mines, the Belle Ayr 1997 Tract.

CBM wells have been producing west of the central group of mines since 1992. CBM drilling and production is expected to continue in the areas around the coal mines, and on the LBA's. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality and wildlife are likely to occur as more CBM resources are developed west of the central mine group. These potential impacts are discussed in the following cumulative impact discussion for these resources.

In addition to the ongoing coal mining and leasing and the CBM development, three other projects are currently in progress or planned in the general vicinity: 1) construction and operation of the Two Elk Power Plant east of the Black Thunder Mine; 2) construction of the Wygen #1 power plant which has been proposed at the Wyodak Mine site; and 3) construction and use of the proposed DM&E rail line. These projects are considered in this cumulative impact discussion because, due to their locations, the impacts from these projects could overlap with the impacts of mining the Belle Ayr 2000 Tract. A fourth project, the ENCOAL facility, which at one time was scheduled for construction at the North Rochelle Mine, has been indefinitely delayed.

Two Elk would be a coal-fired power plant located east of Black Thunder Mine and would generate 250 Mw. The plant would burn low-Btu "waste coal" and coal fines from nearby mines as well as sub-bituminous coal in a pulverized coal boiler. This ability to burn low Btu waste coal and fines would 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 would be transported from the mine to the power plant by direct truck haul on unpaved roads, and ash would be returned to the mine by enclosed, 4-wheel off-highway trucks. An application for an air quality Permit to Construct was submitted to WDEQ and was deemed administratively

complete on August 5, 1997. The Two Elk project received a Permit to Construct from WDEQ/AQD on February 27, 1998. On February 17, 2000 the applicant was granted a permit modification by WDEQ/AQD. The modification allows for relocation of the plant based on soils and geotechnical considerations and also changes the original power plant design. The permittee has two years from the date of issuance to begin construction. No final decisions have been made as to how much water would be used, or where it would be obtained. 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. An EIS will also be necessary to address the transmission line and access road, which both cross lands under USFS jurisdiction. According to a recent article in the *Gillette News-Record*, construction could begin on the plant site in 2001 (*Gillette News-Record* 2000c).

The Wygen #1 will be a 80 Mw coal-fired power plant at the Black Hills Power and Light Company Energy Complex located near the Wyodak Mine. Wygen #1 will burn approximately 500,000 tons of coal per year produced at the Wyodak Mine. Wygen #1 will use air-cooled condensing technology, limiting water use. No additional support or facilities will be constructed with the Wygen #1 plant. Black Hills Power and Light Company estimates that an additional 300 people will be employed during the peak construction phase, and that the plant will be operational by 2003.

The Surface Transportation Board preliminarily approved the DM&E Railroad expansion plan (to build 262 miles of new track in the Powder River Basin and to rehabilitate 650 miles of track across South Dakota and Minnesota) on December 11, 1998. The approval was made pending the completion of an analysis of the environmental impacts of the project. The DM&E had proposed to start construction in 1999 and complete the new railroad line in 2001; however, final approval and construction cannot take place until after the environmental analysis is completed. The proposed route in Wyoming will generally follow along the Cheyenne River valley. A draft EIS has been prepared and is available for public review.

With the exception of some projected impacts to the labor and housing markets, none of the impacts to the physical environment projected by these projects would extend into the Belle Ayr 2000 analysis area. The DM&E railroad line could extend along the eastern side of the Belle Ayr Mine.

The status check identified one part of the coal mining process where the actual levels of development did not agree with the predictions, and this was the number of acres reclaimed. In general, coal mine reclamation efforts have been successful in both the Wyoming and Montana portions of the basin; however, as indicated in Table 4-5, the regional EIS's assumed that reclamation would proceed at a faster pace than has actually occurred.

Table 4-5
Predicted and Actual Coal Mine Disturbance and Reclamation
Campbell and Converse Counties, Wyoming

Year	Surface Coal Mining Disturbance (Acres)*	Surface Coal Mining Reclamation (Acres)**	Percent Reclaimed
1979 EIS Prediction for 1990	22,794	12,666	55.57%
1981 EIS Prediction for 1990	48,400	34,100	70.45%
Actual 1990	31,797	6,994	22.00%
Actual 1996	47,018	12,165	25.87%
Actual 1999/2000***	56,737	16,868	29.73%

* Includes all disturbance, including Mine facilities, rail facilities, roads, sedimentation ponds, etc.

** Includes only acres seeded with permanent seed mixture, not all acres currently being reclaimed.

*** Based on recent Annual Reports submitted to WDEQ/LQD that are available for each Mine, compiled by Mark Humphries, OSM.

Table 4-5 compares the 1979 and 1981 predictions of surface coal mining disturbance and reclamation areas with actual disturbance and reclamation areas. The numbers are not directly comparable because the 1979 and 1981 EIS estimates excluded acres of disturbance occupied by mine facilities but the actual numbers that are reported include acres of disturbance occupied by mine facilities. To make them more comparable, the number of actual disturbed acres would be decreased to reflect the acres at each mine occupied by mine and rail facilities, roads, etc.; however those numbers have not been available for all mines in the annual reports. Also, since reclamation is a process involving many steps, and seeding with the final seed mixture happens near the end of the process, Table 4-5 shows the area that is currently almost completely reclaimed but it does not show the total number of acres that are being reclaimed at this time.

The development of reclamation schedules for Powder River Basin mines must take into account various unique factors:

- Very thick coal seams;
- Diverse premining topography;
- Surface-mining methods using trucks and shovels combined with draglines; and
- Large-volume material movements.

These factors affect the amount of reclamation that can be accomplished at any given time.

Achievement of final postmine topography immediately following mining is not always possible. The mining plan dictates the backfill placement and timing sequence and must take into account changing strip ratios which create material surpluses or deficits. Stockpiling, which may be required to fill final pit voids or store new pit boxcut material, affects the backfill material balance. Operating changes can also affect the backfill placement timing and sequence. Some examples include changing the pit direction to conform to lease configuration, changing plans to accommodate production growth and changes in technology or mining method. The achievement of contemporaneous reclamation is evaluated on a site-by-site basis by the WDEQ taking the mining complexities unique to each mine into account.

Currently, WDEQ/LQD suggests to operators that only large, contiguous areas such as drainage basins be considered for bond release, with the assurance that the area will not be disturbed in the future. Because many mine plans cross a drainage basin several times during the life of mine, final reclamation of the drainage may not occur until late in the life of mine. This issue is further complicated when two operators are mining in the same drainage on different reclamation schedules, in that bond release for the first operator to mine the basin could be held until the second operator's portion

of the basin is reclaimed. Due to the uncertainties involved the process of applying for and receiving final bond release, most companies are electing to postpone the initiation of bond release until late in the life of mine.

At Belle Ayr Mine, approximately 170 acres were disturbed in 1999 and 150 acres were permanently reclaimed. Cumulatively through 1999, a total of 4,366 acres had been disturbed at Belle Ayr Mine and approximately 35 percent of that disturbance (1,510 acres) has been permanently reclaimed. At the Caballo Mine, the most recently available annual report indicated that about 4,348 cumulative acres have been disturbed and approximately 33 percent of that disturbance (1,427 acres) has been permanently reclaimed.

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 miles. The topography in the Powder River Basin 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. 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. The streams typically flow from west to east across the area rather than north to south along the entire corridor. Therefore, only a small part of each stream's drainage area would be disturbed (see Section 4.5.5). CBM development, and the proposed construction of the railroad line and Two Elk power plant would cause minimal topographic and/or physiographic changes.

4.5.2 GEOLOGY

The Powder River Basin coal region encompasses an area of about 20,000 mi² and contains nearly 240 billion tons of sub-bituminous coal resources (BLM 1979). Converse County has a total area of 4,050 mi² of which slightly less than one percent is within current permit boundaries. Campbell County has a total area of about 4,760 mi², of which approximately four percent 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. In the Powder River Basin, 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) coal reserves.

Under the Proposed Action, approximately 244 additional acres of federal coal would be leased, which would represent an increase of less than 1% in the area of leased federal coal in the central group of mines.

Coal and CBM are non-renewable resources that form as organic matter decays and undergoes chemical changes over geologic time. The coal resources and CBM that are removed would be used to generate power and would not be available for use in the future. Based on the information that is currently available, removal of the CBM and water from the coal prior to mining it does not damage the coal. Construction of the proposed railroad

line and power plants would not impact the geology or mineral resources in the area, so there would be no overlapping impacts related to these projects.

4.5.3 SOILS

The anticipated disturbance of 118 additional acres of soils under the Proposed Action is only a 1.4 percent addition to the already approved disturbance area of 8,441 acres expected for the existing Belle Ayr Mine, and is a minimal addition to the combined disturbance of the active mines in this area. Replaced topsoil would support a stable and productive native vegetation community adequate in quantity and quality to support planned postmining land uses such as wildlife habitat and rangeland.

Additional soil disturbance will occur with the proposed CBM development west of the mines and with construction of the proposed power plants.

4.5.4 AIR QUALITY

According to current regulatory standards by which air quality is defined, surface mining and CBM development in the Powder River Basin have not resulted in impacts to air quality that have exceeded federal or state standards.

Based on predictive models conducted for Powder River Basin 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 and that neighboring mines are not actively mining in the immediate vicinity (within 0.6-2.5 miles). Previous modeling (BLM 1992a) has shown that incremental particulate pollution impacts decrease to insignificant levels ($< 1 \mu\text{g}/\text{m}^3$ PM_{10} annual average) within six miles of active mining.

In cases where mines are in close proximity (within two miles), WDEQ follows a

modeling protocol which accounts for all mine-generated particulate air pollutants from all nearby mines 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. In past modeling conducted in support of Belle Ayr Mine's air quality permit, Mine A/Mine B analyses have been conducted. Under the Proposed Action, no modifications to the existing air quality permit for Belle Ayr Mine would be required as coal production will not increase to the permitted volume, operational equipment will not change, and no new point sources will be constructed.

Several regional cumulative air quality impact analyses have been performed as part of EISs analyzing development in the Wyoming Powder River Basin. In 1999, a far-range cumulative air quality modeling analysis was performed for the Wyodak CBM Project DEIS. The Wyodak DEIS analysis estimated impacts on air quality in the year 2015 from projected mining levels other reasonably foreseeable actions including existing coal leases and pending LBA's, the ENCOAL Plant, the DM&E railroad line, the Two Elk Power Plant, and the proposed coal bed methane production. This analysis was updated and modified for the Horse Creek Coal Lease Application DEIS. The Belle Ayr 1997 Tract was included in the cumulative impact analysis prepared for the Horse Creek DEIS as one of the reasonably foreseeable actions. Subsequent to that analysis, RAG modified the Belle Ayr 1997 application and applied for the Belle Ayr 2000 Tract. The cumulative air quality impacts were further updated in the recently released DEIS for the DM&E Railroad Powder River Basin Expansion Project.

The results of the Horse Creek DEIS cumulative air quality analysis are summarized in the table and figures included in Appendix E. The cumulative air quality impact analysis indicates that impacts in Class I and sensitive Class II areas, based on reasonably expected pollutant emission increases through the year 2015, will be quite small with the exception of impacts on visibility. The model results suggest that visibility impacts may exceed Limits of Acceptable Change (LACs) on some days in all areas evaluated. The LACs for visibility impacts, as well as those for other AQRVs, are not regulatory limits, but represent federal land manager policies for evaluating impacts.

The Wyodak and Horse Creek analyses assumed that coal production in 2015 would be approximately 82 percent of the currently permitted production levels, based on the coal demand levels projected for 2015 by Resource Data International. For the Belle Ayr Mine, the permitted production level is 45 million tons of coal per year, and the production level projected for 2015 in the cumulative air quality model was 36.9 million tons. In 1999, the mine produced 17.9 million tons. RAG expects to ship about 15.4 million tons in 2000, and projects it will ship 9.4 million tons in 2001.

No change to long-term cumulative air impacts are anticipated if the Belle Ayr 2000 Tract is leased and mined as a maintenance tract for and existing mine. No increases in production are anticipated if the tract is leased and mined, haul distances will not increase, and overburden thickness on the tract is actually less than on the adjacent existing leases. Mining the tract could extend the life of the Belle Ayr Mine up to three years.

4.5.5 WATER RESOURCES

4.5.5.1 GROUNDWATER

As a result of statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the Powder River Basin. Some of these studies and modeling analyses are discussed below.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern Powder River Basin. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report entitled "Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming", also known as the "CHIA" (Martin, et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area. The CHIA analysis included the proposed mining of all the 1987 leases at all of the existing mines in the central mine group. It did not evaluate potential groundwater impacts related to additional coal leasing in this area and it did not consider the potential for overlapping groundwater impacts from coal mining and CBM development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. The existing permit for the Belle Ayr Mine addresses cumulative hydrologic impacts.

Additional groundwater impact analyses have also been conducted to evaluate the potential cumulative impacts of coal mining and CBM development. One example of

these analyses is the report entitled A Study of Techniques to Assess Surface and Groundwater Impacts Associated with Coal Bed Methane and Surface Coal Mining, Little Thunder Creek Drainage, Wyoming (Wyoming Water Resources Center 1997). This study was prepared as part of a cooperative agreement involving WDEQ/LQD, the Wyoming State Engineer's Office, the WSGS, BLM, OSM and the University of Wyoming. The Wyodak CBM Project EIS (BLM 1999) presented the results of a modeling analysis of the potential cumulative impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers as a result of coal mining and CBM development. The technical report for both this modeling analysis is available for public review at the BLM office in Buffalo, Wyoming (Applied Hydrology Associates, Inc. 1999).

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ/LQD and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas.

The coal mine groundwater monitoring data is published each year by the Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming Powder River Basin, WDEQ, the Wyoming State Engineer's Office, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. In 1991, GAGMO published a report summarizing the water monitoring data collected from 1980 to 1990 in the Wyoming Powder River Basin (Hydro-Engineering 1991b). In 1996, they published a report summarizing the data collected from 1980 to 1995 (Hydro-Engineering 1996a).

The major groundwater issues related to surface coal mining that have been identified by scoping 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;

- changes in water quality as a result of mining; and
- potential overlapping drawdown in the coal due to proximity of coal mining and CBM development.

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 spoils 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 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 1999 verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991a, 1992, 1993, 1994, 1995, 1996b, 1997, 1998, 1999). 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 88 percent of the 51 backfill wells reported for that year. In the 1999 GAGMO report, 89 percent of the 64 backfill wells measured contained water.

Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The cumulative size of the backfill area in the Powder River Basin and the duration of mining activity would be increased by mining of the recently issued leases and the currently proposed LBA tract. However, since reclamation is occurring in mined-out areas and the monitoring data demonstrate that recharge of the backfill is occurring, it is not anticipated that cumulative impacts would change as a result of the pending

leasing actions.

Clinker, also called scoria, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 4-1) and 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 result from mining saturated clinker. Therefore, the major recharge source for the spoil aquifer is not being disturbed by current mining. Clinker is not present on the Belle Ayr 2000 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 15-year report (542 wells out of 600 total) are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. The changes in water levels in the coal seams after 15 years of monitoring as indicated in the 1996 GAGMO 15-year report (Hydro Engineering 1996a) were well within the predicted worst-case 5-ft drawdown derived from groundwater modeling done by the mines. WDEQ/LQD policy is to have the mining companies determine the extent of the 5-ft drawdown contour as a method of determining off-site impacts from the various mining operations.

The additional groundwater impacts that would be expected as a result of extending mining into the LBA's issued or proposed to date would be to extend the drawdown into areas surrounding the proposed new leases. Cumulative drawdowns in the coal and overburden aquifers at the end of 1998 and at their maximum extent 2023 were evaluated during WDEQ/LQD permit renewal activities and are discussed at length in Appendix 3.5-7 of Permit #214. These drawdown predictions are due to mining only and do not account for drawdowns due to CBM production. In the coal aquifer, the maximum extent of cumulative drawdown is predicted to extend approximately 0.7 mile further west than is predicted for the Belle Ayr Mine alone simulation. There is little difference between the predictions of maximum extent of drawdown for the mine alone and for the cumulative simulations. Because of its relatively small size and location between existing leases, mining the Belle Ayr 2000 Tract is not expected to change the predicted cumulative drawdown of mining the existing leases at the Belle Ayr Mine and Caballo Mine.

The CHIA predicted the approximate area of 5 feet or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining". All of the currently producing mines, including the Belle Ayr Mine, were considered in the CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as eight miles from mine pits, although the effects

at that distance were predicted to be minimal.

As drawdowns propagate to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of CBM wells, few wells are completed in the coal in the areas west of the mines. Those wells that are completed in the coal have considerable available drawdown, so adverse impacts to wells outside the immediate mine area are unlikely.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 feet of a mine pit (Martin et al. 1988). Drawdowns occur farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and may be confined or unconfined.

Figure 4-1 shows the Belle Ayr Mine life of mine drawdown map with the maximum modeled drawdowns from the Wyodak CBM superimposed. These modeled drawdowns are for CBM only in the Wyodak Coal and are for the Proposed Action of 3,000 CBM wells (BLM 1999, 1999a). Figure 4-1 shows a projected extent of drawdown in the coal caused by mining at the Belle Ayr Mine alone of approximately 5 feet in areas where anticipated drawdown due to CBM production is some 500 feet. The 1999 GAGMO monitoring data support the models illustrated in Figure 4-1.

The proposed Two Elk project, if constructed, would add to cumulative impacts. Currently, water demands for the Two Elk project have not been finalized. The likely source of supply for the Two Elk project will be the Lance-Fox Hills Aquifer. Because of the distance between the Belle Ayr 2000 Tract and the proposed Two Elk Power Plant, the groundwater impacts of these two projects are not expected to overlap.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. According to the Wyoming State Engineer's records as of July 1999, 14 mines hold permits for 42 wells between 400 feet and 10,000 feet 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).

The Tullock member is in the lower Fort Union Formation. Water level declines in the Tullock Aquifer 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 one mile of the pumped wells (Crist 1991; Martin et al. 1988). The mine facilities in the Powder River Basin are separated by a distance of one mile or more, so little interference between mine supply wells would be expected.

The Belle Ayr Mine holds a permit for the Plant #2 Well, a water supply well that is completed in the Fort Union Formation. Belle Ayr also obtains water from the Belle Ayr No. 4 well, which is completed in the Fox Hills Formation. Use of water from this well does not impact the Tullock Aquifer. Extending the life of the mine with the LBA would not necessarily result in additional water being withdrawn from the Tullock Aquifer because Belle Ayr also uses the Fox Hills well. If additional water is withdrawn, it would not be expected to extend the area of water level drawdown due to the discontinuous nature of the sands in the Tullock Aquifer and the fact that drawdown and yield reach equilibrium in a well due to recharge effects. Under the Proposed Action, an increase in annual water consumption from the deep wells is not expected because production, employment and equipment are not expected to increase.

Water requirements and sources for the proposed Two Elk project are not currently known. The State Engineer is discouraging further development of the lower Fort Union aquifers, so the most likely source for Two Elk is the Lance-Fox Hills. This would reduce the chances that Two Elk will add to cumulative hydrologic impacts of mining.

The fourth issue of concern with groundwater is the effect of mining on water quality; specifically, the effect mining may have on the water quality in the surrounding area, and 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 overburden 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 (Houghton et al. 1987). One pore volume of water is the volume of water which would be required to saturate 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 re-establish 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 ten mines indicated that the quality of water in the spoil will, in general, meet state standards for livestock use 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 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, 1996b, 1997, 1998 and 1999), TDS values in backfill wells have ranged from 400 to 25,000 mg/l. Of the 43 backfill wells measured in 1998 and reported in the 1999 annual GAGMO report (Hydro Engineering 1999), TDS in 70 percent were less than 5,000 mg/l, TDS in 28 percent were between 5,000 and 10,000 mg/l, and TDS in one well was above 10,000 mg/l. These data support the conclusion that water from the spoils will generally be acceptable for its current use, which is livestock watering, before and after equilibrium is established. Leasing and mining of the LBA tract would increase the total volume of spoil and, thus, the time for equilibrium to re-establish.

The fifth area of concern is the potential for cumulative impacts to groundwater resources in the coal due to the proximity of coal mining and CBM development. The Wyodak coal is being developed for both coal and CBM in the same general area. Dewatering activities associated with existing and reasonably foreseeable CBM development have been and would be expected to continue to overlap with and expand the area of groundwater drawdown in the coal aquifer in the Powder River Basin over what would occur due to coal mining alone.

Numerical groundwater flow modeling was used to predict the drawdown impacts of the Wyodak CBM Project EIS (BLM 1999). The modeling considered coal mining and CBM development in order to assess cumulative impacts. Modeling was done to simulate mining with and without CBM development in order to differentiate the impacts of the two types of activities.

As expected, modeling showed that the additional groundwater impacts that would result from CBM development would be additive in nature and would extend the area experiencing a loss in hydraulic head to the west of the mining area. The area between the CBM fields and the mines would be subjected to cumulative impacts of the two activities. The 15-year GAGMO report points out that there are already areas of overlapping impacts between the Marquiss and Lighthouse CBM projects and the Caballo, Belle Ayr and Cordero-Rojo mines (Hydro-Engineering 1996a).

Figure 4-1 shows the Belle Ayr Mine life of mine drawdown map with the maximum modeled drawdowns from the Wyodak CBM Project EIS superimposed. These modeled drawdowns are for CBM only in the upper Wyodak Coal and are for the Proposed Action of 3,000 CBM wells (BLM 1999, 1999b). The groundwater modeling study done for the Wyodak CBM EIS considered the impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers in the area shown in Figure 1-2 using the existing coal mines and predicted CBM well locations based on discussions with CBM operators.

Drawdowns in the coal caused by CBM development would be expected to reduce the need for dewatering in advance of mining, which would be beneficial for mining. Wells completed in the coal may also experience increased methane emissions in areas of aquifer depressurization. There would be a potential for conflicts to occur over whether the coal mining operations or CBM operations are responsible for replacing or repairing private water well users who are adversely impacted by the drawdowns.

As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBM development on water rights, a group of CBM operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. The BLM decision record for the Gillette South CBM Project EIS (BLM 1997) requires that CBM operators offer landowners this agreement as part of the federal well approval process.

BLM and industry have cooperated to develop a system of monitoring wells designed to monitor groundwater levels in the coal and in shallower aquifers in areas of CBM production. In the future, the CBM operators will be responsible for drilling and maintaining additional monitoring wells as the area of CBM development expands.

The increased dewatering or depressuring of the coal seam caused by CBM development and mining together will also increase the time required for water-level recovery to occur after the CBM and mining projects are completed.

4.5.5.2 SURFACE WATER

Surface coal mining reduces streamflows because of the regulations that require all runoff from disturbed areas to be captured and treated in sedimentation ponds. Also, the surface coal mine pits in the Powder River Basin are large, and these pits, together with ponds and diversions built to keep water out of the pits, can intercept the runoff from large drainage areas.

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 CBM resources in the area west of the mines could potentially increase surface flow in some drainages. The amount of CBM produced water that ultimately reaches the major channels is reduced by evaporation, infiltration into the ground, and surface landowners, who sometimes divert the produced water into reservoirs for livestock use because it is of relatively good quality. The Wyodak CBM Project EIS (BLM 1999, 1999b) evaluates impacts of CBM production over a large project area, extending from over 30 miles north of Gillette to over 60 miles south of Gillette. The project area would extend westward from the Powder River Basin coal mine areas for a distance of 18 to 36 miles. The Wyodak CBM project considers 3,000 to 5,000 CBM wells that would each generate 12 gpm of water. This water would be discharged at an estimated 500 to 1,000 different locations over a period of 10 to 20 years. These CBM water discharges would be constant, as opposed to naturally occurring flows which fluctuate widely on a seasonal and annual basis. Most streams in the area are naturally dry throughout most of each year.

The USGS has predicted that, after reclamation, major streams in the Powder River Basin will exhibit increased runoff ranging from 0.4 percent in the Cheyenne River to 4.3 percent in Coal Creek due to cumulative disturbance as a result of existing surface coal mining (Martin et al. 1988). This is based on the assumption that unit runoff rates will be increased after reclamation due to soil compaction, and the percentage changes in runoff are based on permitted mine acreages in 1981. The new leases issued since that time have increased the permitted acreage by about 40 percent and would, under the same assumptions, increase the USGS's estimates of runoff increase by the same incremental amount. This minor increase in runoff is small compared to seasonal and annual variability of runoff in the Powder River Basin.

Sediment concentrations should not increase in area streams even with the addition of mining the pending and recently issued LBA tracts 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 Belle Fourche River drainage is also minimal because it is typically dry for a substantial portion of the year.

The surface drainage from the Belle Ayr 2000 Tract flows toward Caballo Creek, which flows into the Belle Fourche River. The 118 acres of new surface disturbance added by mining the Belle Ayr 2000 Tract would not change the cumulative impacts to surface water quality and quantity in the area.

The CBM discharges could result in erosion and degradation of small drainages, which could affect water quality and channel hydraulic characteristics. From a surface water

standpoint, the increased flows due to CBM discharges and the reduced flows due to surface coal mining will tend to offset each other. However, conflicts could also result. The CBM development takes place upstream from the mines. Provisions the mines have taken to prevent water from entering the pits (e.g., storage ponds or diversions) could be adversely affected by having to deal with flows that were not included in designs or that change conditions for future designs

4.5.6 ALLUVIAL VALLEY FLOORS

There are no AVFs on the Belle Ayr 2000 Tract, and therefore no changes in cumulative impacts to alluvial valley floors are expected to occur as a result of leasing and subsequent mining of the Belle Ayr 2000 Tract. Impacts to designated 's are generally not permitted if the AVF is determined to be significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining but they must be restored as part of the reclamation process. Impacts during mining, before the AVF is restored, would be expected to be incremental, not additive.

4.5.7 WETLANDS

No wetlands will be impacted under the Proposed Action for the Belle Ayr 2000 Tract. Wetlands are discrete features that are delineated on the basis of specific soil, vegetation, and hydrologic characteristics. Wetlands within areas of coal mining disturbance are impacted; wetlands outside the area of disturbance are generally not affected unless their drainage areas (hence, water supplies) are changed by mining. Therefore, the impacts to wetlands as a result of surface coal mining are mostly incremental, not additive as are impacts to groundwater and air quality. Increasing the area to be mined would increase the number of wetlands that would be impacted.

COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. As part of the mining and reclamation plans for each mine, COE approves the plan to restore the wetlands and the number of acres of wetlands to be restored. Replacement of functional wetlands may occur in accordance with agreements with the private landowners; no federal surface lands are included in the Belle Ayr 2000 Tract. During mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not function in the same way as the premine wetlands did.

4.5.8 VEGETATION

Most of the land that is being or would be disturbed by mining in the Wyoming Powder River Basin is grassland, sagebrush shrubland or breaks grassland and is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the

Powder River Basin, comprising 92 percent of the land use in Converse and Campbell Counties. Previously cultivated lands would be disrupted by mining the Belle Ayr 2000 Tract. At the completion of mining, it is anticipated that all disturbed land would be reclaimed for grazing and wildlife habitat, mostly in the form of mixed native grass prairie, sagebrush shrubland and, where appropriate, bottomland grassland. Some of the minor community types, such as those occurring on breaks, would not be restored to premining conditions but may be replaced to a higher level due to use of better quality soils. Following reclamation and release of the reclamation bond, privately owned surface lands would be returned to agricultural management by the private land owner.

Community and species diversities would initially be lower on reclaimed lands than on unmined grasslands and shrublands. The shrub components would take the longest to be restored to premining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub establishment on reclaimed lands should largely restore the species and community diversity on these lands to premining levels.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all 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.

4.5.9 WILDLIFE

The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed but would moderate as more land is reclaimed. 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, surface occupancy and disturbance restrictions, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. Because of the split mineral estate that exists in the Powder River Basin, yearlong prohibitions on surface occupancy and restrictions on activities near areas critical to grouse have not proven successful. These restrictions and stipulations

have helped to protect important raptor and grouse habitat on public lands. Erection of nesting structures 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 restricted pronghorn 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.

The regional EIS's (BLM 1974, 1979, 1981, and 1984b) predicted significant cumulative impacts to pronghorn from existing concentrated mining and related disturbance as a result of habitat disturbance and creation of barriers to seasonal and daily movements. Significant cumulative indirect impacts were also predicted because of increased human population and access resulting in more poaching, increased vehicle/pronghorn collisions, and increased disturbance in general.

The Belle Ayr 2000 Tract is located within the Mule Deer Herd Unit 21 and the Pronghorn Herd Unit 24. Each of these units are approximately 940 square miles, or 60,160 acres (Olin Oedekoven, WY Game and Fish 2000). The additional cumulative disturbance of 118 acres anticipated as a result of mining the Belle Ayr 2000 Tract represents less than two-tenths of one percent of the herd unit areas.

The area of active mining in the Wyoming Powder River Basin contains many raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country and areas where trees have become established. Raptor mitigation plans are included in the approved mining and reclamation plans of each mine. The raptor mitigation plan for each mine is subject to USFWS review and approval before the mining and reclamation plan is approved. Any nests that are impacted by mining operations must be relocated in accordance with these plans, after

special use permits are secured from USFWS and WGFD. 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 occur. 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, would be minor 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 sites would provide areas for waterfowl during mining.

Few vital sage grouse wintering areas or leks have been, or are planned to be, directly impacted by already-approved mining. 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). No sage grouse have been observed on or near the Belle Ayr 2000 Tract during annual monitoring surveys for the adjacent Belle Ayr Mine, and there is no sage grouse habitat on the existing crested wheatgrass pastureland.

The existing and proposed mines in the Powder River Basin 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 Powder River Basin are discussed in BLM regional EIS's 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.

Potential cumulative impacts to T&E species are discussed in Appendix C.

4.5.10 LAND USE

In addition to reducing livestock grazing and wildlife habitat, surface coal mining also disrupts conventional oil and gas development, releases CBM resources that are not produced prior to mining and limits access to public lands.

Cumulative impacts resulting from energy extraction in the Powder River Basin 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).

The Belle Ayr 2000 Tract is located within the Belle Ayr Mine Permit Area and no public lands are included on the tract. There are no recreation facilities, wilderness areas, etc., in the immediate vicinity of the existing central 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. Approximately 80 percent of the land surface in this area is private and access is controlled by the landowner.

Energy development has been the primary cause of human influx into the eastern Powder River Basin. The increased human presence associated with the cumulative energy development in the Powder River Basin 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. Reclaimed areas are attractive forage areas for big game. As an example, reclaimed lands at the Jacobs Ranch Mine have been declared crucial elk winter habitat by WGFD (Oedekoven 1994).

The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately to the population increase. 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 (and may continue to 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.

4.5.11 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 higher population levels associated with coal development coupled with increased access to remote areas can result in increased vandalism both on and off mine property. Development of lands in which coal is strip-mineable (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 Powder River Basin are known because of studies at existing and proposed coal mines. An average density estimate of 8.5 sites per mi² (640 acres) can be made based on inventories at existing mines in the area, and approximately 25 percent 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 Powder River Basin.

Ground disturbance, the major impact, can affect the integrity of or destroy a site. In the case of the Belle Ayr 2000 Tract, the land surface has already been cultivated. 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 occur 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. The data that has been and will be collected provided opportunities for regional and local archeological research projects.

4.5.12 NATIVE AMERICAN CONSULTATION

No cumulative impacts to Native American traditional values or religious sites have been identified as a result of leasing and subsequent mining of the Belle Ayr 2000 Tract.

4.5.13 PALEONTOLOGICAL RESOURCES

Impacts to paleontological resources as a result of the already-approved cumulative

energy development occurring in the Powder River Basin 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.

4.5.14 VISUAL RESOURCES

A principal visual impact in this area is the visibility of mine pits and facility areas. People most likely to see these facilities would either be passing through the area or visiting it on mine-related business. Except for the loading facilities and the draglines, the pits and facilities are not visible from more than a few miles away. No new facilities would be required to mine the Belle Ayr Mine 2000 Tract as an extension of the existing Belle Ayr Mine. Issuance of a lease for the Belle Ayr 2000 Tract would not change this impact.

After mining, the reclaimed slopes generally appear somewhat smoother than premining slopes, however, the landscape of the reclaimed mine areas look very much like undisturbed landscape in the area.

4.5.15 NOISE

Existing land uses within the Powder River Basin (e.g., mining, livestock grazing, oil and gas production, transportation, and 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 Powder River Basin, 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 an 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 Powder River Basin mines have caused substantial increases (more than five dBA) in noise levels along segments of the rail lines over which the coal is transported to markets.

4.5.16 TRANSPORTATION FACILITIES

New or enhanced transportation facilities (road, railroads, and pipelines) are expected to occur as a result of continuing energy development in the Powder River Basin. However, no new cumulative impacts to transportation facilities are expected to occur as a direct result of leasing and subsequent mining of the Belle Ayr 2000 Tract. The transportation facilities for the Belle Ayr Mine are already in place. Bishop Road would have to be relocated, and traffic levels from the mine will be maintained for a longer period under the Proposed Action.

4.5.17 SOCIOECONOMICS

Because of all the energy-related development that has been occurring in and around Converse and Campbell Counties during the past 30 years, socioeconomic impacts have been a major concern. Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Each of these basic industries is important, and 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 minerals industry is by far the largest single contributor to the economy of Wyoming. In 1998, valuation on minerals produced in 1997 was \$4,017,611,483. This was 54 percent of the State's total valuation and placed Wyoming among the top ten mineral producing states in the nation (Wyoming Department of Revenue, 2000). Properties and most minerals are taxed as a percentage of their assessed valuation.

Since 1989, coal production in the Powder River Basin has increased by an average of 6.8 percent per year. WSGS has projected a 1 percent per year increase in coal production in Wyoming from 2000 through 2005. In 1998, Wyoming coal supplied approximately 29 percent of the United States' steam coal needs when Powder River Basin coal was used to generate electricity for public consumption in 25 states as well as Canada and Spain (Lyman and Hallberg 1999). Electricity consumers in those states benefit from low prices for Powder River Basin coal, from cleaner air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the sale of the coal.

Locally, continued sale of Powder River Basin coal helps stabilize municipal, county, and state economies. BLM's 1996 projection predicted that annual coal production would generate about \$2.6 billion of total economic activity, including \$351 million of personal income, and support the equivalent of nearly 15,885 full-time positions in 2005 (BLM 1996a).

Three tracts, the Powder River, Thundercloud and Horse Creek tracts, were recently leased in southern Campbell County and the surrounding area. Projected employment increases of up to 335 persons were predicted as a result of mining these tracts. No increase in employment is expected with the leasing and mining of the Belle Ayr 2000

Tract.

A number of mineral and related developments have occurred, are in progress, or are anticipated in Campbell County and the surrounding area. The North Rochelle Mine located southeast of Wright, WY has completed an \$83.6 million mine construction phase. Construction of the mine facilities began in June 1997 and was completed in 1999.

Construction of the \$744 million ENCOAL facility was planned to coincide with the North Rochelle Mine expansion with construction starting in late 1997 and lasting approximately two years. This project has been indefinitely delayed.

The Two Elk power plant is currently in the developmental stage, and North American Power Group is working on permitting and marketing. According to a recent article in the *Gillette News-Record*, the cost of constructing the proposed plant is estimated at \$300 million; construction could last three years; and the construction-phase work force could peak at more than 600 persons. (*Gillette News Record* 2000a).

According to information provided by the Dakota, Minnesota & Eastern Railroad Corporation, construction of the DM&E railroad line was expected to start in 1999, take two years and cost \$1.5 billion. For Wyoming, the estimated direct construction-phase work force is 700 persons. In December 1998, DM&E got preliminary approval from the Surface Transportation Board, but must complete an environmental analysis as the next step of the approval process. The draft EIS has been completed and is available for public review.

Currently, Gillette is experiencing a population increase as a result of CBM development in this area. According to a March 26, 2000 article in the *Gillette News-Record*, in the past year Gillette's population has increased, unemployment has decreased, housing has becoming increasingly tight, and traffic and criminal activity have increased (*Gillette News-Record* 2000b). School enrollment has not seen an increase over last year, however.

If all of the new projects are undertaken, it is likely that the population in northeastern Wyoming would continue to grow, and there would be increasing demands on housing, schools, roads, law enforcement, etc. in the communities in this area. The population increase would be expected to be somewhat dispersed among all of the communities in the area, which would include Douglas, Wright, and Newcastle as well as Gillette. The extent of the impacts to the local communities would depend on the amount of overlap between the construction periods on the proposed projects. It was previously estimated that construction of the North Rochelle, ENCOAL and Two Elk projects could have added up to 2,900 people in northeastern Wyoming if they had been undertaken at the same time. As it has actually happened, development of these projects has not

occurred concurrently. The North Rochelle construction project has been completed, CBM development is currently contributing to population in the Gillette area, construction at the Two Elk and Wygen power plants could begin in the near future, construction of the proposed DM&E railroad is waiting on completion of the environmental analyses, and the ENCOAL project has been postponed indefinitely.

During the construction phase of the developmental projects, assistance money could total \$7.5 million for Gillette, \$4.43 million for Campbell County and \$527,000 for Wright (Planning Information Corp. 1997). Assuming local sales and use tax permits are required, the developmental projects if approved would generate about \$12.5 million for Gillette, Wright and Campbell County. The State of Wyoming would receive approximately \$16.99 million from the developmental projects. Ad valorem tax is paid on production and property (Wyoming; Department of Commerce, Energy Section 1997). If all three developmental projects had proceeded as planned, ad valorem tax paid in 2001 was estimated to approach \$10 million (*Gillette News-Record* 1996b).

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

From 1999 on, the Belle Ayr Mine would be able to produce coal at the projected production level for another 25 years under the Proposed Action. 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 resemble original contours, 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 temporarily lost during mining and reclamation. During mining of the LBA tract, there would be a combined loss of cultivated vegetation on 118 acres (Proposed Action) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

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. In the coal aquifer depth to groundwater would increase as much as five miles away from the pits during mining. The water levels in the coal aquifer should return to premining levels at some time (possibly more than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the air quality and visual resources of the area on a short-term basis. Following coal removal, removal of surface facilities, and completion of reclamation, there would be no long-term impact on air quality. The long-term impact on visual resources would be negligible.

The Proposed Action would extend the life of Belle Ayr Mine by two to three 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 29 million tons (Proposed Action) of coal to be used for electrical power generation. CBM that is not recovered from this coal before it is mined would also be irreversibly and irretrievably lost. It is estimated that 1-2 percent 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 118 acres (Proposed Action) 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 surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

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