3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the general analysis area for the Eagle Butte West LBA[1] Tract (the affected environment) and analyzes the direct and indirect impacts to those resources that would be associated with mining the tract if it is leased under the Proposed Action or Alternative 1 (the environmental consequences).

> Additional, more detailed information about the affected environment in the general analysis area is contained in a separate document entitled *Supplementary Information on the Affected Environment in the General Analysis Area for the Eagle Butte West Coal Lease Application EIS,* which is available on request.

The probable environmental consequences of the No Action Alternative (Alternative 2, not issuing a lease for the tract) with respect to each of the environmental resources are also considered in this analysis.

Critical elements of the human environment (BLM 1988) that could potentially be affected by the Proposed Action or Alternative 1 include air quality, cultural resources, Native American religious concerns, T&E species, migratory birds, hazardous or solid wastes, water quality, wetlands/riparian zones, floodplains, invasive non-native species, and environmental justice. Four other critical elements (areas of critical environmental concern, prime or unique farmlands, wild and scenic rivers, and wilderness) are not present in the analysis area and are not addressed further. In addition to the critical elements that are potentially present in the general analysis area, this EIS discusses the status and potential effects of mining the LBA tract on topography and physiography, geology and mineral resources, soils, water quantity, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics. The resources that are addressed in this EIS were identified during the scoping process or interdisciplinary team review as having the potential to be affected.

Figure 3-1 shows the general analysis area for most environmental resources. The general analysis area for the tract includes the Eagle Butte West LBA Tract as applied for and the adjacent lands that BLM is considering adding to the tract. The study area for most environmental resources is generally defined as those lands adjacent to and outside of Eagle Butte Mine's current permit area that the applicant anticipates would be contained within the amended mine permit area if they acquire the tract.

[1] Refer to page xv for a list of abbreviations and acronyms used in this document.

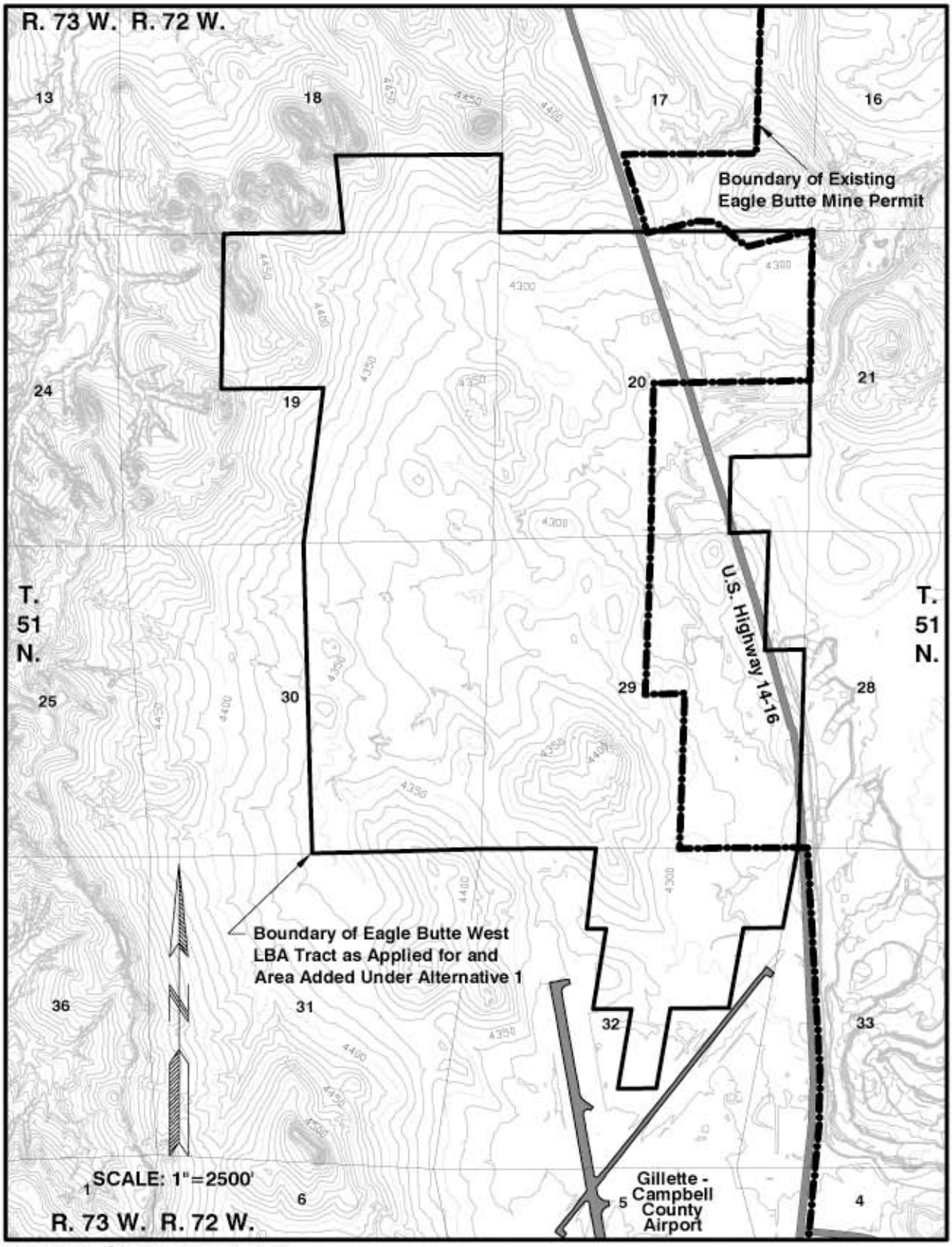

Figure 3-1. General Analysis Area.

Table 3-1 shows the total leased and total mine disturbance areas for the existing Eagle Butte Mine (which represents the No Action Alternative). As indicated in Table 3-1, Eagle Butte's current federal coal leases include approximately 4,884 acres and, under the currently approved mining and reclamation plan, the mine would disturb a total of approximately 6,076 acres in order to recover that coal. According to Eagle Butte Mine's 2004 Annual Report submitted to WDEQ/LQD, the mine had disturbed a total of about 3,556 acres as of December 2004 (FCW 2004b). Of that area of disturbance, approximately 1,535 acres were occupied by permanent or temporary facilities (stockpiles, hydrologic control structures, mine buildings and coal loading facilities, railroad loop, environmental monitoring areas, etc.), 795 acres were being actively mined, and 1,226 acres had been mined and reclaimed or were in the process of being reclaimed (FCW 2004b).

If the Eagle Butte West LBA Tract is leased to the applicant as a maintenance tract under the Proposed Action or Alternative 1, the permit area for the adjacent Eagle

Table 3-1. Comparison of Existing and Proposed Eagle Butte Mine Disturbance Area and Mining Operations – Assuming that U.S. Highway 14-16 is Not Moved and the Coal Underlying the Highway is Not Recovered.[1]

	No Action Alternative (Existing Permit Area)	**Proposed Action**	**Alternative 1[2]**
Additional Lease Area (Acres)	---	1,397.6	2,372.6
Total Lease Area (Acres)[3]	4,884.0	6,281.6	7,256.6
Increase in Lease Area (Percent)	---	28.6	48.6
Estimated Additional Mine Disturbance Area (Acres)[4]	---	2,395.0	2,505.0
Estimated Total Mine Disturbance Area (Acres)	6,076.0	8,471.0	8,581.0
Increase in Estimated Disturbance Area (Percent)	---	39.4	41.2
Estimated Additional Recoverable Coal (Million Tons)[5]	---	203.0	299.9
Estimated Recoverable Coal for Mine as of 1/06 (Million Tons)	340.0	543.0	639.9
Increase in Estimated Recoverable Coal as of 1/06 (Percent)	---	59.7	88.2

1 If the highway is moved, there would be approximately 65 additional acres disturbed and approximately 25 million additional tons of coal would be recovered under the Proposed Action.

2 Under Alternative 1, the numbers shown for the acres of disturbance and tons of represents the coal underlying all of the BLM Study Area. At this time, BLM has concluded that the portion of the study area underlying Rawhide School and Echo Subdivision will not be included in the tract. BLM may include all or a portion of the remaining study area in delineating a tract to consider offering for lease under this alternative.

3 Includes federal and state coal.

4 Total Disturbance Area = area to be mined + area disturbed for mine facilities, access roads, haul roads, highwall reduction, railroad facilities, stockpiles, etc.

5 Estimated Recoverable Coal Resources = tons of mineable coal × recovery factor (96 percent).

Butte Mine would have to be amended to include the new lease area before it could be disturbed by mining activities. Table 3-1 also shows how the leased area and disturbance area would change under the Proposed Action and Alternative 1. The recoverable coal and associated disturbance figures shown in Table 3-1 and elsewhere in this chapter assume that Highway 14-16 is not moved. If WYDOT approves relocation of Highway 14-16, the estimated tons of recoverable coal and associated disturbance would increase as discussed in Chapter 2 in the descriptions of the Proposed Action and Alternative 1. A portion of the LBA tract lies inside the current mine permit area (Figure 3-1). If the tract is leased, the area that would have to be added to the existing mine permit area would be that portion of the LBA tract that lies outside the existing permit boundary plus an adjacent strip of land that would be used for highwall reduction after mining and such mine-related activities as construction of diversions, flood and sediment control structures, roads, and stockpiles. Portions of the LBA tract under the Proposed Action and Alternative 1 lie east of U.S. Highway 14-16, as shown in Figure 3-1. Some of these areas of the tract have been disturbed by the current Eagle Butte mining operation in order to recover the coal in the existing coal leases (Figure 2-1). The environmental consequences of implementing the Proposed Action or Alternative 1 would be similar in nature, but selection of the Proposed Action would disturb a smaller area of land surface.

Surface mining and reclamation have been ongoing in the eastern PRB for nearly three 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 D), 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.

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 until 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) and the professional judgment of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to

insignificance following completion of reclamation.

This chapter also considers regulatory compliance, mitigation, monitoring, and residual impacts. As discussed in Chapter 2, regulatory compliance and mitigation and monitoring measures that are required by federal and/or state law are considered to be part of the Proposed Action and Alternative 1.

Section 3.18 analyzes the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. Section 3.19 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action or Alternative 1.

3.1 General Setting

The general analysis area is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie.

3.1.1 Climate and Meteorology

The climate in the general analysis area is typical of a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature and seasonal variation in precipitation. The average annual precipitation at a NOAA meteorological station (Gillette 9ESE), located about 11 miles southeast of the Eagle Butte Mine, is 15.64 inches (WRCC 2006). June (2.72 inches) and May (2.60 inches) are the wettest months, and February (0.55 inch) is the driest. Snowfall averages 56.7 inches per year, with most occurring in March (10.4 inches) and April (8.6 inches). Potential evapotranspiration, at approximately 31 inches (NOAA 1969), exceeds annual precipitation. Summers are relatively short and warm, while winters are longer and cold. The average daily mean temperature is 45.2 degrees F. The highest recorded temperature was 107 degrees F and the lowest was minus 40 degrees F. July is the warmest month, with a mean daily temperature of 71.0 degrees F, and January is the coldest month, with a mean daily temperature of 21.7 degrees F. The frost-free period is 100-130 days.

In the general analysis area, surface wind speeds average approximately 10 mph throughout the year. The area experiences extreme wind gusts, especially during thunderstorm activity that occurs in June, July, and August. Distinct diurnal changes occur, with average wind velocities increasing during the day and decreasing during the night. Local variations in wind speed and direction are primarily due to differences in topography. Wind speeds are highest in the winter and spring (October through April) and are predominantly from the western and northern sectors. During the warmer months (May through September), wind speeds are calmer and directions are more random, although winds from the northern or southeastern sectors are slightly more predominant.

During periods of strong wind, dust may impact air quality across the region. An average of 15 air-stagnation events occurs annually in the PRB with an average duration of two days each (BLM 1974).

3.2 Topography and Physiography

3.2.1 Affected Environment

The general analysis area is a high plains area within the eastern portion of the PRB. The PRB is an elongated, asymmetrical structural downfold that is bounded by the Black Hills on the east; the Big Horn Mountains on the west; the Hartville Uplift, Casper Arch, and Laramie Mountains on the south; and the Miles City Arch and the Yellowstone River on the north. The Eagle Butte Mine is located on the gently dipping eastern limb of the structural downfold. The regional dip in the area of the mine is to the west.

Landforms of the area consist of a dissected rolling upland plain with low relief, broken by low red-capped buttes, mesas, hills, and ridges. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone. Elevations in the PRB range from less than 2,500 ft to greater than 6,000 ft above sea level. The major river valleys have wide, flat floors and broad floodplains. The drainages dissecting the area are incised, typically are ephemeral or intermittent, and do not provide year-round water sources.

The general analysis area is drained by Little Rawhide Creek, which is the most prominent topographic feature. The topography is generally level to gently rolling, dissected by locally shallow gullies and the broader meandering floodplain of Little Rawhide Creek, an intermittent stream. The steepest terrain exists in the extreme northwest corner of the LBA tract configured under Alternative 1. Unmined lands surrounding the tract are characterized by low rolling hills with a prominent ridgeline immediately to the west. Surface mine lands, both active and reclaimed, dominate the landscape adjacent to the LBA tract's eastern edge. Elevations range from about 4,240 ft to 4,560 ft above sea level, slopes range from flat to around 40 percent, and 73 percent of the surface has a slope of five percent or less. Habitat types within the LBA tract and adjacent area include seeded pastures, sagebrush-grassland, upland-grassland, and areas of previous disturbance. Nearly 65 percent of the LBA tract configured under Alternative 1 is currently agriculture pasture and disturbed land. Other habitats present in limited extent include bottomland or riparian areas, sparse trees, and some open water along Little Rawhide Creek, primarily in the southern portion. Little Rawhide Creek passes through the eastern portion of the tract from south to north, and its tributary, Prong Draw, passes through the central portion of the tract from southwest to northeast. Overall, the Eagle Butte West LBA Tract is similar in topography to the rest of the Eagle Butte Mine permit area.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action and Alternative 1

Surface coal mining would permanently alter the topography of the LBA tract if it is leased and mined. 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 LBA 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. If necessary, the Little Rawhide Creek would be diverted into a temporary channel to prevent pits from being flooded.

Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. The original topography of the Eagle Butte West LBA Tract ranges from relatively flat to gently rolling hills. Slopes range from flat to around 40 percent, as discussed above, and the average slope is about four percent. The expected postmining topography would be similar to the premining topography, but somewhat gentler and more uniform. Following reclamation, the average surface elevation on the LBA tract as proposed would be approximately 69 ft lower due to coal removal. The removal of the coal would be partially offset by the swelling that occurs when the overburden (and interburden, if present) is blasted and removed. Table 3-2 presents the approximate postmining surface elevation change for the LBA tract as applied for under the Proposed Action and Alternative 1. After the coal is removed, the land surface would be restored to approximate original contour or to a configuration approved by WDEQ/LQD when the mining and reclamation permit for the existing mine is revised to include coal removal from the LBA tract.

Direct adverse impacts resulting from topographic moderation include a reduction in microhabitats (e.g., cutbank slopes) for some wildlife species and a reduction in habitat diversity. The reduction in slope-dependent shrub communities and associated habitat would be slight, due to the lack of steep, premining topography on the tract. These impacts may result in a long-term reduction in carrying capacity for some species. 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 (Section 3.8.2). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater.

The approximate original drainage pattern would be restored, and stock ponds would be replaced to provide livestock and wildlife watering

Table 3-2. Comparison of Average Overburden and Coal Thicknesses and Approximate Postmining Surface Elevation Changes Under the No Action and Action Alternatives.

	No Action Alternative (Existing Leases)	Proposed Action (As Applied For LBA Tract)	Alternative 1
Average Overburden Thickness (ft)	200.0	325.0	325.0
Average Interburden Thickness (ft)	5.3	8.0	8.0
Average Coal Thickness (ft)	100.0	110.0	110.0
Swell Factor (percent)	11	11	11
Coal Recovery Factor (percent)	96	96	96
Postmining Elevation Change[1]	73.4 ft lower	69.0 ft lower	69.0 ft lower

[1] Reclaimed (postmining) elevation surface change calculated as:
(coal thickness × coal recovery factor) – (swell factor × overburden + interburden thickness).

sources. These topographic changes would not conflict with regional land use, and the postmining topography would be designed to adequately support anticipated land use.

These impacts are occurring on the existing Eagle Butte Mine coal leases as coal is mined and mined-out areas are reclaimed. Under the Proposed Action or Alternative 1, the areas that would be permanently topographically changed would increase as shown in Table 3-1.

3.2.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the LBA tract. Mining operations and the associated impacts to topography and physiography would continue as permitted on the existing Eagle Butte Mine leases. Table 3-2 presents the approximate postmining surface elevation change for the existing mine. The portion of the Eagle Butte West LBA Tract lying west of U.S. Highway 14-16 would not be disturbed to recover the coal in the existing leases east of the highway.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.2.3 Regulatory Compliance, Mitigation and Monitoring

The mined-out area must be restored to approximate original contour or other topographic configuration approved by WDEQ/LQD. The topographic configuration would be developed and approved as part of the required mining and reclamation plan for the Eagle Butte Mine. WDEQ/LQD monitors topographic restoration by checking the as-built topography in the annual report filed by the mine to see if it conforms to the approved topography.

3.2.4 Residual Impacts

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

3.3 Geology, Mineral Resources, and Paleontology

3.3.1 General Geology and Coal Resources

3.3.1.1 Affected Environment

Stratigraphic units that would be impacted if the tract under consideration for leasing is mined include, in descending order, recent (Quaternary age) alluvial and eolian deposits, the Eocene age Wasatch Formation (the overburden), and the Paleocene age Fort Union Formation (which contains the target coal seams). Figure 3-2 is a chart showing the stratigraphic relationships of the surface and subsurface geologic units in the general analysis area. Additional information about these units is included in the Groundwater section of this document (Section 3.5).

Surficial deposits in the general analysis area include alluvial and eolian deposits and weathered Wasatch Formation. Alluvial deposits occupy the Little Rawhide Creek valley and the lower most section of a tributary, Prong Draw, where it joins the mainstem of Little Rawhide Creek.

The Eocene Wasatch Formation forms most of the overburden in the general analysis area. The boundary between the Wasatch Formation and the underlying Paleocene Fort Union Formation is not distinct. From a practical standpoint, the top of the mineable coal zone is considered as the contact between the two formations. As indicated in Table 3-2, overburden thicknesses in the Eagle Butte West LBA Tract as applied for and under Alternative 1 average about 325 feet. The Wasatch overburden in the general analysis area consists of interbedded sand, clay, silty claystone, and thin coal laminations. Thick sand layers up to 200 ft thick were encountered during exploration drilling in the area. As discussed in Section 3.2.1, the regional dip in this area is to the west; as a result, the overburden thickness is generally thinner to the east and increases to the west. Within the general analysis area, overburden thickness ranges from about 183 ft to 460 ft.

As shown in Figure 3-2, the Fort Union Formation is divided into three members: the Tongue River, the Lebo, and the Tullock, in descending order.

The mineable coal seams in the PRB are part of the Tongue River Member of the Fort Union Formation. At the Eagle Butte Mine and within the Eagle Butte West LBA Tract, there are two mineable coal seams. Locally, these coal seams are referred to as the Roland (upper seam) and Smith (lower seam), separated by a shale parting of variable thickness. The mineable coal seams are referred to as the Anderson and Canyon, Wyodak-Anderson, and Wyodak coal beds by other mines in the eastern

Geologic Unit			Hydrologic Characteristics
RECENT ALLUVIUM HOLOCENE			Typically fine grained and poorly sorted sands interbedded with silts and clays in ephemeral drainages. Occasional very thin, clean interbedded sand lenses. More laterally extensive, thicker, and coarse-grained along the larger stream courses. Excessive dissolved solids generally make this aquifer unsuitable for domestic and agricultural use and marginal for livestock (Class III) use standards. Low infiltration capacity in ephemeral draws unless covered by sandy eolian blanket. Low to moderate infiltration along Little Rawhide Creek.
CLINKER HOLOCENE TO PLEISTOCENE			Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria, red dog, etc.) formed by melting and partial fusing of overburden above the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated. Considered to be part of the Wasatch Formation.
WASATCH FORMATION EOCENE			Lenticular fine sands interbedded in predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch Formation generally does not meet Wyoming Class I (drinking water) standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality that does meet the Class I standard.
FORT UNION FORMATION PALEOCENE	TONGUE RIVER MEMBER	W R S	The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use. W = Wyodak Coal; R = Roland; S = Smith.
	LEBO MEMBER		The Lebo member, also referred to as the "Lebo Confining Layer" or "Lebo Shale". Has a mean thickness of 711 ft in the PRB and a thickness of about 400 ft in the vicinity of Gillette. The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm.
	TULLOCK MEMBER		The Tullock member has a mean thickness of 785 ft in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but vary locally and may be as much as 40 gpm. Records from the SEO indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
LANCE FORMATION UPPER CRETACEOUS	UPPER LANCE		Silty, calcareous sandstones and interbedded sandy shales, claystones, and coals. Provides yields generally less than 20 gpm. Higher yields can occur where sand thicknesses are greatest. Water quality is typically fair to good. Also referred to as the "Upper Lance Confining Layer".
	FOX HILLS SANDSTONE		Marine sandstones and sandy shales. Has a mean thickness of 666 ft and a mean sand content over 50 percent in the PRB. Yields up to 200 gpm are common; however, yields can be significantly less. Water quality is good, with TDS concentrations commonly less than 1,000 mg/L. The City of Gillette is currently using five wells completed in this aquifer to meet municipal water
LEWIS FORMATION UPPER CRETACEOUS	PIERRE SHALE		This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution.
Compiled from Hodson et al. (1973) and Lewis and Hotchkiss (1981).			

Figure 3-2 Stratigraphic Relationships and Hydrologic Characteristics of Upper Cretaceous, Lower Tertiary, and Recent Geologic Units, PRM, Wyoming.

PRB. In the Eagle Butte Mine area, the Roland seam ranges from zero to 70 ft thick, with an average thickness of 40 ft. The Smith seam in places reaches thicknesses of over 100 ft, with an average thickness of 70 ft.

On the Eagle Butte West LBA Tract as applied for and the area added by Alternative 1, the combined thickness of the two coal seams averages about 110 ft (Table 3-2). However, the Roland seam is not present in all areas within the general analysis area, causing a decrease in the total coal thickness. The thickness of coal ranges from approximately 33 ft to 133 ft. Interburden between the two seams, where both seams are present, varies from one ft to 13 ft.

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. Typically, the coal being mined in the PRB has a lower heating value and higher sulfur content north of Gillette than south of Gillette. According to the analyses (which were done on an as-received basis) of exploration drilling samples collected in the Eagle Butte West LBA Tract as applied for and the area added under Alternative 1, the average heating value of the coal is approximately 8,350 Btu/lb, with an average of about 0.35 percent sulfur, 1.9 percent sodium, 4.7 percent ash, and 31 percent moisture.

3.3.1.2 Environmental Consequences

3.3.1.2.1 Proposed Action and Alternative 1

The geology from the base of the lowest coal seam mined to the land surface would be subject to permanent change after the coal is removed on the LBA tract under the Proposed Action or Alternative 1. The subsurface characteristics of these lands would be radically altered by mining. The replaced overburden and interburden (backfill) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shale that currently exist.

Mining would remove an average of 325 ft of overburden, eight ft of interburden, and 110 ft of coal from about 1,333 acres under the tract configuration for the Proposed Action up to 1,989 acres under Alternative 1. These acreage figures represent the estimated area of actual coal removal. Table 3-2 presents the average overburden and coal thicknesses for the Eagle Butte West LBA Tract as applied for and Alternative 1.

The replaced overburden and interburden would be a relatively homogeneous (compared to the premining layered overburden and interburden) and partly recompacted mixture averaging about 374 ft in thickness under both the Proposed Action and Alternative 1. Approximately 203 million additional tons of coal would be recovered under the Proposed Action and up to an estimated 300 million tons would be recovered under Alternative 1.

3.3.1.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the Eagle Butte West LBA Tract. Mining

operations and coal removal would continue as permitted on the existing Eagle Butte Mine coal leases for about 13.6 years. Table 3-2 presents the average overburden, interburden, and coal thicknesses for the existing Eagle Butte Mine permit area. The portion of the Eagle Butte West LBA Tract lying west of Highway 14-16 would not be disturbed to recover the remaining coal in the existing leases east of the highway.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.3.1.3 Regulatory Compliance, Mitigation and Monitoring

Drilling and sampling programs are conducted on existing leases by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in reestablishing 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 Eagle Butte Mine and would be developed for the Eagle Butte West LBA Tract if it is leased.

3.3.1.4 Residual Impacts

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

3.3.2 Other Mineral Resources

3.3.2.1 Affected Environment

3.3.2.1.1 Conventional Oil and Gas

The following discussion is based on a report on conventional and CBNG resources in the area of the Eagle Butte West LBA Tract prepared by the BLM's Reservoir Management Group (WSO-RMG 2005a).

WSO-RMG's review of IHS Energy data indicates that only the Muddy, Dakota and Minnelusa Formations have been productive to date in T.51N., R.72 and 73W. The nearest producing wells produce both oil and gas from the Kitty Field, two miles or more west of the LBA study area, and the Mill-Gillette Field, two miles or more to the east. Both fields produce from the Cretaceous-age Muddy Formation. There has only been one productive Minnelusa well in the two townships, located in Section 1, T.51N., R.72W.; it produced only a few barrels of oil and a small amount of gas.

Nine conventional tests have been drilled in a 12-section area encompassing or immediately adjacent to the LBA study area, including four within the study area itself. According to WOGCC records,

all were drilled and abandoned without any reported production. Although no oil or gas was produced, the records suggest that the Minnelusa, Dakota and Muddy Formations were tested. The most recent conventional test well in the 12-section area was drilled in 1985.

See Section 3.11 for discussion of the ownership of the oil and gas resources in the LBA tract.

3.3.2.1.2 Coal Bed Natural Gas (CBNG)

CBNG has been commercially produced in the PRB since 1989 when production began at the Rawhide Butte Field, immediately west of the Eagle Butte Mine (De Bruin and Lyman 1999). The Rawhide Butte Field is located within the northern portion of the general analysis area. Extensive development of CBNG in the Roland-Smith/Wyodak-Anderson coal zone has occurred in the vicinity of the Eagle Butte West LBA Tract. WOGCC records show that as of May 19, 2006, 68 wells had been drilled for CBNG production and 19 wells were capable of producing from the Roland-Smith/Wyodak-Anderson coal zone in the sections that include the Eagle Butte West LBA Tract as applied for and the area added by Alternative 1 (WOGCC 2006). Extensive CBNG development has also occurred immediately north, west, and south of the LBA tract.

CBNG is being produced locally from other deeper seams in the PRB. For example, within the Eagle Butte West LBA Tract as applied for and the BLM study area included in Alternative 1, four CBNG wells have been drilled to the Danner coal seam (approximately 1,300 ft deep), one of which is currently producing gas, and 10 others are currently permitted to be drilled (WOGCC 2006).

The following discussion is based on a report on conventional and CBNG resources in the area of the Eagle Butte West LBA Tract prepared by the BLM's Reservoir Management Group (WSO-RMG 2005a).

CBNG wells were initially drilled on 40-acre spacing in the Wyoming PRB. Production/reservoir analyses that have been submitted to the WOGCC in various public hearings indicate that CBNG wells in the PRB will produce reserves from larger areas than 40 acres. As a result, the WOGCC established an 80-acre spacing pattern as the default spacing for CBNG wells completed in the PRB within the Fort Union and Wasatch Formations. Most CBNG wells on and near the Eagle Butte West LBA Tract were drilled on a 40-acre pattern, either because the wells were drilled before the spacing was changed to 80 acres or under the authorization of spacing exceptions granted by WOGCC. Certain townships in the PRB are exempt from the 80-acre spacing pattern rule, including T.51N., R.72W. (WOGCC 2005a). All 40-acre spacing units within the proposed Eagle Butte West LBA Tract have been drilled or proposed for drilling. Only four 40-acre spacing units within the BLM study area have not been drilled or proposed for drilling. There has been little recent interest in drilling

additional wells for completion in the Roland-Smith/Wyodak-Anderson coal zone in this area. According to WOGCC and IHS Energy records, the most recent well in the 12-section area encompassing or immediately adjacent to the LBA study area was completed in September 2003.

For the purposes of this EIS, the BLM WSO-RMG reviewed the existing CBNG resource and production data in the general analysis area (WSO-RMG 2005a). The BLM WSO-RMG and USGS have collected extensive CBNG data, including coal gas content, from a number of coal cores at locations near existing PRB mines. The cores were taken from depths comparable to the Eagle Butte West tract area seams (reported depth 325 ft.), ranging from 134 to 407 ft. Although none of the samples were near the Eagle Butte Mine area (cores were collected near the Rawhide mine in deeper seams), the core data generally indicated that coal seams were substantially depleted of CBNG in the vicinity of the mines when the near-mine cores were collected in 2000.

Measured gas content was minimal in all of the cores. Desorbed gas measurements from more than 300 core samples range from 37 to less than 0.1 scf/ton (USGS 2005). Average total gas content from the core desorption analyses is approximately 6.8 scf per ton; the median value is 4.8 scf/ton; and the most common measurement (rounded to a whole number) is 2.0 scf/ton.

Gas content in the Roland-Smith/Wyodak-Anderson coal in the area of the Eagle Butte Mine would have been expected to be comparable to these averages in 2000. Based on the gas content estimates derived from the desorption analyses and the estimates of the volume of coal included in the Eagle Butte West LBA Tract, the estimated gas-in-place in the Eagle Butte West LBA Tract would have ranged from approximately 1.1 bcf to 1.5 bcf of CBNG in 2000. For the LBA tract and study area combined, the estimated gas-in-place in 2000 would have ranged from 1.6 bcf to 2.3 bcf (WSO-RMG 2005a).

Previous analyses by BLM WSO-RMG, USGS, CBNG operators and others have shown that dewatering the coals, both by CBNG production and mine dewatering, reduces the hydrostatic pressure in the coals and allows the CBNG to desorb and escape from the coal. These effects continue over time with continued dewatering. Production has continued since 2000, and it is likely that desorption has continued since 2000; as a result, coal gas content and the gas-in-place on the tract would currently be expected to be less than in 2000.

Due to the extensive prior development, there is sufficient production data available to estimate well life and reserves for existing CBNG wells/spacing units in the Eagle Butte West LBA Tract and BLM study area. BLM WSO-RMG prepared decline analyses, using IHS Energy's "Powertools" software, for all the CBNG wells in T.51N., R.72W., where the LBA is located. Since the area has been nearly completely

developed, the wells within the 12-section area encompassing or immediately adjacent to the Eagle Butte West LBA tract and BLM study area were considered sufficient for all analyses prepared for this review. BLM WSO-RMG reviewed the wells within this 12-section area individually.

Overall, BLM WSO-RMG estimated that the average EUR for the active wells within the 12-section study area is approximately 290.5 mmcf and total economic life is approximately 12 years. Most of the active wells within the 12-section area are projected to be uneconomic to produce by the end of 2008. Only two wells are projected to continue to produce beyond 2010.

The ownership of oil and gas resources in the LBA tract, which includes the CBNG resources, is discussed in Section 3.11.

3.3.2.1.3 Other Minerals

Bentonite, uranium, and scoria are commercially produced in the PRB in addition to conventional oil and gas and CBNG (WSGS 2004 and 2005a).

Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined around the edges of the PRB. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including drilling mud and cat litter. No mineable bentonite reserves have been identified on the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1.

There are substantial uranium resources in Johnson, Campbell, and Converse Counties. There are currently two operating in-situ uranium recovery sites in the PRB, which were recently combined into one operation that is located in central Converse County (WSGS 2005a). No known uranium reserves exist within the general analysis area.

Scoria, also called clinker or burn has been and continues to be a major source of aggregate for road construction in the area due to the shortage of more competent materials. Scoria consists of sediments that were baked, fused, or melted in place when the underlying coal burned spontaneously. Scoria is present within the northern portion of the Eagle Butte Mine permit area, predominantly within Sections 15 and 16, T.51N., R.72W. Scoria does not occur on the LBA tract as applied for, although small, localized deposits do occur in the extreme northwest corner of the area added under Alternative 1, in Sections 18 and 19, T.51N., R.72W. See Section 3.5.1.1.2 for additional information on scoria.

A search of the BLM mining claim index revealed that no active mining claims are presently located on the Eagle Butte West LBA Tract.

3.3.2.2 Environmental Consequences

3.3.2.2.1 Proposed Action and Alternative 1

During mining, other minerals present on the LBA tract could not be developed. Some of these minerals could, however, be developed after mining. The conventional oil and gas reservoirs and the CBNG reservoirs below the Roland-Smith coal would not be directly disturbed by removal of the mineable coal. The oil and gas lessee could drill wells to recover oil and gas resources from any oil and gas or CBNG reservoirs below the mineable coal seams following mining and reclamation. This would only occur if they believe that the value of the reserves would justify the expense of drilling the wells.

Although the Eagle Butte West LBA Tract and BLM study area appear generally unfavorable for additional conventional oil and gas discoveries, the entire study area has not been tested. The formations producing conventional oil and gas in the LBA tract and BLM study area occur at much greater depths than would be affected by mining. The average depth of the productive formations ranges from approximately 8,000 – 8,500 ft. for the Muddy and Dakota Formation wells to nearly 9,900 – 10,000 ft. for the Minnelusa Formation wells. At these depths there would be no direct effects from mining. However, conflicts could arise between the conventional oil and gas production and mining if conventional wells are in production at the time the well locations are to be mined.

Before mining operations could begin, all CBNG wells would have to be abandoned, and all gas production equipment would have to be removed to a level below the coal. CBNG resources that have not been recovered from the Roland-Smith/Wyodak-Anderson zone prior to mining would be lost when the coal is removed.

CBNG production requires withdrawal of water from the coal seams to reduce hydrostatic pressure and enable methane desorption from the coals. Mine-related dewatering of the coal seams reduces hydrostatic pressure and allows the methane to escape in the same way that CBNG well dewatering of the coal seam does. BLM WSO-RMG's review and other CBNG reservoir analyses indicate that depletion of the hydrostatic pressures and methane resources starts to occur adjacent to mining areas a short time after mining begins. Coal mining operations have been ongoing for more than 20 years and are continuing at the Eagle Butte Mine and other adjacent surface coal mines in this area. The ongoing reduction of hydrostatic pressure in the coal due to mining has been accelerated by extensive CBNG production from surrounding lands.

BLM WSO-RMG's analyses of the production and reservoirs indicates that the CBNG resource within the Roland-Smith/Wyodak-Anderson seam has been substantially depleted, either by mining or by recovery from producing wells. Only a few wells remain in production on or adjacent to the LBA tract and it seems likely that these will have exhausted their

economic reserves prior to initiation of mining in the LBA tract. BLM WSO-RMG's production and reservoir analyses submitted to WOGCC indicated that a CBNG well can generally drain more than 40 acres; therefore, it is likely that any undrilled spacing units in the LBA tract and BLM study area have been drained by production from the existing wells and nearby mining activity. Overall, BLM WSO-RMG's analyses suggest that there are insufficient reserves remaining in the parcel to support additional drilling. As a result, mining the proposed Eagle Butte West LBA Tract is unlikely to affect, or to be affected by, CBNG production from the Roland-Smith/Wyodak-Anderson coal seams.

Production from the coal zones underlying the Roland-Smith/Wyodak-Anderson could be delayed as the parcel is mined. If production from these lower seams is established on the LBA tract in the future, additional measures would be required to accommodate both mining and CBNG production (see Section 3.3.2.3).

Section 3.11.1 includes a discussion on the ownership of the oil and gas resources on the LBA tract and the oil and gas facilities in the area of the tract.

3.3.2.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the Eagle Butte West LBA Tract. Mining operations would continue to limit the development of other mineral resources described above on the existing Eagle Butte Mine coal leases. Mineral development limitations related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.3.2.3 Regulatory Compliance, Mitigation and Monitoring

No conventional oil and gas reservoirs containing producible quantities of oil and gas are known to underlie the Eagle Butte West LBA Tract, and the reservoir analyses conducted by the BLM WSO-RMG indicate that most of the recoverable CBNG resources on the Eagle Butte West LBA Tract have probably been produced by the existing wells. Potential does exist for conflicts between coal operations and CBNG wells completed in coal zones below the Roland-Smith/Wyodak-Anderson.

If the federal coal in the tract is leased and conflicts do develop between the operators of the oil and gas wells and the surface coal mine operator, there are several mechanisms that can be used to facilitate recovery of the conventional oil and gas and CBNG resources prior to mining:

- BLM will attach a Multiple Mineral Development stipulation to the Federal coal lease, which states that BLM has the authority to withhold approval of coal mining operations that would interfere with the development of mineral leases issued prior to the coal lease (see Appendix D).

- Conventional oil and gas wells must be abandoned while mining and reclamation operations are in progress but could be recompleted or redrilled following mining if the value of the remaining reserves would justify the expense of reestablishing production.

- BLM has a policy in place on CBNG-coal conflicts (BLM Instruction Memorandum No. 2003-253), which directs BLM decision-makers to optimize the recovery of both resources and ensure that the public receives a reasonable return. This memorandum offers royalty incentives to CBNG operators to accelerate production in order to recover the natural gas while simultaneously allowing uninterrupted coal mining operations. In addition, this memorandum also states that it is the policy of the BLM to encourage oil and gas and coal companies to resolve conflicts between themselves; when requested, the BLM will assist in facilitating agreements between the companies.

- Mining of the Eagle Butte West LBA Tract cannot occur until the coal lessee has a permit to mine the tract approved by the WDEQ/LQD and a MLA mining plan approved by the Secretary of the Interior. Before the MLA mining plan can be approved, BLM must approve the R2P2 for mining the tract. Prior to approving the R2P2, BLM can review the status of CBNG and conventional oil and gas development on the tract and the mining sequence proposed by the coal lessee. The permit approval process generally takes the coal lessee several years, during which time CBNG resources can be recovered.

- Prior to mining the Federal coal, the coal lessee can negotiate an agreement with owners and operators of existing oil and gas facilities on the tract, including owners and operators of oil and gas well and pipeline facilities, regarding removal and relocation of those facilities prior to mining.

3.3.2.4 Residual Impacts

CBNG resources not recovered prior to mining would be vented to the atmosphere and permanently lost.

3.3.3 Paleontology

3.3.3.1 Affected Environment

The formation exposed on the surface of the Eagle Butte West LBA Tract is the sedimentary Eocene Wasatch

Formation, which is known to produce fossil vertebrates of scientific significance throughout Wyoming, including the PRB (Delson 1971, Winterfeld 1978, EVG 2001).

BLM ranks areas according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The Wasatch Formation is ranked as fulfilling BLM Paleontology Condition No. 1, which is described in the Paleontological Resource Management Handbook 8270-I as "areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils". According to the handbook, "consideration of paleontological resources will be necessary if the Field Office review of available information indicates that such fossils are present in the area".

The BLM in Wyoming uses an additional planning tool, called the PFYC, to classify geological units, usually at the formation or member level, according to the probability of them yielding paleontological resources that are of concern to land managers. This classification system is based largely on how likely a geologic unit is to produce scientifically significant fossils. BLM considers the Wasatch Formation to fulfill either the PFYC Class 4 or Class 5, depending on the nature of bedrock exposures present. PFYC classes 4 and 5 are described as follows:

> Class 4 - These geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.
>
> Class 5 - Fossilferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant non-vertebrate (plant and invertebrate) fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.

Although the Wasatch Formation is known to produce fossil vertebrates of scientific significance in Wyoming, outcrops of the Wasatch Formation in the PRB are not generally well-exposed and the conditions of deposition of the formation have contributed to a low preservation potential for fossils. Vertebrate fossils that have been described from the Wasatch Formation include mammals such as early horses, tapiroids, condylarths, primates, insectivores, marsupials, creodonts, carnivores, and multituberculates; reptiles such as crocodilians, alligators, lizards, and turtles; birds; eggs; amphibians; and fish. Non-marine invertebrates such as mollusks and ostrocods have also been described from the Wasatch.

Fossil plant material is common in the Wasatch Formation. The fossil plants inventoried are primarily leaves and fossilized wood. The leaves usually occur as lignitic impressions in sandstone and siltstone and as compact masses in shale. Leaves are the most abundant fossils found during paleontological surveys and are frequently encountered during mining

operations. Fossilized wood often occurs near the top of a coal seam, in carbonaceous shale or within channel sandstone. Exposures of fossil logs are common, but usually very fragmentary. Like fossil leaves, fossil logs can be readily collected in the PRB.

Paleontological surveys were conducted in conjunction with the cultural resource inventories of the current Eagle Butte Mine permit area, the Eagle Butte West LBA Tract, and BLM study area. Pedestrian examinations for fossil indications were conducted along rock outcrops. One of the primary goals of the paleontological surveys was to locate unique pockets of fossilized bone such as those reported elsewhere in the Wasatch Formation in the PRB. Such concentrations of fossilized bone were not found, nor were any fossil vertebrates. Two relatively unique occurrences of tree stumps were found in 1974 within Sections 27 and 34, T.51N., R.72W. The only other fossils inventoried to date have been wood fragments.

No significant or unique paleontological resource localities have been recorded on federal lands in the general analysis area and no specific mitigation has been recommended for paleontology.

3.3.3.2 Environmental Consequences

3.3.3.2.1 Proposed Action and Alternative 1

The rock outcrops present on the Eagle Butte West LBA Tract were examined for the presence of fossils, as discussed above, and no scientifically significant fossils were located. Fossils with scientific significance could be present on the tract but not exposed at the surface. If the tract is leased under the Proposed Action or Alternative 1, paleontological resources located on the tract that are not exposed on the surface would be destroyed when the overburden is removed.

3.3.3.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the LBA tract. Mining operations and the associated potential impacts to paleontological resources described above would continue as permitted on the existing Eagle Butte Mine coal leases. Disturbance related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.3.3.3 Regulatory Compliance, Mitigation and Monitoring

If the Eagle Butte West LBA Tract is leased, BLM will attach a stipulation to the lease requiring the operator to report significant paleontological finds to the authorized federal agency and suspend production in the vicinity of the find until an approved

paleontologist can evaluate the paleontological resource (Appendix D).

3.3.3.4 Residual Impacts

Paleontological resources that are not identified and removed prior to or during mining operations would be lost.

3.4 Air Quality

3.4.1 Background

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is strongly affected by local topography. In the mountainous western United States, topography is particularly important in channeling pollutants along valleys, creating upslope and downslope circulations that may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. In general, local effects are superimposed on the general synoptic weather regime and are most important when the large-scale wind flow is weak.

Wyoming can be characterized as having a combination of both highland and mid-latitude semiarid climates. The dominant factors that affect the climate of the area are elevation, local relief, and the mountain barrier effect. This barrier effect can produce marked temperature and precipitation differences between windward and leeward slopes. Generally, temperatures decrease and precipitation increases with increasing elevation. See Section 3.1.1 for additional information about the climate in the general analysis area.

The general analysis area, shown in Figure 3-1, is located in the east-central portion of the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. As discussed in Section 3.2.1, the topography is primarily rolling plains and tablelands of moderate relief (with occasional valleys and buttes). Elevations range from about 4,240 ft to 4,560 ft above sea level. Slopes in the general analysis area are generally flat and no topographic features that would be expected to profoundly affect the local wind flow patterns or pollutant transport are present. The Big Horn Mountains lie approximately 60 miles to the west and the Black Hills lie approximately 60 miles to the east.

3.4.1.1 Regulatory Framework

Regulations applicable to surface coal mining may include NAAQS/WAAQS, PSD, NSPS, and the Federal Operating Permit Program (Title V). The regulatory programs are described below.

Air pollution impacts are limited by local, state, tribal, and federal air quality regulations and standards, and implementation plans established under the federal CAA and the CAAA of 1990. In Wyoming, air pollution impacts are managed by WDEQ/AQD under the WAQSR and the EPA approved State Implementation Plan.

A fundamental requirement of both federal and state regulations is that ambient concentrations for specific criteria pollutants not exceed allowable levels, referred to as the Ambient Air Quality Standards (AAQS). The EPA and the State of Wyoming have established these standards at levels deemed necessary to preclude adverse impacts on human health and welfare. The National AAQS (or NAAQS) set nationwide thresholds for maximum acceptable concentrations of various pollutants. Currently the EPA has established NAAQS for six pollutants (also known as "criteria pollutants"). The State of Wyoming has also established ambient air quality standards (or WAAQS) for those pollutants that are as stringent as or more stringent than the NAAQS, and are enforceable under WAQSR. Selected NAAQS and WAAQS are shown in Table 3-3. The NAAQS and WAAQS set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access.

Pursuant to the CAA, the EPA has developed classifications for distinct geographic regions known as air basins and for major MSAs. Under these classifications, for each federal criteria pollutant, each air basin (or portion of a basin or MSA) is classified as in "attainment" if the area has "attained" compliance with (that is, not exceeded) the adopted NAAQS for that pollutant, or is classified as "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available are designated as "unclassified" for those particular pollutants. States designate areas within their borders as being in "attainment" or "non-attainment" with the AAQS. Existing air quality throughout most of the PRB in Wyoming is in attainment with all ambient air quality standards, as demonstrated by comparing the background concentration levels with the AAQS concentration levels presented in Table 3-3. However, the Sheridan, Wyoming area has been designated as a non-attainment area (PM_{10} – moderate) where the applicable standards have been violated in the past.

A company initiating a project must go through the WDEQ/AQD New Source Review permitting process to obtain either a construction or modification permit or a permit waiver. During the New Source Review permitting process, applicants must demonstrate compliance with the AAQS standards; this can be done by modeling or other methods approved by the WDEQ/AQD Administrator. A project will typically model for criteria pollutants emitted by the project to show its contribution to ambient air quality concentrations. The assumed background pollutant concentrations included in Table 3-3 were provided by WDEQ/AQD (BLM 2005a). The assumed background pollutant concentrations are below applicable NAAQS and WAAQS for all criteria pollutants and averaging times.

The PSD regulation is intended to prevent deterioration of air quality in areas that are in attainment with the

Table 3-3. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in µg/m[3]).

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments	PSD Class II Increments
Carbon monoxide	1-hour	3,336[3]	40,000	40,000	40,000	---	---
	8-hour	1,381	10,000	10,000	10,000	---	---
Nitrogen dioxide	Annual	5[4]	100	100	100	2.5	25
Ozone	1-hour	167[5]	235	235	235	---	---
	8-hour	140[5]	157	157	157	---	---
Sulfur dioxide	3-hour	181[6]	---	1,300	1,300	25	512
	24-hour	62[6]	365	---	260	5	91
	Annual	13[6]	80	---	60	2	20
PM_{10}	24-hour	54[7]	150	150	150	8	30
	Annual	13[7]	50	50	50	4	17
$PM_{2.5}$	24-hour	19[8]	65	65	65	---	---
	Annual	7.6[8]	15	15	15	---	---

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.
3 Data collected by Amoco at Ryckman Creek for an eight-month period during 1978-1979, summarized in Riley Ridge EIS (BLM 1983).
4 Data collected at TBNG, Campbell County, Wyoming in 2002 (Source: WDEQ).
5 Data collected at TBNG, Campbell County, Wyoming in 2001-2003 (8-hour); 2002 (1-hour)(Source: WDEQ).
6 Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.
7 Data collected by AMAX coal at the Eagle Butte Mine, Campbell County, Wyoming in 2002.
8 Data collected in Gillette, Wyoming in 1999.
Source: (BLM 2005b)

NAAQS. The CAA requires EPA to place each airshed within the U.S. into one of three PSD area classifications. PSD Class I is the most restrictive air quality category. Mandatory federal Class I areas were designated by Congress and include international parks, national wilderness areas greater than 5,000 acres in size, national memorial parks greater than 5,000 acres in size, and national parks greater than 6,000 acres in size which were in existence on August 7, 1977 [40 CFR 52.21(e)]. These classifications may not be redesignated. All areas not established as Class I were designated as Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow air quality to degrade to the NAAQS, have been designated. The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources. The federal CAA also provides for specific visibility protection of mandatory federal Class I areas.

Table 3-4 is a list of mandatory federal Class I areas, tribal Class I areas, and federal Class II areas that are of special interest in the region and their distance from the Eagle Butte West tract general analysis area. Wind Cave National Park, Badlands Wilderness Area, and the Northern Cheyenne Indian Reservation are the closest Class I areas to the Eagle Butte West LBA Tract. Most of the PRB in Wyoming is designated as PSD Class II with less stringent requirements. Even though the development activities being considered in this EIS would occur within areas designated PSD Class II, the potential impacts are not allowed to cause incremental effects greater than the more stringent Class I thresholds to occur inside any distant PSD Class I area.

The PSD regulation prevents deterioration of air quality in attainment areas by establishing increments, or maximum allowable increases in the ambient concentration of PM_{10}, NO_2, and SO_2 for Class I and Class II areas. As shown in Table 3-3, the allowable incremental impacts for NO_2, PM_{10}, and SO_2 within PSD Class I areas are very limited. Future development projects that have the potential to emit more than 250 tpy of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tpy) would be required to undergo a regulatory PSD increment consumption analysis under the federal New Source Review permitting regulations. Development projects subject to the PSD regulations must also demonstrate the use of BACT and show that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, or SO_2. Modifications to existing major PSD sources are also subject to PSD regulation if the modification results in a significant net emissions increase of any regulated pollutant. The net emissions increase is determined by adding the modification to the permits issued after a baseline date. In the PRB, the PM_{10} baseline year is 1997; the NO_2 baseline year is 1988.

Table 3-4. Approximate Distances and Directions from the Eagle Butte West Tract General Analysis Area to PSD Class I and Class II Sensitive Receptor Areas.

Receptor Area	Distance (miles)	Direction to Receptor
Mandatory Federal PSD Class I Area		
Badlands Wilderness Area[1]	160	SE
Bridger Wilderness Area	215	SW
Fitzpatrick Wilderness Area	215	SW
Gates of the Mountain Wilderness Area	340	NW
Grand Teton National Park	250	W
North Absaroka Wilderness Area	205	W
Red Rocks Lake Wilderness Area	300	W
Scapegoat Wilderness Area	390	NW
Teton Wilderness Area	230	W
Theodore Roosevelt National Park (North Unit)	235	NE
Theodore Roosevelt National Park (South Unit)	205	NE
U.L. Bend Wilderness Area	235	NW
Washakie Wilderness Area	210	W
Wind Cave National Park	115	SE
Yellowstone National Park	225	W
Tribal Federal PSD Class I		
Fort Peck Indian Reservation	250	N
Northern Cheyenne Indian Reservation	95	NNW
Federal PSD Class II		
Absaroka-Beartooth Wilderness Area	235	NW
Agate Fossil Beds National Monument	160	SE
Badlands National Park	135	SE
Bighorn Canyon National Recreation Area	130	W
Black Elk Wilderness Area	105	SE
Cloud Peak Wilderness Area	80	W
Crow Indian Reservation	100	NW
Devils Towner National Monument	40	NE
Fort Belknap Indian Reservation	310	NW
Fort Laramie National Historic Site	150	SE
Jewel Cave National Monument	95	SE
Mount Rushmore National Memorial	110	E
Popo Agie Wilderness Area	205	SW
Soldier Creek Wilderness Area	150	SE

[1] The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory Federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

To date, there are no coal mines within the State of Wyoming that have been subject to PSD review in the permitting process. Existing surface coal mining operations in the PRB, including the Eagle Butte Mine, are not subject to PSD regulations for two reasons: 1) surface coal mines are not on the EPA list of 28 major emitting facilities for PSD regulation; and 2) point-source emissions from individual mines have not exceeded the PSD emissions threshold. A new mine would be classified as a major source and subject to PSD review if potential emissions of any regulated pollutant would equal or exceed 250 tpy. Fugitive emissions are not included in the definition of potential emissions except for certain specified source types [40 CFR 52.21, (b)(1)(iii)]. Mining-related fugitive emissions are exempt from the applicability determination. This NEPA analysis compares potential air quality impacts from the Proposed Action and Alternative 1 to applicable ambient air quality standards, PSD increments, and AQRVs (such as visibility), but it does not constitute a regulatory PSD analysis; rather, it is strictly for informational purposes.

All sources being permitted within the State of Wyoming must utilize BACT, not just sources subject to PSD review. During the New Source Review permitting process, a BACT analysis is performed for the proposed construction or modification. The BACT process evaluates possible control technologies for the proposed action on the basis of technical feasibility and economic reasonability. Decisions about which technology should be applied are made on a case-by-case basis and are mandated through the permit. See Section 3.4.2.3 for a discussion of BACT measures that have been applied at coal mines.

The NSPS were established by the CAA and adopted by reference into the WAQSR. The standards, which are for new or modified stationary sources, require the sources to achieve best-demonstrated emission control technology. The NSPS apply to specific processes that are listed in the standards. For surface coal mining in the PRB, this includes certain activities at coal preparation plants. The requirements applicable to these existing units can be found in 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Facilities).

Major sources of air pollutants must obtain an operating permit from WDEQ/AQD Operating Permit Program (also known as Title V). A “major source” is, generally, a facility that emits over 100 tpy of any criteria pollutant, 25 tpy of combined HAPs or 10 tpy of an individual HAP. The operating permit compiles all applicable air quality requirements for a facility and specifies compliance assurance in the form of testing, monitoring, reporting, and recordkeeping requirements.

3.4.1.1.1 Surface Coal Mine Regulatory Framework

The WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program,

anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category. A new coal mine or a modification to an existing mine must be permitted by WDEQ/AQD under WAQSR Chapter 6, Section 2 and must demonstrate that they will comply with all applicable aspects of WAQSR. The following summarizes the construction/modification permitting analysis for surface coal mines.

When a company decides to construct a new surface coal mine or proposes a modification to an existing surface coal mine that will cause an increase in pollutant emissions, they must submit an application, which is reviewed by the WDEQ/AQD New Source Review staff and the applicable WDEQ/AQD Field Office. Typically, a company will meet with the WDEQ/AQD prior to submitting an application to determine issues and details that need to be included in the application. A surface coal mining application will include the standard application, BACT measures that will be implemented, an inventory of point and fugitive sources in the area, and modeling analyses.

BACT must be utilized for all sources being permitted within the State of Wyoming. WAQSR Chapter 6, Section 2(b)(v) lists BACT measures to be utilized by (but not limited to) large mining operations. Applicants use these and other BACT measures in the development of their own PM_{10} and NO_2 point and fugitive source inventories (see Section 3.4.2.3 for a discussion of mining BACT measures). During the application review, WDEQ/AQD can also require further control measures through the BACT review process.

For the PM_{10} modeling analyses, an applicant must put together an emission inventory of PM_{10} from their facility and surrounding sources. For PM_{10}, both point sources and fugitive dust emissions are quantified. The emissions are based on the facility's potential to emit in the highest production year. The applicant also examines the facilities at surrounding coal mines and their previous air quality permits to determine the worst-case emission year for those facilities, based on potential to emit. They then choose two or more years for modeling analyses.

Long-term PM_{10} modeling is conducted for the permit application to demonstrate compliance with the annual PM_{10} standard. Per WDEQ/AQD guidance, the Industrial Source Complex Long-Term Model, Version 3 (ISCLT3) is used for point sources. For fugitive emission sources, the FDM is used. A PM_{10} background concentration of 15 $\mu g/m^3$ and a NO_x background concentration of 20 $\mu g/m^3$ are used, which WDEQ/AQD has chosen as representative of background ambient air quality in the area prior to operation of coal mine sources. Potential emissions corresponding to the maximum production level from the coal mine undergoing permitting and other coal mines in the area are added to this background. The resulting particulate levels are then

compared to the average annual PM_{10} standard of 50 µg/m^3 and the average annual NO_x standard of 100 µg/m^3 to determine compliance with the annual NAAQS. This constitutes a demonstration of compliance with the "long-term" or annual NAAQS.

The background concentrations for PM_{10} and NO_x concentrations chosen by WDEQ/AQD are different than the background PM_{10} and NO_x concentrations shown in Table 3-3 because the values shown in the table are based on recently monitored values in the PRB and include all sources operating at the time the value was measured, including existing coal mine operations located around Gillette, whereas the background values chosen by WDEQ/AQD are representative of background ambient air quality prior to coal mining. The annual background values shown in Table 3-3 for PM_{10} and NO_x are based on data collected for a recent evaluation of potential cumulative air quality impacts in the PRB conducted by ENSR for the Wyoming and Montana (BLM 2006b), which is discussed in Chapter 4.

Short-term PM_{10} modeling is not required by WDEQ/AQD, nor does WDEQ/AQD consider it to be an accurate representation of short-term impacts. The CAAA (Section 234) mandates the Administrator of the EPA to analyze the accuracy of short-term modeling in regard to fugitive particulate emissions from surface coal mines. A June 26, 1996 letter from EPA Region VIII to Wyoming State Representatives states the results of a study where the short-term model failed to meet evaluation criteria and tended to over-predict 24-hr impacts of surface coal mines. The Memorandum of Agreement of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This regulatory procedure remains in place and in effect. Ambient particulate monitoring is required of each coal mine through conditions of their respective permits.

Coal mines in the PRB are also required to quantify NO_2 emissions from their facilities. Dispersion modeling is required to demonstrate compliance with the ambient standard. Potential emissions from diesel powered mining equipment and blasting are modeled. Train locomotive engine emissions are also quantified and included in the NO_2 modeling analysis.

The application is reviewed by WDEQ/AQD to determine compliance with all applicable air quality standards and regulations. This includes review of compliance with emission limitations established by NSPS, review of compliance with ambient standards through modeling analyses, and establishment of control measures to meet BACT requirements. The WDEQ/AQD-proposed permit conditions are placed on public notice for a 30-day review period, after which a final decision on the permit is made.

3.4.1.2 Emission Sources

Air quality conditions in rural areas in the PRB are likely to be very good, as they are characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Occasional high concentrations of CO and particulate matter may occur in more urbanized areas (e.g., cities of Gillette, Sheridan, and Buffalo) and around industrial facilities, especially under stable atmospheric conditions that occur during winter.

The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling of overburden and coal, and the large areas of disturbed land all produce fugitive dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, particulate matter (PM_{10}) is the major significant pollutant from coal mine point sources.

Blasting is responsible for another type of emission from surface coal mining. Overburden blasting sometimes produces gaseous, orange-colored clouds that contain NO_2. Exposure to NO_2 may have adverse health effects, as discussed in Section 3.4.3. NO_2 is one of several products resulting from the incomplete combustion of explosives used in the blasting process. Wyoming's ambient air standards for NO_2 are shown in Table 3-3.

Other existing air pollutant emission sources within the region include:

- exhaust emissions (primarily CO and NO_x) from existing natural gas fired compressor engines used in production of natural gas and CBNG; gasoline and diesel vehicle tailpipe emissions of combustion pollutants (VOCs, CO, NO_x, PM_{10}, $PM_{2.5}$, and SO_2);

- dust (particulate matter) generated by vehicle travel on unpaved graded roads, windblown dust from neighboring areas, agricultural activities such as plowing, and paved road sanding during the winter months;

- transport of air pollutants from emission sources located outside the region;

- emissions from railroad locomotives used to haul coal (primarily NO_2 and PM_{10}); and

- SO_2 and NO_x from power plants. The closest coal-fired power plants are the Dave Johnston plant, located about 100 miles south-southwest of the Eagle Butte West LBA Tract, and the Wyodak, Wygen, and Neil Simpson plants, located about 10 miles southeast of the Eagle Butte West LBA Tract.

3.4.2 Particulate Emissions

3.4.2.1 Affected Environment for Particulate Emissions

Until 1989, the federally regulated particulate matter pollutant was measured as TSP. This measurement included all suspendable dust (generally less than 100 microns in diameter). In 1989, the federally regulated particulate matter pollutant was changed from a TSP-based standard to a PM_{10}-based standard. PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less that can potentially penetrate into the lungs and cause health problems. Wyoming added PM_{10} based standards to match the federal standards in 1989 and retained the TSP standards as state standards until March 2000. Wyoming's ambient air standards for PM_{10} are shown in Table 3-3. Even in the absence of a federal or state standard, TSP is still monitored in some locations to be used as a surrogate for PM_{10} and as an indication of overall atmospheric levels of particulate matter. The EPA promulgated the air quality standards for fine particulate matter ($PM_{2.5}$) on July 18, 1997 and issued official designations for the $PM_{2.5}$ standard on December 17, 2004 and made modifications in April 2005. EPA's official designation for the $PM_{2.5}$ standard for the whole state of Wyoming is "attainment/ unclassifiable." Wyoming also adopted a $PM_{2.5}$ standard in March 2000. Wyoming's ambient air standards for $PM_{2.5}$ are shown in Table 3-3.

3.4.2.1.1 Regional Particulate Emissions

As a result of WDEQ/AQD requirements for the PRB mines to collect air quality data, which is discussed in Section 3.4.2.3, data for TSP date back to 1980 with data for PM_{10} dating back to 1989. This resulted in the collection of nearly 57,000 TSP and 27,000 PM_{10} samples through 2004, which makes the eastern PRB one of the most intensely monitored areas in the world (Figure 3-3). Table 3-5 uses the annual arithmetic average of all sites to summarize these data from 1980 through 2004.

As indicated in Table 3-5, the long-term trend in particulate emissions remained relatively flat through 1998. The overall average annual TSP concentration from 1980 through 1998 was 33.1 $\mu g/m^3$, with annual averages ranging between 27.8 $\mu g/m^3$ and 39.4 $\mu g/m^3$. There were increases in 1988 and 1996, which may have been the result of fires in the region during those years. Annual average PM_{10} concentrations from 1989 through 1998 were similarly relatively flat, ranging between 12.9 $\mu g/m^3$ and 16.5 $\mu g/m^3$, with an overall average of 15.4 $\mu g/m^3$.

This time period (1980-1998) was associated with significant growth in the surface coal mining industry. Coal production increased from about 59 mmtpy to over 293 mmtpy (an increase of almost 500 percent), and associated overburden production increased from 105 mmbcy to 669 mmbcy per year (an increase of over 600 percent). From 1990 through

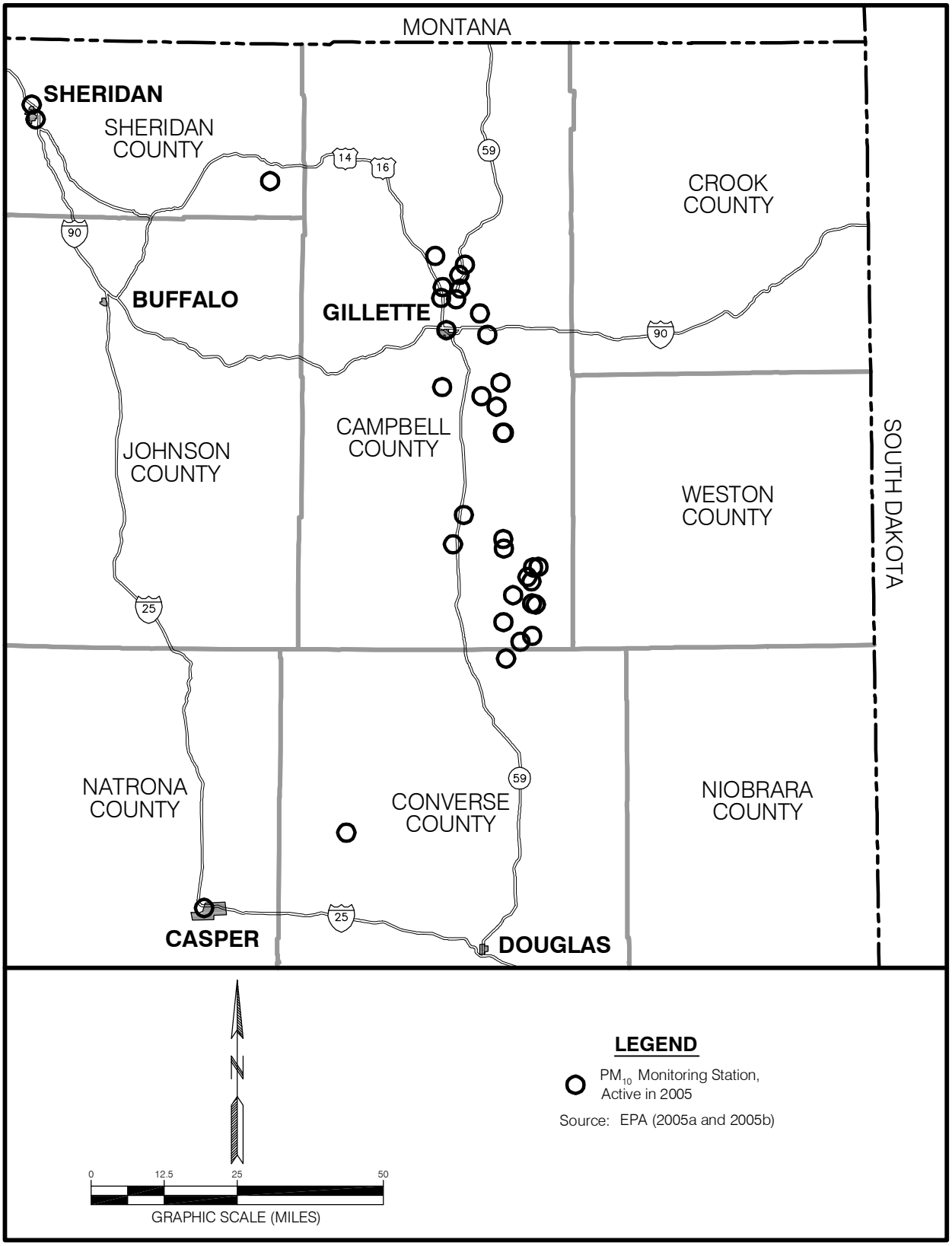

Figure 3-3. Active PM_{10} Monitoring Stations in Northeastern Wyoming.

Table 3-5. Summary of WDEQ/AQD Reports on Air Quality Monitoring in Wyoming's PRB, 1980-2004.

Year	Coal Produced (mmtpy)	Overburden Moved (mmbcy)	Number of Mines Operating/ Monitoring TSP/ Monitoring PM_{10}[1]	Number of TSP/PM_{10} Monitoring Sites[2]	TSP Average ($\mu g/m^3$)	PM_{10} Average ($\mu g/m^3$)
1980	58.7	105.3	10/14/0	34/0	35.5	na[3]
1981	71.0	133.4	11/13/0	35/0	39.4	na
1982	76.1	141.1	11/14/0	40/0	31.2	na
1983	84.9	150.9	13/14/1	41/1	32.6	11.2
1984	105.3	169.5	14/16/1	42/1	33.9	11.1
1985	113.0	203.4	16/17/0	49/0	32.3	na
1986	111.2	165.7	16/17/0	45/0	29.3	na
1987	120.7	174.6	16/17/0	43/0	31.7	na
1988	138.8	209.7	16/17/0	43/0	37.7	na
1989	147.5	215.6	15/17/3	40/3	32.1	15.9
1990	160.7	220.1	17/17/5	47/5	34.3	14.8
1991	171.4	242.3	17/17/5	46/6	32.7	16.5
1992	166.1	296.0	17/17/7	41/7	31.7	15.9
1993	188.8	389.5	17/17/8	40/11	27.8	14.5
1994	213.6	483.9	17/18/8	44/11	31.7	15.5
1995	242.6	512.7	16/18/8	41/12	29.6	12.9
1996	257.0	605.4	17/18/8	41/12	35.4	16.0
1997	259.7	622.0	16/17/10	39/15	33.3	15.9
1998	293.5	669.0	16/17/12	36/17	33.9	15.9
1999	317.1	762.9	15/17/12	36/18	55.3	21.6
2000	322.6	868.9	15/15/12	31/17	56.1	23.4
2001	354.1	927.7	12/11/12	29/29	57.5	27.2
2002	359.7	1,032.1	13/11/13	23/38	56.0	23.3
2003	363.6	1,044.2	13/10/13	16/34	51.9	20.8
2004	381.6	1,184.4	13/5/13	6/36	--[4]	20.0

1 Mines include Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union (acquired by Dry Fork), Clovis Point (acquired by Wyodak), Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, Rochelle, Antelope, and Dave Johnston.

2 Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

3 Not applicable because no monitoring for PM_{10} was done.

4 Data no longer pertinent due to paucity of monitoring sites.

Sources: 1980 through 1996 emissions and production data from April 1997 report prepared by WMA for WDEQ/AQD. 1997 through 2004 emissions data from EPA AirData and WDEQ/AQD databases (EPA 2005a, WDEQ/AQD 2005a). 1997 through 2004 production data from WDEQ/AQD and Wyoming State Inspector of Mines (WDEQ/AQD 2005b and Wyoming Department of Employment 1997-2004).

2004, the average annual increase in coal production was 6.5 percent, while annual overburden production increased an average of 13.1 percent over the same time period. The larger annual increase in overburden production is probably due to the fact that the mines are gradually moving into deeper coals as the shallower reserves are mined out.

The relatively flat trend in particulate emissions from 1980 through 1998 is due in large part to the Wyoming Air Quality Program that requires BACT at all permitted facilities. BACT control measures, which include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and timely final reclamation, are discussed in Section 3.4.2.3.

The average annual TSP concentration increased from 33.9 $\mu g/m^3$ in 1998 to 55.3 $\mu g/m^3$ in 1999, and has remained greater than 50.0 $\mu g/m^3$ since that time. The average annual PM_{10} concentration increased from 15.9 $\mu g/m^3$ in 1998 to 21.6 $\mu g/m^3$ in 1999, and has remained equal to or greater than 20 $\mu g/m^3$ since that time. There were no major fires in the region between 1998 and the present, but there was an increase in CBNG development in the area during that time frame. The increases in coal production over those six years (an average of 4.6 percent per year and 14.7 mmtpy over the six-year period) and associated overburden production (an average of 10.0 percent per year and 85.9 mmbcy over the six-year period) were not larger than any of the six-year increases during the previous 18 years, but the particulate concentration increase was much larger than in previous years. Since 1999 the PRB of northeastern Wyoming has experienced extreme drought conditions as well as the dramatic increase in surface disturbance activities associated with CBNG development, which have exacerbated particulate emissions. The potential causes of and development of effective measures to limit the increasing annual particulate levels that have been documented through monitoring are of concern to air quality regulators and to oil and gas and coal operators in this area.

There were no exceedances of the 24-hour PM_{10} standards anywhere in the PRB through year 2000. From 2001 through 2005, there were 29 monitored exceedances of the 24-hour PM_{10} standard at six operating mines in the Wyoming PRB, four of which are located within the southern portion of the basin. Nineteen of these exceedances occurred in 2001 and 2002, while two, three, and five exceedances occurred in 2003, 2004, and 2005, respectively. None of these exceedances were monitored at the Eagle Butte Mine (Shamley 2006).

3.4.2.1.2 Site Specific Particulate Emissions

For the Eagle Butte Mine air quality monitoring sites, historical particulate matter ambient air quality data generally show the same results as described above for the PRB as a whole. The locations of PM_{10} and TSP particulate emission monitoring

samplers are shown on Figure 3-4. The progression of mining operations requires that the location and number of particulate monitors be adjusted accordingly in order to provide the best documentation of the ambient air quality. Figure 3-5 presents the average annual TSP and PM_{10} emission measured at Eagle Butte Mine's particulate monitors from 1996 through 2005. Annual coal and overburden production for the Eagle Butte Mine for these years (also shown on Figure 3-5) have generally increased like the overall coal and overburden production in the PRB as a whole.

As discussed above, TSP was the federally regulated pollutant until 1989 and was retained as a state regulated pollutant until 2000. PM_{10} became a federal standard in 1989 and was also adopted by the State of Wyoming. Until recently, TSP measurements were used as a surrogate for PM_{10} in lieu of having to replace and/or co-locate an existing TSP sampler with a new PM_{10} sampler. As of October 2004, Eagle Butte Mine no longer monitors TSP. There were two instances in 1996 that the 24-hour TSP concentration monitored at the Eagle Butte Mine exceeded the 150 $\mu g/m^3$ standard. In 2001, there were three instances that the 24-hour TSP concentration monitored at the Eagle Butte Mine exceeded 150 $\mu g/m^3$. As a result of exceeding the 24-hour TSP standard, WDEQ-AQD required the mine to monitor PM_{10} concentration and TSP measurements could no longer be used as a surrogate for PM_{10} measurements at the site of exceedance. Eagle Butte Mine began monitoring PM_{10} in 1996 and there have been no exceedances of the 24-hour or annual PM_{10} standards through 2005.

3.4.2.2 Environmental Consequences Related to Particulate Emissions

Particulates include solid particles and liquid droplets that can be suspended in air. Particulates, especially fine particles, have been linked to numerous respiratory-related illnesses and can adversely affect individuals with pre-existing heart or lung diseases. They are also a major cause of visibility impairment in many parts of the United States. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or gray hazes.

3.4.2.2.1 Proposed Action and Alternative 1

The Eagle Butte West LBA Tract would be mined as an integral part of the Eagle Butte Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 25 million tons, with or without the Eagle Butte West LBA Tract. Eagle Butte Mine's currently approved air quality permit from the WDEQ/AQD limits annual coal production to 35 million tons of coal. If the mine acquires the additional coal in the LBA tract, they would continue to produce at an average rate of 25 mmtpy for a longer period of time (from approximately eight to 12 years). Potential particulate emissions related to mining operations at the existing Eagle Butte

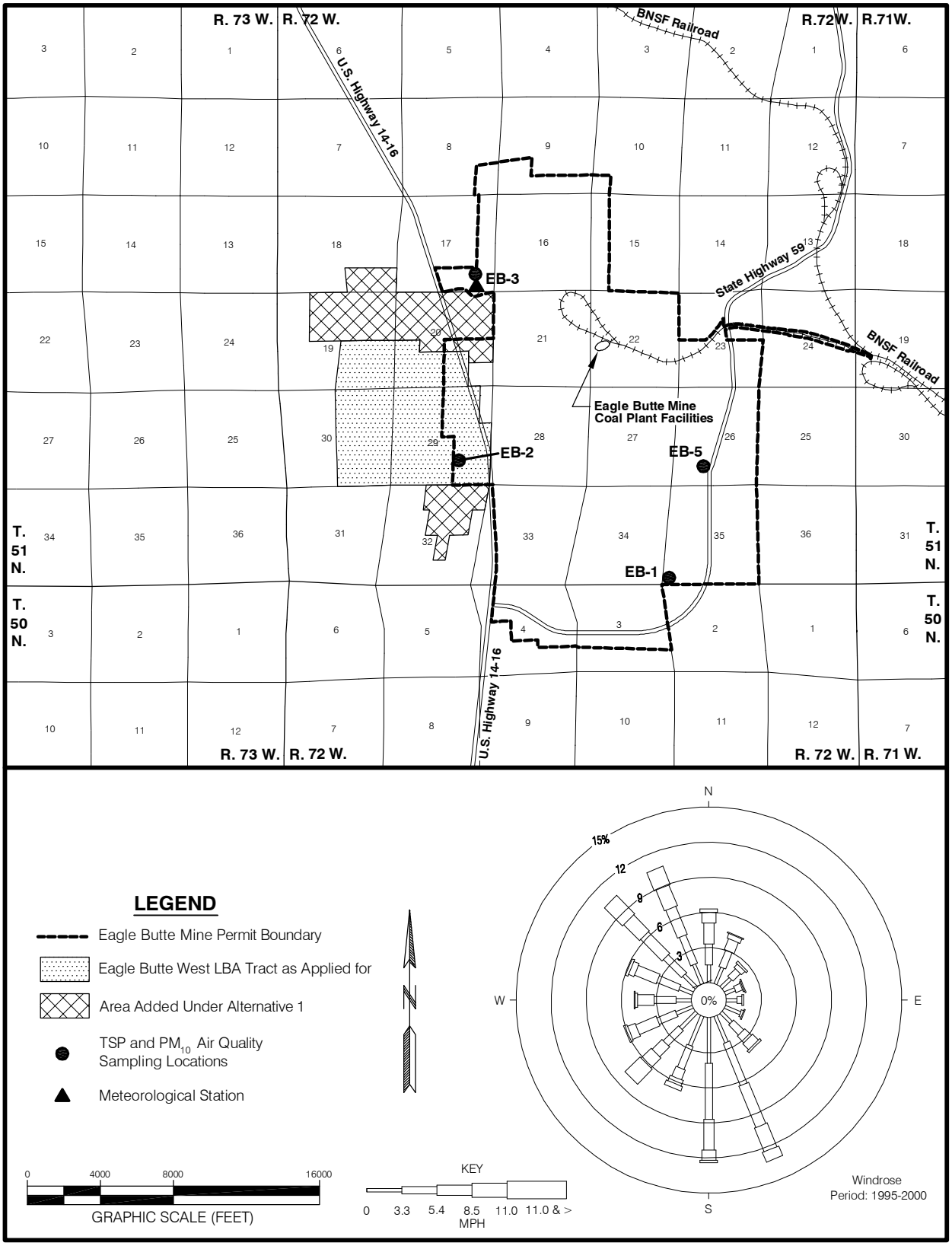

Figure 3-4. Wind Rose, Air Quality, and Meteorological Stations at the Eagle Butte Mine.

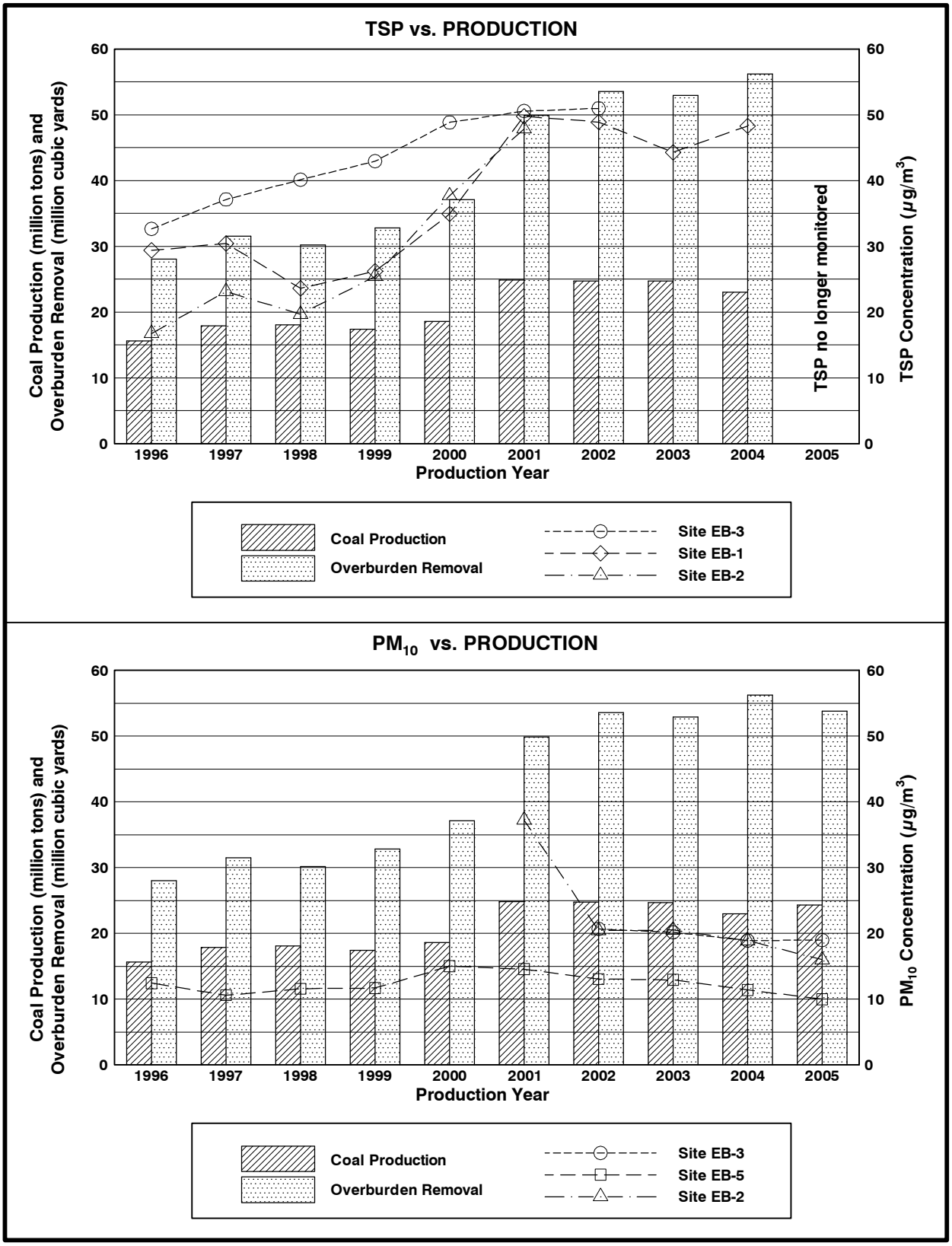

Figure 3-5. Annual Coal Production and Overburden Removal vs. Ambient Particulates for Eagle Butte Mine (1996 through 2005).

Mine are described below. Because of the similarities in mining rates and mining operations, the potential impacts of mining the Eagle Butte West LBA Tract have been inferred from the projected impacts of mining the existing coal leases as currently permitted.

WDEQ/AQD issued air quality permit MD-1251 for the Eagle Butte Mine on October 24, 2005. This air quality permit was issued based on an analysis using emission factors, estimation methods, and model selection consistent with WDEQ/AQD policy. This current air quality permit reflects analyses based on a revised coal removal progression and mine plan. The change did not affect the LNCM boundary or the permitted coal production limit of 35 mmtpy. Eagle Butte Mine's air quality permit also approves the construction of a stilling shed at the coal truck dump, which replaces water spray dust control. Shovels, trucks, front-end loaders, and dozers are utilized for the movement of both overburden and coal (FCW 2004a).

Particulate emission inventories for the mining activities at Eagle Butte Mine were prepared for all years in the currently anticipated life of the mine. Two years, 2005 and 2006, were then selected for worst-case dispersion modeling of PM_{10} based on mine plan parameters and emission inventories. The area source, haul road, and point source PM_{10} information for Eagle Butte Mine and other sources in the area were input into the ISCLT3 Model for each worst-case year.

Receptor locations were placed at approximately 500-meter intervals along the ambient air quality (or LNCM) boundary (see Figures 3-6 and 3-7). As discussed in Section 3.4.1.1.1, a PM_{10} concentration of 15 $\mu g/m^3$ was added to all modeled emissions to account for background fugitive dust. Predicted PM_{10} emissions from the neighboring mines (Buckskin, Rawhide, Fort Union, Dry Fork, and Wyodak) were inventoried using those mines' most recent WDEQ/AQD air quality permit applications. Impacts on ambient air from the Eagle Butte Mine and other regional mines vary by year due to annual changes in emission strength, emission density, pit proximity to defined ambient air boundaries, and pit configuration. Emissions for each year are ranked and candidate worst-case years are further evaluated regarding proximity to neighboring mining operations and emissions. The total PM_{10} concentration at each receptor was determined by summing the concentration due to each active mine in the general area and adding the background concentration of 15 $\mu g/m^3$. The resulting particulate levels were then compared to the average annual PM_{10} standard of 50 $\mu g/m^3$ to determine compliance with the annual NAAQS. This constitutes a demonstration of compliance with the "long-term" or annual NAAQS.

Long-term modeling indicates the currently projected mine activities will be in compliance with the annual PM_{10} ambient air standard for the life of the Eagle Butte Mine. Based on mine plan parameters and highest emissions inventories, the years 2005 and 2006 were selected as the worst-

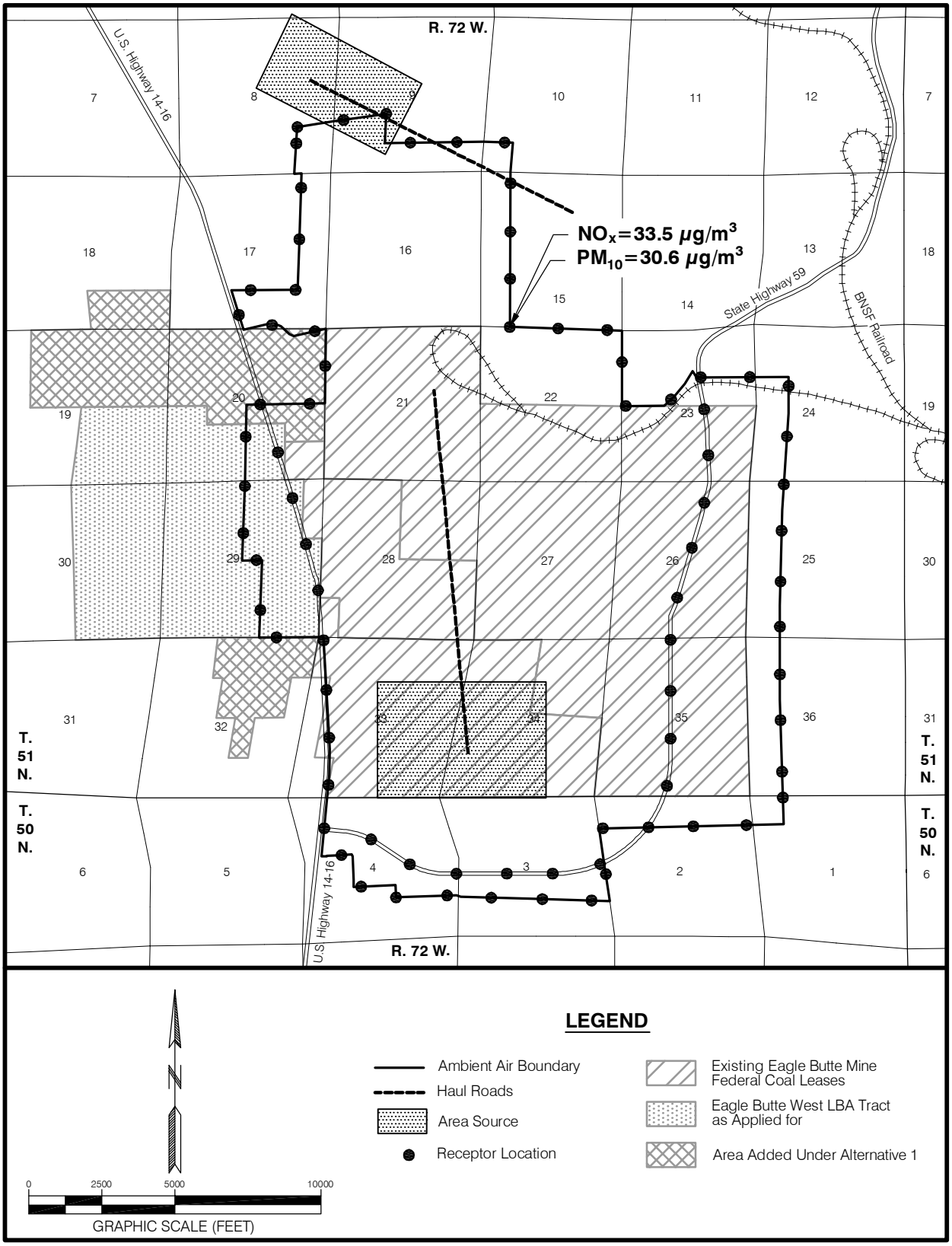

Figure 3-6. Maximum Modeled PM_{10} and NO_X Concentrations at the Eagle Butte Mine Ambient Air Boundary for the Year 2005.

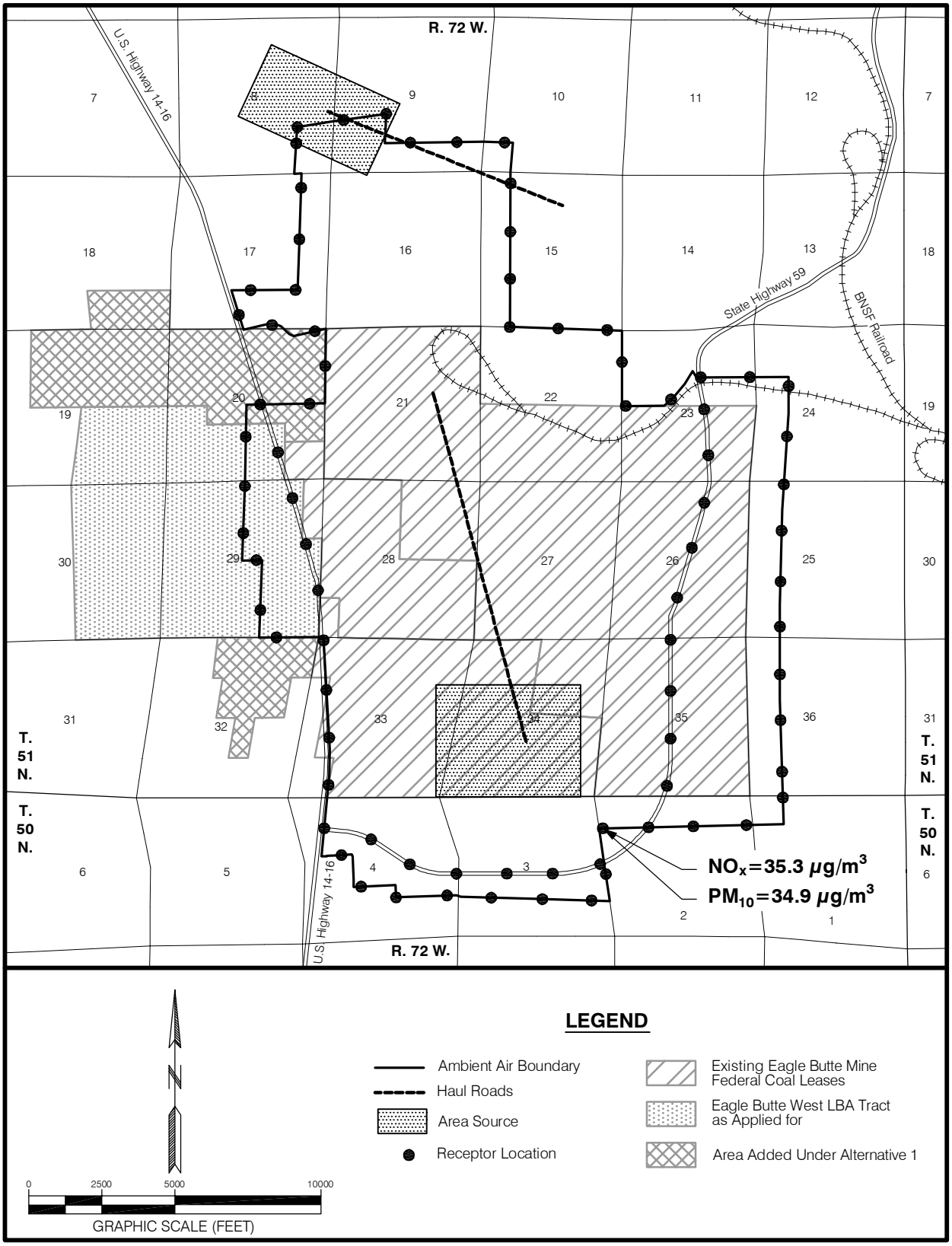

Figure 3-7. Maximum Modeled PM_{10} and NO_X Concentrations at the Eagle Butte Mine Ambient Air Boundary for the Year 2006.

case years. The dispersion model showed a maximum concentration of 30.59 µg/m^3 in 2005 and 34.88 µg/m^3 in 2006. Coal production in both years was projected to be the maximum permitted production level of 35 million tons (FCW 2004a). The locations of the maximum-modeled PM_{10} concentrations for 2005 and 2006 are shown on Figures 3-6 and 3-7, respectively.

As discussed in Section 3.4.1.1, surface coal mines in the Wyoming PRB have not been subject to PSD requirements. Only some fraction of the mine emissions included in the WDEQ/AQD air quality permit analyses consumes increment based on permits in place in the baseline year of 1997. As a result, the concentrations predicted by the WDEQ/AQD air quality permit analyses should not be compared to PSD increments.

The Eagle Butte Mine point source emissions inventory includes all coal preparation and processing facilities (i.e., crushers, material transfer points, silos, and loadouts). All point source parameters for the regional mining operations, which were obtained from WDEQ/AQD files, were also considered in the modeling analysis. As discussed in Section 3.4.1.1, a proposed new point source that has the potential to emit more than 250 tpy of any criteria pollutant (the primary pollutant being particulate matter) must undergo a regulatory PSD increment consumption analysis as well as a BACT review. An inventory of all point sources, controls, and emissions for the MD-1251 air quality permit showed a potential to emit of 77.4 tpy; therefore, a PSD increment consumption analysis was not necessary. Because this value is below the 100 tpy major source threshold limit specified in Chapter 6, Section 3 of the WAQSR, Eagle Butte Mine will not be subject to the Title V Operating Permit program (FCW 2004a).

In Wyoming, monitoring results have been used in lieu of short-term (24-hour) modeling for assessing short-term coal mining-related impacts in the PRB. WDEQ has chosen this procedure in accordance with an agreement between EPA and the State of Wyoming. That agreement recognizes that appropriate models do not exist to accurately predict 24-hour impacts. Twenty-four-hour impacts have been estimated from recent monitoring and emission control activities. There were two instances in 1996 and three instances in 2001 that the 24-hour TSP concentration monitored at the Eagle Butte Mine exceeded the 150 µg/m^3 standard. As a result of exceeding the 24-hour TSP standard, WDEQ-AQD required the mine to monitor PM_{10} concentration and TSP measurements could no longer be used as a surrogate for PM_{10} measurements at the site of exceedance. There have been no exceedances of the 24-hour or annual PM_{10} standards at the Eagle Butte Mine through 2005. Methods for the control of particulate emissions at the mine are discussed in Section 3.4.2.3. No exceedances of the 24-hour or annual ambient air standards are expected from mining the Eagle Butte West LBA Tract.

The average overburden thickness is greater in the LBA tract than within the current leases, but the thickness of the coal in the LBA tract is about the same as in the existing mine area (see Table 3-2). If the Eagle Butte Mine acquires and mines the Eagle Butte West LBA Tract, this could result in an increase in fugitive emissions per ton of coal mined from current levels due to the increased volume of overburden that would have to be removed to recover the coal. The increase in fugitive dust emissions could potentially be moderated somewhat if removal of the larger volume of overburden material results in a slower rate of mining advancement through the LBA tract. This would potentially decrease the number of acres disturbed annually and cause haul distances to increase more slowly.

Current mining techniques (i.e., haulage, blasting, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Shovels and trucks would continue to be utilized for the movement of both overburden materials and coal. Facilities shown in the current air quality permit would not change as a result of proposed mining of the LBA tract. There are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract. In addition, current BACT measures for particulates would continue to be employed.

Modeling conducted for the current Eagle Butte Mine permit predicted no exceedances of the annual PM_{10} NAAQS at a 35-mmtpy production rate and there have been no exceedances of the 24-hour and annual PM_{10} NAAQS. If the Eagle Butte Mine acquires and mines the Eagle Butte West LBA Tract, they estimate that average coal production would be approximately 25 mmtpy. At that production rate, there would be an extension of approximately eight to 12 years in the time that the mine would produce and the overburden thickness would increase over that time period, but fugitive dust emissions should remain within daily and annual NAAQS limits.

Public exposure to particulate emissions from surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of dwellings in the area could also be affected. There are a number of occupied dwellings, businesses, and a school in the area of the existing Eagle Butte Mine and the Eagle Butte West LBA Tract under the Proposed Action and Alternative 1, as shown in Figure 3-8. Roads, highways, and school bus stops in the vicinity of the Eagle Butte Mine and the LBA tract are also shown in Figure 3-8. As discussed in Section 2.2 and shown in Figure 3-8, BLM's study area for the Eagle Butte West LBA Tract, shown as "Area Added Under Alternative 1", includes the north half of Section 20, T.51N., R.72W, where a public school (Rawhide Elementary School) and several occupied dwellings (Echo Subdivision) are located. The coal underlying these structures was included in the study area for geological evaluation purposes; however, BLM must

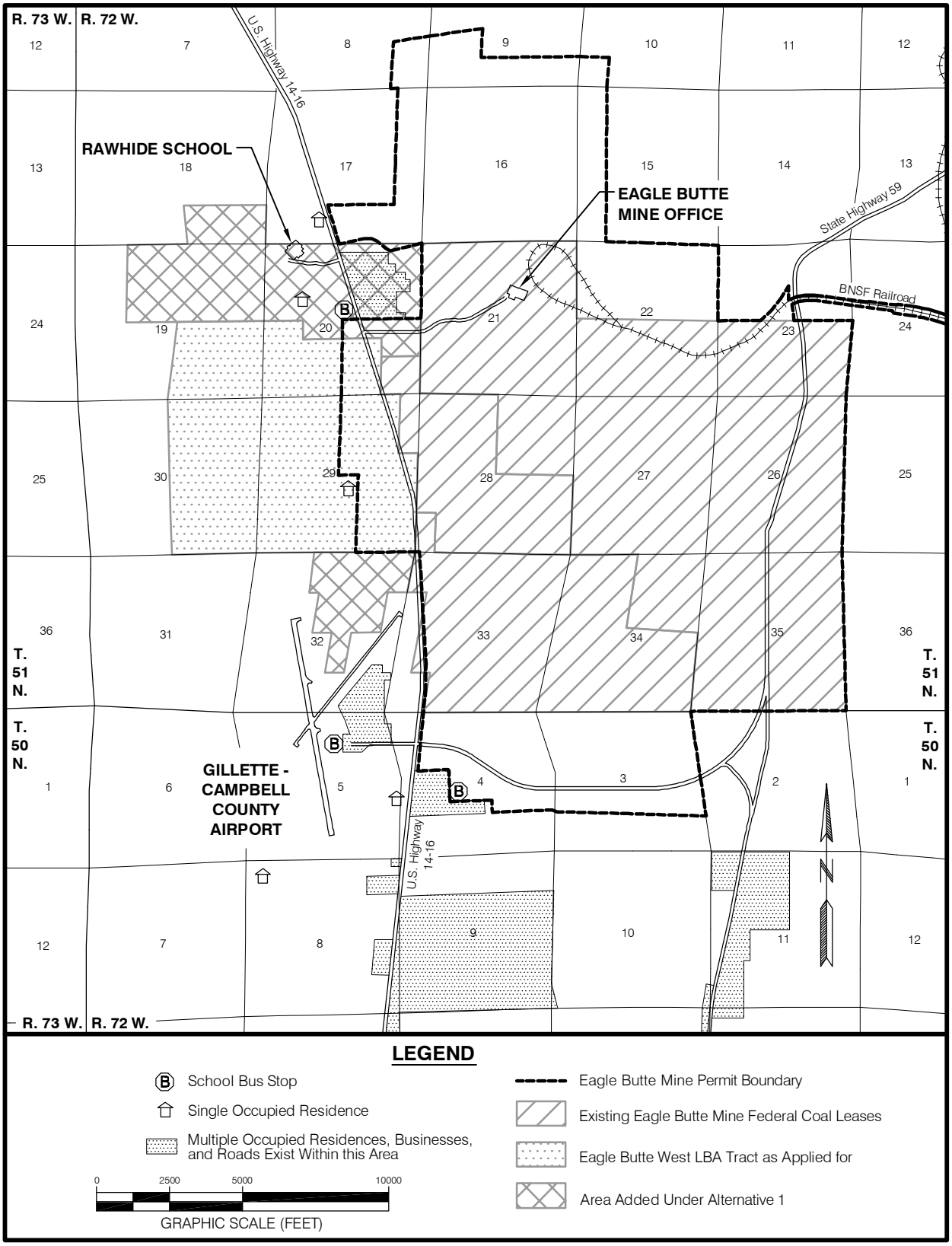

Figure 3-8. Residences, School Bus Stops, Public Roads, and other Publicly Accessible Facilities Within and Adjacent to the Eagle Butte West LBA Tract.

consider this coal to be unsuitable for mining, based on SMCRA and the associated regulatory requirements (see Section 2.2). As a result, BLM has made a preliminary determination that the N½ of Section 20, T.51N., R.72W. will not be included in any tract that is offered for lease.

As discussed above, there have been no exceedances of the 24-hour and annual PM_{10} NAAQS at the Eagle Butte Mine, and modeling conducted for the current Eagle Butte Mine permit predicted no exceedances of the annual PM_{10} NAAQS at a 35-mmtpy production rate. However, several nearby residents who attended the Eagle Butte West LBA scoping meeting, held in Gillette on May 17, 2005, and/or who submitted written scoping comments regarding FCW's proposal to lease the tract indicated that blowing dust from existing operations at the Eagle Butte Mine has affected the air quality in and around their residences, and expressed concern that this problem would continue in the future if the Eagle Butte West LBA Tract is leased and mined.

Another concern expressed during the scoping process was the potential impact of particulate emissions on human health. One written comment indicated that there seems to be a higher than normal incidence of asthma and respiratory problems in the residents living near the mine. According to the EPA, particulate emissions contain microscopic solids or liquid droplets that can get into lungs and can affect both lungs and hearts. Health problems linked to exposure to particulates include decreased lung function, aggravated asthma, chronic bronchitis, irregular heartbeat, and premature death in people with heart or lung disease (EPA 2006a).

3.4.2.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and the Eagle Butte Mine would continue to operate as currently permitted for approximately 13.6 more years. A discussion of the currently permitted mining operations and potential impacts related to PM_{10} emissions is included in Section 3.4.2.2.1. Impacts related to mining operations at the Eagle Butte Mine would continue on the existing mine area as permitted, but mining operations would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.4.2.3 Regulatory Compliance, Mitigation, and Monitoring for Particulate Emissions

Control of particulate emissions at all PRB coal mines is accomplished with a variety of measures. Emissions at coal crushing, storage, and handling facilities (point sources) are controlled with baghouse dust collection systems, PECs, or water sprayers/atomizers/foggers. These

are all considered BACT controls by WDEQ/AQD. When the Eagle Butte Mine's air quality permit was first issued, the BACT on emissions from the mine's point sources included covered conveyors, telescoping loadout chutes, enclosed storage devices (silos), and water spray dust controls at all coal transfer points. In 2005, WDEQ/AQD issued air quality permit MD-1251 to modify operations at the Eagle Butte Mine with the addition of a PEC dust control system (stilling shed) at the coal truck dump that replaced the existing water spray dust controls.

Fugitive emissions are also controlled with a variety of measures that the agency considers BACT. Typically, mine access roads have been paved and water trucks are used to apply water and chemical dust suppressants on all haul roads used by trucks and/or scrapers. Mines often apply dust suppressants to adjoining county roads. Haul truck speed limits are imposed to further help to reduce fugitive emissions from roads. Material drop heights for shovels and draglines (bucket to truck bed or backfill) are limited to the minimum necessary to conduct the mining operations. Timely permanent and temporary revegetation of disturbed areas is utilized to minimize wind erosion. Fugitive emissions from the coal truck dumps are controlled with stilling sheds. All of these control measures are employed at the Eagle Butte Mine.

Addition measures that have been instituted as mine permit requirements at the Eagle Butte Mine to facilitate the control or diminish both NO_x emissions and public exposure to flyrock from blasting operations also act to limit dust impacts to the nearby businesses, residents, and public school, as well as highways (refer to Section 3.4.3.3). For example, the following condition is included in the WDEQ/LQD Mine Permit No. 428-T5:

> The mine will block traffic on U.S. Highway 14-16 and State Highway 59 for all overburden blasts that occur within 1,100 ft of the highway ROW, and traffic control points are periodically moved as mining locations change.

If the Eagle Butte West LBA Tract is leased to the applicant, permit conditions designed to control or limit public exposure to NO_2 and flyrock would be expected to be included within specified distances of potentially affected businesses, dwellings, and the school, as well as the highway when mining operations on the new lease are conducted.

The WDEQ/AQD is continually reviewing the data and considering regulatory options, such as increasing the frequency of monitoring. Continuous monitoring is now required at some PRB mines (not at the Eagle Butte Mine). Other regulatory options may include enforcement actions such as Notices of Violation resulting in a consent decree and/or modified permit conditions. WDEQ/AQD is also coordinating with EPA to develop additional monitoring requirements in CBNG development areas, high PM_{10}

mitigation action plans in permits, and additional mitigation measures under the SIP.

County roads are responsible for some portion of the fugitive dust related to transportation in the PRB. A dust control coalition was formed to help address dust from more than 20 miles of regional county roads. The coalition includes the Campbell County Commission and several regional CBNG and oil producing companies as well as coal mine operators. The coalition has utilized chemical treatments to control dust as well as closing roads where appropriate or necessary and upgrading existing roads to higher specifications.

Other operational control measures that WDEQ/AQD may require at specific mines when exceedances occur include, but are not limited to, site-specific watering of inactive areas and problem areas; relocation of overburden truck-dumping operations; deferring blasting; curtailing topsoil stripping, reclamation dozer operations, and/or production operations; requiring windrows in areas stripped of topsoil; requiring treatment of windrow areas with chemical dust suppressants; inter-seeding of topsoil stockpiles; and soil stabilization. The mines are experimenting with dust control treatments, including magnesium chloride, surfactants, and petroleum-based products. In addition, WDEQ/AQD may require additional monitoring, action levels based on continuous monitoring, expedited reporting of monitored exceedances, detailed reporting of contributing factors (e.g., meteorological conditions), control steps implemented for monitored exceedances, and continual evaluation of activity plans when exceedances are monitored at surface coal mines.

No particular control measures were required by the WDEQ/AQD at the Eagle Butte Mine after the 24-hour TSP exceedances in 1996 and 2001; however, WDEQ/AQD did require the mine to monitor PM_{10} concentration and TSP measurements could no longer be used as a surrogate for PM_{10} measurements at the site that recorded the exceedance. Eagle Butte Mine's air quality permit (FCW 2004a) includes an analysis that demonstrates compliance with the 24-hour PM_{10} standard that focuses of historical monitoring data and continuing employment of BACT on mine-wide emissions and concludes that the 24-hour PM_{10} NAAQA would be protected through the LOM.

The eastern side of the PRB has one of the most extensive networks of monitoring sites for PM_{10} in the nation; most of these monitoring sites are funded and operated by the coal mines (Figure 3-3). WDEQ/AQD requires the collection of information documenting the quality of the air resource at each of the PRB mines. Each mine monitored air quality for a 24-hour period every six days at multiple monitoring sites through the end of 2001. All PM_{10} monitors located at the active mines are now required by WDEQ/AQD to sample air quality for a 24-hour period every three days beginning in 2002.

There are also monitors in Sheridan, Gillette, Arvada, and Wright, Wyoming. The extensive air quality monitoring network currently in use enables the WDEQ to manage the air resource using monitoring data rather than modeled predictions. WDEQ/AQD uses monitoring stations located throughout the state to anticipate issues related to air quality. These monitoring stations are located to measure ambient air quality and not located to measure impacts from a specific source. Monitors located to measure impacts from a specific source may also be used for trends. These data are used to pro-actively arrest or reverse trends towards air quality problems. When WDEQ became aware that particulate readings in the PRB were increasing due to increased CBNG activity and exacerbated by prolonged drought, the WDEQ approached the counties, coal mines, and CBNG industry. A coalition involving the counties, coal companies, and CBNG operators have made substantial efforts towards minimizing dust from graded roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads.

Monitoring is also used to measure compliance. When monitoring shows that any standard has been violated, the WDEQ can take a range of enforcement actions to remedy the situation. Where a standard is exceeded specific to an operation, the enforcement action is specific to the facility. For many facilities, neither the cause nor the solution is simple. The agency normally uses a negotiated settlement in those instances.

3.4.3 Emissions of Nitrogen Oxides (NO_x)

3.4.3.1 Affected Environment for NO_x Emissions

Gases that contain nitrogen and oxygen in varying amounts are referred to as nitrogen oxides, or NO_x. One type of NO_x is nitrogen dioxide (NO_2), a reddish brown gas that is heavier than air and has a pungent odor. Gaseous NO_2 is highly reactive and combines with water to form nitric acid and nitric oxide. According to the EPA (EPA 2001a):

- NO_x gas may cause significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes, and skin.

- Acute exposure may cause death by damaging the pulmonary system.

- Chronic or repeated exposure to lower concentrations of NO_2 may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections.

The primary direct source of emissions of nitrogen oxides during coal mining operations is tailpipe emissions from large mining equipment and other vehicle traffic inside the mine permit area. Blasting that is done to remove the material overlying the coal (the overburden) can result in emissions of several

products, including NO_2, as a result of the incomplete combustion of nitrogen-based explosives used in the blasting process. When this occurs, gaseous, orange-colored clouds may be formed and they can drift or be blown off mine permit areas.

3.4.3.1.1 Regional NO_x Emissions

Annual mean NO_2 concentrations have been periodically measured in the PRB since 1975, as discussed in Section 3.4.3.3. The annual mean NO_2 concentrations recorded by those monitoring efforts have all been well below the 100 $\mu g/m^3$ standard. The highest annual mean concentration recorded to date was 22 $\mu g/m^3$ at two separate sites between March 1996 and April 1997.

NO_2 is released as a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Incomplete combustion during blasting and the resulting rate of release is not well known, but may be caused by downhole moisture, incompetent or fractured geological formations, deformation of bore holes, and blasting agent factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting technique referred to as cast blasting (Chancellor 2003). Cast blasting refers to a type of direct blasting in which the blast is designed to cast the overburden from on top of the coal into the previously mined area.

In the mid-to late-1990s, OSM received complaints from several citizens about blasting clouds from several mines in the PRB. EPA expressed concerns that NO_2 levels in some of those blasting clouds may have been sufficiently high at times to cause human health effects. In response to those concerns, several studies have been conducted, the mines have modified their blasting techniques, and the WDEQ has imposed blasting restrictions on several mines. More information about these studies and restrictions is presented in the following discussion.

3.4.3.1.2 Site Specific NO_x Emissions

Sources of NO_x emissions at the Eagle Butte Mine include the tailpipe emissions from the mining equipment and the emissions from the trains used to haul the coal from the mine. NO_x point sources at the mine include stationary engines and natural-gas fired heaters.

To date, there have been no reported events of public exposure to NO_2 from blasting activities at the Eagle Butte Mine. Residents in the area have, however, reported observing blasting clouds coming off of blasts at the mine. Between 1996 and 2000, nearby residents brought concerns about blasting practices at the Eagle Butte Mine to the EQC several times, which resulted in the inclusion of conditions in the mine's WDEQ/LQD mine permit regulating blasting operations. Control measures to limit public exposure to NO_2 from blasting are presently being instituted at the Eagle Butte Mine. These control measures are defined, in part, by conditions in the WDEQ/LQD Mine Permit No. 428-T5 and the provisions

of the Wyoming EQC ruling of June 26, 2003. Specific control measures are discussed in more detail in Section 3.4.3.3.

3.4.3.2 Environmental Consequences Related to NO_x Emissions

Although there is no NAAQS that regulates short-term NO_2 levels, there is concern about the potential health risk associated with short-term exposure to NO_2 from blasting emissions. According to EPA, NO_x may cause a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including NO_2, nitric acid, nitrous oxide, nitrates, and nitric oxide. Potential health risks associated with short-term exposure to NO_2 include changes in airway responsiveness and lung function in individuals with pre-existing respiratory illnesses and increases in respiratory illnesses in children. Long-term exposure to NO_2 may lead to increased susceptibility to respiratory infection and may cause irreversible alternations in lung structure (EPA 2006b and 2006c).

NIOSH, OSHA, and EPA have identified the following short-term exposure criteria for NO_2:

- NIOSH's recommended Immediately Dangerous to Life and Health level is 20.0 ppm (37,600 μg/m^3);
- EPA's Significant Harm Level, a one-hour average, is 2.0 ppm (3,760 μg/m^3);
- OSHA's Short-Term Exposure Limit, a 15-minute time-weighted average, which was developed for workers, is 5.0 ppm (9,400 μg/m^3, which must not be exceeded during any part of the workday, as measured instantaneously);
- NIOSH's recommendation for workers is a limit of 1.0 ppm (1,880 μg/m^3) based on a 15-minute exposure that should not be exceeded at any time during the workday; and
- EPA recommends that concentrations not exceed 0.5 ppm (940 μg/m^3) for a 10-minute exposure to protect sensitive members of the public (EPA 2003).

A study conducted by Dr. Edward Faeder for the Black Thunder Mine (Figure 1-1) recommended a limit of 5.0 ppm (9,400 μg/m^3) for a 10-minute exposure.

According to EPA "…the exact concentrations at which NO_2 will cause various health effects cannot be predicted with complete accuracy because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response" (EPA 2001a).

The WMA conducted a study beginning in August 1999 and completed in April 2000 with

participation from the WDEQ/LQD and WDEQ/AQD because of the concern with the health risk that could be potentially associated with short-term exposure to NO_x. The study involved collection of 15-minute average NO_2 concentrations in areas that are near PRB coal mining operations and that would be accessible to the public. It was designed to help evaluate potential exposure of the public to NO_2 emissions resulting from blasting activity at surface coal mines. Six monitor locations were selected "…based on their proximity to mining activity and accessibility to the public. Roads adjacent to mining activity were felt to be areas where the public exposure would most likely occur. Locations were also chosen based on dominant wind direction, and to represent areas having the greatest chance of being impacted by several mining operations…" (WMA 2000).

A brief summary of the findings follows:

- Approximately 95 percent of the valid data points were readings of 0 ppm (0 $\mu g/m^3$) NO_2.

- The maximum 15-minute average valid values observed for each of the six monitors ranged from 0 to 1.65 ppm (0 - 3,102 $\mu g/m^3$) NO_2.

- Where readings greater than 0 ppm did occur, there was a strong correlation between NO_2 readings and temperatures. This correlation indicates that the NO_2 readings may have been inflated due to temperature considerations.

The Black Thunder Mine also conducted a study designed to provide information on safe setback distances for blasting activities at that mine (TBCC 2002). Monitors for that report were located close to blasts in order to collect data for a modeling project; they were located within the mine permit boundary in areas that are not and would not be accessible to the public during mining operations and these areas are also cleared of employees during blasting activities. The measured NO_x levels ranged from non-detectable to 21.4 ppm. The highest value was measured 361 ft from the blast.

There are no state or federal rules that require the public or employees to stay back a certain distance from mine blasting operations in order to limit their exposure to NO_2. An administrative ruling by the Wyoming EQC, which is discussed in Section 3.4.3.3, approved a 2,500-ft setback of blasting operations from the southern boundary of the Eagle Butte Mine when prevailing winds are blowing toward the mine's downwind neighbors.

3.4.3.2.1 Proposed Action and Alternative 1

The Eagle Butte West LBA Tract would be mined as an integral part of the Eagle Butte Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 25 million tons, with or without the Eagle Butte West LBA

Tract. Eagle Butte Mine's currently approved air quality permit from the WDEQ/AQD allows up to 35 million tons of coal to be mined per year. If the mine acquires the additional coal in the LBA tract, they would continue to produce at an average rate of 25 mmtpy for a longer period of time (approximately eight to 12 years). Potential NO_x emissions related to mining operations at the existing Eagle Butte Mine are described below. Because of the similarities in mining rates and mining operations, the potential impacts of mining the Eagle Butte West LBA Tract have been inferred from the projected impacts of mining the existing coal leases as currently permitted.

The WDEQ/AQD has determined that an assessment of annual NO_x impacts must be included as part of an air quality permitting analysis for new surface coal mines and existing mine plans revisions. As discussed in Section 3.4.2.2, WDEQ/AQD issued air quality permit MD-1251 for the Eagle Butte Mine on October 24, 2005, and the mine was required to conduct NO_2 dispersion modeling in their permit. Emission rates were determined for the same worst-case years used in the PM_{10} modeling. The amount of NO_x emissions from blasting is related to the amount of ANFO utilized. NO_x emission rates for 2005 and 2006 are expected to be 872 tpy and 871 tpy, respectively. NO_x modeling closely followed many of the same procedures used in the PM_{10} analysis. Emissions were apportioned in a similar manner and the same meteorological data set was used. Emissions from neighboring mines and other types of regional sources were also determined and considered for 2005 and 2006. Pursuant to WDEQ/AQD requirements, emissions from all stationary engines and natural-gas fired heaters, which are considered to be NO_x point sources at the mine, were considered in the inventory. The regional background NO_x annual concentration used was 20 $\mu g/m^3$. Additional mobile sources were added to describe the railroad locomotives and large mining equipment on the Eagle Butte Mine site. Long-term modeling indicated the currently projected mine activities will be in compliance with the annual NO_x AAQS for the life of the Eagle Butte Mine. For year 2005, the maximum annual NO_x concentration was 33.5 $\mu g/m^3$ and for year 2006, the maximum annual NO_x concentration was 35.3 $\mu g/m^3$ (FCW 2004a). Coal production in both years was assumed to be the maximum permitted production level of 35 million tons. The locations of the maximum-modeled NO_x concentrations for 2005 and 2006 are shown on Figures 3-6 and 3-7, respectively. The potential NO_x impacts from mining the Eagle Butte West LBA Tract have been inferred to be similar to the currently permitted impacts of mining the existing coal leases at the Eagle Butte Mine because of the similarities in mining rates and mining operations.

The average overburden thickness is greater in the LBA tract than within the current leases, but the thickness of the coal is about the same as in the existing mine area (Table 3-2). If the Eagle Butte Mine acquires and mines the Eagle Butte West LBA Tract, there

are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract. However, if the average annual rate of production is maintained, there would potentially be an increase in the frequency of blasting in order to remove the additional volume of overburden overlying the coal.

Residents in the area have reported observing blasting clouds coming off of blasts at the mine, but there have been no events of public exposure to NO_2 from blasting activities at the Eagle Butte Mine reported to WDEQ/LQD through 2005. Public exposure to emissions caused by surface mining operations is most likely to affect travelers on publicly accessible roads and highways that pass through and near the area of the mining operations and occupants of dwellings near the area of mining operations. Figure 3-8 shows the locations of currently occupied residences, school bus stops, public roads and highways, Rawhide School, Gillette-Campbell County Airport, and other publicly-accessible facilities in the vicinity of the Eagle Butte West LBA Tract. The density of residences and publicly-accessible businesses increases to the south, toward the city of Gillette.

As discussed in Section 3.4.3.3, Eagle Butte Mine is presently subject to restrictions that are imposed as WDEQ/LQD mine permit conditions to control/limit both emissions and public exposure to intermittent, short-term (blasting) releases. If the Eagle Butte Mine acquires the Eagle Butte West LBA Tract and mining activities proceed into the new lease area, the restrictions in the current permit will continue to limit both the rate of NO_x released and the potential of public exposure.

If Eagle Butte Mine acquires the Eagle Butte West LBA Tract, current mining techniques (i.e., blasting, excavating, hauling, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Modeling for the current Eagle Butte Mine permit projected no exceedances of the annual NO_x NAAQS at a 35-mmtpy production. Therefore, air quality impacts that result from mining the Eagle Butte West LBA Tract by the applicant at an estimated average annual coal production rate of 25 mmt should also be within annual NAAQS limits.

3.4.3.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and the Eagle Butte Mine would continue to operate as currently permitted. A discussion of the currently permitted mining operations and potential impacts related to NO_x emissions is included in Section 3.4.3.2.1. Impacts related to mining operations at the Eagle Butte Mine would continue on the existing mine area as permitted, but mining operations would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time

would not preclude an application to lease the tract in the future.

3.4.3.3 Regulatory Compliance, Mitigation, and Monitoring for NO_x Emissions

Several of the surface coal mines in the PRB have undertaken voluntary blasting restrictions to avoid NO_x impact to the public. Voluntary measures that have been instituted, particularly when large blasts are planned include:

- telephone notification of neighbors (both private parties and other mining operations) in the general area of the mine prior to large blasts;
- monitoring of weather and atmospheric conditions prior to the decision to detonate a large blast;
- minimizing blast size to the extent possible;
- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;
- closing public roads that enter the general mine area, depending on wind conditions and blast location with respect to the road; and
- providing post-blast notification to neighbors of potential exposure to the blasting cloud.

After WDEQ received reports of public exposure to NO_2 from blasting operations at some of the PRB mines prior to 2001, measures to prevent future such incidences were instituted at those mines when large overburden blasts are planned. WDEQ has required several mines, including Antelope, North Antelope/Rochelle, Black Thunder, Belle Ayr, Eagle Butte, and Wyodak (Figure 1-1), to stop traffic on public roads during blasting due to concerns with fly rock and the "startle factor". Other measures that have been instituted as mine permit requirements include:

- notification of neighbors and workers in the general area of the mine prior to a blast;
- blast detonation between 12:00 p.m. and 3:00 p.m. whenever possible to avoid temperature inversions and minimize inconvenience to neighbors;
- monitoring of weather and atmospheric conditions prior to the decision to detonate a blast;
- posting of signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;
- closing public roads when appropriate to protect the public; and
- establishment of safe setback distances for blasting operations from the mine boundary.

Two mines in the Wyoming PRB, Black Thunder and Eagle Butte, currently have blasting restrictions in their mine permits to address NO_x. Measures to control or limit both emissions and public exposure to NO_2 from blasting presently being instituted at the Eagle Butte Mine are defined, in part, by conditions that have been included in the WDEQ/LQD Mine Permit No. 428-T5. These conditions include such procedures as:

- blasting of overburden within certain specified mine areas will not occur when the wind is blowing from the blast site toward Rawhide Village to the north;

- the mine will block traffic on U.S. Highway 14-16 and State Highway 59 for all overburden blasts that occur within 1,100 ft of the highway ROW, and traffic control points are periodically moved as mining locations change;

- a monitoring plan for NO_x will be implemented for blasts that require traffic control as wind conditions warrant, and NO_x monitoring will occur at the traffic control point that is downwind from the blast on Highway 14-16 when traffic is stopped; and

- the mine will use specific blasting methods (low-NO_x techniques) that have been shown to reduce emissions within specified areas of the mine, including a 1,100 ft corridor for public highways.

On June 26, 2003, the Wyoming EQC issued a Final Order that addresses procedures and notification protocols related to providing protections from overburden blasting within the Eagle Butte Mine area. The conditions state that the following procedures will be used when overburden blasting occurs within 2,500 feet of the residences and businesses located south and west of the mine:

- blast size will be limited to 50,000 pounds;

- blasting will be conducted using the low-NO_x blasting techniques that have been shown to reduce emissions within a 1,100 ft corridor for public highways;

- no blasting will be conducted when the prevailing winds are blowing toward the residences or businesses to the south and west of the mine site;

- if wind conditions prevent the Eagle Butte Mine from blasting for more than one consecutive day, then the mine can conduct blasting on the second and subsequent days regardless of wind conditions, if the mine notifies DEQ when blasting must be conducted to avoid "sleeping holes" and if notifications are made to residences and businesses south and west who request such notification. "Sleeping holes" refers to the practice of loading holes but not setting off

the blast until the next day, which can increase emissions of NO_x.

This order also placed limits of the size of the blasting that can be conducted within the Eagle Butte Mine Southwest Extension area (the area that was included in the Eagle Butte LBA Tract, which was leased to the mine in 1995) and restricts blasting in the Southwest Extension area under certain atmospheric conditions.

Mine operators in the eastern PRB have also been working with blasting agent manufacturers to reduce NO_x emissions. Efforts to eliminate NO_x production have included use of different blasting agents, different blends of blasting agents, different additives, different initiation systems and sequencing, borehole liners, and smaller cast blasts. Operators have tried adding substances like microspheres and rice hulls, using different blends of ANFO and slurries and gels, using electronic detonation systems that can vary shot timing, different shot hole patterns, and using plastic liners within the shot holes. No one single procedure or variation has proven consistently successful due to the numerous factors that are believed to contribute to the production of NO_2. The most successful control measure has been reducing the size of the cast blasting shots (Doug Emme 2003, Rick Chancellor 2003). The low-NO_x blasting techniques described above coupled with reduced blast size has almost eliminated NO_x production at the Eagle Butte Mine. The North Antelope Rochelle Mine (Figure 1-1) has had success in eliminating NO_x in over 75 percent of their cast blasting through the use of borehole liners and changing their blasting agent blends (Rick Chancellor 2003).

NO_2 was monitored from 1975 through 1983 in Gillette and from March 1996 through April 1997 at four locations in the PRB. Table 3-6 summarizes the results of that monitoring.

Due to public concerns about emissions of nitrogen dioxides as a result of blasting and a general concern of the WDEQ about levels of nitrogen dioxides due to development of all types in the eastern PRB, the coal mining industry instituted a monitoring network in cooperation with WDEQ/AQD to gather data on NO_2 beginning in 2001. Industry funded and operated the network for approximately three years. The 2001 through 2005 data from this regional network are summarized in Table 3-7.

The WDEQ now funds and operates the NO_2 monitoring network along the east side of the basin. Ownership of the monitoring equipment was transferred to WDEQ by the mines and the mines have given ongoing access to the monitoring sites and provide electrical power for the instrumentation.

As represented by Table 3-7, NO_2 monitoring data are available from four currently active sites in the PRB. With respect to the Eagle Butte West LBA Tract, the Thunder Basin National Grassland Site is approximately 30 miles north-northeast; the Campbell County Site

Table 3-6. Annual Ambient NO_2 Concentration Data.

Site	Gillette, WY	Black Thunder Mine	Belle Ayr Mine	Bill, WY
Year	Percent of Standard[1]	Percent of Standard[1]	Percent of Standard[1]	Percent of Standard[1]
1975	6*			
1976	4*			1*
1977	4*			5*
1978	11*			
1979	11			
1980	12			
1981	14			
1982	11			
1983[2]	17			
1996[3]	16	16	22	22

1 Based on arithmetic averaging of data.
2 Monitoring discontinued December 1983, reactivated March 1996 to April 1997.
3 Arithmetic average – actual sampling ran from March 1996 to April 1997.
* Inadequate number of samples for a valid annual average.
Source: (McVehil-Monnett 1997)

Table 3-7. 2001 Through 2005 Annual Mean NO_2 Concentration Data.

Site Address	2001 (µg/m³)	2002 (µg/m³)	2003 (µg/m³)	2004 (µg/m³)	2005 (µg/m³)
Thunder Basin National Grassland	6*	5	6	4	4
Campbell County	--	--	13	8	8
Tracy Ranch	--	--	--	8	--
Black Thunder Mine	5**	6	--	--	--
Belle Ayr Mine, Site Ba-4	14	14	13	13	13
Antelope Mine, Site 3	7	6	8	8	9

* Data for May through December 2001. Monitor was not operational until May 2, 2001.
** Data for the third quarter is questionable and therefore is not used in the determination of the annual mean for the site.
Sources: EPA AirData and WDEQ/AQD databases (EPA 2006d, WDEQ/AQD 2006).

is approximately 18 miles south-southwest; the Belle Ayr Mine Site is approximately 20 miles south-southeast; and the Antelope Mine Site is approximately 60 miles south. These monitoring stations are maintained by WDEQ/AQD and respective mines. The WDEQ/AQD is relying on the on-going monitoring data and emission inventories in air quality permit applications to demonstrate compliance with the

annual NO_2 ambient air standard (Table 3-3).

3.4.4 Visibility

Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. Fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the furthest distance a person can see a landscape feature. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western U.S. and 90 miles in the eastern U.S. (EPA 2001b).

Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the EPA's Regional Haze Rule to achieve the National Visibility Goal. The National Visibility Goal was established as part of the CAA in order to prevent any future, and remedy any existing, impairment of visibility in mandatory Federal Class I areas that result from manmade air pollution. The deciview index is a scale related to visual perception that has a value near zero for a pristine atmosphere. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment.

3.4.4.1 Affected Environment for Visibility

AQRVs, including the potential air pollutant effects on visibility, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area sets an LAC for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Table 3-4 shows the distances from 31 PSD Class I and Class II areas in the vicinity of the PRB to the Eagle Butte West LBA Tract general analysis area.

The Regional Haze Rule calls for improved visibility on the most-impaired days and no additional impairment on the least-impaired days. EPA participates in the IMPROVE visibility monitoring program as part of its visibility protection program. The IMPROVE monitoring sites were established to be representative of all Class I areas. Figure 3-9 shows annual averages for the 20 percent best, average, and worst visibility days at Badlands and Bridger Wilderness Areas from 1989 through 2003. To date, Badlands National Park has statistically shown improved visibility on the least impaired days and no change in visibility on the average and most-impaired days. Bridger Wilderness has shown no statistically significant change in visibility on the least, average, or most impaired days (IMPROVE 2005).

The *Wyoming State Implementation Plan for Class I Visibility Protection* states: "Wyoming's long term strategy will focus on the prevention of any

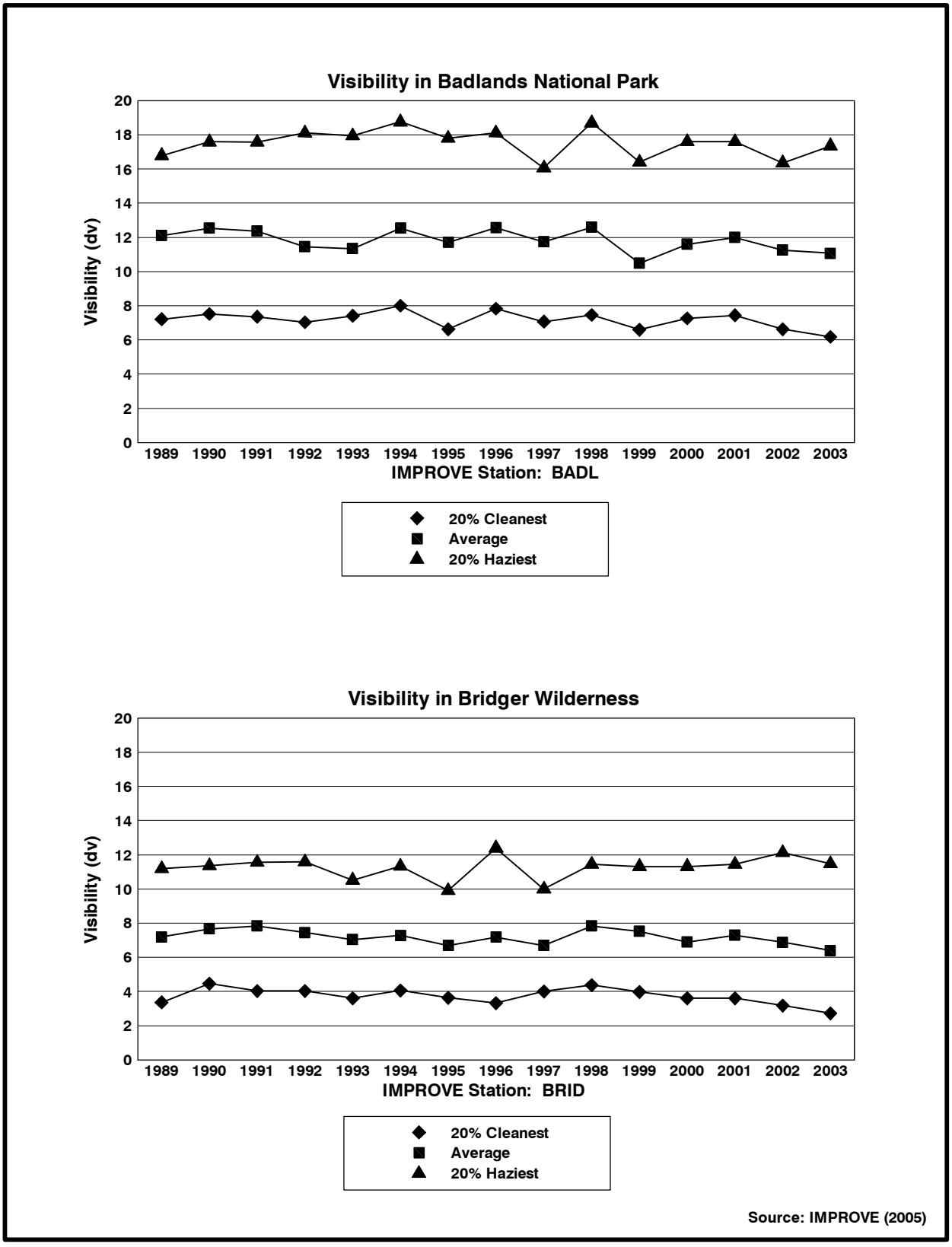

Figure 3-9. Visibility in the Badlands and Bridger Wilderness Area.

future visibility impairment in Class I areas that can be attributed to a source or small group of sources as the Federal Land Managers have not identified any current impairment in the State's Class I areas due to such sources" (WDEQ/AQD 2005c). WDEQ/AQD prepared the *2003 Review Report on Wyoming's Long Term Strategy for Visibility Protection in Class I Areas*, as required by WAQSR, which calls for AQD to review and revise, if appropriate, the Long Term Strategy every three years. The 2003 Review Report is available on the WDEQ/AQD website at http://deq.state.wy.us/aqd/visibility.asp.

3.4.4.2 Environmental Consequences for Visibility

3.4.4.2.1 Proposed Action and Alternative 1

The impacts to visibility from mining the Eagle Butte West LBA Tract have been inferred from the currently permitted impacts of mining the existing coal leases at the Eagle Butte Mine. The Eagle Butte West LBA Tract would be mined as an integral part of the Eagle Butte Mine. The average annual coal production is anticipated to remain at the projected post-2005 rate of 25 million tons, with or without the Eagle Butte West LBA Tract. Eagle Butte Mine's currently approved air quality permit from the WDEQ/AQD allows up to 35 million tons of coal to be mined per year. If the mine acquires the additional coal in the LBA tract, they would continue to produce at an average rate of 25 mmtpy for a longer period of time (approximately eight to 12 years). Therefore, impacts to visibility under the Proposed Action and Alternative 1 would be similar to the impacts under the No Action Alternative, but they would be extended by eight to 12 years.

Current mining techniques (i.e., haulage, blasting, etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit. Material movement would continue to utilize shovels and trucks in overburden and coal. Facilities shown in the current air quality permit would not change as a result of proposed mining of the LBA tract. There are no plans to change blasting procedures or blast sizes associated with the mining of the LBA tract; however, the blasting processes and required mitigation measures would be reviewed when the mining permit is amended to include the new lease area. At that time, the blasting plan would be reviewed and modified to incorporate the BACT protection measures that are in effect at that time.

Surface coal mines are not considered to be major emitting facilities in accordance with Chapter 6, Section 4 of WDEQ/AQD Rules and Regulations. Therefore, the State of Wyoming does not require mines to evaluate their impacts on Class I areas; however, BLM considers such issues during leasing.

3.4.4.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and the

Eagle Butte Mine would continue to operate as currently permitted for about 13.6 more years. Coal removal would not occur on the LBA tract. Impacts to visibility related to mining operations at the existing Eagle Butte Mine would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.4.4.3 Regulatory Compliance, Mitigation and Monitoring for Visibility Impacts

As discussed above, fine particulate matter ($PM_{2.5}$) is the main cause of visibility impairment. Mitigation measures being used to limit emissions of particulate matter are discussed in Section 3.4.2.3.

Visibility monitoring within the State of Wyoming consists of both the WDEQ/AQD sponsored Wyoming Visibility Monitoring Network and the IMPROVE program. WDEQ has sited two visibility monitoring stations in the PRB. One of these sites (the Thunder Basin National Grasslands site) is 32 miles north of Gillette and includes a nephelometer, a transmissometer, an IMPROVE aerosol sampler, instruments to measure meteorological parameters (temperature, RH, wind speed, wind direction), a digital camera, instruments to measure ozone and instruments to measure oxides of nitrogen (NO, NO_2, NO_x). The second visibility monitoring station (the Cloud Peak Wilderness Area site) is located 14 miles west of Buffalo and includes a nephelometer, a transmissometer, an IMPROVE aerosol sampler, instruments to measure meteorological parameters, and a digital camera.

These sites are being utilized to characterize the extent, frequency of occurrence, and magnitude of visual air quality. The IMPROVE Steering Committee approved the incorporation of the Thunder Basin and Cloud Peak sites into the IMPROVE network in June 2002. Although these stations are not located in areas classified as Class I areas, the collected data will be comparable to monitoring data available from the state's Class I areas. This information can help scientists determine the types and concentrations of air pollutants and their direction of travel in order to project visibility impacts to Class I areas. The Wyoming Visibility Monitoring Network was recently supplemented with the development of a website (http://www.wyvisnet.com/all.html) to allow public access to real-time monitored visibility and air quality conditions (WDEQ/AQD 2005d).

3.4.5 Acidification of Lakes

The acidification of lakes and streams is caused by atmospheric deposition of pollutants (acid rain). According to EPA, sulfur dioxide and NO_x, primarily derived from the burning of fossil fuels, are the primary causes of acid rain. Most lakes and streams have a pH between 6 and 8, although

some lakes are naturally acidic even without the effects of acid rain. Acid rain primarily affects sensitive bodies of water, which are located in watersheds whose soils have a limited ability to neutralize acidic compounds (called "buffering capacity"). Lakes and streams become acidic (pH value goes down) when the water itself and its surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain also releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms.

Several regions in the U.S. were identified in a national surface water survey as containing many of the surface waters sensitive to acidification. They include the Adirondacks and Catskill Mountains in New York State, the mid-Appalachian highlands along the east coast, the upper Midwest, and mountainous areas of the western U.S.

Scientists predict that the decrease in SO_2 emissions required by the Acid Rain Program will significantly reduce acidification due to atmospheric sulfur. Without the reductions in SO_2 emissions, the proportions of acidic aquatic ecosystems would remain high or dramatically worsen (EPA 2005c). The USDA-FS has been monitoring air quality in the Wind River Mountain Range in Wyoming since 1984 and is seeing a general trend of decreasing sulfates. Nitrates, on the other hand, have been increasing globally.

3.4.5.1 Affected Environment

AQRVs, including the potential air pollutant effects on the acidification of lakes and streams, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area sets an LAC for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards.

Lake acidification is expressed as the change in ANC measured in microequivalents per liter (μeq/L), the lake's capacity to resist acidification from acid rain. Table 3-8 shows the existing ANC monitored in some mountain lakes and their distance from the Eagle Butte West LBA Tract general analysis area.

3.4.5.2 Environmental Consequences

3.4.5.2.1 Proposed Action and Alternative 1

The Eagle Butte West LBA Tract would be mined as an integral part of the Eagle Butte Mine; therefore, the impacts to air quality from mining the Eagle Butte West LBA Tract have been inferred from the impacts at the currently permitted mining operation. Eagle Butte Mine anticipates that coal production would remain unchanged from projected post-2005 levels if the Eagle Butte West LBA Tract is acquired. Impacts to air quality related to lake acidification under the Proposed Action and Alternative 1 would be similar to the impacts under the No Action Alternative, but they would be extended from eight up to 12 years. Therefore, current mining techniques (i.e., haulage, blasting,

Table 3-8. Existing Acid Neutralizing Capacity in Sensitive Lakes.

Wilderness Area	Lake	Background ANC (μeq/L)	Distance from General Analysis Area (miles)
Bridger	Black Joe	69.0	250
	Deep	61.0	240
	Hobbs	68.0	255
	Upper Frozen	5.8[1]	260
Cloud Peak	Emerald	55.3	110
	Florence	32.7	100
Fitzpatrick	Ross	61.4	250
Popo Agie	Lower Saddlebag	55.5	240

[1] The background ANC is based on only six samples taken between 1997 and 2001.
Source: Argonne (2002)

etc.) would be expected to continue for a longer period of time than is shown in the currently approved air quality permit.

3.4.5.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and the Eagle Butte Mine would continue to operate as currently permitted for about 13.6 more years. Coal removal would not occur on the LBA tract. Lake acidification impacts related to mining operations at the existing Eagle Butte Mine would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.4.5.3 Regulatory Compliance, Mitigation, and Monitoring

Mitigation and monitoring for coal mine emissions, including the emissions that contribute to the acidification of lakes, are discussed in Sections 3.4.2.3, 3.4.2.4., 3.4.3.3, and 3.4.3.4. Other air quality monitoring programs that are in place in the PRB include WARMS monitoring of sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle, and NADP monitoring of precipitation chemistry in Newcastle.

3.4.6 Residual Impacts to Air Quality

No residual impacts to air quality would occur following mining and reclamation.

3.5 Water Resources

3.5.1 Groundwater

3.5.1.1 Affected Environment

The Eagle Butte West LBA Tract overlies three geologic water-bearing

strata that have been directly affected by existing mining activities and would be directly affected by mining the LBA tract. In descending order, these units are the recent alluvium, the Wasatch Formation overburden, and the mineable coal seams in the Tongue River Member of the Fort Union Formation, which are referred to as the Roland and Smith by the Eagle Butte Mine. The underlying, subcoal Fort Union Formation and the Fox Hills Sandstone are utilized for municipal, industrial, and domestic water supply by the city of Gillette, residential subdivisions, Eagle Butte Mine, and other nearby coal mines, but these units are not physically disturbed by mining activities. Both regional and site-specific baseline hydrogeologic environments within and around the Eagle Butte Mine are extensively characterized in the WDEQ/LQD mining and reclamation permit (FCW 2005a), which also provides groundwater monitoring data. Figure 3-2 presents the hydrostratigraphic units underlying the general analysis area.

3.5.1.1.1 Recent Alluvium

Within the Eagle Butte West LBA Tract, alluvial (unconsolidated, stream laid) deposits primarily occupy the Little Rawhide Creek valley and the lower-most portion of a tributary, Prong Draw, where it joins the main stem of Little Rawhide Creek. The Little Rawhide Creek alluvium overlies the Wasatch Formation bedrock and the lithologies are very similar at the contact. The thickness of alluvial deposits varies from less than one ft to 22 ft, and is typically around 15 ft. The lithologic composition of Little Rawhide Creek alluvium varies with respect to the lithology of the underlying Wasatch Formation bedrock. The lithology of the alluvium is such that it appears to be Wasatch Formation that has been reworked by fluvial processes. Certain finite reaches of Little Rawhide Creek alluvial deposits are nearly impermeable and do not readily transmit groundwater due to their clayey nature. These reaches generally overlie bedrock strata comprised of shales, claystones, and siltstones. Conversely, certain finite reaches of the valley fill deposits readily transmit groundwater due to their sandy nature and these deposits generally overlie bedrock strata comprised of sands and sandstones (FCW 2005a).

Data from Eagle Butte Mine's Little Rawhide Creek alluvial monitor wells indicate that alluvial groundwater flow is down-valley. Recharge to the alluvium comes primarily from the underlying bedrock aquifer and precipitation and streamflow infiltration, depending upon the season and the extent of alluvial saturation. Groundwater elevations fluctuate seasonally, increasing in the spring in response to snowmelt and precipitation runoff, and then decreasing throughout the remainder of the year (FCW 2005a).

Aquifer pump testing within the current Eagle Butte Mine permit area downstream/downgradient of the Eagle Butte West LBA Tract indicates that the Little Rawhide Creek alluvium has a very low hydraulic conductivity and, therefore, cannot be

described as an aquifer in that area. Aquifer tests conducted within and upgradient of the LBA tract indicate that the Little Rawhide Creek alluvium has a low hydraulic conductivity, ranging from 0.4 ft/day to 7.2 ft/day, with a mean value of 4.4 ft/day, which is representative of fine sands and persistence of silt and clay (FCW 2005a).

Very little alluvium is present along Prong Draw, with the majority of the valley fill consisting of buried, ancestral playa deposits that are overlain by a thin deposit of fine-grained eolian materials. The playa deposits, which are buried beneath a blanket of eolian materials, contain significant amounts of displacive gypsum, indicative of an evaporative depositional environment. Groundwater was found to occur within these deposits at a depth between seven and 18 ft below ground level. Aquifer tests were conducted to determine the hydraulic conductivity of these deposits and found to be very low, ranging from 0.02 ft/day to 0.18 ft/day. Given the dominance of clay, the very low permeability, and the limited areal extent of the unconsolidated valley fill deposits associated with Prong Draw; these deposits are not considered to be an aquifer.

Little Rawhide Creek alluvial groundwater quality varies greatly. TDS concentrations range from around 2,000 mg/L to 20,000 mg\L. The alluvial water type is generally a magnesium/sodium-sulfate or a magnesium/calcium-sulfate. The sodium adsorption ratio (SAR) values range from 0.94 to 5.48, and have a mean value of 3.29. In general, the groundwater in the saturated Little Rawhide Creek alluvium is poor quality and unsuitable for domestic consumption or irrigation, and it is considered marginal to unsuitable for livestock use. These poor water quality characteristics are indicative of limited groundwater circulation due to the low permeability of the fine-grained alluvial deposits (FCW 2005a).

The shallow groundwater that occurs beneath Prong Draw is also of poor quality. In the upper reaches of the drainage, the TDS concentration is over 3,000 mg/L and is a calcium-sulfate type water, which seems to reflect the gypsum-rich valley fill materials. In the lower reaches of the drainage, the groundwater quality has characteristics of CBNG-produced, sodium-bicarbonate type water (refer to Section 3.6).

The low hydraulic conductivities, limited areal extent of saturation, and poor water quality indicate that the alluvium does not exhibit aquifer characteristics adequate for agricultural or domestic use. There is currently no known use of alluvial groundwater in or near the Eagle Butte West LBA Tract. Within the Eagle Butte West LBA Tract, Little Rawhide Creek and its alluvial aquifer have not been disturbed or impacted by surface coal mining activities at the adjacent Eagle Butte Mine to date.

3.5.1.1.2 Wasatch Formation

Within the PRB, the Wasatch Formation (the strata lying above the

mineable coal seams, or the overburden) consists of interbedded sands, silts, and clays with occasional discontinuous deposits of coal and carbonaceous material. This description basically holds true for the area within and around the Eagle Butte West LBA Tract. The Wasatch strata range in cohesion from unconsolidated (i.e., loose sands and silts) to lithified (sandstones, siltstones, shales, and coal stringers). Any of the deposits may be water bearing, although the sands and sandstones possess a greater potential for groundwater yield. These sands and sandstones are generally discontinuous and separated laterally and vertically by the finer-grained siltstone and shale deposits. The discontinuous nature of the deposits produces considerable variability in groundwater elevations both laterally and vertically. The hydraulic connection between sandstone lenses is tenuous due to intervening shale aquitards; thus, groundwater movement through the Wasatch Formation overburden is limited. Because the water-bearing units within the Wasatch Formation are not continuous, the Wasatch is not considered to be a regional aquifer. However, Wasatch sandstones do provide limited amounts of groundwater for livestock and domestic uses on a local scale, provided the water quality is suitable.

Another geologic unit that may be considered a part of the Wasatch Formation is scoria, also called clinker or burn. It consists of sediments that were baked, fused, and melted in place when the underlying coal burned spontaneously. These burned sediments collapsed into the void left by the burned coal. Scoria deposits can be a very permeable aquifer and can extend laterally for miles in the eastern PRB. The occurrence of scoria is site specific, typically occurring in areas where coal seams crop out at the surface. The hydrologic function of scoria is to provide infiltration of precipitation and recharge to laterally contiguous overburden and coal beds. Scoria outcrop areas occur within the northern portion of the Eagle Butte Mine's current permit area. Scoria does not occur on the LBA tract as applied for, although small, localized deposits do occur in the extreme northwest corner of the area added under Alternative 1, in Sections 18 and 19, T.51N., R.72W.

Recharge to the Wasatch Formation in the PRB is predominately from the infiltration of precipitation and lateral movement of water from adjacent scoria bodies. Regionally, groundwater is discharged from the Wasatch Formation by evaporation and transpiration, pumping wells, vertical leakage into the underlying coal seams, drainage into mine excavations, and seepage into the overlying alluvium along stream courses. Overburden in the vicinity of the Eagle Butte West LBA Tract is recharged naturally by precipitation infiltration into exposed sand and sandstone bedrock outcrop areas and infiltration of surface water runoff beneath drainages. Additional, artificial recharge occurs where reservoirs have been constructed for ranching operations and for storage of CBNG discharge water. Locally,

groundwater flow in the Wasatch Formation is generally from the west and south toward the north where the water discharges into the Little Rawhide Creek alluvial groundwater system (FCW 2005a). Overburden sand bodies within the Wasatch Formation were the most influential groundwater aquifers in the Eagle Butte Mine area prior to mining in that they provided the most regionally extensive recharge areas for the underlying coal seams and discharged water to Little Rawhide Creek (FCW 2005a).

For the Wasatch Formation as a whole in the PRB, the discontinuous nature of the water bearing units results in low overall hydraulic conductivity and low groundwater flow rates. Martin et al. (1988) reported that hydraulic conductivities within the Wasatch range from 10^{-4} ft/day to 10^{2} ft/day, and the mean value, based on 203 tests, was 0.2 ft/day. The mean hydraulic conductivity from 70 aquifer tests using wells completed in sandstone in the Wasatch overburden was 0.35 ft/day, while that from 63 aquifer tests using wells completed in siltstone and claystone in the Wasatch was 0.007 ft/day (Rehm et al. 1980).

The Wasatch Formation overburden sand bodies appear to be relatively extensive within the general analysis area. Thick sand layers were encountered in the Wasatch Formation overburden during exploration drilling conducted in 2002 and 2004 by the Eagle Butte Mine in the general analysis area (refer to Section 3.3). These discontinuous sand bodies are generally saturated. Five overburden monitoring wells (numbers 345398OW, 344403OW, 350395OW, 357398OW, and 357402OW) were completed in the saturated overburden sands at that time, the locations of which are shown in Figure 3-10. A geologic cross section that illustrates the areal extent and continuity of the overburden sand layers in the general analysis area is depicted in Figure 3-11. During drilling, the open-hole, airlift water production from these five monitoring wells ranged from 25 gpm to 225 gpm (as illustrated in Figure 3-11). The overburden sand bodies are in contact with the overlying Little Rawhide Creek alluvial deposits, although it does not appear that the saturated overburden sand bodies are in hydraulic communication with the mineable coal zones (referred to as the Roland and Smith coal beds by FCW), but rather, are perched above a shale/claystone layer that overlies the coal, effectively separating the two aquifers in the general analysis area.

Aquifer pumping tests were conducted in 1980, 1986, and 1998 to help determine the aquifer characteristics of the overburden sands in the Eagle Butte Mine area. The test results indicate that the hydraulic characteristics of the Wasatch sands are highly variable. Hydraulic conductivity values range from approximately 0.02 ft/day to 3.3 ft/day and storage coefficients indicate the sands are predominately unconfined aquifers (FCW 2005a). In 2005, aquifer pumping tests were conducted on the five overburden monitoring wells that were recently

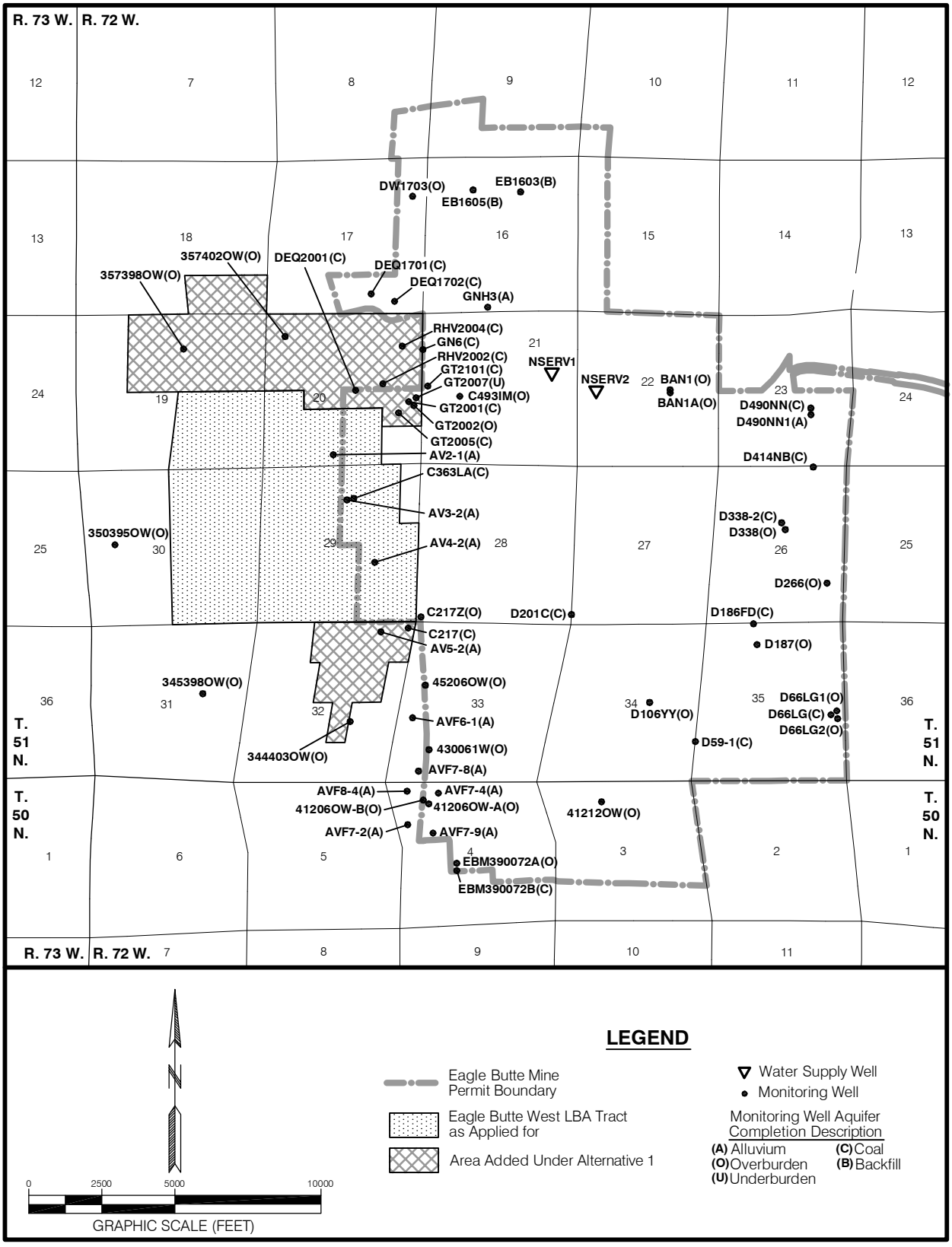

Figure 3-10. Locations of Currently Active Groundwater Monitoring and Water Supply Wells at the Eagle Butte Mine.

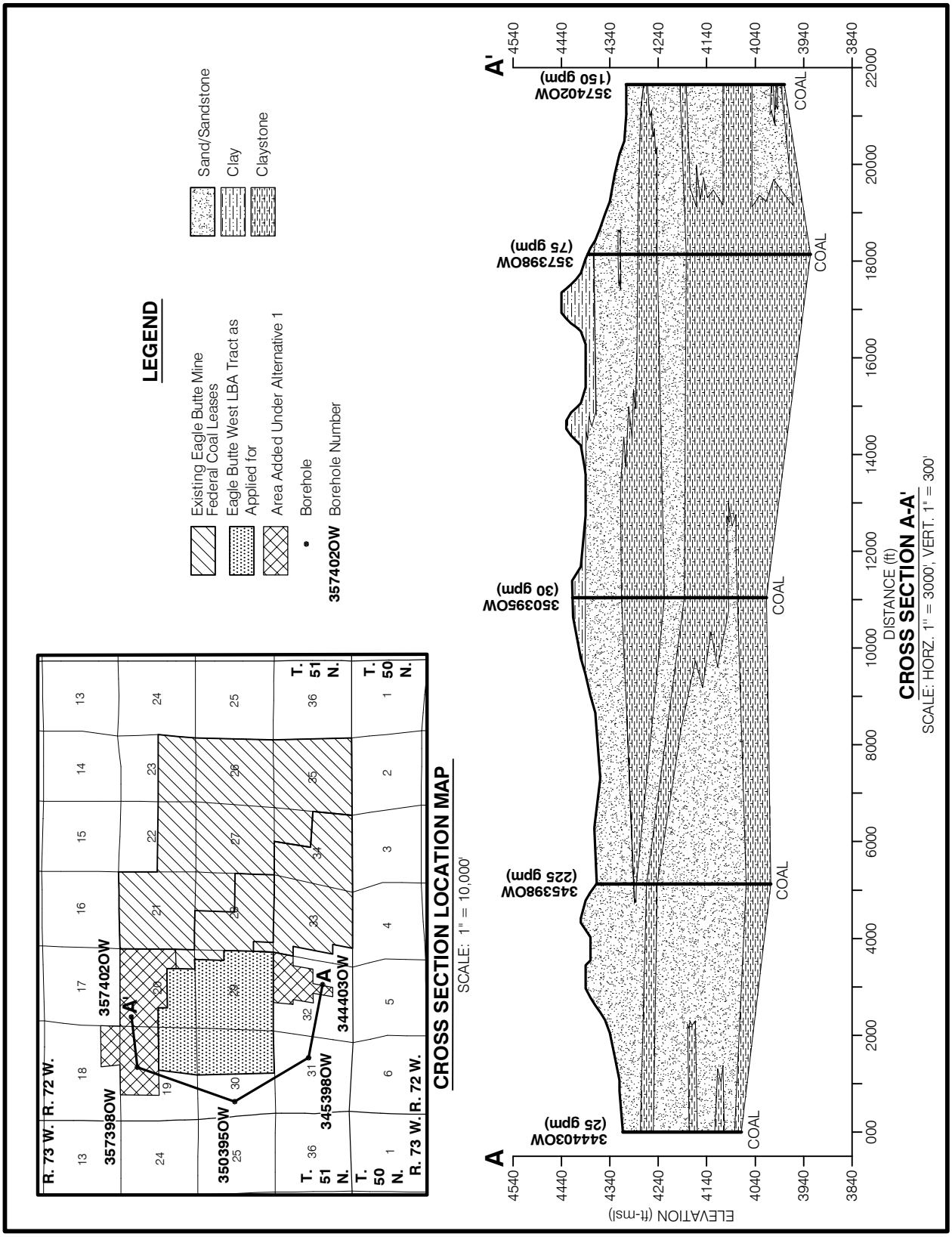

Figure 3-11. Geologic Cross Section of the Wasatch Formation Overburden in the Area of the Eagle Butte West LBA Tract.

installed in the general analysis area (Figure 3-10). Like the lithology of the overburden in the LBA tract, the hydraulic characteristics of the saturated sands are areally inconsistent. The hydraulic conductivity values ranged from approximately 0.1 ft/day to 100 ft/day.

The overburden aquifer's saturated thickness is also highly variable, ranging from just a few feet in Eagle Butte Mine's current permit area to over 200 ft in the western portion of the Eagle Butte West LBA Tract. Due to the discontinuous nature of the deposits, premine overburden groundwater flow in the vicinity of the Eagle Butte Mine generally followed the topography, which was basically to the north. Groundwater discharge would then occur wherever saturated overburden sands were in hydraulic communication with the overlying Little Rawhide Creek alluvial deposits. Groundwater movement in the overburden has since been affected locally by the mining operations in the area. Current monitoring well data indicate that overburden groundwater in the Eagle Butte Mine area still flows from south to north and discharges into the mine's open pits and the Little Rawhide Creek alluvial system (FCW 2005b and Hydro-Engineering 2006). Groundwater levels measured in 2005 in the five recently installed overburden monitoring wells located immediately north, west, and south of the proposed lease area (Figures 3-10 and 3-11) varied from about 25 ft to 120 ft below land surface.

The quality of groundwater in the Wasatch Formation aquifer in the Eagle Butte Mine area is somewhat variable (FCW 2005a). Baseline groundwater samples were collected in 2004 and 2005 from the five recently installed overburden monitoring wells. The water quality at all five sites is characterized as a calcium-sulfate type and the average TDS concentrations range from 1,390 mg/L (at well 357398OW) to 4,121 mg/L (at well 344404OW). The median TDS for the Wasatch Formation for the group of mines north of Gillette, as calculated by WDEQ/LQD based on 752 samples, is 2,326 mg/L (Ogle et al. 2006). Groundwater from all five overburden monitoring wells in the general analysis area meets only WDEQ/Water Quality Division's (WQD's) Class III use suitability classification (suitable for livestock and wildlife use) due to excessive concentrations of TDS, sulfate, and/or iron. The groundwater quality observed in the overburden sand aquifer in the Eagle Butte West LBA Tract area is typical of that observed in the overburden throughout the existing Eagle Butte Mine area.

3.5.1.1.3 Roland-Smith/Wyodak-Anderson Coal

The Tongue River Member of the Fort Union Formation contains the mineable coal zone, which is often divided by partings that separate it into two or more units. As discussed in Section 3.3.1.1, the mineable coal zones are variously referred to as the Anderson and Canyon, Wyodak-Anderson, and Wyodak coal beds in the eastern PRB. At the Eagle Butte

Mine they are referred to as the Roland and Smith seams. In the Eagle Butte Mine area, the Roland Coal seam ranges from zero to 70 ft thick, with an average thickness of 40 ft. The Smith Coal seam in places reaches thicknesses of over 100 ft, with an average thickness of 70 ft.

The Roland and Smith seams are generally present within the Eagle Butte West LBA Tract; however, the Roland seam is not present in all areas. The thickness of coal ranges from 33.4 ft to 133.1 ft, with overburden thickness ranging from 182.9 to 459.2 ft. in the proposed lease area. The parting (dark brown to black carbonaceous clay and clayey coal) between the Roland and Smith seams ranges from one ft to 13 ft thick, where both seams are present. In general, exploration drill holes in the Eagle Butte West LBA Tract as proposed had a total of more than 100 ft of coal present. A general description of the coal seam aquifer is presented as follows.

The Fort Union coal seams are considered regional aquifers because they are water bearing and laterally continuous throughout large areas. Historically, the Fort Union coal seams have been a source of groundwater for domestic and livestock uses in the eastern PRB. However, due to the one to three degree west, northwest dip of the coal beds, within a couple of miles west of the PRB surface coal mines, including Eagle Butte Mine, the coal seams become too deep to be an economical source of water.

Hydraulic conductivity within the coal seams is highly variable and reflective of the amount of fracturing the coal has undergone, as unfractured coal is virtually impermeable. Field tests indicate that the coal has a low to moderate transmissivity with a range of roughly three orders of magnitude, with localized zones of moderately high transmissivity due to increased fracturing. The yield of groundwater to wells and mine pits is smallest where the permeability of the coal is derived primarily from localized unloading fractures. The highest permeability is imparted to the coal by tectonic fractures. Due to their pronounced surface expression, these tectonic fractures are often referred to as “lineaments”. Coal permeability along lineaments can be increased by orders of magnitude over that in the coal fractured by unloading only. Hydraulic conductivity values, using a mean saturated thickness of 100 ft, range from 0.1 to 9.0 ft/day in the Eagle Butte Mine area (FCW 2005a).

Under premining conditions, water in the coal was confined in places within the Eagle Butte Mine permit area and unconfined in others, depending upon the presence of lack of an aquiclude (a claystone/shale stratigraphic layer) that separates the coal from the overlying Wasatch Formation sand lenses.

Recharge to the coal occurs principally by infiltration in the clinker outcrop areas along the eastern flank of the Powder River structural basin. Secondary vertical recharge from the overburden also occurs. Prior to mining in the Eagle Butte Mine area, groundwater in the

areally continuous coal seams flowed down dip to the northwest, with local variations caused by hydrologically significant lithologic features such as a "no coal zone" and a paleo-erosional cut-out within the overlying Wasatch Formation. The no coal zone, which is in the northern portion of the existing Eagle Butte Mine permit area (in Sections 16 and 21, T.51N., R.72W.), is an area where the coal was replaced with a dominantly claystone/shale material of very low permeability that acts as a groundwater dam. Groundwater in the coal seams flowed around and over the feature, thus causing groundwater to discharge upward into the Little Rawhide Creek alluvial aquifer system. The Wasatch cut-out feature is basically where a sand paleo-channel was deposited directly over the coal, permitting direct hydraulic communication between the coal and overburden aquifers and the Little Rawhide Creek alluvium. These local variations play a significant part in the groundwater and surface water regimes for Little Rawhide Creek in the Eagle Butte Mine area. Except for the limited areas where the coal's premining potentiometric surface indicated recharge upward to Little Rawhide Creek, the movement of groundwater in the Fort Union Formation coal zone and the Wasatch Formation overburden was primarily down dip (FCW 2005a).

Site-specific water-level data collected from monitoring wells by Eagle Butte Mine and other Gillette area coal mining companies and presented in the GAGMO 20-year report (Hydro-Engineering 2001) indicate that the groundwater flow directions in the mineable coal zones (Roland-Smith/Wyodak-Anderson) have been greatly influenced by surface mine dewatering and groundwater discharge associated with CBNG development. Groundwater level declines observed near active mining areas prior to 1994 were likely due to mine dewatering alone and the direction of groundwater flow as toward the mine excavations. By year 2000, groundwater level decline rates had dramatically increased because drawdown caused by widespread CBNG development west of the mines was overlapping with drawdowns caused by mining operations. The extent of drawdown west of the mines that is attributable to mine dewatering can no longer be defined due to much greater CBNG development (Hydro-Engineering 2001). The coal seam water level contours presented in the GAGMO 2005 Annual Report (Hydro-Engineering 2006) depict the groundwater flow direction in the Eagle Butte Mine area to be entirely west-northwest, away from the open pits. Roughly 30 years of surface mining and CBNG development has resulted in complete dewatering of the coal seams in localized areas, particularly near the mines' open pits and where the coal seams are structurally highest.

Coal groundwater commonly exceeds many suitability criteria for domestic uses and has a high salinity and sodium hazard, which makes it unsuitable for agricultural uses. Therefore, coal groundwater is typically only suitable for livestock and wildlife watering purposes.

Groundwater samples collected from monitoring wells within and around the existing Eagle Butte Mine permit area (Figure 3-10) indicate that the coal seam water quality generally exhibits lower TDS concentrations than the alluvial or overburden groundwater. The composition of groundwater in the coal is fairly uniform and there are no seasonal or long-term trends. The predominant cation is sodium, while the predominant anion is bicarbonate. Those wells located closer to the coal-scoria contact have much higher sulfate concentrations. In the general analysis area, TDS concentrations range 874 mg/L to 3,316 mg/L, and average approximately 1,700 mg/L. This compares to a median TDS of 1,412 mg/L calculated by WDEQ/LQD for the group of mines north of Gillette, based on 1,598 samples collected from the coal aquifer (Ogle et al. 2006).

3.5.1.1.4 Subcoal Fort Union Formation

As discussed in Section 3.3.1.1, the Fort Union Formation is divided into three members: the Tongue River Member, the Lebo Member, and the Tullock Member. The mineable coal seams occur within the Tongue River Member. The subcoal Fort Union Formation consists primarily of lithified sands and shales, and is divided into three hydrogeologic units: the upper Tongue River aquifer, the Lebo confining layer, and the Tullock aquifer (Law 1976). Of the three units, the Tullock is the most prolific in terms of groundwater yield.

Mining does not directly disturb the hydrogeologic units below the mineable coal, but many PRB mines use them for industrial water supply wells. In a few cases, there have been drawdowns in the subcoal aquifer due to leakage into mine pits, dewatering, and CBNG development (BLM 2001a).

Transmissivities are generally higher in the deeper Tullock aquifer than in the shallower Tongue River aquifer, and many mines in the PRB have water-supply wells completed in this interval (Martin et al. 1988). The average transmissivity for the Tullock, as reported by OSM (1984), is 290 ft^2/day.

Data from drilling water supply wells at Eagle Butte Mine indicate that the subcoal Fort Union Formation is rather impermeable above a depth of about 670 ft below ground level. The Eagle Butte Mine uses two wells completed in the Tullock aquifer (NSERV1 and NSERV2) at depths of 900 to 1,000 ft for its water supply (Figure 3-10). As discussed above, the Tullock aquifer is utilized for municipal, industrial, and domestic water supply by the city of Gillette, residential subdivisions, and other nearby coal mines, as well as the Eagle Butte Mine.

The water quality of the subcoal Fort Union Formation is generally good. TDS concentrations measured in various subcoal Fort Union Formation water supply wells in the eastern PRB range from 230 mg/L to 520 mg/L. This water is generally suitable for domestic use and may be suitable for irrigation, depending upon TDS concentrations and site-specific SAR

values. Well NSERV1 is sampled periodically and the water quality meets WDEQ/AQD Class I standards (WDEQ 2005), having TDS concentrations of approximately 280 mg/L, a pH of 8.0, and it is a sodium bicarbonate type (FCW 2004b and 2005b).

3.5.1.2 Environmental Consequences

3.5.1.2.1 Proposed Action and Alternative 1

Surface coal mining impacts the quantity of the groundwater resource in two ways: 1) the coal aquifer and any aquifers present in the overburden are removed from the mined land and replaced with unconsolidated backfill, and 2) water levels in the coal and overburden aquifers adjacent to the mine pits are depressed as a result of seepage into and dewatering from the open excavations in the area of coal and overburden removal.

If the Eagle Butte West LBA Tract is leased under the Proposed Action or Alternative 1, the area of coal removal and reclamation would increase, which would result in an increase in the area of mining-related impacts to groundwater quantity. Currently approved mining will remove the overburden, interburden (if present), and coal on the existing leases at the Eagle Butte Mine and replace these stratified units with backfill material composed of an unlayered mixture of the shale, siltstone, and sand that makes up the existing Wasatch Formation overburden and Fort Union Formation interburden (where present). The existing leases currently include approximately 5,524 acres. Mining the LBA tract as a maintenance lease would extend the area of overburden and coal removal by about 2,395 acres under the Proposed Action up to about 2,505 acres under Alternative 1.

If the Eagle Butte West LBA Tract is leased and mined, the coal and overburden aquifers within the tract would be completely dewatered and removed and the area of drawdown caused by coal and overburden removal would be extended further to the west of the active mine area. In general, the extent that drawdowns would propagate away from the mine pits is a function of the water-bearing properties of the aquifer materials. In materials with high transmissivity and low storativity, drawdowns would extend further from the pit face than in materials with lower transmissivity and higher storage capacity. While there would be variations in hydrologic properties, the time the pits are open, the distance from mining and the dewatering that has already occurred as a result of previous mining and CBNG development, the area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

In general, due to the variable lithologic makeup of the Wasatch Formation overburden (discontinuous sandstone and sand lenses in a matrix of siltstone and shale), drawdowns in the overburden are variable and do not extend great distances from the active mine pits. Overburden water levels are currently being monitored by Eagle Butte Mine

at 18 monitoring wells (Figure 3-10). Historical data do not indicate that mine dewatering has necessarily caused water levels in the overburden to be depressed in proportion to distance and direction from the active pits or in proportion to the time since mine dewatering began. The maximum drawdown observed is approximately 60 ft at a single well located about 500 ft from an active pit. Drawdown measured at all of the other active overburden monitoring wells ranges from about 32 ft to two ft, and none of these wells are located more than 4,000 ft from an open pit (Hydro-Engineering 2006, FCW 2005b).

In 1998, Eagle Butte Mine used the numerical groundwater flow model MODFLOW to predict the extent of the life-of-mine drawdowns in the local overburden aquifer system attributable to mining the existing leases (WWC 1998). The results of the groundwater modeling are reported in Appendix 4.6-3, Section 4.6 of the Eagle Butte Mine Permit 428-T5 (FCW 2005a). There was generally good agreement between groundwater level monitoring data and the modeled drawdowns through 1990, indicating that the model provided reasonable drawdown predictions. Based on the modeling done in 1998, the predicted five ft drawdown contour in the overburden aquifer over the life of the Eagle Butte Mine extends approximately two miles south and two miles west of the current mine permit boundary. The coal-mining related drawdown in the Wasatch overburden sand aquifer over the life of the Eagle Butte Mine if the Eagle Butte West LBA Tract is mined is therefore predicted to extend approximately two miles beyond the areas of overburden removal. This extrapolation serves as a general approximation of the potential impacts, based on previous experience, but it does not take into account variations in hydrologic properties, the time the pits are open, and the dewatering that has occurred as a result of previous mining. More precise predictions of the extent of drawdowns would be required in order to amend the Eagle Butte West LBA Tract into the WDEQ/LQD permit area, if the Eagle Butte Mine acquires the Eagle Butte West LBA Tract.

Water level drawdowns propagate farther and in a more consistent manner in the coal seam aquifers than in the overburden due to the regional continuity and higher transmissivity of the coal seams. Drawdowns in the coal aquifers are primarily a function of distance from the pit, although geologic and hydrologic barriers and boundaries such as crop lines, fracture zones, and recharge sources can also influence drawdowns. Drawdowns within the coal from 1980 to 1990 in the Eagle Butte Mine area were fairly rapid and inversely proportional to the monitoring wells' distances from the active pit. By 1995, the rate of drawdown had declined and drawdown was probably being caused by both mine pit dewatering and CBNG production. The extent of coal-mining related drawdown in the coal (the five ft drawdown contour) in 1995 was approximately two miles west and from one to 2.5 miles south of Eagle Butte Mine's active pit. At

that time, a maximum of approximately 160 ft of drawdown had occurred adjacent to the mine's active pit (Hydro-Engineering 1996). Since 1995, BLM and state monitoring wells located at varying distances west of the mines' groundwater monitoring networks have recorded an increased rate of drawdown in the coal as a result of CBNG production. By year 2000, the five ft drawdown contour extended approximately four to five miles south of the Eagle Butte Mine and could no longer be defined to the west due to the much larger drawdown caused by CBNG development (Hydro-Engineering 2001). In 2000, monitoring wells located immediately adjacent to the active pit had recorded around 180 ft of drawdown; however, drawdowns extrapolated by Hydro-Engineering (2001) using BLM and state monitoring well data exceeded 200 ft at a distance of over four miles west of the mine pit. As of 2004, minimal additional drawdown had occurred immediately adjacent the advancing pit, although an additional 100 ft of drawdown had occurred in the vicinity of the Eagle Butte West LBA Tract (Hydro-Engineering 2004). As of 2005, dewatering by existing mining and CBNG development activities in the area of the Eagle Butte Mine had nearly completely drained groundwater from the coal seams, particularly near the open mine pits and where the coal seams are structurally highest (Hydro-Engineering 2006). The direction of groundwater flow within the LBA tract is now to the west-northwest rather than toward the Eagle Butte Mine's open pits to the east. Groundwater level monitoring data are included in the annual progress reports that Eagle Butte Mine submits to the WDEQ/LQD, as well as in the GAGMO annual reports.

In 1991, RAG used the numerical flow model MODFLOW to predict the extent of water level drawdown in the Roland and Smith coal aquifers attributable to mining at the Eagle Butte Mine. The results of the groundwater modeling are reported in Section 3.5, Appendix 3.5-10, of the Eagle Butte Mine 428-T5 Permit (FCW 2005a). In 1998, RAG updated the coal aquifer drawdown estimates in order to address the impacts of mining the Eagle Butte LBA Tract in the WDEQ/LQD mine permit. The Eagle Butte LBA Tract, which is shown in Figure 1-1, is called the Southwest Extension Amendment Area in the Eagle Butte Mine permit document. The 1998 predictions were extrapolated by extending the life-of-mine five ft drawdown contour to the west and south by the dimensions of the Eagle Butte LBA Tract. (The coal seams are not areally continuous east and north of the mine.) This method of prediction was approved by the WDEQ/LQD in light of the extensive drawdowns associated with offsite CBNG development. It would have been difficult or impossible to verify a new model predicting impacts due to surface coal mining only and track its predictions against measured drawdowns (FCW 2005a).

The predicted extent of coal-mining related drawdown (five ft contour) in the Roland and Smith coal seams over the life of the Eagle Butte Mine if

the Eagle Butte West LBA Tract is mined is shown on Figure 3-12. The life-of-mine drawdown shown in this figure extends the predicted 1998 life-of-mine five ft drawdown contour westward by the dimensions of the Eagle Butte West LBA Tract. This extrapolation serves as a general approximation of the potential impacts, based on previous experience, but it does not take variations in hydrologic properties, the time the pits are open, the distance from mining and dewatering that has occurred as a result of previous mining and CBNG development into account. More precise predictions of the extent of drawdowns may be required in order to amend the Eagle Butte West LBA Tract into the WDEQ/LQD permit area, if the Eagle Butte Mine acquires the Eagle Butte West LBA Tract.

The subcoal aquifers (i.e., Tullock Member of the Fort Union Formation and Lance Formation-Fox Hills Sandstone) are not removed or disturbed by mining, so they are not directly impacted by coal mining activity. The Eagle Butte Mine has two water supply wells completed in the Tullock aquifer below the Roland and Smith coal seams. If the Eagle Butte West LBA Tract is leased by the applicant, water would be produced from these wells for a longer period of time, but FCW would not require additional sub-coal wells to mine the LBA tract.

As noted above, the existing layers of sediment and rock in the mine excavation area would be replaced by generally homogeneous, unconsolidated backfill material, which would recover as a single hydrostratigraphic unit. The backfill unit created in the LBA tract area would be in hydraulic communication with the undisturbed coal, overburden, and adjacent mine backfill aquifer system. Premining recharge areas, described in Section 3.5.1.1, would not be disturbed by mining. Surface infiltration recharge rates for the backfill materials should be equivalent to or somewhat greater than infiltration recharge through undisturbed overburden, due primarily to the generally flatter topography resulting in less surface runoff.

The hydraulic properties of the backfill aquifer based on the results of aquifer testing at mines in the PRB are quite variable, although generally equal to or greater than the undisturbed overburden and coal aquifers (Van Voast et al. 1978 and Rahn 1976). It is early in the process of full reclamation and to date, not all of the backfilled materials have reached an adequate saturated thickness to be aquifer tested at the Eagle Butte Mine. However, two backfill monitoring wells (EB1603 and EB1605) were tested in 2000. The backfill at these two well locations (Figure 3-10) is approximately 180 ft and 190 ft thick and the saturated thickness at that time was approximately 78 ft and 90 ft, respectively. Hydraulic conductivity values were determined to be 1.1 ft/day and 2.1 ft/day (FCW 2005a), which is comparable to the hydraulic conductivity values for the undisturbed overburden and coal seams within the Eagle Butte Mine area. These data therefore provide an

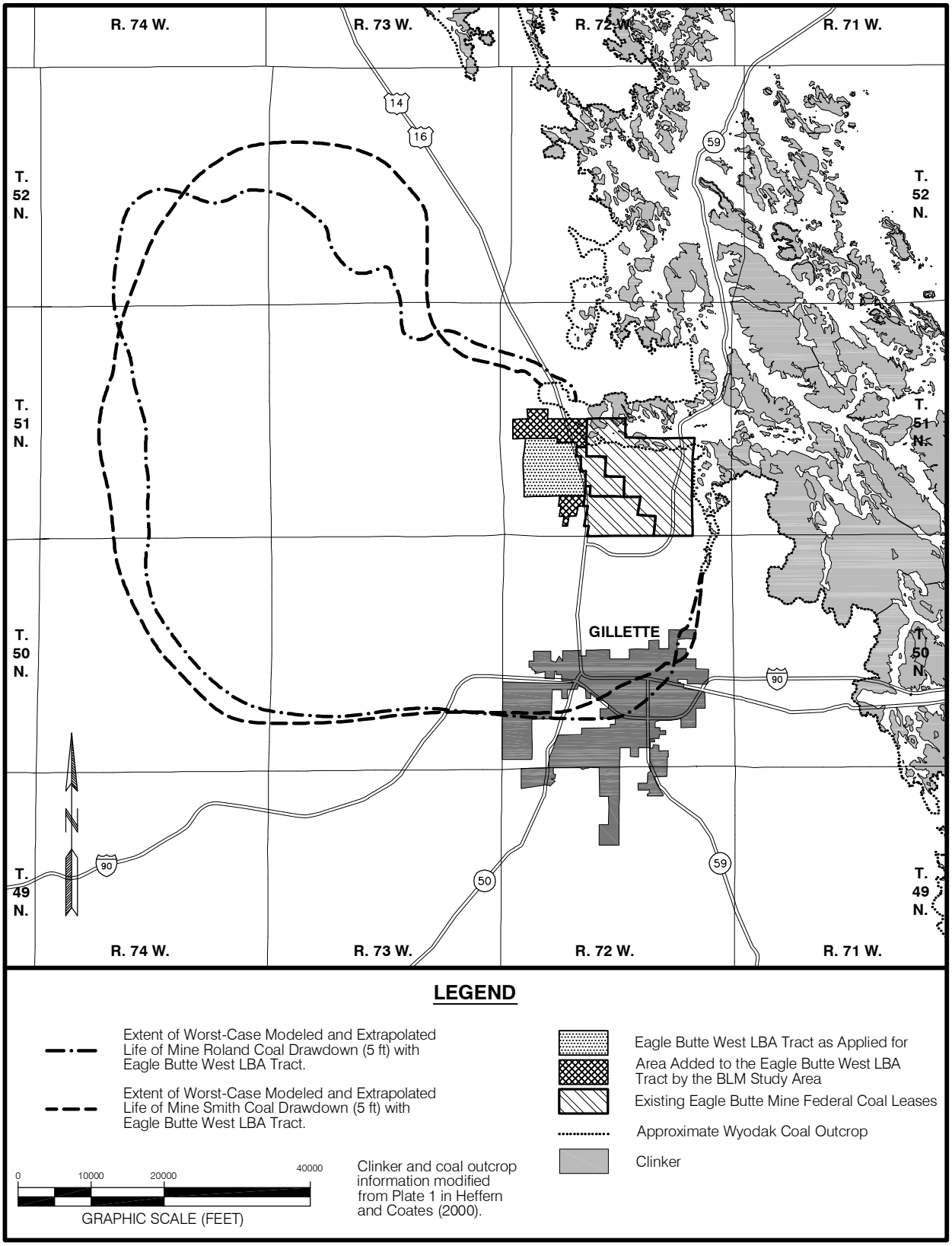

Figure 3-12. Life of Mine Drawdown Map, Resulting from Currently Approved Mining With Addition of the Eagle Butte West LBA Tract.

indication that the Eagle Butte Mine backfill would readily resaturate as postmining potentiometric elevations recover in the surrounding undisturbed aquifers, and that wells completed in the backfill (including in the Eagle Butte West LBA Tract) would be capable of supplying sufficient yields to wells constructed for livestock watering uses.

Mining and reclamation also impacts groundwater quality; the TDS concentration in the water resaturating the backfill is generally higher than the TDS concentration in groundwater from the coal seam aquifer prior to mining. This is due to the exposure of fresh mineral surfaces to groundwater that moves through the backfill. Research conducted by the Montana Bureau of Mines and Geology on the coalfields of the northern PRB (Van Voast and Reiten 1988) indicates that upon initial saturation, mine backfill is generally high in TDS concentration and contains soluble salts of calcium, magnesium and sodium sulfates. As the backfill is resaturated, the soluble salts are leached by groundwater inflow and TDS concentrations tend to decrease with time, indicating that the long term groundwater quality in mined and off-site lands would not be compromised (Van Voast and Reiten 1988).

Groundwater quality within the backfill at the Eagle Butte West LBA Tract would be expected to be similar to groundwater quality measured in existing wells completed in the backfill at the Eagle Butte Mine. To date, two wells (EB1603 and EB1605) have been installed to monitor water levels and water quality in the backfill at the Eagle Butte Mine. Water quality in these two backfill monitoring wells have been and continue to be sampled on a quarterly schedule. TDS concentrations in samples collected from well EB1603, from 2000 through 2004, have ranged from 4,281 to 4,822 mg/L, with a geometric mean of 4,497 mg/L. TDS concentrations in samples collected from well EB1605, from 2000 through 2004, have ranged from 5,286 to 6,072 mg/L, with a geometric mean of 5,804 mg/L (Hydro-Engineering 2006). TDS concentrations observed to date in samples from these two Eagle Butte Mine backfill monitoring wells are generally higher than those from the undisturbed Roland and Smith coal seams or Wasatch Formation overburden. However, water quality samples from most of the mine's alluvial monitoring wells and at least two overburden monitoring wells have higher TDS concentrations (FCW 2004b and 2005b).

Using data compiled from 10 surface coal mines in the eastern PRB, Martin et al. (1988) concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Clark (1995) conducted a study to determine if the decreases predicted by laboratory studies actually occur onsite. In the area of the West Decker Mine near Decker, Montana, his study found that dissolved solids concentrations

increased when water from an upgradient coal aquifer flowed into a backfill aquifer, and apparently decreased along an inferred path from a backfill aquifer to a downgradient coal aquifer. Postmining groundwater quality is expected to improve after one pore volume of water moves through the backfill. In general, the mine backfill groundwater TDS can be expected to range from 3,000 - 6,000 mg/L, similar to the premining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

Changes to the premining hydraulic characteristics of the alluvial aquifer and the quality of alluvial groundwater are expected to be minor after final reclamation, because Eagle Butte Mine would be required to maintain the essential hydrologic functions of Little Rawhide Creek and its alluvial groundwater system (as is currently required for the already-approved mining operations affecting Little Rawhide Creek). See additional discussion in Section 3.5.1.3.

As discussed in Chapter 2, the Proposed Action and Alternative 1 assume that this LBA tract would be leased as a maintenance tract to an existing mine. As discussed above, there have been drawdowns in the coal and overlying aquifers as a result of the existing approved mining and the existing CBNG development in the vicinity of the LBA tract. As of May 2006, the level of groundwater in the Roland and Smith coal beds in the general analysis area had already been lowered to near the base of the coal as a result of dewatering by existing mining and CBNG development activities in the area. The potential overlapping impacts of the existing mining activities with other proposed activities are discussed in Chapter 4.

3.5.1.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the Eagle Butte West LBA Tract. Impacts to groundwater resources related to existing approved mining and CBNG development, described above, would continue as permitted on the existing Eagle Butte Mine leases. Mining operations would not be extended onto portions of the Eagle Butte West LBA Tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.5.1.3 Regulatory Compliance, Mitigation and Monitoring

In order to obtain a mining and reclamation permit, the Eagle Butte Mine was required to evaluate regional and site-specific baseline hydrogeologic environments within and around the mine and use a groundwater flow model to predict the extent of water level drawdown in the Wasatch Formation overburden and Roland and Smith coal aquifers that would occur as a result of mining the existing leases at the Eagle Butte Mine. Results of these studies are

included in the WDEQ/LQD mine permit (FCW 2005a). If the Eagle Butte West LBA Tract is leased and mined, the permit for the Eagle Butte Mine would have to be amended to include the tract, and these studies would be revised accordingly.

The surface coal mines, including Eagle Butte Mine, are required to monitor water levels and water quality in the overburden, coal, interburden, underburden, and backfill. Groundwater monitoring wells installed by Eagle Butte Mine within and around the current permit area have been used to evaluate groundwater conditions since 1974. A total of 139 wells have historically been installed for monitoring purposes at the Eagle Butte Mine. Most monitor wells were installed between 1975 and 1992 and used for long-term monitoring purposes before either being removed by mining operations or discontinued. Wells for which monitoring has been discontinued are still in place and may be reincorporated into the monitoring network in the future. Additional wells have been installed as mining has progressed. Currently, there are 56 wells in and surrounding the mine permit area that are actively being monitored by FCW: 12 in the alluvium, 22 in the overburden, 19 in the coal, two in the mine backfill, and one in the aquifer below the coal. The locations of these monitoring wells are shown on Figure 3-10.

The Eagle Butte Mine's WDEQ/LQD mine permit requires the mine to maintain the essential hydrologic functions of Little Rawhide Creek and its alluvial groundwater system that were identified prior to mining. In order to meet this requirement, the stream-laid alluvial materials are salvaged and stockpiled during mining and would be replaced upon final reclamation. This requirement would be extended to include mining operations on the Eagle Butte West LBA Tract, if it is leased.

As stated in Sections 3.5.1.1.1 and 3.5.1.1.2, overburden sand bodies within the Wasatch Formation provide recharge for the Little Rawhide Creek alluvial groundwater system, which in turn contributes to Little Rawhide Creek streamflow. In order to maintain the hydrologic balance between the overburden sand aquifers and Little Rawhide Creek, and to restore the essential hydrologic functions of the Little Rawhide Creek AVF, WDEQ/LQD determined that discharge from the bedrock aquifers to the alluvium must be reestablished after mining (FCW 2005). Eagle Butte Mine therefore committed, as part of their existing permit, to reconstructing a sand body aquifer to replace a hydrologically significant overburden sand aquifer removed during mining. The majority of the general backfill is siltstones and shales, but sand within the overburden was selectively used for the reconstructed sand body, which is therefore expected to exhibit aquifer characteristics similar to the premining sand body. Eagle Butte Mine also committed to replacing the alluvial deposits along Little Rawhide Creek that were in contact with the overburden sand aquifer prior to mining in order to maintain the premining hydrologic balance and support the postmining land uses

(FCW 2005a). Eagle Butte Mine's current hydrologic restoration plan includes a reconstructed sand body aquifer that will be in hydraulic communication with a saturated, undisturbed sand body along the western limit of mining and an infiltration pond within the reconstructed Little Rawhide Creek stream channel. If the Eagle Butte West LBA Tract is acquired by the Eagle Butte Mine and the proposed lease area is amended into the WDEQ/LQD permit area, more extensive reconstruction of hydrologically significant overburden sand body aquifers and the Little Rawhide Creek alluvial aquifer may be required in order to maintain the premining hydrologic balance and support the postmining land uses.

3.5.2 Surface Water

3.5.2.1 Affected Environment

The existing Eagle Butte Mine permit area and the adjacent Eagle Butte West LBA Tract are located within the Little Rawhide Creek and Dry Fork Little Powder River watersheds. The majority of the mine's permit area lies within the Little Rawhide Creek drainage basin and only the extreme eastern portion of the permit area is drained by the Dry Fork Little Powder River. Little Rawhide Creek and its tributary, Prong Draw, drain the entire Eagle Butte West general analysis area. Little Rawhide Creek flows from south to north and empties into Rawhide Creek about three miles north of the LBA tract. Rawhide Creek is a tributary to the Little Powder River, which joins the Powder River near Broadus, Montana. Surface water features in the Eagle Butte West LBA Tract and the surrounding areas prior to all mining disturbance are displayed in Figure 3-13.

The main channel of Little Rawhide Creek is within the eastern portion of the Eagle Butte West LBA Tract, which is inside the current Eagle Butte Mine permit area. Little Rawhide Creek is currently diverted from its natural channel by Diversion No. 6 to facilitate mining within the current Eagle Butte Mine permit area. Little Rawhide Creek Diversion No. 6 was constructed in 1981. The diversion channel begins inside the LBA tract area immediately downstream of the Highway 14-16 crossing in the NW¼SE¼ of Section 20, T.51N., R.72W., then runs to the northeast until it empties into a reservoir located in the Rawhide Mine permit area. Little Rawhide Creek Diversion No. 6 is shown in Figure 3-13. Other surface runoff control structures (e.g., reservoirs and diversion channels) have been constructed on Little Rawhide Creek's ephemeral tributaries within the current Eagle Butte Mine permit area.

Gently rolling topography characterizes the drainage basin of Little Rawhide Creek within and upstream of the LBA tract. Near the headwaters, the stream channel elevation is about 4,500 ft. The channel elevation is about 4,300 ft where it enters the LBA tract, about 4,260 ft where the Little Rawhide Creek Diversion No. 6 begins, and drops to approximately 4,100 ft at the confluence with Rawhide Creek. The channel slope, or gradient, from the

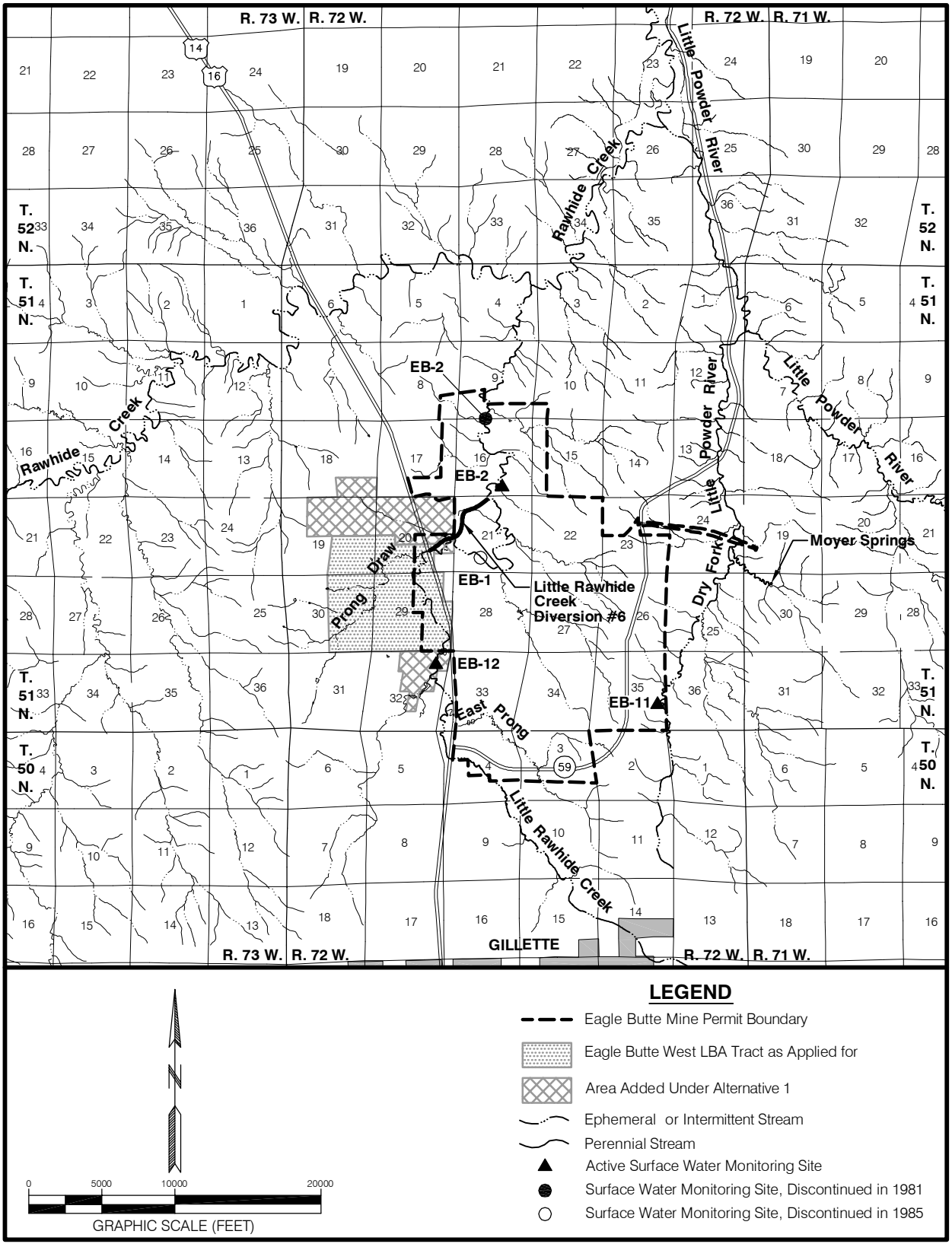

Figure 3-13. Surface Water Features Within and Adjacent to the Eagle Butte West LBA Tract as Applied for and the Area Added Under Alternative 1.

headwaters to the diversion is approximately 23 ft per mile (0.004 ft/ft), and from there to the mouth of the stream the channel gradient is about 15 ft per mile (0.003 ft/ft). Little Rawhide Creek has a total drainage area of approximately 34.1 square miles. At the upstream end of the diversion, approximately where the stream leaves the LBA tract, the drainage area is about 21.2 square miles.

Prong Draw flows diagonally across the LBA tract from southwest to northeast and joins with the main channel of Little Rawhide Creek near the eastern boundary of the LBA tract (Figure 3-13). The average channel gradient through the LBA tract is 0.006 ft/ft, with a total drop of about 85 ft. Prong Draw drains about 59 percent of the Eagle Butte West LBA Tract and has a total drainage area of approximately 3.4 square miles. No natural topographic depressions, internally drained areas, or playas exist within the general analysis area. No springs occur within the general analysis area.

Seven reservoirs used for livestock watering and storage of groundwater discharged from CBNG wells are currently located on the LBA tract as applied for under the Proposed Action and Alternative 1, two of which are located on Little Rawhide Creek and the other five are located on Prong Draw and its tributaries.

The Little Rawhide Creek valley includes areas underlain by both alluvium and colluvium and exhibits a winding course. It is bounded on its sides by slope wash, fan deposits, and bedrock outcrops. There is evidence of abandoned meander scars within the valley, which range in width from 250 ft to 1,350 ft. In the general analysis area, numerous man-made modifications (e.g., impoundments and diversion dikes) have been constructed along the main channel and tributaries to Little Rawhide Creek. The width and depth of the channel varies considerably, primarily due to the effects of these channel modifications. The stream alternately forms pools and constrictions along its length. The pools average about 50 ft in length and the constricted “riffle” areas average about 200 ft in length. The pools are important with respect to the interaction between surface water and groundwater and for use by livestock and wildlife in dry months. Upstream from the impoundments and diversions, the channel is as much as 20 ft wide and filled with soft silts and clays high in organic matter that obscure the natural channel geometry. In areas well upstream of the channel modifications the channel is normally about two to six ft wide and about 1.5 ft deep and is often partially or totally covered with cattails or grasses. Numerous impoundments have also been constructed along the Prong Draw channel, most of which are associated with the storage of groundwater discharged by CBNG development.

Eagle Butte Mine established a surface water monitoring network in 1974 to assess the pre- and during-mining surface water quantity and quality characteristics of Little Rawhide Creek. Continuously

recording discharge gaging stations, sites EB-1 and EB-2, were established in March 1974. Site EB-1 was deactivated in 1985 and site EB-12 was established south of the Eagle Butte Mine permit boundary to replace EB-1. Site EB-2 was moved to its current location in 1990 to accommodate Rawhide Mine advances. The locations of these surface water monitoring sites are depicted on Figure 3-13.

Flow in the stream is influenced by the in-channel impoundments; however, the storage capacity of those impoundments is relatively small. Streamflow hydrographs recorded at gaging stations EB-1 and EB-2 indicate that Little Rawhide Creek streamflow during baseline conditions (pre-1977) was characterized by wide fluctuations on a seasonal and annual basis. Due to the short duration, high intensity nature of summer storms in this area, flow events were typically of short duration and sharply peaked. Flow typically occurred rapidly in response to large storm events, and then tapered off to no flow within a few days. The larger storms produced enough runoff to fill the channel impoundments and recharged the alluvium along Little Rawhide Creek, resulting in a prolonged period of flow due to alluvial groundwater seepage.

Before mining and CBNG development activities commenced in this part of the PRB, streamflow above (upstream of) a point roughly in the center of Section 29, T.51N., R.72W. was more ephemeral in nature, generally occurring only in direct response to precipitation and snowmelt runoff events. However, downstream of that point stream baseflow was sustained by groundwater discharging from underlying bedrock and alluvial aquifers, thus making the stream more intermittent in nature. The annual discharge volumes of Little Rawhide Creek recorded at site EB-12 (upstream site) over the 21-year period of record (1985-2005) is 148 ac-ft. The annual discharge volumes of Little Rawhide Creek recorded at site EB-2 (downstream site) over the 32-year period of record (1974-2005) is 403 ac-ft.

Prior to the relatively recent effects from the surface discharge of groundwater associated with CBNG development and drought conditions in northeastern Wyoming (Curtis 2004), streamflow in Little Rawhide Creek was of short duration and exhibited temporal patterns similar to precipitation events. Under current conditions, discharges from CBNG development in the Little Rawhide Creek drainage basin have altered the frequency and duration of streamflow events in the main stream and most of its tributaries. Annual streamflow at site EB-2 from 2001 through 2005 is 28.6 ac-ft; only 9.6 percent of the 32-year mean. Annual precipitation amounts have been considerably below normal since the spring of 2000 (Curtis 2004), which has resulted in below normal streamflows. In 2004, Eagle Butte Mine's meteorological monitoring station recorded only 8.1 inches of precipitation, which was 47 percent of the annual average. Concurrently, streamflow recorded at site EB-12 has been considerably higher than at site EB-2 six of the

last seven years, which is the reverse of baseline/natural conditions. The mean annual discharge at site EB-12 from 2001 through 2005 is 101 ac-ft; 68 percent of the 21-year mean. This anomalous streamflow condition is attributable to the augmentation from CBNG groundwater discharge outfalls that are located relatively near site EB-12. In addition, streamflow between these two gaging stations is being lost by discharge to the alluvium and underlying overburden aquifers. Shallow impoundments along the stream channel that are located immediately upstream and downstream of site EB-12 presently hold water year-round, although water does not flow continuously within the channel downstream. Streamflow recorded at these two gaging sites from October 2000 through August 2005 indicate that flow occurred at site EB-12 on approximately 67 percent of the days that the site was operational, compared to approximately 32 percent of the days that site EB-2 was operational.

Eagle Butte Mine has not monitored the streamflow of Prong Draw; however, surface runoff flood estimates for the drainage were computed and are included in the mine permit (FCW 2005a).

Little Rawhide Creek is listed in the WDEQ/WQD Surface Water Classification List as a Class 3B stream that is not protected for drinking water or as a fishery, but is protected for other aquatic life, recreation, wildlife, agriculture, industry, and scenic value. All other ephemeral streams draining the existing Eagle Butte Mine permit area and LBA general analysis area are categorized as Class 4 streams (where it has been determined that aquatic life uses are not attainable) (WDEQ/WQD 2005).

Eagle Butte Mine has monitored the water quality of Little Rawhide Creek in the vicinity of the mine since 1972. Eagle Butte Mine, in compliance with WDEQ/LQD permit requirements, currently collects quarterly water quality samples from Little Rawhide Creek at sites EB-2 and EB-12 (Figure 3-13) and includes the analyses in the mine's annual reports. Based on these historical water quality analyses, water from Little Rawhide Creek varies temporally, but is generally not suitable for domestic or agricultural uses. An improvement in quality is generally noted in the spring, which can be attributed to the flushing and dilution effect from snowmelt and rainfall runoff. Water from Little Rawhide Creek is usually unsuitable for domestic or irrigation uses due to excessive concentrations of TDS and sulfate, but suitable for livestock and wildlife use. The TSS concentration is typically less than 30 mg/L, which is relatively low for an ephemeral/intermittent stream, but may be due to low-flow conditions at the time of sampling and the numerous impoundments along the stream channel upstream of the monitoring stations that act to trap suspended solids. High TSS concentrations can be expected from floods caused by large thunderstorms.

Prior to 1982, water quality samples collected downstream of the Eagle Butte West LBA Tract at Sites EB-1 and EB-2 had TDS concentrations that averaged around 6,000 mg/L and the predominant ions were calcium, magnesium, and sulfate. The average TDS concentration of all water samples collected in recent years (between 1999 and 2005) decreased to approximately 3,300 mg/L and the sodium and bicarbonate ion concentrations, in general, increased relative to the calcium, magnesium, and sulfate ion concentrations. This shift in water quality may be attributed to the fact that water sampled at site EB-2 is a blend of natural surface flow, treated mine discharge water, and CBNG discharge water.

Water quality samples were collected monthly at station EB-12 in 1985 when that monitoring station was first established. During that year, the water was consistently a magnesium-sulfate type and the TDS concentration ranged from 4,650 to 8,330 mg/L. The TDS concentration of all water samples collected at this location in recent years (between 1999 and 2005) has ranged from 1,505 to 12,724 mg/L and averaged 2,930 mg/L. Not only does the TDS concentration vary seasonally and with flow, the chemical composition of the water has been relatively inconsistent over this period of time. For example, the predominant anions are sulfate or bicarbonate, the former being the predominant anion of most samples; however, the concentration of bicarbonate relative to sulfate has generally increased over time. The predominant cations were typically magnesium or sodium, with the ionic concentration of sodium increasing over time. The surface discharge of coal seam groundwater, which is rich in sodium and bicarbonate, from CBNG development in the area is apparently affecting the stream's natural water quality.

Because of the lack of regular natural streamflow in Prong Draw, water quality data are not available. Surface water samples were collected from a similar tributary, East Prong Little Rawhide Creek, as part of Eagle Butte Mine's Southwest Extension permit amendment application, and it is likely that the surface water quality in Prong Draw would be similar to that in this tributary of Little Rawhide Creek. The natural surface flow in East Prong is magnesium-sulfate type water, with TDS concentrations ranging from under 100 mg/L to approximately 600 mg/L. The lower TDS value reflects water quality during major runoff events, which would be of suitable chemical quality for irrigation.

3.5.2.2 Environmental Consequences

3.5.2.2.1 Proposed Action and Alternative 1

Changes in surface runoff characteristics and sediment discharges would occur during mining of the LBA tract as a result of the destruction and reconstruction of drainage channels as mining progresses and the use of sediment control structures to manage discharges of surface water from the mine permit area. Erosion rates could be high on the disturbed areas

because of vegetation removal. However, both state and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. Generally, the surface runoff sediment is deposited in ponds or other sediment control devices inside the permit area before the surface runoff water is allowed to leave the permit area.

Since the LBA tract would be mined as an extension of the existing mine under the Proposed Action or Alternative 1, there would not be a large increase in the size of the area that is disturbed and not reclaimed at any given time as a result of leasing the tract. The presence of disturbed areas creates a potential that sediment produced by large storms (i.e., greater than the 10-year, 24-hour storm) could potentially adversely impact areas downstream of the mining operation. This potential for adverse downstream impacts would be extended if the LBA tract were leased.

In reclaimed areas, the loss of soil structure would act to increase runoff rates. However, the general decrease in average slope in reclaimed areas, as discussed in Section 3.2.2, 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.

Substantial streamflow in Little Rawhide Creek may occur within the Eagle Butte West LBA Tract. Sections of Little Rawhide Creek and East Prong Little Rawhide Creek are currently diverted within the existing Eagle Butte Mine permit area. During mining of the LBA tract, hydrologic control would likely consist of building another diversion channel for the main stream around the open pit area. Because most of the LBA tract is drained by Prong Draw, an ephemeral tributary of Little Rawhide Creek, runoff within the tract would not be expected to be substantial. In addition to diverting Little Rawhide Creek, hydrologic control during mining would most likely consist of allowing surface runoff to accrue to the mine pit where it would be treated and discharged according to the standards of the WDEQ/WQD. A need for large flood control reservoirs is not anticipated for the LBA tract.

The impacts described above would be similar for both the Proposed Action and Alternative 1, and they are similar to the expected impacts for the currently permitted mining operation.

3.5.2.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected; coal removal and associated disturbance of Little Rawhide Creek and Prong Draw would not occur on the Eagle Butte West LBA Tract. The impacts to surface water resources described above would continue on the existing mine permit area as a result of currently approved mining and CBNG development. Impacts related to

mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.5.2.3 Regulatory Compliance, Mitigation and Monitoring

In accordance with SMCRA and Wyoming State Statutes, the Little Rawhide Creek stream channel would be restored after surface mining operations are completed on the Eagle Butte West LBA Tract. Surface water flow, quality, and sediment discharge would approximate premining conditions. The drainages that intersect the permit area would be reclaimed to exhibit channel geometry characteristics similar to the premining characteristics. The Little Rawhide Creek stream channel would be restored in approximately the same location as the natural channel and its hydrologic functions, including the alluvial groundwater-surface water interaction would be restored. (See additional discussion in Section 3.5.1.3.)

Other WDEQ/LQD permit requirements for the existing Eagle Butte Mine include constructing sediment control structures to manage discharges of surface water from the mine permit area; treatment of all surface runoff from mined lands as necessary to meet effluent standards; and restoration of stock ponds and in-channel impoundments disturbed during mining. These requirements would be extended to include the Eagle Butte West LBA Tract when the mine permit is amended to include the tract.

Monitoring requirements for the existing Eagle Butte Mine include a monitoring program to assure that sediment ponds would always have adequate space reserved for sediment accumulation, collection of streamflow and water quality data from Little Rawhide Creek at sites EB-2 and EB-12 (Figure 3-12) on a quarterly basis, and compliance with EPA's NPDES permits. These requirements would be extended to include the Eagle Butte West LBA Tract when the mine permit is amended to include the tract.

3.5.3 Water Rights

3.5.3.1 Affected Environment

The Wyoming SEO administers water rights in Wyoming. Water rights are granted for both groundwater and surface water appropriations. Prior to development of water resources associated with energy development, water appropriations (either groundwater or surface water) in the PRB were typically for livestock use. Currently, mining companies and CBNG development companies hold the majority of the water rights in the general analysis area.

Records of the SEO have been searched for groundwater rights within a three-mile radius of the Eagle Butte West LBA Tract as applied for under the Proposed Action

and Alternative 1. This information is required for WDEQ permitting. A summary of the most recent search is provided below. A more detailed listing of the non-coal mine related groundwater rights within a three-mile radius of the LBA tract is presented in the supplementary information document for this EIS, which is available on request.

For the Eagle Butte West LBA Tract, SEO data indicate that, as of October 2004, there are 1,312 permitted water wells within three miles of the tract, of which, 300 are owned by coal mining companies. The other 1,012 non-coal mine related, permitted water wells, which include 788 wells permitted for uses related to CBNG development, are permitted for the following uses:

- 393 stock and CBNG
- 296 CBNG only
- 69 monitoring
- 63 miscellaneous, stock, and CBNG
- 52 miscellaneous
- 41 stock only
- 39 domestic only
- 24 miscellaneous and CBNG
- 14 domestic and stock
- 5 stock, CBNG, and reservoir supply
- 3 industrial
- 2 CBNG and reservoir supply
- 2 industrial and miscellaneous
- 2 stock, miscellaneous, dewatering, and CBNG
- 1 irrigation and domestic
- 1 miscellaneous and dewatering
- 1 miscellaneous, dewatering, stock, wildlife, and CBNG
- 1 miscellaneous and domestic
- 1 stock, CBNG, and monitoring
- 1 stock and miscellaneous
- 1 stock, miscellaneous, monitoring, and CBNG

SEO records have been searched for surface water rights within a three-mile radius of the Eagle Butte West LBA Tract as applied for and Alternative 1. Like the groundwater rights, this information is also required for WDEQ permitting. A summary of the most recent search is provided below. A more detailed listing of the non-coal mine related surface water rights is presented in the supplementary information document for this EIS.

For the Eagle Butte West LBA Tract, SEO records indicate that as of October 2004, there are 16 non-coal mine related, permitted surface water rights within the search area. These surface water rights are permitted for the following uses:

- 8 miscellaneous
- 7 stock
- 1 miscellaneous and industrial

3.5.3.2 Environmental Consequences

3.5.3.2.1 Proposed Action and Alternative 1

In October 2004, Wyoming SEO records indicate a total of 1,312 permitted water wells are presently located within three miles of the LBA tract. As discussed above, 300 of these wells are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the 1,012 non-coal mine related wells within the search area,

approximately 78 percent are permitted either for CBNG development only or for CBNG development and other uses; 58 percent are permitted either for livestock use only or for livestock and other uses; 15 percent are permitted either for miscellaneous only or for miscellaneous and other uses; seven percent are either permitted for monitoring only or for monitoring and other uses; and five percent are either permitted for domestic only or for domestic and other uses. The majority of these 1,012 wells are permitted for multiple uses.

Without considering the groundwater level drawdowns that are just related to CBNG development, some of these privately permitted water wells would be likely to be impacted (either directly by removal of the well or indirectly by water level drawdown) by approved mining operations occurring at the Eagle Butte and adjacent mines. Excluding wells constructed for monitoring, mine dewatering, and CBNG development, none of the permitted water wells that are listed in Section 3.5.3.1 and have completion depths that indicate they produce water from the Roland or Smith coal seams are located within the expanded five-ft drawdown contour associated with mining the Eagle Butte West LBA Tract (Figure 3-12). It is therefore unlikely that any additional private water wells completed in either the Roland or Smith coal seams would be affected if the LBA tract is leased and mined.

Due to the areally discontinuous nature and varied hydraulic properties of the water-bearing units within the Wasatch Formation overburden, the extent and degree of water level drawdowns in the overburden would be variable. There may be private water supply wells completed in the local overburden aquifer that would be affected if the tract is leased and mined. If the Eagle Butte Mine acquires the LBA tract, the mine's WDEQ/LQD permit would be amended to include the Eagle Butte West LBA Tract and the extent of the life-of-mine drawdowns in the local overburden aquifer system attributable to mining the proposed lease area would be evaluated.

3.5.3.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application and coal removal would not occur on the Eagle Butte West LBA Tract. The impacts to water rights associated with existing approved mining and CBNG development would continue to occur. Impacts to water rights related to mining operations at the Eagle Butte Mine would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.5.3.3 Regulatory Compliance, Mitigation and Monitoring

SMCRA and Wyoming regulations require surface coal mine operators to

provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality. This required mitigation is considered to be part of the Proposed Action and Alternative 1. The most probable source of replacement water would be one of the aquifers underlying the coal. For example, the subcoal Fort Union Formation aquifers are not removed or disturbed by coal mining and would therefore be a potential source of replacement water.

If the Eagle Butte West LBA Tract is leased, the mine operator would be required to update the list of potentially impacted private water supply wells and predict impacts to those wells within the five-ft drawdown contour as part of the permitting process. The operator would be required to commit to replacing those water supplies that are determined to be affected by mining with water of equivalent quality and quantity.

3.5.4 Residual Impacts

The area of coal and overburden removal and replacement of overburden and associated groundwater drawdowns would be increased under the Proposed Action and Alternative 1 compared with the area of coal and overburden removal and overburden replacement and associated groundwater drawdowns for the existing Eagle Butte Mine. The postmining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Monitoring data from wells completed in existing backfilled areas in the PRB suggest that there would be an adequate quantity of water in the backfill to replace current use, which is for livestock. Water quality in the backfill would generally be expected to meet the pre-mining coal seams' Wyoming Class III standards for use as stock water.

The area of overburden sand body aquifer and Little Rawhide Creek alluvial aquifer removal and reconstruction would be increased under the Proposed Action and Alternative 1, compared with the area of overburden sand body and alluvial aquifer removal and replacement for the existing Eagle Butte Mine. The time required to reconstruct and resaturate the post-mining aquifers in order to restore the essential hydrologic functions of Little Rawhide Creek and its alluvial aquifer system would be increased, but no residual impacts would occur.

3.6 Alluvial Valley Floors

3.6.1 Affected Environment

Prior to leasing and mining, AVFs must be identified because, under SMCRA, mining on AVFs is prohibited unless the affected AVF is undeveloped rangeland that is not significant to farming or if the affected AVF is of such small acreage that it would have a negligible impact on a farm's agricultural production. These restrictions also apply to AVFs that are downstream of the area of disturbance but might be affected by disruptions in streamflow. AVFs that

are determined not to be significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

WDEQ regulations define AVFs as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Guidelines established by OSM and WDEQ/LQD for the identification of AVFs require detailed studies of geomorphology, soils, hydrology, vegetation, and land use. These studies are used to identify 1) the presence of unconsolidated stream laid deposits, 2) the possibility for artificial flood irrigation, 3) past and/or present flood irrigation, and 4) apparent subirrigated areas and the possibility for natural flood irrigation. Areas that are identified as AVFs following these studies are evaluated for their significance to farming by WDEQ/LQD.

The reach of Little Rawhide Creek within and adjacent to the existing Eagle Butte Mine permit area has been investigated for the presence of AVFs. These AVF studies were conducted as part of the WDEQ/LQD mine permitting process for the purpose of recovering coal in the mine's existing leases. As a result of these studies, Little Rawhide Creek and a small portion of Prong Draw at its confluence with Little Rawhide Creek were declared an AVF non-significant to farming by the WDEQ/LQD (FCW 2005a). Little Rawhide Creek and its alluvial valley lie within the eastern portion of the Eagle Butte West LBA Tract, which is inside Eagle Butte Mine's existing permit area. Therefore, the entire reach of Little Rawhide Creek within the LBA tract as applied for and the area added by Alternative 1 has been declared an AVF non-significant to farming by the WDEQ/LQD. Approximately 83 acres of declared AVF lie within the Eagle Butte West LBA Tract as applied for, and an additional 45 acres of declared AVF lie within the BLM study area (Alternative 1).

Eagle Butte Mine conducted AVF investigations on the undeclared portion of Prong Draw within and adjacent to the LBA tract in the summer of 2004. These studies included identifying and mapping stream-laid deposits, assessing the extent of subirrigation, evaluating alluvial groundwater availability and quality, evaluating natural and artificial flood irrigation, and identifying the stream's essential hydrologic functions. These studies concluded that the AVF characteristics of Prong Draw are negligible and it does not meet the regulatory definition of an AVF because the stream laid deposits are very limited in areal extent and support little or no natural subirrigation or flood irrigation activities, and the quality of groundwater that occurs in the alluvial deposits is unsuitable for agricultural use. Surface water quantity is insufficient to support agricultural activities, further supporting the contention that the portion of Prong Draw within the LBA tract is not an AVF. Formal declarations of the presence or absence of an AVF, its significance to agriculture, and the appropriate

perimeter (areal extent) would be made by the WDEQ/LQD as part of the mine permitting process if the LBA tract is leased and proposed for mining.

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action and Alternative 1

If the Eagle Butte West LBA tract is mined by the applicant as an extension of existing operations under the Proposed Action or Alternative 1, the mining operations would affect between 83 and 128 acres of declared AVF along Little Rawhide Creek. Mining activity would not be restricted in the AVF areas because the WDEQ/LQD has declared them not to be significant to farming. Portions of Little Rawhide Creek upstream and downstream of the LBA tract have been affected by previous mining operations at the Eagle Butte Mine.

As indicated above, the WDEQ/LQD has not made a formal AVF declaration for Prong Draw or evaluated its significance to agriculture. However, it is unlikely that mining activity would be precluded by the presence of an AVF significant to farming in those areas due to the absence of irrigated agricultural development.

No direct, indirect, or cumulative impacts are anticipated to off-site AVFs through mining of the Eagle Butte West LBA Tract. Streamflows in drainages within the Eagle Butte West LBA Tract would be diverted around the active mining areas in temporary diversion channels, captured in flood control reservoirs above the pit, or allowed to flow into the mine pit and routed through settling ponds. If flood control impoundments and/or settling ponds are used, it would be necessary to evacuate them following major runoff events to provide storage volume for the next flood. Consequently, disruptions to streamflows that might supply downstream AVFs are expected to be negligible. Groundwater and surface runoff intercepted by the mine pits would be routed through settling ponds to meet state and federal quality criteria, and the pond discharges would likely increase the frequency and amount of flow in these streams, thereby increasing surface water supplies to downstream AVFs.

3.6.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal and associated impacts to the Little Rawhide Creek AVF would not occur on the Eagle Butte West LBA Tract. The impacts to the Little Rawhide Creek AVF associated with existing approved mining operations would continue to occur. Impacts related to mining operations at the Eagle Butte Mine would not be extended onto those portions of the Little Rawhide Creek AVF within the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time

would not preclude an application to lease the tract in the future.

3.6.3 Regulatory Compliance, Mitigation and Monitoring

As discussed above, AVFs must be identified because SMCRA restricts mining activities that affect AVFs that are determined to be significant to agriculture. Impacts to designated AVFs are generally not permitted if the AVF is determined to be significant to agriculture. If the AVF is determined not to be significant to agriculture, or if the permit to affect the AVF was issued prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored as part of the reclamation process. The determination of significance to agriculture is made by WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part. For any designated AVF, regardless of its significance to agriculture, it must be demonstrated that the essential hydrologic functions of the valley will be protected. Downstream AVFs must also be protected during mining.

As stated in Section 3.5.1.2, WDEQ/LQD has determined that, in order to restore the essential hydrologic functions of Little Rawhide Creek and its AVF, discharge from the Wasatch Formation overburden sand aquifer to the alluvial aquifer must be reestablished after mining. Eagle Butte Mine's current hydrologic restoration plan includes a reconstructed sand body aquifer that is in hydraulic communication with a saturated, undisturbed sand body along the western limit of mining and an infiltration pond within the reconstructed Little Rawhide Creek stream channel. The current reclamation plan was designed to maintain the premining acreage of subirrigated vegetation along Little Rawhide Creek that has been or will be disturbed by mining. If the Eagle Butte West LBA Tract is acquired by the Eagle Butte Mine and the proposed lease area is amended into the WDEQ/LQD permit area, more extensive reconstruction of hydrologically significant overburden sand body aquifers and the Little Rawhide Creek alluvial aquifer may be required in order to maintain the premining hydrologic balance, restore the essential hydrologic functions of Little Rawhide Creek and its AVF, and support the postmining land uses.

3.6.4 Residual Impacts

No residual impacts to AVFs would occur following mining.

3.7 Wetlands

3.7.1 Affected Environment

Waters of the U.S. is a collective term for all areas subject to regulation by the COE under Section 404 of the CWA. Waters of the U.S. include *special aquatic sites*, wetlands, and jurisdictional wetlands. Special aquatic sites are large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection or other important and

easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of special aquatic site that includes "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" [33 CFR 328.3(a)(7)(b)].

There are effectively three categories of wetlands:

- Jurisdictional wetlands, which are defined as those wetlands which are within the extent of COE regulatory review. They must contain three components: hydric soils, a dominance of hydrophytic plants, and wetland hydrology.

- Non-jurisdictional wetlands, which are non-navigable, isolated intrastate wetlands (e.g., playas) and other Waters of the U.S. These wetlands are not considered to be jurisdictional as a result of a Supreme Court ruling (Solid Waste Agency of Northern Cook County *v.* United States Army Corps of Engineers, January 9, 2001). Navigable, non-isolated wetlands and other Waters of the U.S. are still considered jurisdictional by the COE.

- Functional wetlands, which are areas that contain only one of the three criteria listed under jurisdictional wetlands. The USFWS used this categorization in producing the NWI maps. These maps were produced using aerial photo interpretation, with limited field verification.

Several types of wetland systems are present within the general analysis area. These wetland systems are limited in size; however, the vegetation in these environments is highly productive and diverse, and provides habitat for many wildlife species. Further, the systems as a whole play important roles in controlling floodwaters, recharging groundwater, and filtering pollutants (Niering 1985).

A preliminary wetlands inventory, based on USFWS NWI mapping and vegetation mapping in the field, was conducted in 2004. The wetland analysis area includes the Eagle Butte West LBA Tract as applied for, the lands added under Alternative 1, and a ¼-mile disturbance buffer around the tract sufficient to mine and reclaim the tract as a part of the existing Eagle Butte Mine operation (approximately 4,172 acres). A formal wetland delineation has been confirmed by the COE for the portion of the wetland analysis area (947.94 acres) that is within the current Eagle Butte Mine permit area. A formal jurisdictional wetland survey for the portion of the Eagle Butte West LBA Tract that is outside of the current Eagle Butte Mine permit area has not yet been completed.

Current field conditions may not be representative of the field conditions in the future. Wetland areas

previously mapped by the USFWS NWI have been recently altered due to CBNG-related water production within and upstream of the wetland analysis area. The NWI maps were consulted prior to the initiation of the preliminary wetlands field survey; however, the boundaries of the existing potential jurisdictional wetlands vary to a greater or lesser extent from the boundaries shown on the NWI maps. Due to the ephemeral nature of CBNG dewatering activities, the boundaries, and therefore wetland areas, are likewise ephemeral. A formal jurisdictional wetland delineation survey would be conducted and submitted to the COE for verification as part of the mining and reclamation permit process, if the tract is leased.

Wetlands occur in a variety of forms within the wetland analysis area. Palustrine wetlands, defined by their close association with emergent herbaceous marshes, swales, and wet meadows, support a variety of lush plant life and occur sporadically along drainages and a few small closed depressions. These areas are supported by the saturated soils along the water courses of Little Rawhide Creek and its tributaries that are adequately supplied with surface runoff, discharged CBNG waters, and groundwater discharged from Wasatch Formation sand body aquifers (Section 3.5.1.1.2). The identified potential jurisdictional wetlands within the wetland analysis area, as identified by NWI mapping, include Riverine-Emergent Marsh and Riverine-Wet Meadow.

Within the entire wetland analysis area, the preliminary inventory identified a total of approximately 50.38 acres of Waters of the U.S., including a total of 49.85 acres of jurisdictional Waters of the U.S. Approximately 37.53 of those acres are jurisdictional wetlands that occur along the watercourses of Little Rawhide Creek and its tributaries. The 12.32 acres of jurisdictional other Waters of the U.S. that did not qualify as jurisdictional wetlands consist primarily of the open water that is held within the linear upland drainage channels and in-channel impoundments and intermittent pools. The non-jurisdictional Waters of the U.S. contained in the wetland analysis area (approximately 0.53 acre) consists of small, isolated depressions where CBNG discharge water has ponded.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action and Alternative 1

A formal wetland delineation has been confirmed by COE for some of the wetlands included in the proposed LBA tract (approximately 948 acres of the Eagle Butte Mine's current permit area lie within the preliminary wetland analysis area), but a formal wetlands inventory covering the entire LBA tract has not yet been submitted to COE for verification. This wetland inventory would be submitted to COE for verification as part of the mining and reclamation permit process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The

reclamation plan is then revised to incorporate replacement of at least equal types and number of jurisdictional wetlands.

Based on current USFWS NWI mapping and vegetation mapping in the field that was completed in 2004, a maximum of approximately 37.5 acres of jurisdictional wetlands would be disturbed if the LBA tract is leased and subsequently mined under the largest tract configuration (Alternative 1). If the Eagle Butte West LBA Tract is leased, a formal wetland inventory would be conducted as part of the mining and reclamation permit process, thus verifying the areas of jurisdictional and non-jurisdictional wetlands, as well as the other Waters of the U.S.

During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the premine wetlands, but replacement plans would be evaluated by COE and replacement would be in accordance with the requirements of Section 404 of the CWA as determined by COE.

As a result of court directives, playas are no longer identified as jurisdictional Waters of the U.S. under Section 404 of the CWA. These non-jurisdictional wetland features, having significant biological and hydrological features, are not present within the preliminary wetland analysis area.

3.7.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal would not occur on the Eagle Butte West LBA Tract. The impacts to wetlands on the existing Eagle Butte Mine leases would occur as currently permitted. Impacts related to mining operations at the Eagle Butte Mine would not be extended onto those portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.7.3 Regulatory Compliance, Mitigation and Monitoring

The presence of jurisdictional wetlands on a mine property does not preclude mining. A wetland delineation must be completed according to approved procedures (COE 1987) and submitted to the COE for verification as to the amounts and types of jurisdictional wetlands present. There are special required permitting procedures to assure that after mining there will be no net loss of wetlands. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the CWA.

Section 404 does not cover non-jurisdictional or functional wetlands; however, Executive Order 11990 requires that all federal agencies

protect all wetlands. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. Surface land ownership on the entire Eagle Butte West LBA Tract as applied for is private. The lands added under Alternative 1 are private and county-owned. WDEQ/LQD allows and sometimes requires mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Reclaimed wetlands are monitored using the same procedures used to identify pre-mining jurisdictional wetlands.

3.7.4 Residual Impacts

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetland, but all wetland replacement plans would be approved by COE.

3.8 Soils

3.8.1 Affected Environment

Numerous baseline soil surveys associated with surface mining operations and oil field development have been conducted in the eastern PRB. Soil surveys of Campbell County, Wyoming, including the Eagle Butte West LBA Tract soils analysis area, have also recently been conducted by the NRCS (Prink et al. 2004). The Eagle Butte West LBA soils analysis area (2,373 total acres) includes the LBA tract as applied for under the Proposed Action and the BLM study area. Soil surveys were completed in 2005 by James Nyenhuis to an Order 3 resolution as approved by BLM (BLM 2004). The inventories included field sampling and observations at the requisite number of individual sites, and laboratory analysis of representative collected samples. Soils within the analysis area were identified by series, which consist of soils that have similar horizons in their profile.

Soils vary depending upon where and how they were formed. Major factors involved in the formation of soils include whether or not the material was transported and how the material was weathered during transportation. Four primary soil formation processes causing different soil types were noted in this area: 1) those soils developing predominantly in thin residuum from sandstone or shale on upland ridges, 2) those soils developing predominantly in slopewash, colluvium, or alluvial fan deposits from mixed sources on gently sloping uplands, 3) those soils developing predominantly in coarse-textured alluvium or sandy eolian deposits on rolling uplands, and 4) drainage soils developing in mixed stream laid alluvium on terraces and channels, and in fine-textured playa deposits in depressions and closed basins.

The soil depths and types on the Eagle Butte West LBA Tract soils analysis area are similar to soils currently being salvaged and utilized for reclamation at the adjacent Eagle

Butte Mine and other mines in the eastern PRB. Additional information about the soil types on the LBA tract is included in the supplemental information document, which is available on request. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils, which are one component used in identifying wetlands. Areas with soils that are not suitable to support plant growth include sites with high alkalinity, salinity, or clay content.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action and Alternative 1

Removal and replacement of soils during mining and reclamation would cause changes in the soil resources. In reclaimed areas, soil chemistry and soil nutrient distribution would generally 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 Eagle Butte West LBA Tract baseline soils analysis indicates that the amount of suitable topsoil that would be available for redistribution on all disturbed acres within the soils analysis area during reclamation would vary from an average depth of 0.67 ft to an average depth of 5.0 ft. 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 and rangeland).

There would be an increase in the near-surface bulk density of the reclaimed soil resources on the LBA tract. 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 the effects of decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering action would form a new soil structure in the reclaimed soils, and infiltration rates would gradually return to premining levels. The reclaimed landscape would contain stable landforms and drainage systems that would support the postmining land uses. Reconstructed stream channels and floodplains would be designed and established to be erosionally stable.

Direct biological impacts to soil resources on the Eagle Butte West LBA Tract would include short-term to long-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement.

Potential impacts to soil resources on the LBA tract after final reclamation under the Proposed Action or Alternative 1 are quantified as follows. Under the currently approved mining and reclamation plan, approximately 6,076 acres of soil resources will be disturbed in

order to mine the coal in the existing leases at the Eagle Butte Mine (Table 3-1). If the Eagle Butte West LBA Tract is leased, disturbance related to coal mining would directly affect approximately 2,395 additional acres of soil resources on and adjacent to the LBA tract under the Proposed Action, or up to approximately 2,505 additional acres under Alternative 1 (Table 3-1). Average topsoil thickness would be about 24 inches across the entire reclaimed surface. The types of soils and the quantities of the soil resource included in the Eagle Butte West LBA Tract under the Proposed Action and Alternative 1 are similar to the soils on the existing leases at the Eagle Butte Mine.

3.8.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal and the associated disturbance and impacts to soils would not occur on from 2,395 (Proposed Action) up to 2,505 (Alternative 1) additional acres. Coal removal and the associated soil removal and replacement would occur on the existing Eagle Butte Mine leases as currently permitted (as summarized in Table 3-1). Impacts to soils related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.8.3 Regulatory Compliance, Mitigation and Monitoring

Soils suitable to support plant growth would be salvaged for use in reclamation. Soil stockpiles would be protected from disturbance and erosional influences. Soil material that is not suitable to support plant growth would not be salvaged. Soil or overburden materials containing potentially harmful chemical constituents (such as selenium) would be specially handled.

At least four ft of suitable overburden would be selectively placed on the graded backfill surface below the replaced topsoil to meet guidelines for vegetation root zones. After topsoil is replaced on reclaimed surfaces, revegetation would reduce wind erosion. The mine would construct sediment control structures as needed to trap eroded soil.

Regraded overburden would be sampled for compliance with root zone criteria. Vegetation growth would be monitored on reclaimed areas to determine if soil amendments are needed.

3.8.4 Residual Impacts

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

3.9 Vegetation

3.9.1 Affected Environment

The vegetation analysis area (2,373 total acres) includes the LBA tract as applied for under the Proposed Action and the BLM study area. The Eagle Butte West LBA Tract vegetation analysis area is located partially within and west and south of the current Eagle Butte Mine permit boundary. Consequently, portions of the analysis area were previously mapped and sampled in accordance with the current WDEQ/LQD mine permitting requirements. The balance of the vegetation assessment was completed by Habitat Management, Inc. of Gillette, Wyoming in 2004. The vegetation communities in this area were appraised and mapped to provide a preliminary assessment.

The vegetation within the analysis area consists of species common to eastern Wyoming and consistent with vegetation that occurs within the adjacent Eagle Butte Mine permit area. A total of five vegetation types have been preliminarily identified and mapped within the Eagle Butte West LBA vegetation analysis area. Water and disturbed areas were also mapped. The vegetation types include agricultural pasture 1, sagebrush grassland, agricultural pasture 2, grassland, and CBNG impacted bottomland.

The predominant vegetation types, in terms of total acres of occurrence in the vegetation analysis area are agricultural pasture 1 (36.1 percent), sagebrush grassland (27.6 percent), and agricultural pasture 2 (11.9 percent). Common plant species on these types include crested wheatgrass, smooth brome needleandthread, threadleaf sedge, Sandberg bluegrass, western wheatgrass, cheatgrass brome, silver sagebrush, and Wyoming big sagebrush. Lichen can make a substantial contribution to ground cover within the sagebrush grassland type, particularly in dry years. The predominant vegetation types on approximately 24 percent of the vegetation analysis area include disturbed lands, open water, CBNG-impacted bottomlands, and grasslands. CBNG-impacted bottomlands and disturbed lands were identified and mapped but not quantitatively sampled in this study. The CBNG-impacted bottomlands community would be characterized when a formal jurisdictional wetland inventory is conducted. The common species in the grasslands community include western wheatgrass, Sandberg bluegrass, cheatgrass brome, needle and thread, green needlegrass, and prairie Junegrass. Shrubs and subshrubs are essentially absent from the grassland community and plains pricklypear cactus is found in varying densities. Table 3-9 presents the acreage and percent of the analysis area encompassed by each vegetation type. Additional information about the vegetation types on the LBA Tract is included in the supplemental information document, which is available on request. In addition to the five vegetation communities, there are also two shelterbelts associated with residences within the vegetation analysis area containing 310 trees.

Table 3-9. Vegetation Types Identified and Mapped Within the Eagle Butte West LBA Tract Vegetation Analysis Area.

Vegetation Type	Acres	Percent of Area
Agricultural Pasture 1	850.3	36.1
Sagebrush Grassland	651.6	27.6
Disturbed Area	389.7	16.5
Agricultural Pasture 2	280.6	11.9
Grassland	134.9	5.7
CBNG-Impacted Bottomland	31.5	1.3
Open Water (Reservoir)	19.2	0.8
Total	**2,357.8**	**100.0**

Source: Nyenhuis 2005

The majority of these trees are located around a residence that is within the northern portion of the BLM study area. Roughly 12 mature cottonwood trees occur at the perimeter of the stock reservoir located within the southern portion of the BLM study area.

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action and Alternative 1

Under the currently approved mining and reclamation plan, approximately 6,076 acres of vegetation will be disturbed in order to mine the coal in the existing leases at the Eagle Butte Mine. Under the Proposed Action, mining of the Eagle Butte West LBA Tract would progressively remove the native vegetation on 2,395 additional acres on and near the LBA tract. Under Alternative 1, mining of the LBA tract would progressively remove the native vegetation on up to 2,505 additional acres on and near the LBA tract. Vegetation removal on the LBA tract under the Proposed Action and Alternative 1 is presented as the additional mine disturbance area in Table 3-1.

Short-term impacts associated with the removal of vegetation from the Eagle Butte West LBA tract would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat or loss of habitat carrying capacity for some wildlife species as a result of reduced plant species diversity or reduced plant density for some species, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed 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. Some roads and facilities would not be reclaimed until the end of mining. No new life-of-mine facilities would be located on the LBA tract under the Proposed Action or Alternative 1 because the LBA tract would be mined as an extension of an existing mine.

Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the LBA area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within several years following seeding with the approved final seed mixture. There would not be a substantial restriction of wildlife use of the area throughout the operations.

In an effort to approximate premining conditions, the applicant would plan to reestablish vegetation types that are similar to the premine types during the reclamation operation. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the LBA tract. Initially, the reclaimed lands would be primarily a mixture of prairie grasslands with graminoid/forb-dominated areas. An overall reduction in species diversity, especially for the shrub component, would occur. At least 20 percent of the native vegetation area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Estimates for the time it would take to restore shrubs, including sagebrush, to premining density levels range from 20 to 100 years. As indicated previously, the predominant vegetation type on approximately 28 percent of the vegetation analysis area is sagebrush grassland and the reclamation standards call for restoration of sagebrush to at least 20 percent of the reclaimed area. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of 10 years), a diverse, productive, and permanent vegetative cover would be established on the LBA tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Following reclamation bond release, management of the privately owned surface areas would revert back to the private surface owners, who would have the right to manipulate the reclaimed vegetation.

A reduction in sagebrush would result in a long term reduction of habitat for some species and may delay use of the reclaimed area by shrub-dependent species, such as the sage grouse. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity.

On average, roughly 200 to 300 acres of surface would be disturbed per year of mining if the proposed lease

area is mined, regardless of which alternative is selected. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25 percent would be reseeded during the following two to three years as the life-of-mine facilities area is reclaimed.

The reclamation plan for the existing Eagle Butte Mine includes steps to control invasion by weedy (invasive nonnative) plant species. The reclamation plan for the Eagle Butte West LBA Tract would also include steps to control invasion from such species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

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, 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.

Changes expected in the surface water network on the LBA tract as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum overland slope would be 20 percent, in accordance with WDEQ policy. The average reclaimed overland slope on the LBA tract would not be known until WDEQ's technical review of the permit revision application is complete. No major changes in the average overland slope are predicted.

There would be no net loss of jurisdictional wetlands. They would be restored under the jurisdiction of the COE (Section 3.7). Functional wetlands would be restored in accordance with the requirements of the surface landowner or WDEQ/LQD.

3.9.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and coal removal and the associated disturbance and impacts to vegetation would not occur on from 2,395 up to 2,505 acres that would be disturbed under the Proposed Action or Alternative 1, respectively. Coal removal and the associated vegetation removal and replacement would occur on the existing Eagle Butte Mine leases as currently permitted (as summarized in Table 3-1). Impacts to vegetation related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time

would not preclude an application to lease the tract in the future.

3.9.3 Threatened, Endangered, Proposed, and Candidate Plant Species, and BLM Sensitive Species

Refer to Appendices E and F.

3.9.4 Regulatory Compliance, Mitigation and Monitoring

Reclaimed areas would be revegetated as specified in the approved mine plan using reclamation seed mixtures which would be approved by WDEQ. The majority of the species would be native to the LBA tract. At least 20 percent of the native vegetation area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Shrubs would be selectively planted in riparian areas.

Steps to control invasion by weedy (invasive nonnative) plant species using chemical and mechanical methods would be included in the amended mine plan.

Detailed wetland mitigation plans would be developed and approved by COE during the permitting stage to ensure no net loss of jurisdictional wetlands occurs within the total disturbance area (Section 3.7). Non-Jurisdictional and functional wetlands would be restored in accordance with the requirements of the surface landowner or as required by WDEQ/LQD.

Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if there is a need for corrective action during establishment of vegetation. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for post-mining land uses.

3.9.5 Residual Impacts

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

3.10 Wildlife

3.10.1 General Setting

This section discusses the affected environment and environmental consequences to wildlife in general. The subsequent sections address the potential impacts to specific groups of wildlife species.

3.10.1.1 Affected Environment

Background information on wildlife in the vicinity of the Eagle Butte West LBA Tract was drawn from several sources, including the South Powder River Basin Coal FEIS (BLM 2003a), WGFD and USFWS records, and personal contacts with WGFD and USFWS biologists. Site-specific data for the Eagle Butte West LBA Tract general analysis area were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant and nearby coal mines. FCW initiated baseline

investigations in 2004 expressly for the Eagle Butte West LBA Tract, and the proposed lease area has received comprehensive coverage during baseline and annual wildlife monitoring surveys for the adjacent Eagle Butte Mine since the mid-1970s. Baseline and annual wildlife surveys cover a large perimeter around mine permit area; consequently, a majority of the proposed lease area has been surveyed as part of the required monitoring surveys for the Eagle Butte Mine. Site-specific surveys for the entire leased area and appropriate perimeter would be part of the mine permitting process if the tract is leased.

The topography within the vicinity of the LBA tract is generally level to gently rolling, dissected by locally shallow gullies and the broader meandering floodplain of Little Rawhide Creek, an intermittent stream. The steepest terrain exists in the extreme northwestern corner of the LBA tract under Alternative 1. Unmined lands surrounding the LBA tract are characterized by low rolling hills with a prominent ridgeline immediately to the west. Surface mine lands, both active and reclaimed, dominate the landscape adjacent to the LBA tract's eastern edge. Elevations range from approximately 4,240 to 4,560 feet above sea level.

In an undisturbed condition, the major vegetation types in the general analysis area provide habitats for many species. Vegetation types tend to occur in a mosaic across the landscape; therefore, many wildlife species can be expected to utilize more than one habitat type. Predominant wildlife habitat types classified on the LBA tract and adjacent area correspond with the major plant communities defined during the vegetation baseline survey (Section 3.9) and consist primarily of seeded grassland, grassland, and sagebrush grassland. Various, relatively small parcels of crested wheatgrass pasture occur throughout the area and networks of road and well-pad disturbance areas overlay much of the sagebrush grassland and sandy grassland areas. There are also numerous tank batteries and miles of pipeline disturbance with varying degrees of recovering vegetative cover. No designated critical, crucial, or unique habitats are present.

The predominant natural habitat is sagebrush grassland and sandy grassland is the next largest habitat type (Table 3-9). Seeded grassland (Agricultural Pasture vegetation type) is dominated by crested wheatgrass, but older seedings have a mixture of less dominant native plant species and, with the passage of time, these seedings begin to resemble sagebrush grassland again. Bottomland grassland, or streamside bottomland habitat is limited to a narrow band along limited reaches of Little Rawhide Creek. Trees are present within residential windbreaks and around an impoundment located in the NE¼ of Section 32, T.51N., R.72W. (Section 3.9).

Little Rawhide Creek passes through the eastern portion of the LBA tract from south to north, and its tributary,

Prong Draw, passes through the central portion of the tract from southwest to northeast (Figure 3-13). Under natural conditions, Little Rawhide Creek is classified as an intermittent stream and its tributaries, including Prong Draw, are all ephemeral streams. Essentially all water courses in the study area are currently receiving discharge water from CBNG development. At least seven distinct, in-channel impoundments are located on the Eagle Butte West LBA Tract as applied for and three others are located on lands added under Alternative 1. Streamflow occurrence is now more persistent and these shallow impoundments along Little Rawhide Creek and Prong Draw are seldom completely dry, resulting in an increase in habitat for waterfowl, shorebirds, and aquatic species.

Eagle Butte Mine's approved WDEQ/LQD mine permit allows disturbance of the Little Rawhide Creek channel. Approximately 3.5 miles of the natural channel has been diverted to-date within the Eagle Butte Mine's current permit area. FCW would propose another diversion of Little Rawhide Creek if they acquire a lease for the Eagle Butte West LBA Tract.

3.10.1.2 Environmental Consequences

3.10.1.2.1 Proposed Action and Alternative 1

If the Eagle Butte West LBA Tract were leased under the Proposed Action or Alternative 1, the areas of mining disturbance would extend onto the LBA tract. Mining would be extended by up to 12 years at the Eagle Butte Mine. Impacts to wildlife that would be caused by mining the LBA tract would be addressed as part of the review of the mine permit application by the WGFD and the WDEQ/LQD as part of the WDEQ's mine permit approval process.

Mining directly and indirectly impacts local wildlife populations. 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. If the Eagle Butte West LBA Tract is leased and mined, the direct impacts related to mine traffic and mine operations would be extended within the general analysis area by up to 12 years.

The indirect impacts are longer term. After the LBA tract is leased, mined, and reclaimed, alterations in the topography and vegetative cover, particularly the reduction in

sagebrush density, would cause a decrease in carrying capacity and diversity. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent. Microhabitats may be reduced on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

3.10.1.2.2 No Action Alternative

Under the No Action Alternative, the Eagle Butte West coal lease application would be rejected and the impacts to wildlife and associated with coal removal described above would not occur on the Eagle Butte West LBA Tract. Wildlife habitat on from 2,395 to 2,505 additional acres (under the Proposed Action and Alternative 1, respectively) would not be disturbed. Mining operations and associated impacts to wildlife and wildlife habitat would continue as currently permitted on the existing Eagle Butte Mine coal leases but would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

3.10.2 Big Game

3.10.2.1 Affected Environment

The two big game species that are common in suitable habitat throughout the general analysis area are pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*). White-tailed deer (*Odocoileus virginianus*) are occasionally observed. No crucial big game habitat or migration corridors are recognized by the WGFD in this area.

Pronghorn are by far the most common big game species in this area. This species is most abundant in the sagebrush grassland or mixed-grass prairie habitats. Reclaimed grassland constitutes only a small portion of the available habitat around the PRB mines, although pronghorn are observed during all seasonal surveys in these areas. Home range for pronghorn can vary between 400 acres to 5,600 acres, according to several factors including season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movement does not exceed six miles. Pronghorn may make seasonal migrations between summer and winter habitats, but migrations are often triggered by availability of succulent plants and not local weather conditions (Fitzgerald et al. 1994). The WGFD has classified the general analysis area as primarily winter/yearlong pronghorn range, which means that a population or a portion of a population of animals makes general use of this habitat on a year-round basis and that there is a significant influx of additional animals onto this habitat from other seasonal ranges in the winter. The WGFD Gillette Herd Unit encompasses the entire general analysis area. In post-season 2003, the WGFD estimated the Gillette Herd Unit to be 13,000 animals, with an objective of 11,000 (WGFD 2004).

Mule deer use nearly all habitats, but prefer sagebrush grassland, rough breaks, and riparian bottomland.

Browse is an important component of the mule deer's diet throughout the year, comprising as much as 60 percent of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 1994). Mule deer are frequently observed on Eagle Butte Mine reclaimed lands. In certain areas of the state, this species tends to be more migratory than white-tailed deer, traveling from higher elevations in the summer to winter ranges that provide more food and cover. However, monitoring indicates that mule deer are not very migratory in the vicinity of the Eagle Butte West LBA Tract. The WGFD has classified a majority of the general analysis area as being out of normal mule deer use range, which means an area that does not contain enough animals to be an important habitat or is a habitat that is of limited importance to a species. The entire area is located within the WGFD Powder River Mule Deer Herd Unit. No crucial or critical mule deer ranges or migration corridors occur on or within several miles of the Eagle Butte West LBA Tract or in the general analysis area. Crucial range is defined as any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level. The WGFD estimated the 2003 post-season mule deer for the herd unit at 51,000, which is near the current objective of 52,000 (WGFD 2004).

White-tailed deer are generally managed separately by the WGFD in the Central Herd Unit. White-tailed deer prefer riparian habitats and are therefore seldom observed in the general analysis area due to the lack of that particular habitat. The WGFD classifies the entire general analysis area as out of the normal white-tailed deer use range. White-tailed deer are occasionally recorded along the Rawhide Creek/Little Powder River to the north but have rarely been recorded in the general analysis area.

The nearest elk population is in the Fortification Unit, approximately 15 miles to the west of the general analysis area. None of the general analysis area is classified by the WGFD as within normal elk use range. No elk have been observed recently within the general analysis area.

3.10.2.2 Environmental Consequences

3.10.2.2.1 Proposed Action and Alternative 1

Under the Proposed Action and Alternative 1, big game would be displaced from portions of the Eagle Butte West LBA Tract to adjacent ranges during mining. Pronghorn would be most affected; however, no areas classified as crucial pronghorn habitat occur on or within two miles of the LBA tract. Mule deer would not be substantially impacted, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas. White-tailed deer are not usually found in the area but are occasionally observed to the north. None of the land within the general analysis area is considered by WGFD to be an elk use area and no elk have been observed within the vicinity of

the Eagle Butte West LBA Tract in recent years.

Big game displacement would be incremental, occurring over several years and allowing for gradual changes in 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. On the existing coal leases, however, big game have continued to occupy areas adjacent to and within active mining 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 the construction of 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.

Following reclamation, topographic moderation and changes in vegetation may result in a long-term reduction in big game carrying capacity.

3.10.2.2.2 No Action Alternative

The impacts to big game under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.3 Other Mammals

3.10.3.1 Affected Environment

A variety of small and medium-sized mammal species occur in the vicinity of the general analysis area, although not all have been observed on the LBA Tract itself. These include predators and furbearers, such as coyote (*Canis latrans*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), badger (*Taxidea taxus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*). Prey species include various rodents (such as mice, rats, voles, gophers, ground squirrels, chipmunks, muskrats, and black-tailed prairie dogs) and lagomorphs (jackrabbits and cottontails). These prey species are cyclically common and widespread throughout the region. Porcupines (*Erethizon dorsatum*) and bats (such as hoary [*Lasiurus cinereus*] and big brown [*Eptesicus fuscus*]) also have habitat in the vicinity. The prey species are important for raptors and other predators.

The black-tailed prairie dog was added to the list of candidate species for federal listing on February 4, 2000 (USFWS 2000a). The USFWS has since removed the black-tailed prairie dog from the list of candidate species (USFWS 2002a), but continues to encourage the protection of prairie dog colonies for their value to the prairie ecosystem and the myriad of species that rely on them (USFWS 2004).

The black-tailed prairie dog is a highly social, diurnally active, burrowing mammal. Aggregations of individual burrows, known as colonies, form the basic unit of prairie dog populations. Found throughout the Great Plains in shortgrass and mixed-grass prairie areas (Fitzgerald et al. 1994), the black-tailed prairie dog has declined in population numbers and extent of colonies in recent years. The three major impacts that have influenced black-tailed prairie dog populations are the initial conversion of prairie grasslands to cropland in the eastern portion of its range from approximately the 1880s-1920s; large-scale control efforts conducted from approximately 1918 through 1972, when an Executive Order was issued banning the use of compound 1080; and the introduction of sylvatic plague into North American ecosystems in 1908 (USFWS 2000b). In Wyoming, this species is primarily currently found in isolated populations in the eastern half of the state (Clark and Stromberg 1987). USFWS recently estimated that about 125,000 acres of black-tailed prairie dog occupied habitat exists in Wyoming (USFWS 2000b). Many other wildlife species, such as the black-footed ferret, swift fox, mountain plover, ferruginous hawk, and burrowing owl may be dependent on the black-tailed prairie dog for some portion of their life cycle (USFWS 2000b).

The species is considered a common resident in eastern Wyoming, utilizing shortgrass and mid-grass habitats (Luce et al. 1999). According to UDSA-FS observations on the Thunder Basin National Grassland, the largest concentrations of prairie dog colonies in the vicinity of the eastern PRB surface coal mines are found east of the coal burnline, which is outside and east of the area of surface coal mining (Tim Byer, personal communication 9/11/2003). The large prairie dog complexes in this area east of the coal burnline have been drastically impacted by outbreaks of plague. The prairie dog colonies west of the burnline, including the areas near the Eagle Butte West LBA Tract, are generally smaller and less densely concentrated. These colonies have not been affected by plague.

Surveys have been conducted to locate prairie dog colonies on and within one mile of the LBA tract as applied for under the Proposed Action and Alternative 1. One prairie dog town was found within this survey area. This small town (approximately one acre in area) is located just over ¾-mile north of the northern portion of the BLM study area (Figure 3-14). Additional discussion of prairie dog colonies identified in the vicinity of the Eagle Butte Mine area is included in the Biological Assessment (Appendix E) of this EIS.

3.10.3.2 Environmental Consequences

3.10.3.2.1 Proposed Action and Alternative 1

Medium-sized mammals (such as lagomorphs, coyotes, and foxes) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition

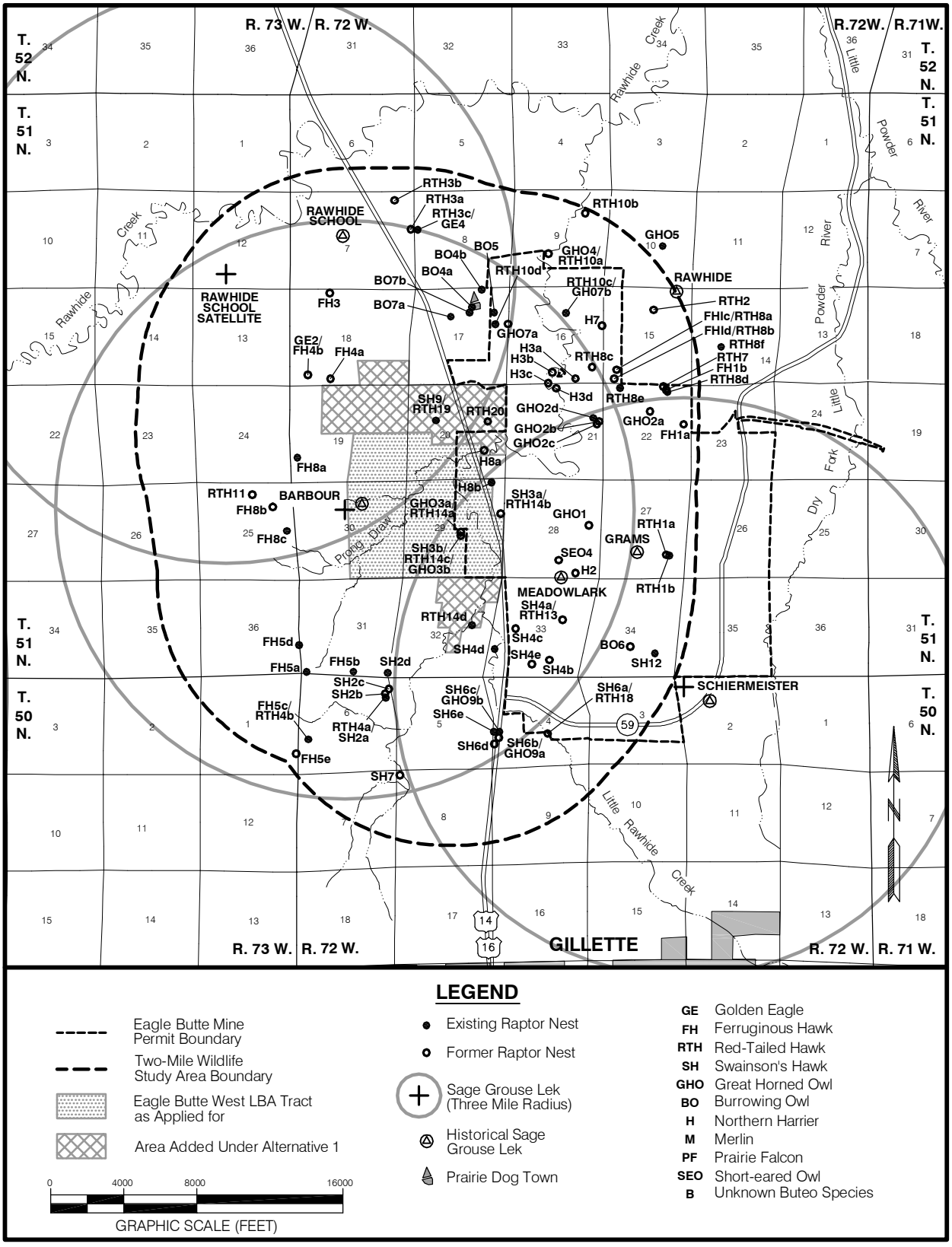

Figure 3-14. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the Eagle Butte West LBA Tract.

and mortality. However, these animals would rebound as forage is developed or small mammal prey species recolonize the reclaimed areas. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many would retreat into burrows when disturbed. Therefore, populations of such prey animals as voles, ground squirrels and mice would decline during mining. However, these animals have a high reproductive potential and tend to re-occupy and adapt to reclaimed areas quickly. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that reclamation objectives to encourage recolonization by small mammal communities are being achieved (Shelley 1992). That study evaluated sites at five separate mines.

Prairie dogs would not be affected by leasing and mining the Eagle Butte West LBA Tract because no colonies are currently present on or within ¾ mile of the tract as applied for and the area added by Alternative 1.

3.10.3.2.2 No Action Alternative

Impacts to small mammals under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.4 Raptors

3.10.4.1 Affected Environment

The raptor species expected to occur in suitable habitats in the general analysis area include the golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), great horned owl (*Bubo virginianus*), burrowing owl (*Athene cunicularia*), and short-eared owl (*Asio flammeus*). The bald eagle (*Haliaeetus leucocephalus*) is a migrant and winter resident as discussed in the Biological Assessment (Appendix E) of this EIS. Those species that commonly nest in the general analysis area are the ferruginous hawk, golden eagle, red-tailed hawk, Swainson's hawk, northern harrier, burrowing owl, and great horned owl. The short-eared owl occasionally nests in the area. Habitat is limited for those species that nest exclusively in trees or on cliffs, but several species are adapted to nesting on the ground, creek banks, buttes, or rock outcrops.

Figure 3-14 shows the locations of raptor nests identified since monitoring began for Eagle Butte Mine in an area that includes the Eagle Butte West LBA Tract under the Proposed Action and Alternative 1. Over time, natural forces have destroyed many nests, while others have been relocated for mitigation or removed by mining activities. In some cases, nests have been created to mitigate other nest sites impacted by mining operations at this mine.

During surveys that were completed in 2004 by TWC, a total of five raptor species (golden eagle, northern harrier, red-tailed hawk, Swainson's

hawk, and burrowing owl) were currently nesting on the raptor survey area, which includes the Eagle Butte West LBA Tract as proposed, lands added by Alternative 1, and a two-mile radius. In the past, the great horned owl, ferruginous hawk, and short-eared owl have also been identified as nesting within or adjacent to the raptor survey area. The 2004 survey identified 28 intact raptor nests in the survey area, 10 of these nests were active. No active nests were observed in 2004 on the Eagle Butte West LBA tract as proposed. One active northern harrier nest and one active red-tailed hawk nest were documented on the area added under Alternative 1. No intact ferruginous hawk nests are within the area as applied for under the Proposed Action or the area added by Alternative 1 but four nests are located within one mile of the Eagle Butte West LBA tract. These nests have not been active since at least 2000. One intact, unoccupied Swainson's hawk/red-tailed hawk nest is present on the lands added under Alternative 1. No other intact raptor nests were present on the LBA tract area as applied for under the Proposed Action or the area added by Alternative 1.

3.10.4.2 Environmental Consequences

3.10.4.2.1 Proposed Action and Alternative 1

Mining the LBA tract would not impact regional raptor populations; however, individual birds or pairs may be impacted. Mining activity could cause raptors to abandon nests proximate to disturbance. USFWS recommends a one-mile buffer around all ferruginous hawk nests. No intact ferruginous hawk nests are within the LBA tract as applied for under the Proposed Action or the area added by Alternative 1, but four nests are located within one mile of the Eagle Butte West LBA Tract. These nests have not been active since at least 2000.

USFWS and WDEQ/LQD approval would be required before mining would occur within buffer zones for active raptor nests. The Eagle Butte Mine annually monitors territorial occupancy and nest productivity on and around their existing leases. Raptor nesting activity has previously occurred in active mining and construction areas and the applicant mine has successfully executed state-of-the-art mitigation techniques to protect nest productivity.

Mining near raptor territories would minimally impact availability of raptor forage species. At the applicant mine, lack of nesting habitat for many raptor species that nest in trees or on cliffs, not a lack of forage area, has been determined to be the most important limiting factor. During mining, nesting habitat is created by the excavation process (highwalls), as well as through enhancement efforts (nest platforms, nest boxes, and tree plantings).

3.10.4.2.2 No Action Alternative

Impacts to raptor species under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.5 Upland Game Birds

3.10.5.1 Affected Environment

Four upland game bird species are known to occur in suitable habitats in the general analysis area. These species are sage-grouse (*Centrocercus urophasianus*), mourning doves (*Zenaida macroura*), sharp-tailed grouse (*Tympanuchus phasianellus*), and gray partridge (*Perdix perdix*).

Sage grouse are a large upland game bird considered a "landscape species", annually using widespread areas of sagebrush habitats. This grouse is referred to as both sage grouse and greater sage grouse, and the terms are interchangeable. Sage grouse are found in sagebrush shrub-land habitat, and sagebrush is essential for sage grouse during all seasons of the year. During winter, sage grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush above snow. Sage grouse tend to select wintering sites where sagebrush is 10-14 inches above the snow. Population and habitat analyses suggest that wintering habitat can be as limiting as mating and breeding habitats. Breeding occurs on strutting grounds (leks) during late March and April. Leks are generally situated on sites with low vegetation and little or no sagebrush, broad ridge tops, grassy openings, and disturbed sites such as burns, abandoned well locations, airstrips or roads. However, often there are areas of denser sagebrush near the lek that are used for foraging, loafing, and hiding cover (WGFD 2003). Approximately two-thirds of hens nest within three miles of the lek where they were bred. The rest of the hens usually nest within 15 miles of the lek. Sage grouse typically nest under tall sagebrush, but may use other large shrubs. Sagebrush stands used for nesting range in height from eight to 18 inches, with individual plants reaching up to 32 inches tall. Both new spring herbaceous growth and residual cover are important in the understory for nesting sage grouse (WGFD 2003). Hens move their brood immediately upon hatching from the nest site to brood-rearing areas. Sites used during the first 10-14 days after hatching are typically within 1.5 miles of the nest. The vast majority of chick mortality (87 percent of total brood loss in four studies conducted in Wyoming) occurs during this period. After the first 10 days, broods may have dispersed five or more miles from the nest. As summer progresses and food plants mature and dry, sage grouse move to areas still supporting succulent herbaceous vegetation. They continue to rely on adjacent sagebrush for protection from weather and predators, and for roosting and loafing. Sage grouse normally move off late brood-rearing habitat onto transitional fall habitat before moving onto winter range (WGFD 2003).

On and after July 2, 2002, the USFWS received three petitions requesting that the greater sage grouse be listed as endangered across its entire range. Following a 12-month status review of the best available scientific and commercial information on the species, the USFWS found that listing was not warranted at this time. However, the

USFWS continues to have concerns regarding sage grouse population status, trends and threats, as well as concerns for other sagebrush obligates (USFWS 2005). USFWS indicated the need for continued efforts to conserve sage grouse and sagebrush habitat on a long-term basis. USFWS encouraged continued development and implementation of conservation strategies throughout the grouse's range.

On September 11, 2003, the Wyoming Game and Fish Commission announced that the 2003 hunting season for sage grouse in Johnson, Sheridan, and Campbell Counties would be closed, following the deaths of 11 sage grouse in northeastern Wyoming from West Nile virus in August and early September of that year. According to a press release, the commission took this action because the incidence of infection is much higher in northeastern Wyoming than the rest of the state and the area is on the fringe of sage grouse range with marginal, fragmented habitat (WGFD September 11, 2003 press release). Recent lek, or strutting ground, count data indicate that Wyoming's sage grouse populations increased slightly in 2004 and 2005. Lower incidences of West Nile virus mortalities were documented in 2004 and 2005, primarily the result of cooler temperatures that reduced mosquito populations. Sage grouse hunting seasons were consequently reopened in 2004. A 2005 hunting season similar to 2004 was recommended (Christiansen 2004).

In May 2002, the USFWS office in Cheyenne, Wyoming released a list entitled *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming,* which replaced the previous *Migratory Birds of High Federal Interest List*. The greater sage grouse is included on the new list and, as a result, the presence of sage grouse and sage grouse sign are included in the annual migratory bird surveys that are conducted in both spring and summer.

Eagle Butte Mine conducts surveys to identify new sage grouse leks and sage grouse lek attendance at previously identified leks in the spring as part of the annual wildlife surveys that are conducted for the mine. These surveys and baseline inventories, which include the mine's permit area and a one-mile perimeter, were initiated in the mid-1970s when the mine was initially permitted. As a result, most of the area included in the proposed Eagle Butte West LBA Tract has been included in previous annual survey areas.

The sage grouse is a yearlong resident and is occasionally encountered in the general analysis area. In terms of total acres of occurrence on the LBA tract as applied for and the area added under Alternative 1, the predominant vegetation type on 28 percent of the area is sagebrush grassland type (Section 3.9), which is characterized by the moderate to heavy presence of Wyoming big sagebrush. At the present time, sage grouse do not appear to be abundant or common in the area. Six historic sage grouse leks have been monitored within the wildlife study area (Figure

3-14). Two of the six leks have been active within the last five years. The locations of three of the other four leks were previously disturbed by mining operations at the Eagle Butte and Rawhide Mines. Each active lek is generally surveyed three times each breeding season.

The two leks within the wildlife study area that have been active within the last five years are the Barbour lek and the Rawhide School Satellite lek. The Barbour lek, located at the western edge of the Eagle Butte West LBA Tract, was first documented in 1984 during Eagle Butte Mine baseline surveys. The peak number of males was 28 in 1991. No males were recorded in surveys conducted between 1994 and 2000. Breeding activities shifted approximately 1,000 ft southwest of the original lek in 2001. Twenty-four males were observed on the strutting ground in 2001, but numbers declined through 2005 (FCW 2005b). Two sage grouse were spotted in the general vicinity of the Barbour lek on two separate occasions in 2004 and no sage grouse were recorded on the Barbour lek in 2005 (FCW 2005b). The Rawhide School Satellite lek was first discovered in 2001. At least 16 males were in attendance at that time. Peak male attendance declined during each of the four subsequent years and no birds were observed in the vicinity of the lek in 2005 (FCW 2005b).

The three historic strutting grounds that were removed in conjunction with mining activities at Eagle Butte and Rawhide Mines were the Grams, Rawhide, and Meadowlark leks. No males were in attendance at these three grounds at least one year prior to lek disturbance. No grouse have been observed at the historic Rawhide School lek since at least 1988 (WGFD data), though it was not checked every year. Figure 3-14 shows the location of the two recently active leks and the four historical lek sites.

Research has indicated that most hens (approximately two-thirds) will nest within three miles of the lek where they were bred. The three-mile radius around the Barbour and Rawhide School Satellite leks extends onto the LBA tract as proposed (Figure 3-14). The three-mile radius around another lek, the Schiermeister lek also extends onto the LBA tract. The Schiermeister lek, which is located east of Eagle Butte Mine's active mining operation just outside of the wildlife study area for the Eagle Butte West LBA Tract (Figure 3-14), was active in 2004 and 2005 (FCW 2005b).

Mourning doves are a migrant and relatively common in the area during migration, particularly near sites with water sources and trees and in the summer for breeding and nesting. This species is a relatively common breeding bird in Campbell County and may be found in a variety of habitat types. Mourning doves were observed on the survey area in 2004 and 2005 (FCW 2005b).

Sharp-tailed grouse were observed in 2004 approximately one mile southeast of the LBA tract, but these sightings were infrequent, occurring only during the winter. The nearest sharp-tailed grouse lek is over six miles northeast of the survey area.

Gray (or Hungarian) partridge, an introduced species, have been infrequently observed on reclaimed areas, sagebrush shrublands, upland grassland, and cultivated lands in the vicinity of the LBA tract. In some years this species is occasionally encountered while in other years partridge appear to be totally absent. Hungarian partridge were not observed on the survey area in2004 and 2005 (FCW 2005b).

3.10.5.2 Environmental Consequences

3.10.5.2.1 Proposed Action and Alternative 1

Overall, the sage grouse population has been steadily declining in Wyoming and across the rest of the west. A study prepared by the Western Association of Fish and Wildlife Agencies (Connelly et al. 2004) estimated that sage grouse populations in western North America declined at an overall rate of 2.0 percent per year from 1965 to 2003. The decline rate was larger from 1965 to 1985, with populations stabilizing and some increasing from 1986 to 2003. For Wyoming, this study estimated that sage grouse populations declined at an average rate of 9.66 percent from 1968 to 1986, and at an average rate of 0.33 percent per year from 1987 to 2003. Population lows were reached in the mid-1990s and there has been some gradual increase in numbers since that time (Connelly et al. 2004).

The Eagle Butte West LBA Tract is within the Northeast Wyoming Local Sage-Grouse Working Group (NWLWG) Area, which includes portions of the WGFD Sheridan and Casper regions and the Thunder Basin National Grassland, which is located south of the Eagle Butte West LBA Tract. Sage grouse monitoring has occurred within the NWLWG Area since 1967. Within this area, sage grouse population trends have exhibited a cyclical pattern, with each successive peak of a cycle being lower than the preceding peak. This suggests a long term population decline since at least 1967 (Figure 3-15).

Population trends within the NWLWG Area appear to be mirroring statewide trends in Wyoming, although the average number of males per lek in the NWLWG Area, including in the Thunder Basin National Grassland, has typically been lower than those observed state wide (Figure 3-16). Since 1996, sage grouse populations within the state and in northeast Wyoming has fluctuated but exhibited an overall increase, with a recent peak in male lek attendance occurring in 2000 or 2001.

The causes of the range-wide decline in sage grouse population levels are not completely understood, but they may be influenced by local conditions. However, habitat loss due to disturbance of leks, nesting and brood-rearing areas as a result of increasing development, drought, and the potential for West Nile virus, as well as loss of population connectivity are key threats to this species (Braun 1998, Wisdom et al. 2002, Naugle et al. 2004).

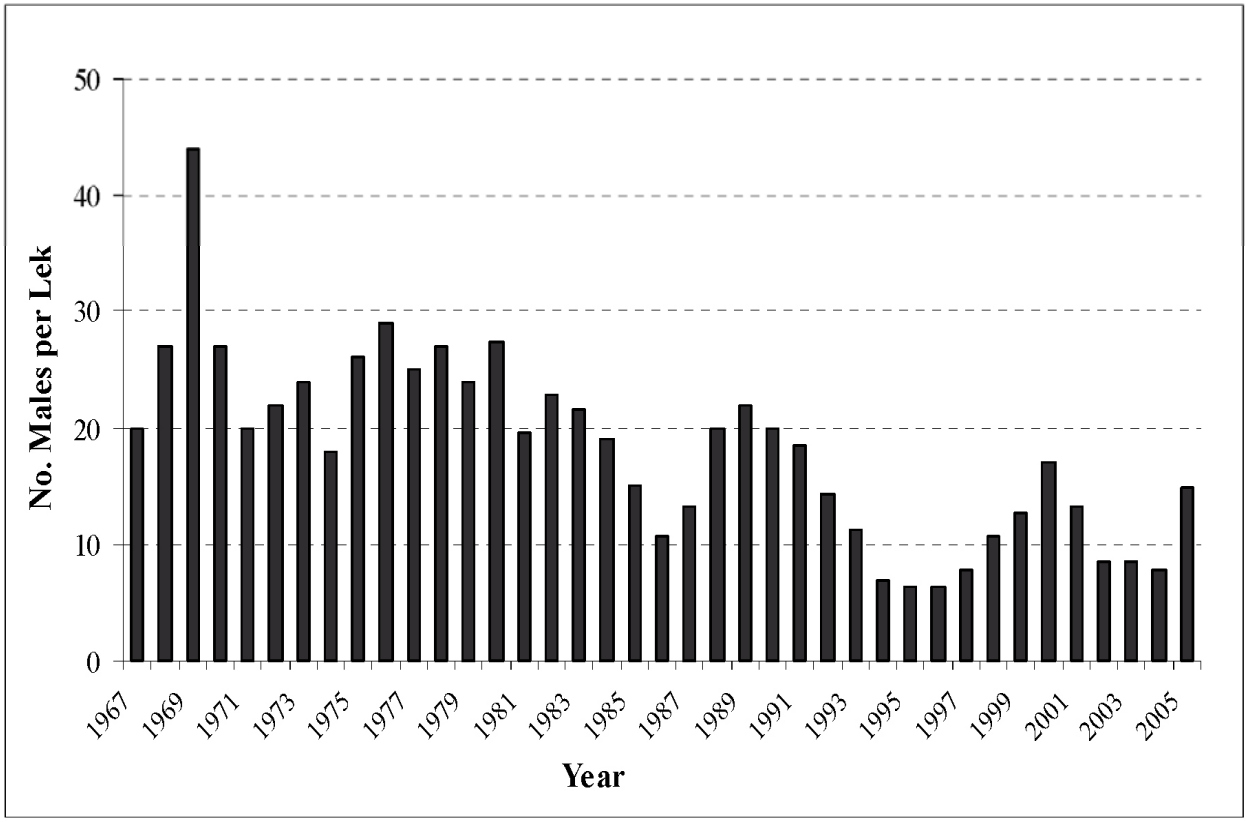

Figure 3-15. Sage Grouse Trends for the Wyoming Game and Fish Department Sheridan Region.

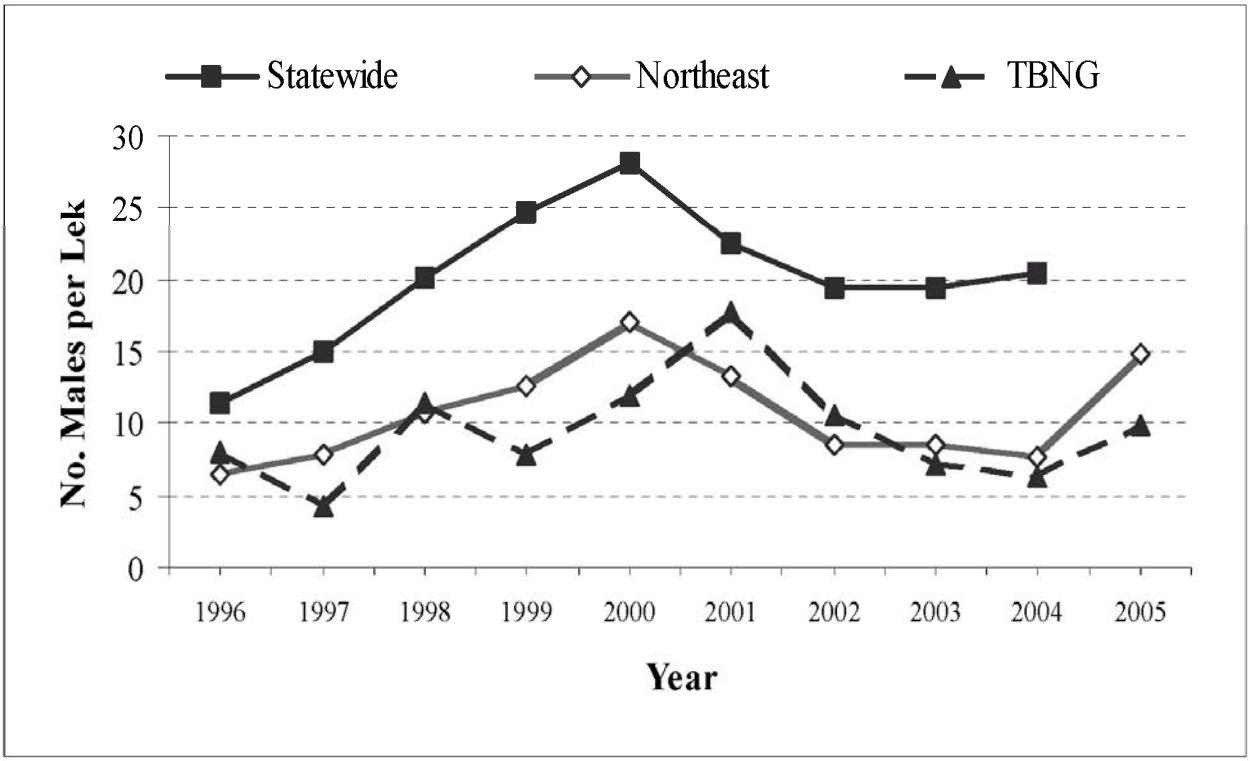

Figure 3-16. Sage Grouse Trends for Thunder Basin National Grassland.

Some potential impacts of mineral development (including coal mining and oil and gas development) on sage grouse include: (1) direct habitat loss and fragmentation from mine, well, road, pipeline, transmission and power line construction, (2) alteration of plant and animal communities, (3) increased human activity which could cause animals to avoid the area, (4) increased noise, which could cause animals to avoid an area or reduce their breeding efficiency, (5) increased motorized access by the public leading to legal and illegal harvest, (6) direct mortality associated with water evaporation ponds and production pits, and (7) reduced water tables resulting in the loss of herbaceous vegetation. Some of these impacts are short-term related to specific periods of activity, and some may result in positive effects such as increased forb production, habitat diversity, and additional water sources. Impacts may be long-term (30 years or more), and rehabilitation of impacted habitats may take many years to complete (WGFD 2003).

Areas of suitable habitat for nesting and strutting grounds are needed to sustain sage grouse populations. One recent study suggests that availability of winter habitat may also affect sage grouse populations (Naugle et al. 2006). During mining, there is a short-term loss of potential nesting habitat and potential disturbance to breeding activities, especially when mining operations occur in proximity to sage grouse leks. Following reclamation, there may be a long term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining. Approximately 28 percent of the premining vegetation on the Eagle Butte West LBA Tract as applied for and Alternative 1 is sagebrush grassland, while reclamation standards call for restoration of sagebrush on at least 20 percent of the reclaimed area. As discussed in Section 3.9.2.1, estimates for the time it would take to restore shrubs, including sagebrush, to premining density levels range from 20 to 100 years. Until sagebrush levels return to their premining density, there would be a reduction in sage grouse nesting and winter habitat on the Eagle Butte West LBA Tract.

If mining activities disturb a lek, sage grouse would have to use an alternate lek or establish a new lek site for breeding activities. Fidelity to lek sites has been well documented (WGFD 2003), but monitoring of sage grouse activities has indicated that the birds may change lek sites. There is currently one active sage grouse strutting ground (Barbour lek) located at the edge of the tract and two other active leks (Rawhide School Satellite and Schiermeister) located within three miles of the LBA tract under the Proposed Action and Alternative 1. If the tract is leased and mined, nesting habitat for the grouse that have attended these leks would be affected by the mining activity on the tract because, as discussed above, research has indicated that the tract is in the area that most hens from those leks would be expected to nest. The noise associated with mining operations may also disrupt sage grouse breeding and nesting.

There is some evidence that grouse populations do repopulate areas after reclamation for the species, but there is no evidence that populations attain their previous levels and reestablishment in reclaimed areas may take 20 to 30 years, or longer (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage grouse repopulation in the reclaimed areas.

Leasing and mining the Eagle Butte West LBA Tract would also affect potential habitat for mourning doves, sharp-tailed grouse, and gray partridge; however, the tract does not provide unique habitat for these species. Sightings of sharp-tailed grouse and gray partridge are infrequent in this area.

3.10.5.2.2 No Action Alternative

Impacts to upland game birds under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.6 Other Birds

3.10.6.1 Affected Environment

USFWS uses a list entitled *Migratory Bird Species of Management Concern in Wyoming*, specifically the *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming*, for reviews related to existing and proposed coal mine leased land (USFWS 2002b). This list was taken directly from the Wyoming Bird Conservation Plan (Cerovski et al. 2000). The *Migratory Bird Species of Management Concern in Wyoming* replaced the *Migratory Birds of High Federal Interest* (MBHFI) list. Eagle Butte Mine previously conducted annual surveys for the species included on the MBHFI list and now conducts annual surveys for the species included on the coal mine list. The surveys, which are conducted in the winter through summer, include the permit area and a one-half to one mile perimeter.

The wildlife section of the supplementary information document to this EIS, which is available on request, includes a tabulation of the regional status and expected occurrence, historical observations, and breeding records for each of the species on the list of *Migratory Bird Species of Management Concern in Wyoming*, based on a compilation of the results of the annual surveys conducted on and near the proposed lease area. Twenty-four of the listed species have historically been observed within the general analysis area. Species that have been recorded nesting in the area include the burrowing owl, greater sage-grouse, Brewer's sparrow (*Spizella breweri*), Swainson's hawk, short-eared owl, ferruginous hawk, lark bunting (*Calamospiza melanocorys*), grasshopper sparrow (*Ammodramus savannarum*), McCown's longspur (*Calcarius mccownii*), upland sandpiper (*Bartramia longicauda*), chestnut-collared longspur (*Calcarius ornatus*), sage thrasher (*Oreoscoptes montanus*), loggerhead shrike (*Lanius ludovicianus*), lark sparrow (*Chondestes grammacus*), and the vesper sparrow (*Pooecetes gramineus*). Other species observed in the area

include the long-billed curlew (*Numenius americanus*), peregrine falcon (*Falcon peregrinus*), bald eagle, dickcissel (*Spiza Americana*), bobolink (*Dolichonyx oryzivorus*), common loon (*Gavia immer*), red-headed woodpecker (*Melanerpes erthrocephalus*), Merlin (*Falco coumbarius*), and Sprague's pipit (*Anthus spragueii*). The bald eagle is only observed in the winter or as a migrant and the long-billed curlew, peregrine falcon, dickcissel, bobolink, loon, red-headed woodpecker, Spague's pipit, and merlin have only been observed as migrants.

The mountain plover (*Charadrius montanus)* is included on the list of *Migratory Bird Species of Management Concern* in Wyoming. The mountain plover was designated as a proposed threatened species by the USFWS in October 2001 (USFWS 2001). USFWS subsequently published a withdrawal of the proposed rule to list the mountain plover as threatened on September 9, 2003, (USFWS 2003). The USFWS continues to encourage provisions that would provide protection for this species, as it continues to be protected under the Migratory Bird Treaty Act and as a sensitive species under BLM policy (Bureau Manual 6840.06 E. Sensitive Species).

Wildlife surveys conducted at the Eagle Butte Mine since the 1970s have failed to detect the presence of this species in the area. The survey area, which includes the Eagle Butte Mine permit area and a half-mile perimeter, is inventoried for suitable mountain plover habitat annually. No sightings of mountain plover have ever been recorded in the vicinity of the LBA tract.

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in northeastern Wyoming's PRB. No bald eagle roosting habitat is present on the Eagle Butte West LBA Tract or areas added by Alternative 1. No known nest sites, or consistent yearly concentrated prey or carrion sources for bald eagles are present in the area of the Eagle Butte Mine, including the Eagle Butte West LBA Tract and adjacent study area. This species is infrequently observed in the general vicinity of the Eagle Butte West LBA Tract in the winter. Additional information about the observed occurrence of the bald eagle on the Eagle Butte West LBA Tract can be found in the Biological Assessment (Appendix E).

The burrowing owl is common and a pair of owls has nested in a small prairie dog town in the general analysis area during 10 of the last 12 years. Sage grouse, recently added to the Level 1 list, are becoming less common in the general analysis area but are still classified as a common breeder on and in the near vicinity of the Eagle Butte West LBA Tract (see discussion in Section 3.10.5, above).

Suitable nesting habitat is scarce if not absent in the general analysis area for the remainder of the *Migratory Bird Species of Management Concern in Wyoming*; therefore, the other species have rarely or never been recorded.

Under natural conditions, the Eagle Butte West LBA Tract provides limited waterfowl and shorebird habitat. The natural aquatic habitat, prior to CBNG development within the Little Rawhide Creek drainage basin, was mainly available during spring migration as ponds (primarily stock reservoirs) and ephemeral streams. Many of these water features generally got quite low or dried up during the summer. However, the relatively recent development of CBNG resources upstream and within the general analysis area has supplied the creek, its tributaries, and in-stream reservoirs/ponds with water nearly continuously, resulting in an increase in habitat for waterfowl and shorebird species. Broods of blue-winged teal (*Anas discors*), mallard (*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), Canada goose (*Branta canadensis*), killdeer (*Charadrius vociferous*), and American avocet (*Recurvirostra americana*) were observed during 2004 and 2005 (FCW 2005b).

3.10.6.2 Environmental Consequences

3.10.6.2.1 Proposed Action and Alternative 1

Of the twenty-four *Migratory Bird Species of Management Concern in Wyoming* that have historically been observed in the general analysis area, the Level 1 species (those identified as needing conservation action) that have been recorded nesting in the area include the burrowing owl, greater sage-grouse, Brewer's sparrow, and Swainson's hawk. Level 1 species that do not have abundant nesting habitat available in the general analysis area, but have been documented to nest include the short-eared owl and ferruginous hawk. Other Level 1 species observed in the area include the long-billed curlew, McCown's longspur, upland sandpiper, and bald eagle.

The existing habitat for these species on the Eagle Butte West LBA Tract would be destroyed during mining. The habitat loss would be short-term for grassland species, but would last longer for shrub-dependent species. There are currently no naturally-occurring trees on the LBA tract as applied for, although some domestic trees are planted within residential windbreaks on the LBA tract as applied for and the northern portion of the BLM study area, and some cottonwood trees occur within the southern portion of the BLM study area. Eagle Butte Mine's current reclamation practices are designed to provide a mosaic of upland grass and sagebrush habitats that would potentially host most of these species. A research project on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Shelley 1992).

No impacts to mountain plovers are anticipated because they have not been observed in the vicinity of the LBA tract during wildlife surveys conducted for the Eagle Butte Mine that began in the 1970s, and the typical suitable habitat for this

species is not currently present on the tract.

Potential impacts to the bald eagle, sage grouse and other raptors in general, as well as measures in place to prevent impacts to these species from existing mining operations are included in the preceding discussions or in Appendix E.

Mining the LBA tract would have a negligible effect on migrating and breeding waterfowl and shorebirds. Sedimentation ponds created during mining would provide interim habitat for these fauna. The Little Rawhide Creek diversion channel would not provide the same habitat as the natural stream channel, although natural streamflow and the presence of CBNG discharge water would not be affected. Eagle Butte Mine's current reclamation plan requires that the portion of the stream channel affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. If the LBA tract is leased and mined, these reclamation efforts would be extended onto the portion of the stream affected by mining the tract. Replacement of all impacted jurisdictional wetlands would be required in accordance with Section 404 of the CWA (Section 3.7). If the replaced wetlands on the Eagle Butte West LBA Tract do not duplicate the exact function and/or landscape features of the premine wetlands, waterfowl and shorebirds could be beneficially or adversely affected as a result.

3.10.6.2.2 No Action Alternative

Impacts to migratory bird species, waterfowl, and shorebirds under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.7 Amphibians, Reptiles, and Aquatic Species

3.10.7.1 Affected Environment

Wildlife surveys completed specifically for the applicant and adjacent mines, as well as biological research projects in the eastern PRB, have documented numerous other wildlife species that inhabit the region, including various amphibians, reptiles, and aquatic species. All these species are generally common inhabitants of the area.

Under natural conditions, aquatic habitat is limited by the ephemeral nature of surface waters in the general analysis area. The lack of deep-water habitat and extensive and persistent water sources limits the presence and diversity of fish and other aquatic species. Fish surveys were conducted in Little Rawhide Creek during baseline studies for the Eagle Butte Mine in between 1977 and 1984 and again in 1985. The 1977-84 surveys were completed along Little Rawhide Creek in the northern and northwestern portion of the Eagle Butte Mine area. The 1985 survey was completed on the portion of Little Rawhide Creek that is within the Eagle Butte West LBA Tract. No fish were noted during any of these surveys.

As discussed above, water discharged from CBNG wells has supplied Little Rawhide Creek and some tributaries and ponds with water nearly continuously, resulting in an increase in habitat for aquatic species. However, due to the nature of the Little Rawhide Creek hydrologic system (as explained in Section 3.5.2.1), only short reaches of the channel length through the Eagle Butte West LBA Tract currently contains water year-round, while the remaining channel length is dry. Little Rawhide Creek has not become perennial, even with the addition of CBNG discharge water. The in-channel reservoirs on Prong Draw hold CBNG discharge water throughout the year; however, Prong Draw has not become perennial either.

Numerous reptile and amphibian species have been recorded during the various surveys on the Eagle Butte Mine area and adjacent lands including the LBA tract. These species include the tiger salamander (*Ambystoma tigrinum*), plains spadefoot (*Scaohiopus bombifrons*), great plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousei*), boreal chorus frog (*Pseudacris triseriata maculata*), northern leopard frog (*Rana pipiens*), common snapping turtle (*Chelydra serpentina serpentina*), western painted turtle (*Chrysemys picta belli*), short-horned lizard (*Phrynosoma douglassi*), prairie rattlesnake (*Crotalus viridis viridis*), bullsnake (*Pituophis melanoleucas sayi*), western plains garter snake (*Thamnophis radix haydeni*), and eastern yellowbelly racer (*Coluber constrictor flaviventris*). The only amphibians that were encountered on the LBA tract in 2004 were the boreal chorus frog and leopard frog. The western painted turtle and common snapping turtle have also been recorded along Little Rawhide Creek within the eastern portion of the survey area. The only amphibians that were encountered on the LBA tract in 2005 were the boreal chorus frog and western painted turtle (FCW 2005b). The scarcity of mesic habitat elsewhere within the survey area reduces the potential of the area to attract numerous species, particularly amphibians. No fish were observed in Little Rawhide Creek during the 2004 survey.

3.10.7.2 Environmental Consequences

3.10.7.2.1 Proposed Action and Alternative 1

Mining the LBA tract would remove habitat for aquatic species, amphibians, and reptiles in a portion of Little Rawhide Creek and sections of the ephemeral tributaries within the proposed lease area. Although the channel and surface water flow would be restored during reclamation, the stream would be diverted and habitat for these species would be lost during mining operations. Under natural conditions, habitat for aquatic species is limited on the Eagle Butte West LBA Tract, however, as discussed above, a variety of aquatic species and reptiles and amphibians have been observed on and in the vicinity of the tract.

Under jurisdiction of Eagle Butte Mine's current WDEQ/LQD mine

permit, a portion of Little Rawhide Creek has been diverted in order to recover coal from the existing coal leases (Section 3.5.2.1).

Reclamation of the stream channel and restoration of surface water flow quantity and quality after mining to approximate pre-mining conditions would restore aquatic resources of Little Rawhide Creek.

3.10.7.2.2 No Action Alternative

Impacts to reptiles, amphibian, and aquatic species under the No Action Alternative would be similar to the impacts described in Section 3.10.1.2.2, above.

3.10.8 Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species

Refer to Appendices E and F.

3.10.9 Regulatory Compliance, Mitigation and Monitoring

Regulatory guidelines and requirements designed to prevent or reduce surface coal mining impacts to wildlife include:

- fencing designed to permit pronghorn passage to the extent possible;
- creation of raptor nests to mitigate other nest sites impacted by mining operations at this mine;
- relocation of active raptor nests that would be impacted by mining in accordance with the approved raptor monitoring and mitigation plan;
- obtaining a permit for removal and mitigation of golden eagle nests;
- buffer zones for protection of raptor nests;
- restriction of mine-related disturbances from encroaching in the near vicinity of any active raptor nest from March until hatching;
- restriction of disturbances near raptor nests containing nestlings to prevent danger to, or abandonment of, the young;
- creation of nesting habitat through enhancement efforts (nest platforms, nest boxes, and tree plantings);
- reestablishment of the ground cover necessary for the return of a suitable raptor prey base after mining;
- restoration of sage grouse habitat after mining including reestablishment of sagebrush and other shrubs on reclaimed lands and grading of reclaimed lands to create swales and depressions;
- development of a *Raptor and Migratory Birds of High Federal Interest (MBHFI) Monitoring and Mitigation Plan* which must be approved by USFWS;

- required use of raptor-safe power lines;
- restoration of diverse landforms, direct topsoil replacement, and the construction of brush piles, snags, and rock piles to enhance habitat for wildlife;
- restoration of habitat provided by jurisdictional wetlands; and
- reclamation of the river channel and restoration of surface water flow quantity and quality after mining to approximate pre-mining conditions.

FCW's current mine permit requires reconstruction of bed form features in the stream channel of Little Rawhide Creek, such as pools and runs, that should help restore the channel's natural form and function, as well as provide habitat. Restoration will be achieved by salvaging sufficient material from channel terrace alluvium to reconstruct naturally-occurring features. Current reclamation, as well as future reclamation of Little Rawhide Creek by the Eagle Butte Mine would incorporate alluvium salvaged from the original channel.

These measures are included in the existing mining and reclamation permit and would be included in the amended mining and reclamation plans, if the LBA tract were leased and proposed for mining.

Baseline wildlife surveys were conducted for the Eagle Butte Mine before mining operations began. Annual wildlife monitoring surveys have been conducted since the mid-1970s. These surveys are required by state and federal regulations. The wildlife monitoring surveys cover the area included in the mine permit area and a perimeter beyond the permit area that varies in size according to the species being surveyed. As a result, a majority of the Eagle Butte West LBA Tract has been surveyed as part of the required monitoring surveys for the Eagle Butte Mine.

The annual monitoring program includes:

- winter surveys of raptors and migratory birds wintering or nesting in the area;
- spring surveys for new and/or occupied raptor nests, upland game bird lek locations, T&E species and migratory birds;
- late spring surveys of raptor production for occupied nests, opportunistic observations of all wildlife species, T&E species, and migratory birds;
- raptor territorial occupancy and nest productivity is surveyed annually on and around the existing leases; and
- summer surveys for raptors, migratory birds, and lagomorph density.

Monitoring data were collected by all of the surface coal mines in the PRB for big game species until 1999. At that time, the WGFD reviewed

monitoring data and requirements for big game species on those mine sites. They concluded that the monitoring had demonstrated a lack of impacts to big game on existing mine sites. No severe mine-caused mortalities had occurred and no long-lasting impacts on big game had been noted on existing mine sites. The WGFD therefore recommended at that time that big game monitoring be discontinued on all existing mine sites. New mines will be required to conduct big game monitoring if located in crucial winter range or in significant migration corridors, neither of which are present within the general analysis area.

There is an approved raptor monitoring and mitigation plan for the Eagle Butte Mine. This monitoring and mitigation plan would be amended to include the Eagle Butte West LBA Tract if it is leased and proposed for mining. The amended raptor mitigation plan would be subject to review and approval by USFWS before the amended mining plan is approved.

Mitigation plans for *Migratory Bird Species of Management Concern* have been developed in cooperation with USFWS for the existing Eagle Butte mining operations, and those plans would be amended to include the LBA tract. If additional species are documented nesting or using the area regularly, a mitigation plan would be developed to protect those birds and their habitat.

3.10.10 Residual Impacts

Although the Eagle Butte West LBA Tract would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species. Reclamation standards may limit replacement of habitat for some species, such as mountain plover. Some species, such as sage grouse, may repopulate reclaimed areas but populations may not attain pre-mining levels.

3.11 Land Use and Recreation

3.11.1 Affected Environment

The majority of the surface of the lands included in the Eagle Butte West LBA Tract as applied for under the Proposed Action and the lands added under Alternative 1 is privately owned, but approximately 15 acres of the area included in the northern part of the BLM study area are owned by Campbell County, a portion of which is occupied by an elementary school. FCW is the major private surface owner, but there are 11 other private surface owners in the Echo Subdivision, which is also included in the northern part of the BLM study area. Surface ownership for the Eagle Butte West LBA Tract is shown on Figures 3-17 and 3-18.

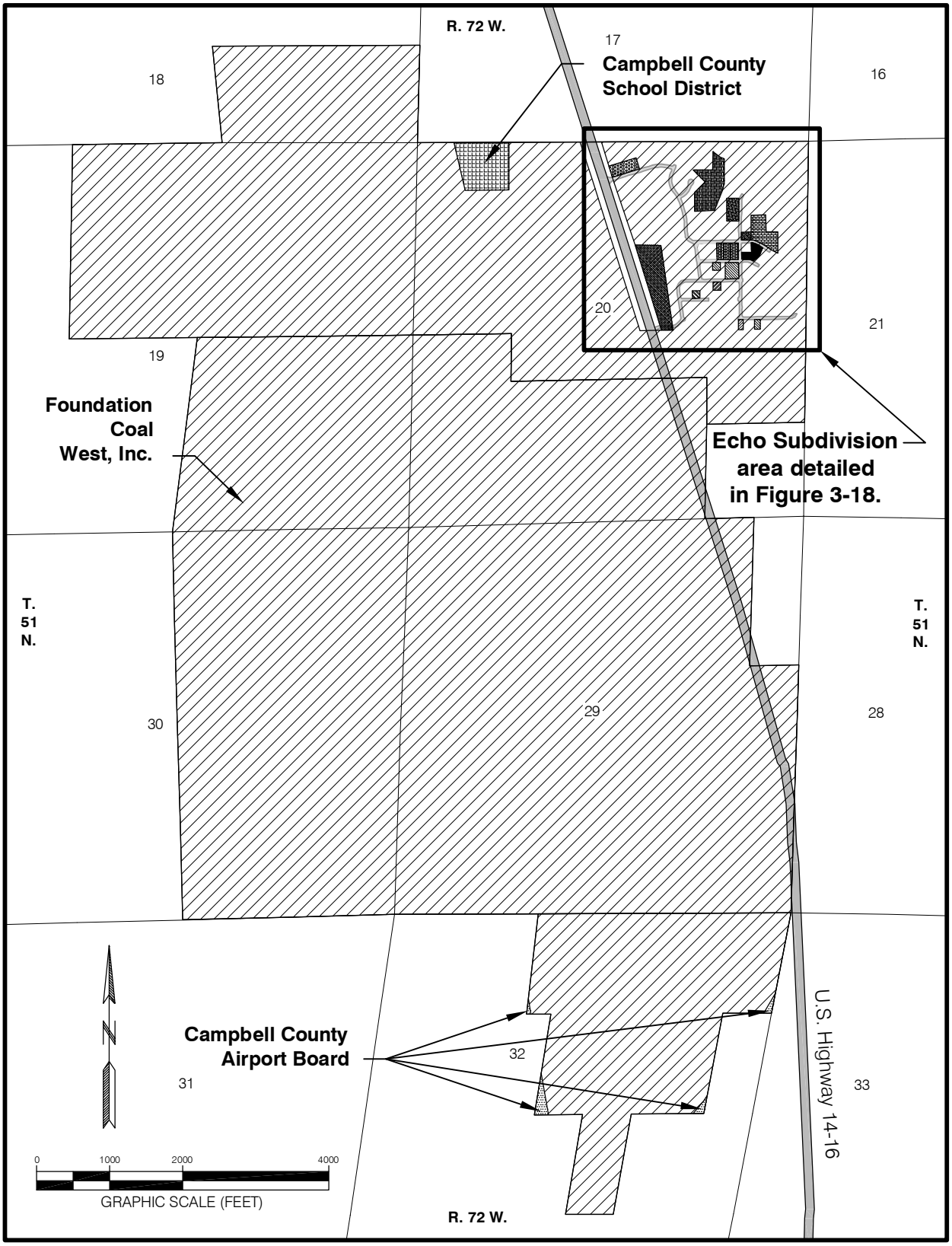

Figure 3-17. Surface Ownership Within the Eagle Butte West LBA Tract.

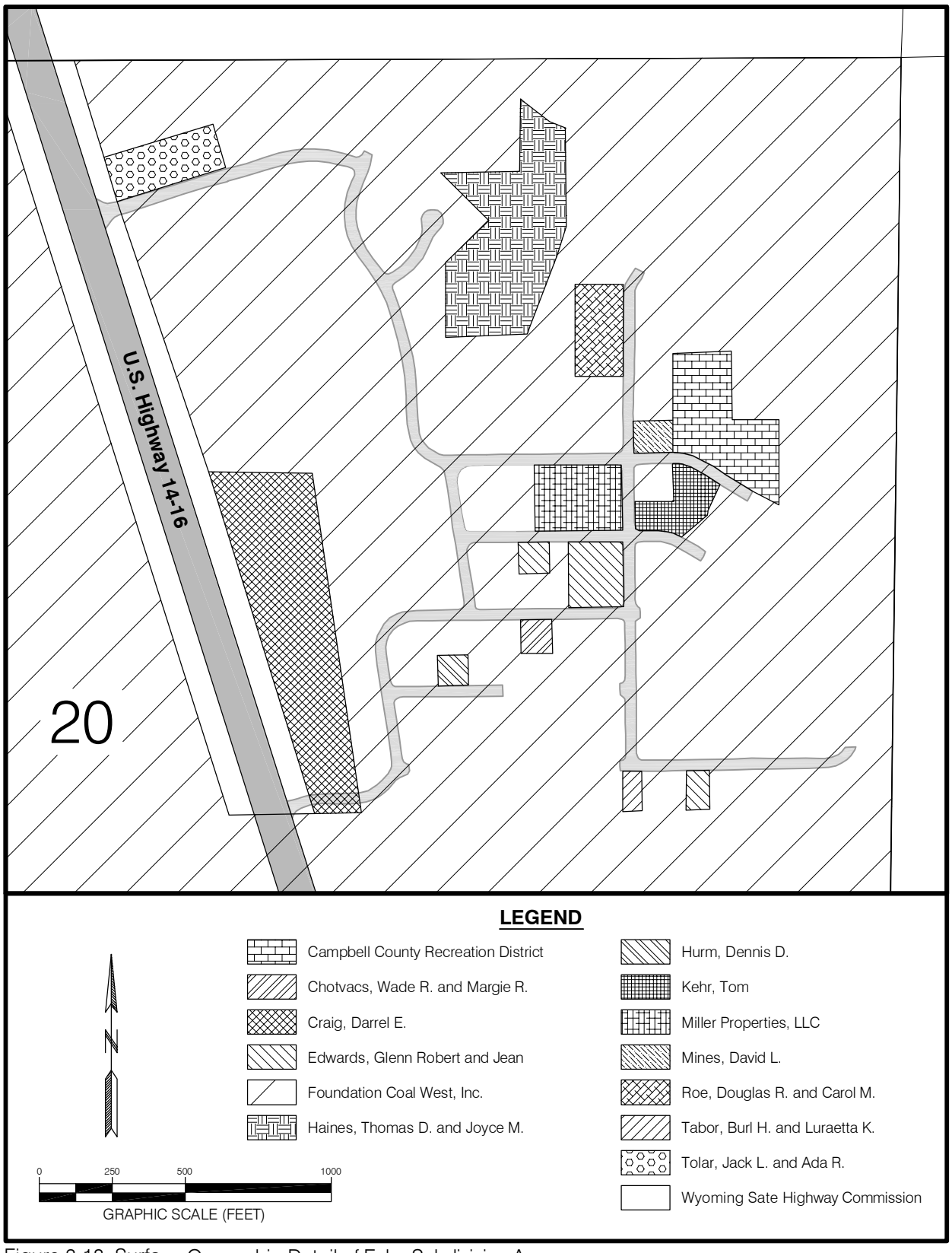

Figure 3-18. Surface Ownership Detail of Echo Subdivision Area.

Livestock grazing on native rangeland is the primary land use within the tract under the Proposed Action and Alternative 1, while oil and gas production, wildlife habitat, and recreation are secondary land uses for both public and private lands. As discussed above, the northern portion of BLM's study area includes an elementary school and housing subdivision.

The county-owned surface within the tract under Alternative 1, which includes the location of the Rawhide Elementary School and the Echo Subdivision are generally located in the N½ of Section 20, T.51N., R.72W. As discussed in Section 2.2, BLM included the coal underlying the school and the subdivision in the study area for geological evaluation purposes because it is underlain by unmined federal coal that could logically be mined if the Eagle Butte West LBA Tract is leased and mined. However, if this coal is included in any tract that BLM would decide to offer for lease, BLM would be required by the regulations at 43 CFR 3461.5(c)(1) to make a determination that this coal is unsuitable for mining. As a result, BLM has made a preliminary determination that it will not include the portion of the study area that includes the Rawhide School and Echo Subdivision in the Eagle Butte West LBA Tract, if it is offered for lease.

Areas of disturbance within and near the Eagle Butte West LBA Tract are generally associated with roads, oil and gas wells and production facilities, surface mine-related facilities, and ranching operations. U.S. Highway 14-16 crosses eastern limits of the LBA tract. State Highway 59 and the Hannum Road (a paved county road) are located roughly a mile south of the LBA tract. There are residential streets in the area of the Rawhide Elementary School and the Echo Subdivision, and several unnamed two-track roads traverse and provide public and private access within and near the proposed lease area and BLM study area.

The oil and gas estate within the Eagle Butte West LBA Tract is federally and privately owned, with the majority (approximately 88 percent) being privately owned. All of the federally owned oil and gas estate is leased. The ownership of the oil and gas estate for the LBA tract is shown in Figure 3-19. A list of the current federal oil and gas lessees is given in Table 3-10.

According to the WOGCC records as of May 19, 2006, there were no permitted conventional oil and gas wells on lands included in the Eagle Butte West LBA Tract as proposed and the lands added under Alternative 1 (Figure 3-19). Four conventional oil wells that were drilled on private leases were unproductive and were subsequently plugged and abandoned.

The Supreme Court has ruled that the CBNG belongs to the owner of the oil and gas estate (98-830). Therefore, the oil and gas lessees have the right to develop CBNG as well as conventional oil and gas on the LBA tract.

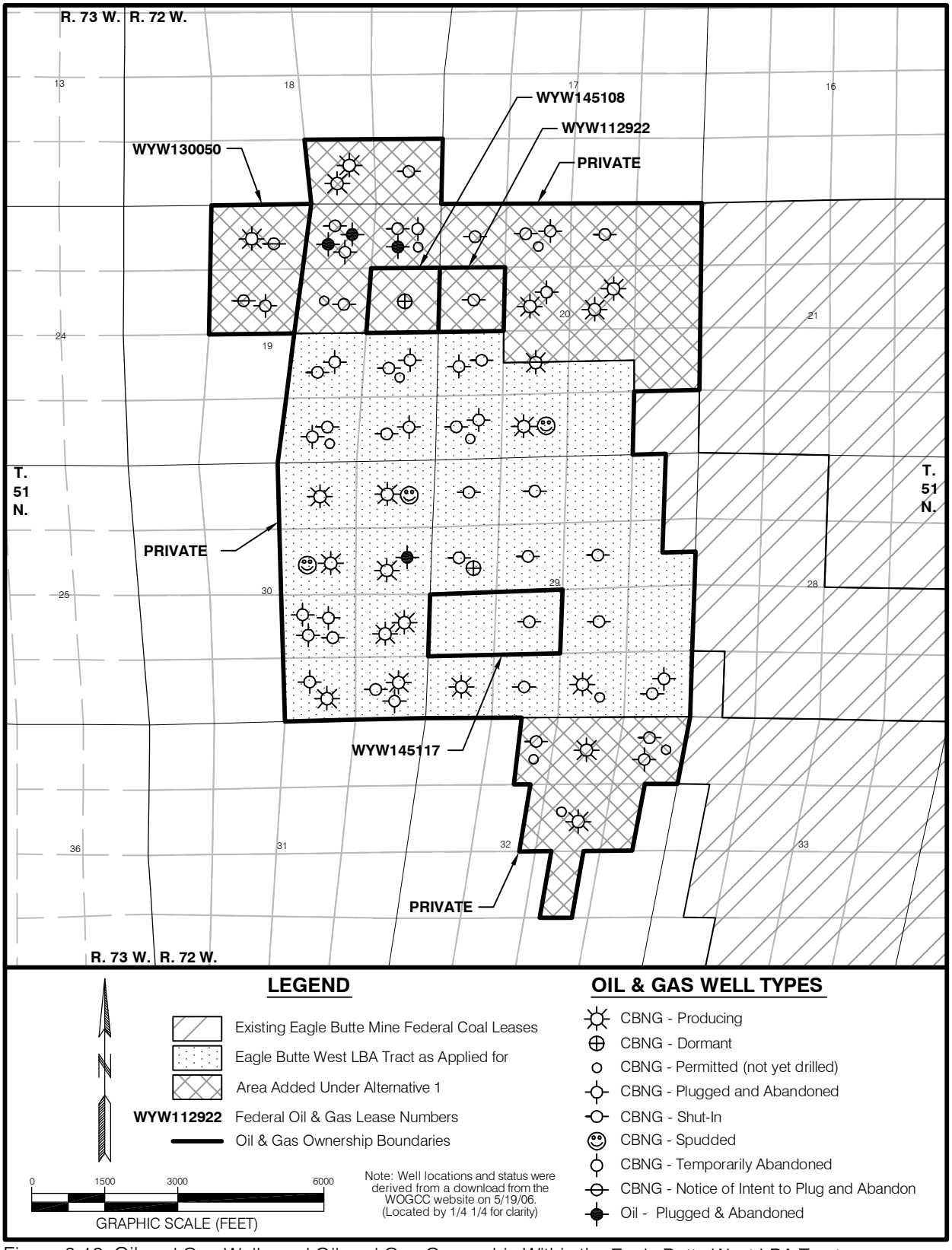

Figure 3-19. Oil and Gas Wells and Oil and Gas Ownership Within the Eagle Butte West LBA Tract.

Table 3-10. Eagle Butte West LBA Tract Oil and Gas Ownership

Location	Lease Number	Lessees of Record
T.51N., R.72W.		
Section 19 Lots 8, 10	WYW-130050	Maurice W. Brown
Section 19 Lot 12	WYW-145108	Devon Energy Corporation
Section 20 Lot 5	WYW-112922	Maurice W. Brown
Section 29 Lots 11, 12	WYW-145117	Lance Oil and Gas Co. Inc.

Note: From BLM Oil & Gas Plat (4/4/06). The oil and gas rights (including CBNG) and coal rights for the above locations are owned by the federal government. For the rest of the LBA tract, the oil and gas rights (including CBNG) are privately owned, and the coal rights are federally owned.

According to the WOGCC records as of May 19, 2006, there were 20 CBNG wells that were producing, 17 plugged and abandoned, 27 were shut-in, five were dormant, temporarily abandoned or intended to be abandoned, three were recently spudded, and 10 were permitted to be drilled within the lands encompassed by the Eagle Butte West LBA Tract as proposed and the lands added under Alternative 1 (Figure 3-19). Extensive CBNG development has occurred north, south, and west of the tract. CBNG wells capable of production on or in sections adjacent to the Eagle Butte West LBA Tract are listed in Appendix G.

Additional information on the conventional oil and gas and CBNG development in the Eagle Butte West LBA Tract and surrounding area is included in Section 3.3.2. Certain ancillary facilities are needed to support oil and gas production. These support facilities may include well access roads, well pads, production equipment at the wellhead (which may be located on the surface and/or underground), well production casing (which extends from the surface to the zone of production), underground pipelines (which gather the oil, gas, and/or water produced by the individual wells and carry it to a larger transmission pipeline or collection facility), facilities for treating, discharging, disposing of, containing, or injecting produced water, central metering facilities, electrical power utilities, gas compressor stations, and high-pressure transmission pipelines for delivering the gas to market. Currently, there are some oil and gas production facilities, primarily oil and gas pipelines, on the LBA tract, as discussed in Section 3.15 of this EIS. It is unlikely that additional support facilities would be constructed on the LBA tract because no productive conventional oil and gas wells have been drilled on the tract and most of the CBNG wells that exist on the tract have been either shut in or plugged and abandoned due to exhausted reserves and diminished production.

Coal mining is a dominant land use to the north, east, and southeast of the LBA tract. The Buckskin, Rawhide, Eagle Butte, Dry Fork, and Wyodak Mines form a group of contiguous or nearly contiguous surface coal mines located in Campbell County (Figure 1-1). Coal production from these five active mines increased by 48 percent between 1993 and 2005 (from approximately 44 million tons in 1994 to 65 million tons in 2005). Three leases, including two LBA tracts (the Eagle Butte Tract and the West Hay Creek Tract) and one exchange tract (the Belco Exchange tract adjacent to the Buckskin Mine), have been issued within this group of four mines since decertification of the federal coal region. The Eagle Butte West LBA Tract being evaluated in this EIS and the Hay Creek II lease application, which is currently pending, are in this group of mines (Tables 1-1 and 1-2).

Campbell County does not have a county-wide land use plan, but is currently developing a comprehensive land use plan jointly with the City of Gillette (City of Gillette 1978 and Campbell County 2005). The Gillette area land use plan is an integral part of the overall plan for Campbell County and recommends general types of uses for the area immediately surrounding the City of Gillette (City of Gillette 1978). The proposed lease area does not have a designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county.

Big game hunting is the principal recreational land use within the general analysis area, and pronghorn, mule deer, and white-tailed deer are present within the area (Section 3.10.2). On private lands, hunting is allowed only with landowner permission. Land ownership within the PRB is largely private (approximately 80 percent), with some private landowners permitting sportsmen to cross and/or hunt on their land. There has been a trend over the past two to three decades towards a substantial reduction in private lands that are open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as for sportsmen who desire access to these animals (WGFD 2004).

In general, publicly owned lands (i.e., Forest Service or BLM-administered federal lands and state school sections) are open to hunting if legal access is available. Due to safety concerns, however, public surface lands contained within an active mining area are generally closed to the public, further limiting recreational use. As shown in Figures 3-17 and 3-18, no public surface lands are included in the Eagle Butte West LBA Tract as applied for. Fifteen acres of land owned by Campbell County are included in the area added under Alternative 1, but not all of that area is currently accessible to the public.

Recreational use on the privately owned surface is allowed only with landowner permission. Sport hunting in varying degrees occurs on the LBA tract. Sage grouse, mourning dove, waterfowl, rabbit, and coyote are hunted in the vicinity, and some coyote and red fox trapping may occur.

Specific details regarding big game herd management objectives within and near the general analysis area are contained in the *Casper* and *Sheridan Region Annual Big Game Herd Unit Reports* (WGFD 2004). The WGFD classifies the general analysis area as winter/yearlong (67 percent) or yearlong (33 percent) habitat for antelope. No crucial or critical pronghorn habitat is recognized by the WGFD in this area (Note: WGFD definitions of big game ranges are included in Section 3.10.2.1). The proposed lease area is within pronghorn antelope Hunt Area 17, which is contained in the Gillette Herd Unit. In post-season 2003, the population of the Gillette Herd Unit was estimated to be approximately 13,000 animals, which is above the WGFD objective of 11,000 (WFGD 2004).

Historical problems associated with the management of the Gillette Herd Unit include hunter access, over harvest on the limited public lands, and quantifying landowner preferences and desires. Prior to 1997, the herd population was fairly stable and near the objective of 11,000 antelope. Losses from severe winters, poor production rates, and disease subsequently decreased the population, but it has recently recovered and begun to stabilize near the objective level. Hunt Area 17 contains mostly privately owned surface lands and hunter access to the limited areas of public land is poor; therefore, the number of antelope is expected to steadily increase. If the population exceeds objective levels, more licenses will be needed and these may be difficult to sell in this mostly private land area. Nearly all landowners charge access fees for hunting and private land access is based on the desires and perceptions of the landowners. Increased harvest may be difficult to achieve because of the increased CBNG development, which is limiting rifle hunting on associated lands. Given the predicted harvest and average winter conditions, the 2004 post-season population was expected to be 13,985 antelope.

The WGFD has classified the majority of the general analysis area as out of normal mule deer use range. Crucial or critical mule deer habitat does not occur on or within several miles of the general analysis area. The proposed lease area is located within the Powder River Mule Deer Herd Unit, which also includes Hunt Areas 17, 18, 23, and 26. A majority of the surface of the Powder River Herd Unit is privately owned. Access fees are common, resulting in heavy hunting pressure on accessible public lands, particularly in recent years. Between 1998 and 2002, the post-season objective for this mule deer herd was 52,000 and the average population was at that objective. The 2000 post-season population was estimated at near 55,000 animals. Numbers dropped to near 47,000 deer in 2001

and 2002. The herd has been slowly recovering toward the objective over the last several years. The 2003 post-season mule deer population was estimated at 51,000, which is near the herd objective. Additional harvest is needed to maintain the herd at objective levels.

The nearest elk population is in the Fortification Unit, approximately 15 miles west of the general analysis area. None of the general analysis area is classified by the WGFD as within normal elk use range. No elk have been observed recently within the wildlife study area.

White-tailed deer are currently managed separately by the WGFD in the Powder River and Black Hills Herd Units. White-tailed deer prefer riparian habitats and are therefore seldom observed in the general analysis area due to the lack of that particular habitat type. The WGFD classifies the entire general analysis area as out of the normal white-tailed deer use range. White-tailed deer are occasionally recorded along the Rawhide Creek/Little Powder River area several miles to the north but are rarely recorded in the general analysis area.

Under natural conditions, aquatic habitat is limited by the ephemeral nature of surface waters in the general analysis area. The lack of deep-water habitat and extensive and persistent water sources limits the presence and diversity of fish and other aquatic species. Fish surveys were conducted in the Little Rawhide Creek during baseline studies for the Eagle Butte Mine in between 1977 and 1984 and again in 1985. The 1977-84 surveys were completed along Little Rawhide Creek in the northern and northwestern portion of the Eagle Butte Mine area. The 1985 survey was completed on the portion of Little Rawhide Creek that is within the Eagle Butte West LBA tract. No fish were noted during any of these surveys.

3.11.2 Environmental Consequences

3.11.2.1 Proposed Action and Alternative 1

The major adverse environmental consequences of leasing and mining the Eagle Butte West LBA Tract on land use would be the reduction of livestock grazing (cattle and sheep), loss of wildlife habitat (particularly big game), and curtailment of oil and gas development while the coal is being mined and during reclamation. This would include removal of all existing oil and gas surface and downhole production and transportation equipment and facilities. Wildlife and livestock use would be displaced while the tract is being mined and reclaimed. Access for recreational and other (i.e., ranching, oil and gas development) activities would be restricted during mining operations. There are no federal surface lands within the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1, but 15 acres of county-owned surface are included in the BLM study area under Alternative 1. The loss of accessibility to lands within the tract is long term (during mining and reclamation), but is not permanent. Estimated disturbance areas for the Eagle Butte

West LBA Tract and the Alternative 1 tract configuration are presented in Table 3-1.

As discussed above, BLM has made a preliminary determination that it will not include the portion of the study area that includes Rawhide School and the Echo Subdivision in the Eagle Butte West LBA Tract, if it is offered for lease. As a result, the federal coal underlying these facilities will not be mined.

Sections 3.3.2 and 3.11.1 and Appendix G of this document address producing, abandoned, and shut in oil and gas (conventional and CBNG) wells on the LBA tract under the Proposed Action and Alternative 1. Well location information, federal oil and gas ownership, and federal oil and gas lessee information are presented in Figure 3-19 and Table 3-10. BLM manages federal lands on a multiple use basis, in accordance with the regulations. In response to conflicts between oil and gas and coal lease holders, BLM policy advocates optimizing the recovery of both coal and CBNG resources to ensure that the public receives a reasonable return for these publicly owned resources. Optimal recovery of both coal and oil and gas resources requires negotiation and cooperation between the oil and gas lessees and the coal lessees. In the past, negotiations between an applicant mine and some of the existing oil and gas lessees have resulted in agreements to allow development of both resources in the PRB. Producing CBNG wells are present on the Eagle Butte West LBA Tract. In the PRB, royalties have been and would be lost to both the state and federal governments if the federal CBNG is not recovered prior to mining, or if federal coal is not recovered due to conflicts. State and federal governments can also lose bonus money when the costs of the agreements between the lessees are factored into the fair market value determinations.

Hunting on the Eagle Butte West LBA Tract would be eliminated during mining and reclamation. Pronghorn and mule deer occur on and adjacent to the LBA tract, as do sage grouse, mourning dove, waterfowl, rabbit, and coyote.

Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. The reclamation standards required by SMCRA and Wyoming State Law meet the standards and guidelines for healthy rangelands. Following reclamation bond release, management of the privately owned surface would revert to the private surface owner.

3.11.2.2 No Action Alternative

Under the No Action Alternative, coal removal would not occur and current land uses would continue on from 2,395 up to 2,505 additional acres that would be disturbed under the Proposed Action or Alternative 1, respectively. Currently approved mining operations would continue on the existing Eagle Butte Mine leases (Table 3-1). Impacts to land use related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA

tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.11.3 Regulatory Compliance, Mitigation and Monitoring

Mined areas would be reclaimed as specified in the approved mine plan to support the anticipated post-mining land uses of wildlife habitat and rangeland. The reclamation procedures would include stockpiling and replacing topsoil, using reclamation seed mixtures, which would be approved by WDEQ, and replacing stock reservoirs.

Steps to control invasion by weedy (invasive nonnative) plant species using chemical and mechanical methods would be included in the amended mine plan.

Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if there is a need for corrective action during establishment of vegetation. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for anticipated post-mining land uses.

See Section 3.3.2.3 for discussion of regulatory requirements, mitigation and monitoring related to oil and gas development.

3.11.4 Residual Impacts

No residual impacts to land use and recreation are expected.

3.12 Cultural Resources

3.12.1 Affected Environment

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are nonrenewable remains of past human activity. The PRB, including the general analysis area, appears to have been inhabited by aboriginal hunting and gathering people for more than 13,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources. Several thousand cultural sites have been recorded within the PRB.

Frison's (1978, 1991) chronology for the Northwestern Plains divides occupations from early to late into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, and Protohistoric periods. Frison's chronology is listed below. The Plains designation within the Early, Middle, and Late Archaic periods has been omitted from the list.

- Paleoindian period (13,000 to 7,000 years B.P.)
- Early Archaic period (7,000 to 5,000-4,500 years B.P.)
- Middle Archaic period (5,000-4,500 to 3,000 years B.P.)

- Late Archaic period (3,000 to 1,850 years B.P.)
- Late Prehistoric period (1,850 to 400 years B.P.)
- Protohistoric period (400 to 250 years B.P.)
- Historic period (250 to 120 years B.P.)

The Paleoindian period dates from about 13,000 to 7,000 years ago and includes various complexes (Frison 1978). Each of these complexes is correlated with a distinctive projectile point style derived from a general large lanceolate and/or stemmed point morphology. The Paleoindian period is traditionally thought to be synonymous with "big game hunters" who exploited megafauna such as bison and mammoth (plains Paleoindian groups), although evidence of the use of vegetal resources is noted at a few Paleoindian sites (foothill-mountain groups).

The Early Archaic period dates from about 7,000 to 5,000-4,500 years ago. Projectile point styles reflect the change from large lanceolate types that characterize the earlier Paleoindian complexes to large side- or corner-notched types. Subsistence patterns reflect exploitation of a broad spectrum of resources, with a much-diminished utilization of large mammals.

The onset of the Middle Archaic period (4,500 to 3,000 years B.P.) has been defined on the basis of the appearance of the McKean Complex as the predominant complex on the Northwestern Plains around 4,900 years B.P. (Frison 1978, 1991, 2001). McKean Complex projectile points are stemmed variants of the lanceolate point. These projectile point types continued until 3,100 years B.P. when they were replaced by a variety of large corner-notched points (i.e., Pelican Lake points) (Martin 1999). Sites dating to this period exhibit a new emphasis on plant procurement and processing.

The Late Archaic period (3,000 to 1,850 years B.P.) is generally defined by the appearance of corner-notched dart points. These projectile points dominate most assemblages until the introduction of the bow and arrow around 1,500 years B.P. (Frison 1991). The period witnessed a continual expansion of occupations into the interior grasslands and basins, as well as the foothills and mountains.

The Late Prehistoric period (1,850 to 400 years B.P.) is marked by a transition in projectile point technology around 1,500 years B.P. The large corner-notched dart points characteristic of the Late Archaic period are replaced by smaller corner- and side-notched points for use with the bow and arrow. Around approximately 1,000 years B.P., the entire Northwestern Plains appears to have suffered an abrupt collapse or shift in population (Frison 1991). This population shift appears to reflect a narrower subsistence base focused mainly on communal procurement of pronghorn and bison.

The Protohistoric period (400 to 250 years B.P.) witnesses the beginning of European influence on prehistoric cultures of the Northwestern Plains.

Additions to the material culture include most notably the horse and European trade goods, including glass beads, metal, and firearms. Projectile points of this period include side-notched, tri-notched, and unnotched points, with the addition of metal points. The occupants appear to have practiced a highly mobile and unstable residential mobility strategy.

The historic period (250 to 120 years B.P.) is summarized from Schneider et al. (2000). The use of the Oregon Trail by emigrants migrating to the fertile lands of Oregon, California, and the Salt Lake Valley brought numerous pioneers through the state of Wyoming, but few stayed. It was not until the fertile land in the West became highly populated, along with the development of the cattle industry in the late 1860s, that the region currently comprising the state of Wyoming became attractive for settlement. The region offered cattlemen vast grazing land for the fattening of livestock, which could then be shipped across the country via the recently completed (1867-1868) transcontinental railroad in southern Wyoming.

The settling of the region surrounding Gillette, Wyoming began in the late 1800s, after a government treaty in 1876 placed the Sioux Indians on reservations outside the territory. Cattlemen were the first settlers to establish themselves in the area, with dryland farmers entering the area after 1900. The town of Gillette was established by the railroad in 1891 in an effort to promote the settling of undeveloped areas along their rail lines. The presence of the railroad allowed for the greater development of the cattle industry because it facilitated shipping cattle from the area. Several early ranches established in the region include the four homestead sites that are located within the Eagle Butte West LBA Tract cultural resources study area. The homesteads were patented in the early 1900s and one site (48CA1137) is still occupied. FCW currently owns all four properties.

A Class III cultural resources survey is an intensive and comprehensive inventory of a proposed project area conducted by professional archaeologists and consultants. The survey is designed to locate and identify all prehistoric and historic cultural properties 50 years and older that have exposed surface manifestations. The goal of the survey is to locate and evaluate for the NRHP all cultural resources within the project area. Cultural properties are recorded at a sufficient level to allow for evaluation for possible inclusion to the NRHP. Determinations of eligibility are made by the managing federal agency in consultation with the SHPO. Consultation with the SHPO must be completed prior to the approval of the mining plan.

After completion of a Class III cultural resources survey, additional investigations may be undertaken to complete an individual site record. If necessary, site-specific testing or limited excavation may be utilized to collect additional data which will: 1) determine the final evaluation status of a site; and/or 2) form the basis of

additional work to be conducted during implementation of a treatment plan if the site is determined eligible for the NRHP. A treatment plan is then developed for those sites that are eligible for the NRHP and are within the area of potential effect. Treatment plans are implemented prior to mining and can include such mitigation measures as avoidance (if possible), large scale excavation, complete recording, Historical American Building Survey/Historic American Engineering Record documentation, archival research, and other acceptable scientific practices.

Data recovery plans are required for sites that are recommended as eligible for the NRHP following testing and consultation with the SHPO if they cannot be avoided by project development. Until consultation has occurred and agreement regarding NRHP eligibility has been reached, all sites recommended as eligible or undetermined eligibility must be protected from disturbance. Full consultation with the SHPO will be completed prior to approval of the mining plans. Those sites determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment.

Numerous Class I (survey records review) and Class III cultural resource surveys associated with oil and gas field development and surface mining operations have been conducted in the general area. FCW contracted with ACR Consultants, Inc. of Sheridan, Wyoming to perform Class I and Class III surveys of the Eagle Butte West LBA Tract survey area in 2004. The LBA survey area is comprised of the LBA tract as applied for under the Proposed Action and the BLM study area.

The Eagle Butte West LBA survey area has been entirely surveyed for cultural resources at a Class III level. A total of 17 cultural sites (9 re-recorded and 8 new) were documented in the survey area. Twelve isolated finds were also recorded. Of the 17 cultural sites, nine are prehistoric, five are historic, and three are multi-component. One site was originally considered eligible for the NRHP by the cultural site recorder. ACR Consultants, Inc. reevaluated this site and recommends that the site is not eligible for the NRHP. The remaining 16 sites are considered not eligible for the NRHP. Additional information about the cultural sites that were documented in the survey area is included in the supplementary information document for this EIS, which is available on request.

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action and Alternative 1

Data recovery plans are required for any sites recommended eligible to the National Register following testing and consultation with the SHPO. Until consultation with SHPO has occurred and agreement regarding NRHP eligibility has been reached, all sites would be protected from disturbance.

Full consultation with SHPO must be completed prior to approval of the MLA mining plan. At that time, those sites determined to be unevaluated or eligible for the NRHP through consultation would receive further protection or treatment. Impacts to eligible or unevaluated cultural resources cannot be permitted. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties may be destroyed without further work.

Any eligible sites on the Eagle Butte West LBA Tract that cannot be avoided or that have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery plan is developed to address the impacts to the sites. The lead federal and state agencies would consult with Wyoming SHPO on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of but adjacent to mine permit areas.

3.12.2.2 No Action Alternative

Under the No Action Alternative, coal removal would not occur on from 2,395 up to 2,505 additional acres disturbed that would be disturbed under the Proposed Action or Alternative 1, respectively. Currently approved mining operations would continue on the existing Eagle Butte Mine leases. Impacts to cultural resources related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.12.3 Native American Consultation

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering, fasting, or vision quest sites. Other sites of cultural interest and importance may include rock art, stone circles, various rock features, fortifications or battle sites, burials, and locations that are sacred or part of the oral history and heritage but have no man-made features.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded to date within the general analysis area. However, the geographic position of the general analysis area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devils Tower to the north) creates the possibility that existing locations may have special religious or sacred

significance to Native American groups. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

Tribes that have been identified as potentially having concerns about actions in the PRB include the Crow, Northern Cheyenne, Shoshone, Arapaho, Oglala Sioux, Rosebud Sioux, Crow Creek Sioux, Lower Brule Sioux, Standing Rock Sioux, Cheyenne River Sioux, Apache Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Kiowa Tribe of Oklahoma. These tribal governments and representatives have been sent copies of the EIS. They are also being provided with more specific information about the known cultural sites on the tract in this analysis. Their help is being requested in identifying potentially significant religious or cultural sites in the general analysis area before a leasing decision is made on the Eagle Butte West LBA Tract.

Native American tribes were consulted at a general level in 1995-1996 as part of an update to the BLM *Buffalo Resource Area RMP*. Some of the Sioux tribes were consulted by BLM on coal leasing and mining activity in the PRB at briefings held in Rapid City, South Dakota in March 2002.

3.12.4 Regulatory Compliance, Mitigation and Monitoring

Class I and III surveys are conducted to identify cultural properties on all lands affected by federal undertakings. Prior to any mining disturbance, SHPO is consulted to evaluate the eligibility of the cultural properties for inclusion in the NRHP. Cultural properties that are determined to be eligible for the NRHP would be avoided or, if avoidance is not possible, a recovery plan would be implemented prior to disturbance.

Mining activities are monitored during topsoil stripping operations. If a lease is issued for the Eagle Butte West LBA Tract, BLM would attach a stipulation to the lease requiring the lessee to notify appropriate federal personnel if cultural materials are uncovered during mining operations (Appendix D).

3.12.5 Residual Impacts

Cultural sites that are determined to be eligible for the NRHP would be avoided if possible. Eligible sites that cannot be avoided would be destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP would be lost.

3.13 Visual Resources

3.13.1 Affected Environment

Visual sensitivity levels are determined by people's concern for what they see and their frequency of travel through an area. Landscapes within the general analysis area include rolling sagebrush and short-grass prairie, which are common throughout the PRB. There are also areas of altered landscape, such as oil fields and surface coal mines. The existing active surface coal mines located on the eastern side of the PRB

form three geographic groups that are separated by areas with no mining (refer to Figure 1-1). Two of the surface mine groups are located along the east side of State Highway 59, from south of Gillette to south of Wright, the third mine group is located on the east side of U.S. Highway 14-16, from Gillette north for about 13 miles. Other man-made intrusions include ranching activities (fences, homesteads, and livestock), oil and gas development (pumpjacks, pipeline ROWs, CBNG well shelters, and CBNG compressor stations), transportation facilities (roads and railroads), environmental monitoring installations, road signage, and electrical power transmission lines. The natural scenic quality in and near the immediate lease area is fairly low because of the industrial nature of the adjacent existing mining operations and high density oil and gas development.

VRM guidelines for BLM lands are to manage public lands for current VRM classifications and guidelines. The VRM system is the basic tool used by BLM to inventory and manage visual resources on public lands. The VRM classes constitute a spectrum ranging from Class I through Class V that provides for increasing levels of change within the characteristic landscape.

The inventoried lands were classified into VRM classes as follows:

- Class I – Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.
- Class II – Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.
- Class III – Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.
- Class IV – Activity attracts attention and is a dominant feature of the landscape in terms of scale.
- Class V – This classification is applied to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the 2001 BLM Buffalo RMP update (BLM 2001a). The inventoried lands were classified into VRM classes. In the general analysis area, the predominant VRM class is Class IV for lands not yet disturbed by mining and Class V for lands that have already been disturbed by mining. For lands classified as VRM Class IV, activities, such as mining, attract attention and are dominant features of the landscape in terms of scale. Class V applies to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action and Alternative 1

State Highway 14-16 crosses the eastern portion of the Eagle Butte West LBA Tract; however, FCW proposes to move the road, as discussed in Section 3.15, below. It is likely that some mining activities on the LBA tract would be visible from this major travel route whether it is moved or remains in its current location.

If the Eagle Butte West LBA Tract is leased and mined, the portions of the general analysis area that would be disturbed under the Proposed Action or Alternative 1 would be considered as VRM Class V prior to reclamation. After reclamation of the LBA tract and adjoining mines, the areas classified as Class V would improve to resemble the surrounding undisturbed terrain. No visual resources that are unique to this area have been identified on or near the Eagle Butte West LBA Tract.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) and gentler (less steep) than undisturbed terrain and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

3.13.2.2 No Action Alternative

Under the No Action Alternative, coal removal would not occur on from 2,395 up to 2,505 additional acres that would be disturbed under the Proposed Action or Alternative 1 and the current VRM Class IV and V designations would not change for those lands. Currently approved mining operations would continue on the existing Eagle Butte Mine leases. Impacts to visual resources related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.13.3 Regulatory Compliance, Mitigation and Monitoring

Landscape character would be restored during reclamation to approximate original contour and would be reseeded with an approved seed mixture, including native species.

See Section 3.2 and Section 3.9 for additional discussion of the regulatory requirements, mitigation, and monitoring for topography and vegetation.

3.13.4 Residual Impacts

No residual impacts to visual resources are expected.

3.14 Noise

3.14.1 Affected Environment

Existing noise sources in the general analysis area include coal mining activities, traffic on the nearby highways and county roads, rail traffic, aircraft traffic to and from the nearby airport, wind, and CBNG compressor stations. Noise originating from CBNG development equipment (e.g., drilling rigs and construction vehicles) is apparent locally over the short term (i.e., 30 to 60 days) where well drilling and associated construction activities are occurring. The amount of noise overlap between well sites is variable and depends on the timing of drilling activities on adjacent sites and the distance between the site locations.

Studies of background noise levels at PRB mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. The unit of measure used to represent sound pressure levels (decibels) using the A-weighted scale is a dBA. It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies. Figure 3-20 presents noise levels associated with some commonly heard sounds.

No site-specific noise level data are available for the proposed lease area. Because the Eagle Butte Mine is adjacent to the proposed LBA tract, the current median noise level is estimated to be 40-60 dBA for day and night, with the noise level increasing with proximity to active mining operations at the adjacent mine. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992).

OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) that determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. The air overpressure created by blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 2,500 ft (0.47 mile), the intensity of this blast would be reduced to 55 dBA. A noise level below 55 dBA does not constitute an adverse impact.

The nearest occupied dwellings in the general analysis area include one residence that is located within the LBA tract as applied for and seven residences that are located within the northern portion of the BLM study area under Alternative 1. Numerous other dwellings are located within a two-mile radius of the Eagle Butte West LBA Tract configured under Alternative 1. The Rawhide School is located within the northern portion of the BLM study area and the Gillette-Campbell County Airport is located immediately adjacent to the southern portion of the BLM study area. Figure 3-8 depicts the locations of occupied residences, the school building, and the airport facility with respect to the Eagle Butte West LBA Tract. As discussed in Section 2.2, BLM has made a preliminary determination that the area occupied by the Rawhide school and the seven

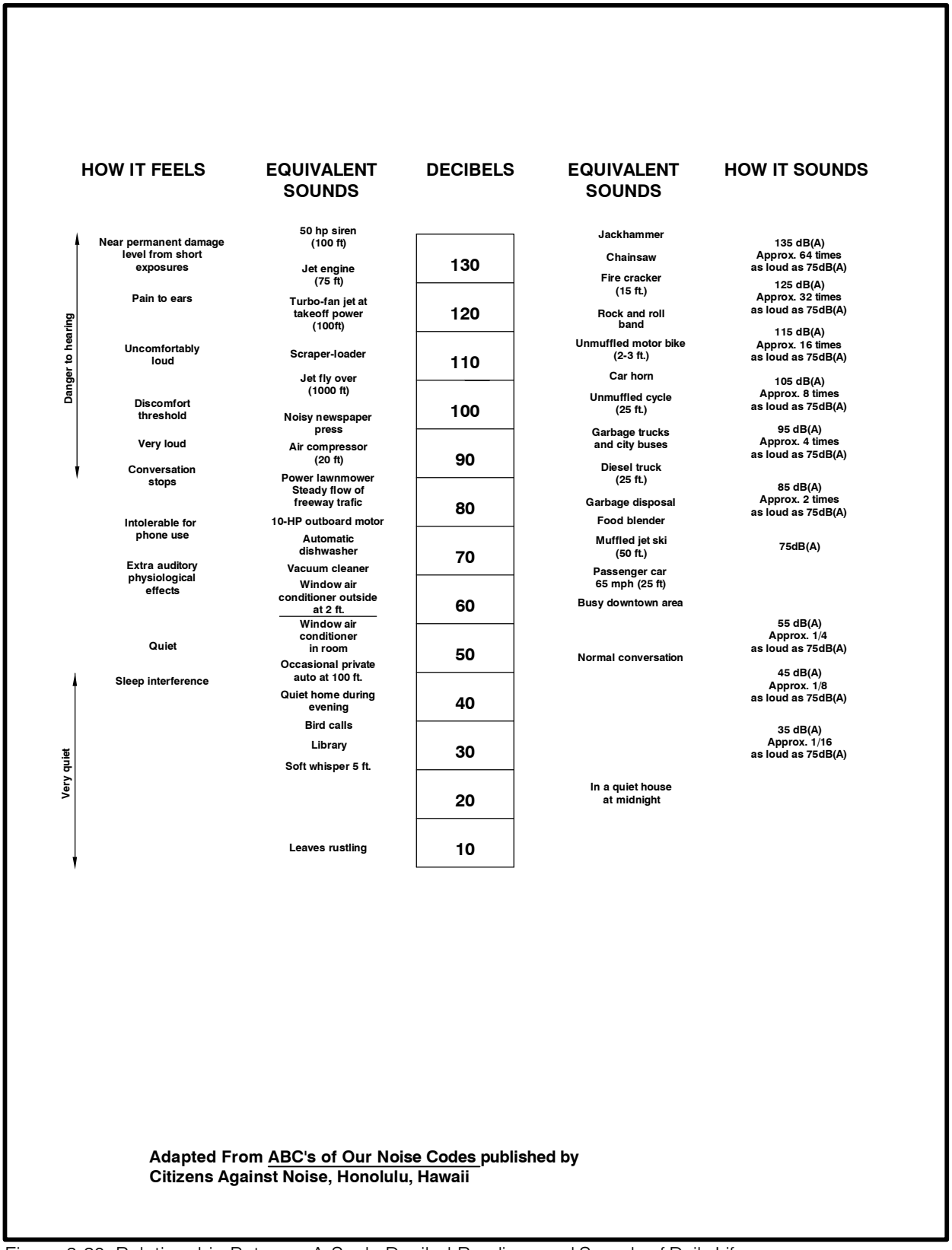

Figure 3-20. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.

residences in the northern portion of the BLM study area (the N½ of Section 20, T.51N., R.72W.) will not be included in any tract that is offered for lease.

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action and Alternative 1

Noise levels on the LBA tract would be increased considerably by mining activities such as blasting, loading, hauling, and possibly in-pit crushing. Since the LBA tract would be mined as an extension of existing operations under the Proposed Action or Alternative 1, 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.

The nearest public facilities and occupied dwellings to the Eagle Butte West LBA Tract include the Rawhide School, Gillette-Campbell County Airport, and eight residences located within the LBA tract as applied for and Alternative 1. Two of these residences are owned by FCW and would be removed if the LBA tract is leased. Therefore, noise impacts at these two occupied dwellings are not considered in this analysis. As discussed above, BLM has made a preliminary determination not to include the N½ of Section 20, T.51N., R.72W., where the school and remaining six occupied residences are located, in any tract that is offered for lease. The six occupied dwellings, the Rawhide School, and the airport would experience an adverse noise impact if mining activities (particularly blasting) occur within 2,500 ft of them under either the Proposed Action or Alternative 1.

Because mining is already ongoing in the area, noise impacts would not be noticeably different than existing conditions off-site. Wildlife in the immediate vicinity of mining may be adversely affected by the noise of the mining operations. Anecdotal observations at surface coal mines in the area suggest that some wildlife may adapt to increased noise associated with coal mining activity. After mining and reclamation are completed, noise would return to premining levels.

3.14.2.2 No Action Alternative

Under the No Action Alternative, coal removal and the associated noise impacts would not occur on from 2,395 up to 2,505 additional acres that would be disturbed under the Proposed Action or Alternative 1, respectively. Currently approved mining operations and associated noise impacts would continue on the existing Eagle Butte Mine leases. Noise impacts related to mining operations at the Eagle Butte Mine would not extend onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.14.3 Regulatory Compliance, Mitigation and Monitoring

Mine operators are required to comply with MSHA regulations concerning noise, which include protecting employees from hearing loss associated with noise levels at the mines. MSHA periodically conducts mine inspections to ensure compliance with the requirements of the Federal Mine Safety and Health Act of 1977.

3.14.4 Residual Impacts

No residual impacts to noise are expected.

3.15 Transportation

3.15.1 Affected Environment

Transportation resources near the Eagle Butte West LBA Tract include U.S. Highway 14-16, State Highway 59, an improved two-lane county road (Hannum Road), several improved and unimproved local roads and accesses, numerous two-track trails, the Eagle Butte Mine BNSF railroad spur, oil and gas pipelines, utility/power lines, telephone lines, and associated ROWs. The Gillette-Campbell County Airport is located directly south of the LBA tract. Figure 3-21 depicts the current transportation facilities, excluding the oil and gas pipelines, within and near the proposed lease area. Figure 3-22 depicts the oil and gas pipelines within and near the proposed lease area.

U.S. Highway 14-16, State Highway 59, and Hannum Road are the major north-south public transportation corridors, while the principal east-west public transportation corridors are State Highway 59 and Hannum Road. Access to the Eagle Butte West LBA Tract is on unnamed local access roads and two-track trails off of U.S. Highway 14-16, which crosses the eastern edge of the proposed lease area. These highways and improved roads all provide public and private access within the general analysis area. The unimproved local access roads and trails in the area are primarily for private use.

The nearest railroad facilities are the BNSF Railroad spurs accessing the surface mines along the eastern edge of the PRB. The Buckskin Mine railroad loop is the northern terminus of a series of spur lines that serve the surface coal mines and extends approximately 13 miles north of Gillette. The individual spur lines connect each of the mines to the railroad for the purpose of transporting the coal out of the eastern PRB once it is mined.

The Gillette-Campbell County Airport complex consists of two runways (7,500 and 5,803 ft in length) and averages 44 aircraft operations per day. Approximately 53 percent of the airport's traffic is related to transient general aviation (general aviation operating away from their home base).

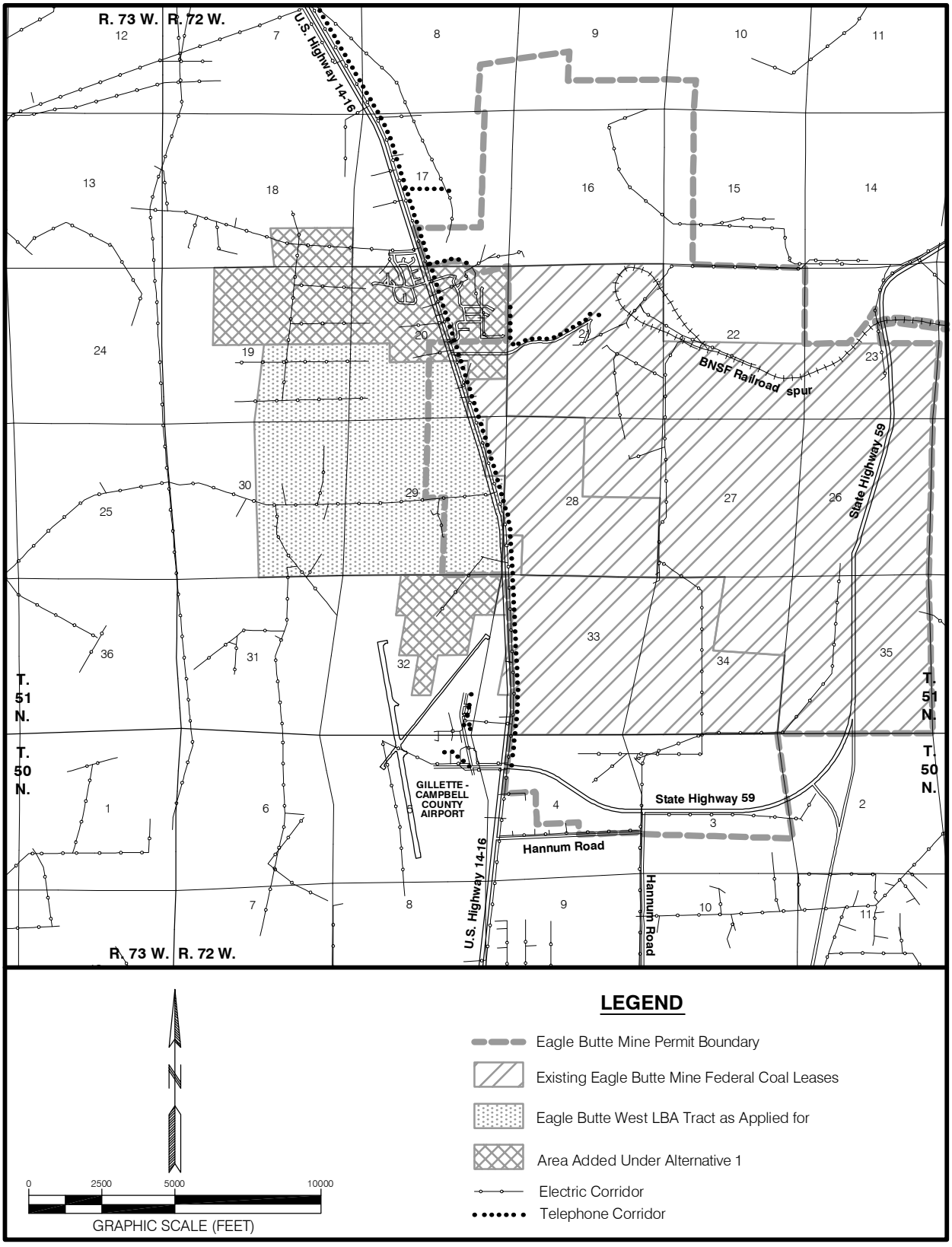

Figure 3-21. Transportation Facilities Within and Adjacent to the Eagle Butte West LBA Tract.

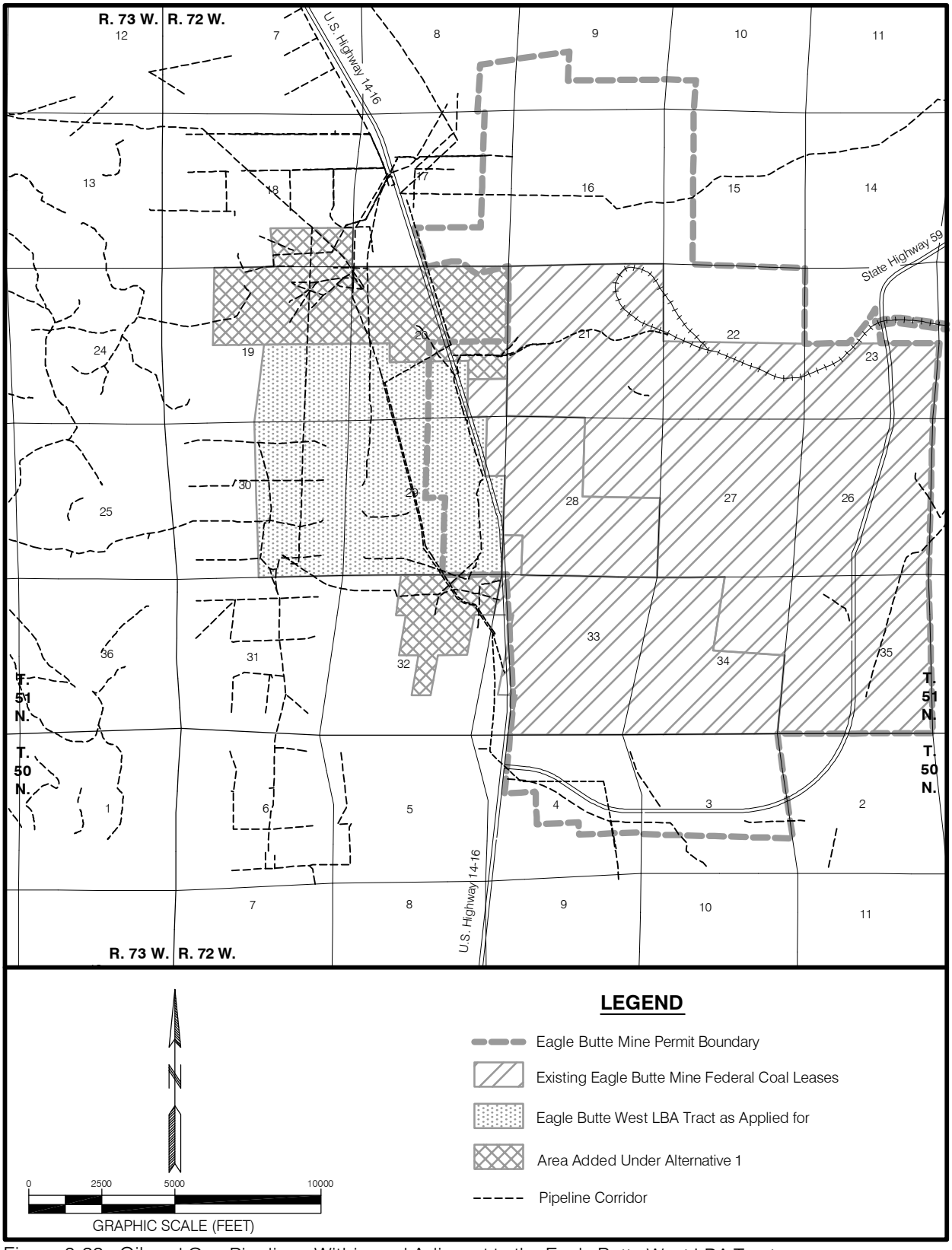

Figure 3-22. Oil and Gas Pipelines Within and Adjacent to the Eagle Butte West LBA Tract.

3.15.2 Environmental Consequences

3.15.2.1 Proposed Action and Alternative 1

Essentially all of the coal mined on the LBA tract would be transported by rail system. Since the Eagle Butte West LBA Tract would be an extension of the existing Eagle Butte Mine operations, the existing rail infrastructure would be used during mining of the proposed lease area. BNSF has upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected for the PRB, with or without the leasing of the proposed Eagle Butte West LBA Tract.

Active pipelines and utility/power transmission lines currently cross the LBA tract. Any relocation of these pipelines and utility lines would be handled according to specific agreements between the coal lessee and the pipeline and utility owners, if the need arises. There would be additional surface disturbance associated with construction when pipeline is relocated.

As discussed in Chapters 1 and 2, not all of the coal included in the Eagle Butte West LBA Tract is mineable. Some of the coal included in the tract under both the Proposed Action and Alternative 1 is overlain by U.S. Highway 14-16 ROW. This coal has been determined to be unsuitable for mining according to coal leasing unsuitability criterion 3 [43 CFR 3461(c)]. This determination is based on SMCRA, which prohibits mining within 100 ft of the outside ROW line of any public road unless the appropriate public road authority allows the road to be relocated or closed after public notice, an opportunity for a public hearing, and a finding that the interests of the affected public and landowners will be protected [30 CFR 761.11(d)]. The coal underlying U.S. Highway 14-16 is included in the tract being considered for leasing because the coal under the highway could be mined if the authorized public road authority determines that the road could be moved [see 43 CFR 3461.5(c)(2)(iii) and discussion in Section 2.1]. If the road is not moved, including the coal underlying the highway in the lease would allow maximum recovery of all the mineable coal adjacent to the highway ROW and buffer zone (100 ft on either side of the highway ROW).

FCW is proposing to obtain approval from the public road authority in Wyoming, WYDOT, to relocate U.S. Highway 14-16 so that the coal underlying the highway ROW and buffer zone can be recovered. FCW estimates that moving the highway would allow an estimated 25 million tons of coal underlying the highway ROW and buffer zone within the Eagle Butte West LBA Tract to be recovered under the Proposed Action (see Tables 2-2 and 2-3). Under Alternative 1, FCW estimates that up to 26 million additional tons of coal would be recoverable within the Eagle Butte West LBA Tract if U.S. Highway 14-16 were moved. Several of the existing Eagle Butte Mine leases located east of U.S. Highway 14-16 also include federal coal underlying the highway, and those additional coal reserves

would be recoverable if the highway is moved.

U.S. Highway 14-16 is a major public transportation route that is utilized by a large number of businesses (i.e., mining, CBNG development, agricultural) for transporting their products to and from the marketplace, as well as by many citizens commuting to and from the city of Gillette for jobs, business, shopping, and pleasure. Relocating the highway would affect the distances that these businesses and citizens would have to drive, which would potentially result in increased fuel costs. Relocating the highway could also affect the time it takes emergency vehicles to respond to fires, accidents, and medical emergencies.

In a public open house held by WYDOT at the Tower West Lodge in Gillette on February 7, 2006, FCW presented three potential relocation routes for U.S. Highway 14-16. The purpose of the open house was to provide information and gather public feedback for the proposed highway relocation. Figure 3-23 presents the three proposed alternative routes (Alternatives A, B, and C) for the U.S. Highway 14-16 relocation.

As depicted in Figure 3-23, the Alternative A route would result in an additional one-way travel distance of approximately 1.5 miles, the Alternative B route would result in an additional one-way travel distance of approximately 0.25 mile, and the Alternative C route would add approximately 5.6 miles of additional one-way travel distance. Alternative A would require 6.8 miles of new highway construction, Alternative B would require 2.7 miles of new highway construction, and Alternative C would require 3.7 miles of new highway construction. There would be additional surface disturbances associated with road construction of the Alternative A and C routes, although the Alternative B route would be across a backfilled pit that is partially reclaimed within Eagle Butte Mine's current permit area.

There are unmined coal resources underlying much of the Alternative A route, which would potentially mean that another relocation would be needed in the future, if that alternative is chosen. The coal has already been removed underlying the Alternative B route, and no coal is present under the Alternative C route.

People who attended the open house in Gillette on February 7, 2006 and who subsequently submitted comments to WYDOT generally expressed a preference for Alternative B, which represents the shortest additional travel distance of the three proposed alternative routes. The Campbell County Board of Commissioners also endorsed the Alternative B route (Gillette News Record 2006a).

WYDOT is evaluating FCW's proposal to relocate U.S. Highway 14-16. A subsurface geotechnical study was recently conducted by FCW to evaluate the Alternative B route across Eagle Butte Mine's backfill area. Based on the public's preference for Alternative B and the results of the geotechnical study,

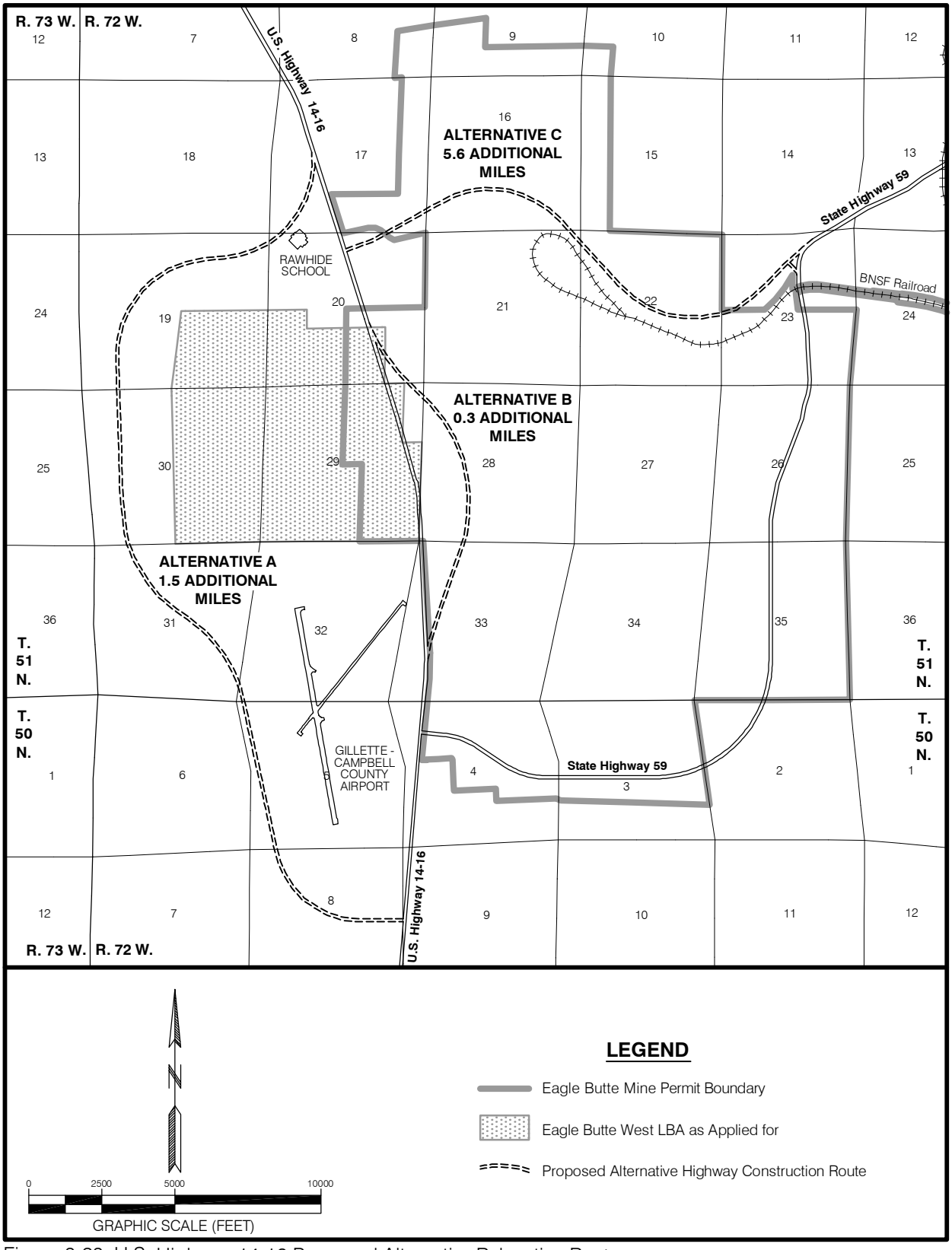

Figure 3-23. U.S. Highway 14-16 Proposed Alternative Relocation Routes.

WYDOT has indicated that moving the highway onto the backfill (Alternative B) is feasible. WYDOT must next make a decision as to whether the highway should be moved permanently or temporarily (Holwell 2006).

Actions that will temporarily or permanently relocate a public highway or will require redesign of a highway require the designated regulatory authority to conduct its own public process and NEPA evaluation. According to WYDOT, FCW is required to obtain the necessary construction permits and provide a NEPA document (WYDOT 2005). Generally, WYDOT leads the design effort and conducts public meetings to obtain input on alignment, safety items, construction methods, schedule, and other factors prior to selecting a route. The final design is then completed and construction scheduled. FCW is interactive in the process and typically covers the costs related to all steps of work. This would likely be a design-build project by a firm or team of firms that is approved by WYDOT. The project steps are directed by WYDOT according to a previously defined procedure to ensure that the constructed roadway achieves all objectives for the involved parties.

It would not be necessary to relocate State Highway 59 in order to recover the coal included in the Eagle Butte West LBA Tract. Highway 59 has been relocated in advance of mining operations at the Eagle Butte Mine twice previously.

Mining the Eagle Butte West LBA Tract as applied for would not bring FCW's operations any closer to the Gillette-Campbell County Airport than they currently are; however, mining activities would continue at existing levels for an additional eight years. If the southern portion of BLM's study area is included in the tract that is offered for lease, FCW's mining operations would be considerably closer to the airport's runways than the current Eagle Butte mining operations are and could be extended at existing production levels for an additional 12 years. The airport is a vital component of transportation to many of the area's businesses and citizens and any disruptions to the operations of the airport by mining activities would have an impact upon those who depend on air travel. Concerns that were expressed by the airport with regard to potential conflicts between mining activities and the airport and its air traffic include:

1) Mobile mining equipment, topsoil stockpiles, overburden backfill peaks, restored topographic features, etc. may intrude within the airport's protected airspace. Under Federal Aviation Regulation Part 77, an airport's airspace must be protected by a 7:1 slope, at least up to a limit that provides a 50-ft terrain and obstacle clearance.

2) Blasting effects (air turbulence and airborne blasting debris, or flyrock) may impact the airport facilities and aircraft landing and departing the airport. If

the southern portion of the BLM study area under Alternative 1 is included in the tract that is offered for lease and mining occurs in the area between the two runways, blasting would eliminate most options to aircraft that are landing or departing and would most likely result in airport operational delays.

3) The relocation of Highway 14-16 may impact convenient public airport access and access of the airport's commercial water load-out facility. Convenient public access to the airport and access to the airport's commercial water loadout facility would both potentially be affected if U.S. Highway 14-16 relocation route Alternative A is selected, but would not be changed under Alternatives B or C. The airport currently relies on its commercial water loadout facility as a major source of revenue.

4) The location of the Eagle Butte LBA Tract may impact future airport expansion plans. The airport's Master Plan calls for future expansion of a runway and facilities to the north, which would require future property acquisition to the north. Depending upon the location of the final coal lease boundary that is selected by the BLM, the airport expansion would potentially be delayed by eight or more years.

5) Mining operations north of the airport may result in increased particulate (dust) drifting onto the airport due to the prevailing winds from the north and northwest, thus decreasing visibility for aircraft landing and departing.

6) Mining operations may potentially affect the airport's water supply well, which is completed in the Fort Union Formation at a depth of about 1,200 ft. The depth of the well indicates that is it completed below the mined coal seams and would not be directly affected by coal removal and reclamation operations in the Eagle Butte West LBA Tract.

Extending the life of the Eagle Butte Mine by eight to 12 years, depending on which alternative is selected, would help to maintain current use levels at the airport, which helps assure availability of regular airline service to citizens and businesses.

3.15.2.2 No Action Alternative

Under the No Action Alternative, coal removal would not occur on from 2,395 up to 2,505 additional acres that would be disturbed under the Proposed Action or Alternative 1, respectively, and the transportation resources located in those areas would not be affected by mining. Relocation of U.S. Highway 14-16 would be necessary to allow recovery of the coal resources located under the highway. Currently approved mining operations and any associated impacts to transportation resources

would continue on the existing Eagle Butte Mine leases. Impacts related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.15.3 Regulatory Compliance, Mitigation and Monitoring

The regulatory requirements regarding transportation facilities require that existing pipelines and utility lines be relocated, if necessary, in accordance with specific agreements between the coal lessee and the pipeline and utility owners.

The Eagle Butte Mine obtained a permit from the FAA while mining operations were conducted within the approach surface of the Gillette-Campbell County Airport's cross-wind runway. That permit included specific requirements for lighting of mine equipment and establishment of protocols and notification procedures when mining activities were conducted within designated areas. The mine would pursue the necessary permits from the FAA prior to mining the Eagle Butte West LBA Tract, if it is leased. Those permits would include specific requirements for conducting mining operations on the Eagle Butte West LBA Tract. The mine has indicated they would work with the airport to design a post-mine topography that would not impact protected airspace and would meet with the airport's approval.

Blasting would be conducted in accordance with Chapter 6 of the WDEQ Rules and Regulations. These regulations establish vibration standards that were developed to protect structures. A pre-blast survey of the airport complex was conducted in 2001, and a follow-up survey would be conducted if required.

Eagle Butte's current mining and reclamation plan includes requirements to control fugitive dust in accordance with WDEQ/AQD requirements for BACT. Management practices that are used to control fugitive dust include timely reclamation, seeding and, in some cases, ripping soils to control erosion. The Eagle Butte Mine has purchased larger water trucks to increase dust control efficiency.

3.15.4 Residual Impacts

If WYDOT's evaluation concludes that U.S. Highway 14-16 can be relocated, and if the highway is relocated permanently, the residual impacts would include increased transportation and/or labor costs to businesses and citizens traveling to and from Gillette. The amount of the increased cost would depend upon the chosen relocation route. No other residual impacts to transportation facilities are expected.

3.16 Hazardous and Solid Waste

3.16.1 Affected Environment

Potential sources of hazardous or solid waste on the Eagle Butte West LBA Tract would include spilled, leaked or dumped hazardous substances, petroleum products, and/or solid waste associated with coal and oil and gas exploration, oil and gas development, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present on the Eagle Butte West LBA Tract. Wastes produced by current mining activities at the Eagle Butte Mine are handled according to the procedures described in Section 2.1.2.

3.16.2 Environmental Consequences

3.16.2.1 Proposed Action and Alternative 1

If the applicant mine acquires the LBA tract, the wastes that would be generated in the course of mining the tract would be similar to those currently being generated by the existing mining operation. The procedures that are used for handling hazardous and solid wastes at the existing mine are described in Chapter 2, Section 2.1.2. Wastes generated by mining the Eagle Butte West LBA Tract would be handled in accordance with the existing regulations using the procedures currently in use and in accordance with WDEQ-approved waste disposal plans at the Eagle Butte Mine.

3.16.2.2 No Action Alternative

Under the No Action Alternative, coal removal would not occur on from 2,395 up to 2,505 additional acres that would be disturbed under the Proposed Action or Alternative 1, respectively, and no waste materials would be generated as a result of coal removal on the tract. Currently approved mining operations would continue on the existing Eagle Butte Mine leases. Impacts related to mining operations at the Eagle Butte Mine would not be extended onto portions of the LBA tract that will not be affected under the current mining and reclamation plan.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.16.3 Regulatory Compliance, Mitigation and Monitoring

The regulatory requirements regarding production, use, and/or disposal of hazardous or extremely hazardous materials are discussed in Section 2.1.2. All mining activities involving the hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

3.16.4 Residual Impacts

No residual hazardous and solid waste impacts are expected.

3.17 Socioeconomics

The social and economic study area for the proposed project includes Campbell County and the City of Gillette. The community of Gillette would most likely attract the majority of any new residents due to its current population levels and the availability of services and shopping amenities.

3.17.1 Local Economy

3.17.1.1 Affected Environment

Coal production reported to the Wyoming State Inspector of Mines, showed Wyoming's coal mines set a new annual production record of 404.5 million tons in 2005. This was an increase of 2.2 percent over the 395.7 million tons produced in 2004. PRB coal production (from Campbell and Converse Counties, 13 active mines) represented more than 96 percent of the state coal production in 2005 and increased 2.3 percent from 2004 to 2005 (381.6 million tons to 390.3 million tons). Campbell County coal production (12 active mines in 2004 and 2005) increased by 2.4 percent (351.9 million tons to 360.3 million tons) from 2004 to 2005 (Wyoming Department of Employment 2004 and 2005).

In the first quarter of 2005, 29 percent of the total employment and 45 percent of the total payroll in Campbell County were attributed to the mining sector, which also includes oil and gas employment (Wyoming Department of Employment 2005b). In 2005, Campbell County employment grew faster than the statewide average (8.1 percent versus 3.3 percent change). Job growth occurred in construction, trade, manufacturing, transportation and utilities, and local government, but the most dramatic increase was in the mining sector (Wyoming Department of Employment 2006).

In 2004, the greatest source of revenue to the state and federal governments from federal coal was lease bonus bids, which are paid to the federal government for the right to enter into lease agreements for federal coal. Bonus bids are paid in five annual installments; the state receives half of each installment. In 2004 and 2005, BLM held competitive sealed-bid lease sales for six coal tracts (NARO South, West Antelope, West Hay Creek, Little Thunder, West Roundup, and NARO North). The successful bonus bids for these six lease sales ranged from 30 cents per ton to 97 cents per ton and totaled $1.69 billion (BLM 2006c).

Annual bonus bid payments from the six lease sales total $338.2 million. Combined with remaining bonus bid payments from lease sales held in previous years of $90.1 million, the annual bonus bid payment total for 2004 was $428.3 million, derived directly from federal coal in Campbell and Converse Counties.

Wyoming, Campbell County and the cities and towns in the county receive revenue from a variety of taxes and royalties on the production of federal coal in addition to the bonus bids. These include ad valorem taxes, severance taxes, royalty payments, and sales and use taxes and required

contributions to the AML program and the Black Lung Disability Trust Fund.

The royalties are collected by the federal government at the time the coal is sold and equal 12.5 percent of the sale price. Royalty and bonus bids are divided equally with the State of Wyoming, while half of Wyoming's AML contributions are earmarked for later use in the state. Additional sources of revenue include federal income tax and annual rentals that are paid to the government.

Sales and use taxes are distributed to cities and towns within the county and to the county's general fund. According to the Excise Tax Division of the Wyoming Department of Revenue (2004), the sales and use taxes collected from coal mines and coal mining-related services in Campbell County in FY 2004 was $8.2 million.

In 1994, the University of Wyoming estimated that the total fiscal benefit to the State of Wyoming for coal produced in the PRB was $1.10 per ton (Borden et al. 1994). This study did not include AML fees or bonus bid payments in the calculation for fiscal benefits to the State of Wyoming. Calculating the estimated total fiscal benefit to the State of Wyoming in 2005 by including half of the bonus bid payments, half of the federal mineral royalties based on current prices, half of the AML fees, and all of the ad valorem taxes, severance taxes, and sales and use taxes for coal produced in Campbell County in 2005 results in an estimated $661 million, or $1.62 per ton. Figure 3-24 depicts the estimated total revenues to state and federal governments from 2005 coal production in Campbell County.

Recent GDP calculations for Wyoming (2002) indicate that the minerals industry accounted for 22 percent of the GDP, which made it the largest sector of the Wyoming economy. Mining alone accounted for 8.7 percent of the Wyoming GDP (Wyoming Department of Administration and Information 2005).

3.17.1.2 Environmental Consequences

3.17.1.2.1 Proposed Action and Alternative 1

The federal and state revenues that would be generated by leasing and mining the Eagle Butte West LBA Tract would depend on which alternative is selected and the sale price of the coal. Average PRB coal prices were slightly higher in 2004 than in 2003 (WSGS 2005b). WSGS estimates that the average price for PRB coal will range from $6.67 to $6.91 from 2006 through 2010 (WSGS 2005b). For the coal included in the Eagle Butte West LBA Tract, which has an average Btu value of a little under 8,400, an average price of $5.80 per ton is estimated.

Using the coal tonnages shown in Table 3-1, projected federal and state revenues for the Eagle Butte West LBA Tract are presented in Table 3-11, assuming an average coal price of $5.80 per ton recovered and a potential range of bonus payments on

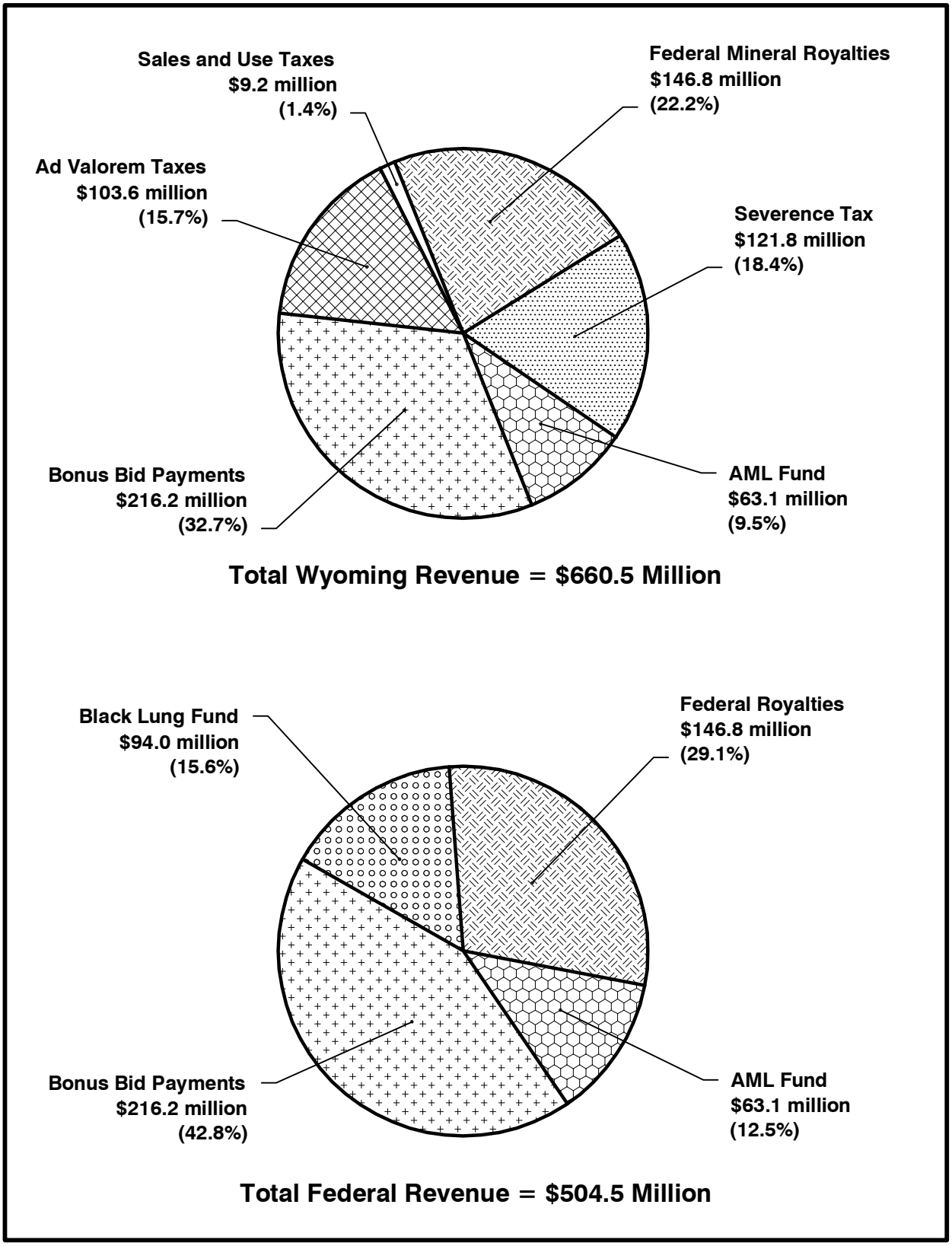

Figure 3-24. Estimated Wyoming and Federal Revenues from 2005 Coal Production in Campbell County.

Table 3-11. Projected Socioeconomic Impacts from Leasing the Eagle Butte West LBA Tract Under the Proposed Action or Alternative 1 – Assuming That Highway 14-16 Is Not Moved And The Coal Underlying The Highway Is Not Recovered.

Item	No Action Alternative (Existing Eagle Butte Mine)	Added by Proposed Action	Added by Alternative 1
State Revenues	$ 394.5 mm	$ 267.2 to $ 337.9 mm	$ 349.5 to $ 499.5 mm
Federal Revenues	$ 261.6 mm	$ 187.9 to $ 258.5 mm	$ 277.6 to $ 382.3 mm
Increased Mine Life	0 yrs	8.1 yrs	12.0 yrs
Additional Employees	0	0	0

the leased (minable) coal of 30 to 97 cents per ton.

If the Eagle Butte West LBA Tract is leased and mined under the Proposed Action, the potential additional federal revenues would range from approximately $188 to $259 million. Under Alternative 1, the potential additional federal revenues would range from about $278 million to $382 million.

If the LBA tract is leased and mined under the Proposed Action, the potential additional state revenues would range from approximately $267 to $338 million. Under Alternative 1, potential additional state revenues would range from about $350 to $500 million.

The base of economic activity provided by wages and local purchases would continue for from eight up to 12 additional years, depending on which alternative is selected.

3.17.1.2.2 No Action Alternative

Under the No Action Alternative, the coal included in the LBA tract under the Proposed Action or Alternative 1 (from about 203.0 million tons up to as much as 300 million tons, if Highway 14-16 is not moved) would not be recovered and the economic benefits associated with mining that coal would not be realized by the local, state, or federal governments. Currently approved mining operations and associated economic benefits would continue on the existing Eagle Butte Mine leases for approximately 13.6 more years.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.17.2 Population

3.17.2.1 Affected Environment

Campbell County had a population of 33,698 in 2000 and an estimated population of 37,812 in 2004. This represents a 12.2 percent growth rate

since 2000 and makes Campbell County the second fastest growing county in the state. Campbell County's population ranks it as the fourth largest of Wyoming's 23 counties and Gillette is the fourth largest city in the state, following only Cheyenne, Casper, and Laramie (USDOC 2000, CCEDC 2006, and Wyoming Department of Administration and Information 2005).

Gillette's population totaled 17,054 in 1987 and, since then, the population has generally grown steadily (City of Gillette 2004). According to census data, by 2000 Gillette's population was 19,646. Between 1990 and 2000, Gillette grew by 2,011 persons, averaging 1.1 percent per year. In 2003, Gillette accounted for 21,840, or 60 percent, of the county's residents (USDOC 1990 and 2000 and Wyoming Department of Administration and Information 2005).

3.17.2.2 Environmental Consequences

3.17.2.2.1 Proposed Action and Alternative 1

As indicated by Table 3-11, leasing and subsequently mining the LBA tract would extend the life of the Eagle Butte Mine, and current employment at the mine, from eight to as much as12 years at the current rate of production, depending on which tract configuration is selected. Average yearly employment at the mine would not increase under the Proposed Action or Alternative 1. It is likely that if any additional employees would be needed at the Eagle Butte Mine they would be available from the existing workforce in Campbell County and no influx of new residents would occur as a result of filling those new positions.

3.17.2.2.2 No Action Alternative

Under the No Action Alternative, the coal included in the LBA Tract would not be mined and population levels would not be affected by mining operations on the LBA tract, which would be extended by eight to 12 additional years under the Proposed Action or Alternative 1, respectively. Currently approved mining operations and associated employment levels would continue on the existing Eagle Butte Mine leases for approximately 13.6 more years.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.17.3 Employment

3.17.3.1 Affected Environment

Coal mining has changed a great deal since the 1970s, and new technologies have been a major contributor to these changes. The local coal mining labor force grew during the 1970s. Between 1980 and 1998, overall production rose while employee numbers generally decreased or remained constant. The employment declines followed large industry capital investments in facilities and production equipment, the majority of which were aimed at

increasing productivity. Direct employment in Campbell County at coal mines increased from 3,011 to 4,168 between 1998 and 2005 (Wyoming Department of Employment 1998 and 2005).

The mining sector, which includes oil and gas workers, accounts for almost 28 percent of all employment in Campbell County, nearly four times the statewide percentage.

In 2005, around 6,007 people were directly employed by surface coal mines or coal contractors in Campbell County, representing about 25 percent of the employed labor force (Wyoming Department of Employment 2005). Campbell County also has slightly higher percentages of construction and wholesale trade employment, which is keeping with the development demands of continuing growth and the county's position as a commercial center for northeast Wyoming.

3.17.3.2 Environmental Consequences

3.17.3.2.1 Proposed Action and Alternative 1

Leasing and subsequently mining the Eagle Butte West LBA Tract would extend the life of the Eagle Butte Mine from eight to as much as 12 years, depending on which tract configuration is selected. As discussed above, average yearly employment at the mine would not increase under the Proposed Action or Alternative 1. In July 2005, the unemployment rate in Campbell County was 2.7 percent (641 persons) (Wyoming Department of Employment 2005d). It is likely that if any additional employees would be needed they would be available from the existing workforce in Campbell County, depending on the timing of the hiring at the mine as compared to the timing of hiring for other ongoing and proposed projects in the county, which are discussed in Section 4.1. The economic stability of the community of Gillette would benefit by having the current Eagle Butte Mine workforce living in the community and employed at the mine for up to 12 additional years.

3.17.3.2.2 No Action Alternative

Under the No Action Alternative, the coal included in the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1 would not be mined and mining operations and associated employment would not be extended by as much as 12 additional years. Currently approved mining operations and associated employment would continue on the existing Eagle Butte Mine leases for approximately 13.6 more years to recover the coal in the existing leases.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.17.4 Housing

3.17.4.1 Affected Environment

According to a 2001 report on housing needs in Campbell County, roughly 61 percent of PRB surface

coal mining employees live in Gillette and surrounding areas, 14 percent live in Wright, and 25 percent live outside of Campbell County (BLM 2003a).

There were 11,538 housing units in Campbell County reported in the 1990 census. The 2000 census counted 13,288 housing units in Campbell County, of which 12,207 were occupied at the time. There were 8,989 (73.6 percent) owner occupied units and 3,218 (26.4 percent) occupied rental units (U.S. Census Bureau 2000).

The number of housing units in Gillette increased from 7,078 in 1990 to 7,931 in 2000, an increase of 12 percent. From 2000 to 2004, 1,472 additional units were built (or installed, in the case of manufactured units) in Gillette and Wright, alone, suggesting that the current housing stock in Campbell County is at least 14,760 units (CSI 2005). The number of units added in unincorporated, rural areas of Campbell County is not known because the county does not require building permits or certificates of occupancy for residential development in unincorporated areas (Braunlin 2004).

The types of housing units counted in 2000 included 6,698 single-family detached units, 794 single-family attached units, 2,276 multi-family units, 3,432 mobile homes, and 88 RVs, vans, or similar types of units. Subsequent construction added 561 single-family detached, 61 single-family attached, 498 manufactured homes, and 352 multi-family units in Gillette and Wright, plus an unknown number of single-family and manufactured units in rural areas. The resulting current totals are estimated at 7,259 single-family detached units (49.2 percent), 855 single-family attached units (5.8 percent), 2,628 multi-family units (17.8 percent), 3,930 mobile/manufactured units (26.6 percent), and 88 RV/vans (0.6 percent) (CSI 2005).

The overall vacancy rate in Campbell County in 1990 was 13.6 percent, although the homeowner vacancy rate was just 3.6 percent while rental vacancies were at 19.4 percent (U.S. Census Bureau 1990). By 2000, the overall vacancy rate in the county had dropped to 8.1 percent with the rate for rental units at 9.0 percent and the rate for owner units at 1.2 percent (U.S. Census Bureau 2000). Due to the population growth that has recently occurred in association with CBNG development, the housing vacancy rate within the City of Gillette has continued to decrease. Overall rates at the present time are not known, but a survey conducted in October 2004 estimated the vacancy rate of rental units to be 7.0 percent, based on a sample of approximately 40 percent of all rental units, mostly in larger complexes (CSI 2005). Some apartments had waiting lists. Vacancy rates in owner-occupied housing are probably still much lower than for rental units. Single-family unit vacancy in December 2004 was at 5.4 percent (City of Gillette 2004).

Several major subdivisions are planned in and around Gillette to provide additional housing. As of

January 2005, six developments were proposed for a total of 609 units (242 duplexes and 367 single-family homes) if they are constructed as planned (CSI 2005). The city of Gillette is trying to address the shortage of housing in the city by other means until new housing construction catches up with housing demand, including drafting regulations to allow RV's to be placed within existing mobile home parks and amending zoning rules dealing with temporary housing permits.

The average selling price of a house in Campbell County was $133,482 in 2002. Prices tend to be lowest in Wright and highest in unincorporated areas, with the City of Gillette in between. Average selling prices in the first three quarters of 2004 ranged from $78,189 for a manufactured home in Gillette to $230,601 for a site-built home in rural Campbell County (CSI 2005).

An October 2004 survey found average apartment rents ranging from $363 per month for an efficiency apartment to $572 per month for a three-bedroom unit (CSI 2005). In the fourth quarter of 2003, average rent for a house in Campbell County was $707 and the average rent for a mobile home was $590 (Wyoming Department of Administration and Information 2005).

In addition to permanent housing, temporary or transient housing is a consideration for any project that might have a construction component. Temporary housing can include hotels or motels, campgrounds, and possibly mobile home parks.

There are 17 motels in Gillette with 1,346 guest rooms, one additional 27-room motel in Wright, and a two-room bed and breakfast in Gillette. Hotel occupancy rates have recently been very high and several new hotels are proposed for construction (Gillette News Record 2006b). Gillette has two year-round commercial campgrounds with 150 hookups for RVs plus tent areas (Gillette Convention and Visitor's Bureau 2004). Campbell County has a multi-event facility, the CAM-PLEX, located in Gillette. It has 1,821 RV sites, which vary from 688 full service sites with rest rooms and shower facilities to electric only sites. The CAM-PLEX facilities are generally available only for scheduled special events, not for public camping (CAM-PLEX 2005).

Gillette also has approximately 1,595 mobile home park spaces. Mobile home parks are generally considered permanent housing resources, but they sometimes provide temporary spaces for RVs as well if there are vacant spaces available. As discussed above, the Gillette City Council is considering changing the existing regulations to allow RVs to be placed in mobile home parks for up to three years (Gillette News Record 2006c). As of early October 2004, the average vacancy rate in Gillette's mobile home parks was 35 percent, or 558 spaces (CSI 2005).

3.17.4.2 Environmental Consequences

3.17.4.2.1 Proposed Action and Alternative 1

As discussed above, average yearly employment at the mine would not increase under the Proposed Action and Alternative 1. Current employment levels would continue for from eight up to 12 additional years, but no additional demands on the existing infrastructure or services in the community would be expected. If any additional employees are needed at the Eagle Butte Mine, it is likely that housing would be available from the existing and proposed units in Campbell County.

3.17.4.2.2 No Action Alternative

Under the No Action Alternative, the coal included in the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1 would not be mined. The employees needed to recover the coal included in the tract would not affect housing occupancy for as much as 12 additional years. Currently approved mining operations and associated employment levels would continue on the existing Eagle Butte Mine leases for approximately 13.6 more years.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.17.5 Local Government Facilities and Services

3.17.5.1 Affected Environment

The availability of revenues generated by mineral production has helped local government facilities and services keep pace with growth and are adequate for the current population.

Campbell County School District No. 1's 2005 enrollment was stable at 7,500 students, making it the third largest school district in Wyoming. Enrollment has increased since the end of the 2005-2006 school year and some schools are becoming more crowded (Gillette News Record 2006d). The district facilities include: one high school (with two campuses) and two junior high schools in Gillette, a junior-senior high school in Wright and 15 elementary schools (including one in Wright and four in rural areas). The district also operates an alternative high school and aquatic center in Gillette (CCSD 2005).

The Campbell County Sheriff provides police protection throughout the county, except within the City of Gillette. In addition to general law enforcement, the Sheriff's staff provides court security, detention facilities, and animal control. For the 2004 fiscal year, the department budgeted for 60 law enforcement employees. Recent improvements have increased the Campbell County detention facility to 128 beds, which includes separate modules for women and juveniles (BLM 2005b).

Fire protection throughout Campbell County is provided by the Campbell County Fire Department, which is governed by a city-county joint powers board (Vonsik 2005). The department maintains four stations in Gillette and six dispersed throughout the county. The department has 17 full-time staff and 150 trained volunteers. In addition, there are 30 to 40 volunteers in outlying areas who are trained and equipped primarily to fight wildland fires. Campbell County coal mines generally provide equipment and trained staff to fight fires on mine property. The County Fire Department provides backup assistance with personnel and equipment (Vonsik 2005).

The primary medical care facility in Campbell County is Campbell County Memorial Hospital, a 90-bed acute care hospital. The hospital has a medical staff of over 50 affiliated physicians in 20 specialties and a total staff of 800 (CCMH 2005). The hospital also operates the Wright Clinic, a satellite clinic with a full-time, family practice physician. Ambulance service for Campbell County is provided by the hospital, which has a 24-hour emergency service capability. The Campbell County Fire Department provides first responder service to emergency calls, but transport is the responsibility of the hospital affiliated ambulance service (Vonsik 2005).

Water and wastewater treatment systems are provided by the City of Gillette. Gillette serves the city and some urbanized areas nearby from groundwater wells. The water system has the capacity to serve approximately 25,000 people. Water use approaches capacity during the summer months when parks and private lawns are being irrigated (Morovits 2005). An additional well field is being planned for completion in about five years. In the interim, the city has other wells it can pump if necessary, but high natural fluoride levels require careful monitoring if they are used (Morovits 2005). Gillette's sewer treatment system was designed for a service population of approximately 35,000 and improvements begun in the fall of 2004 were designed to increase treatment capacity to accommodate a projected population of 41,000. Currently, the system serves an estimated 25,000 people in the city and surrounding areas.

3.17.5.2 Environmental Consequences

3.17.5.2.1 Proposed Action and Alternative 1

As discussed above, average yearly employment at the mine would not increase under the Proposed Action and Alternative 1. Current employment levels would continue for from eight up to 12 additional years, but no additional demands on the existing infrastructure or services in the community would be expected. If any additional employees are needed at the Eagle Butte Mine, it is likely that the demand for public facilities and services would be satisfied by the existing facilities and services currently in place in Campbell County.

3.17.5.2.2 No Action Alternative

Under the No Action Alternative, the coal included in the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1 would not be mined. Local government facilities and services would not be affected by an extension of mining operations of up to 12 additional years at the Eagle Butte Mine. Currently approved mining operations and associated employment levels would continue on the existing Eagle Butte Mine leases for approximately 13.6 more years.

As discussed in Section 2.2, a decision to reject the Eagle Butte West lease application at this time would not preclude an application to lease the tract in the future.

3.17.6 Environmental Justice

3.17.6.1 Affected Environment

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations", was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

Communities within Campbell County, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of surface coal mines in the area. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of Environmental Justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning Environmental Justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with consultation and coordination described in Section 1.6 of this document. This EIS and contributing socioeconomic analysis provide a consideration of the impacts with regard to disproportionately adverse impacts on minority and/or low-income groups, including Native Americans.

3.17.6.2 Environmental Consequences

3.17.6.2.1 Proposed Action and Alternative 1

Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level make up "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole. Also, the Native American population is smaller than in the state as a whole and there are no known Native American sacred sites on or near the proposed LBA site. Consequently, implementation of the proposed project would not adversely affect the environmental justice considerations in the area.

3.17.6.2.2 No Action Alternative

Economic and demographic data indicate that neither minority populations nor people living at or below the poverty level make up "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole. Also, the Native American population is smaller than in the state as a whole and there are no known Native American sacred sites on or near the existing Eagle Butte Mine. Consequently, the No Action Alternative would not adversely affect the environmental justice considerations in the area.

3.17.7 Regulatory Compliance, Mitigation and Monitoring

Surface coal mines are required to pay royalty and taxes as required by federal, state, and local regulations. The BLM compares the amount of coal reported as produced with the estimated amount of coal in the ground to verify that the federal coal is efficiently mined and royalties are paid on all of the coal that is recovered.

3.17.8 Residual Effects

No socioeconomic residual impacts are expected.

3.18 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

From 2006 on, the Eagle Butte Mine would be able to produce coal at an average production level of 25 mmtpy for almost 14 more years under the No Action Alternative, compared with an average of 25 mmtpy for about 22 years under the Proposed Action, or an average of 25 mmtpy for up to 26 years under Alternative 1 (Table 2-3).

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 loss of native vegetation on 1,333 acres (Proposed Action) up to a maximum of 2,308 acres (Alternative 1) 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.

Mining would disturb pronghorn and sage grouse nesting habitat. There would be loss and displacement of wildlife during mining, but it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat, which is crucial for pronghorn and sage grouse, would be expected to take even longer.

CBNG is currently being recovered from within and/or near the LBA tract and BLM's analysis suggests that a large portion of the CBNG resources on the tract has been recovered or would be recovered prior to mining. CBNG that is not recovered prior to mining would be vented to the atmosphere during the mining process. Methane is a greenhouse gas that contributes to global warming. According to the EIA/DOE, U.S. anthropogenic methane emissions totaled 28.0 million metric tons in 2001 (U.S. Department of Energy 2002). U.S. 2001 methane emissions from coal mining were estimated at 2.78 million metric tons (10 percent of the U.S. total anthropogenic methane emissions in 2001). According to Table 14 of that report, surface coal mining was estimated to be responsible for about 0.53 million metric tons of methane emissions in 2001. This represents about 1.89 percent of the estimated U.S. anthropogenic methane emissions in 2001, and about 19.06 percent of the estimated methane emissions attributed to coal mining of all types. Based on the 2001 coal production figures, it is estimated that Wyoming and Montana PRB surface coal mines were responsible for approximately 0.98 percent of the estimated U.S. anthropogenic methane emissions in 2001.

Total U.S. methane emissions attributable to coal mining would not be likely to decrease if the Eagle Butte West LBA Tract is not leased at this time because a decision to lease or not to lease the tract would not directly affect total U.S. coal production. However, the methane on an LBA tract could be more completely recovered if leasing is delayed.

Coal is a major source of electricity generation in the U.S. Coal-fired power plant emissions include greenhouse gasses that contribute to global warming. The applicant mine plans to produce the coal included in the LBA tract at currently permitted levels using existing production and transportation facilities. As a result, leasing the Eagle Butte West LBA Tract to an existing mine under the Proposed Action or Alternative 1 would not be expected to result in increased or new emissions from coal-fired power plants.

Coal also releases mercury into the air when it is burned. According to the EPA, coal-fired power plants account for more than 40 percent of all domestic human-caused mercury emission. Mercury in the air settles into water or onto land, where it can be washed into the water. Certain microorganisms can change it into methyl mercury, which is a highly toxic mercury compound that builds up in fish and shellfish when they feed. There are adverse health effects to both humans and other animals that consume these fish and shellfish. Research has shown that most people's fish consumption does not cause a health concern, but high levels of methyl mercury in the bloodstream of unborn babies and young children may harm the developing nervous systems of those children (EPA 2006e). As indicated previously, the Eagle Butte Mine plans to produce the coal included in the LBA tract at currently permitted levels using existing production and transportation facilities. As a result, leasing the Eagle Butte West LBA Tract under the Proposed Action or Alternative 1 would not be expected to result in increased or new emissions of mercury from coal-fired power plants.

If the Eagle Butte West LBA Tract is leased, mined, and reclaimed, there would be a deterioration of the groundwater quality in the lease area; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. As a result of mining alone, depth to groundwater would increase during mining in an area extending roughly 11 miles west of the Eagle Butte Mine pits in the coal aquifer. The depth to groundwater in the overburden aquifer would also increase during mining around the Eagle Butte Mine pits. The water levels in the coal and overburden aquifers should return to premining levels at some time after mining has ceased, as discussed in Section 3.5.4, because recharge areas would not be disturbed in order to recover the coal in the LBA tract.

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 minor.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance and reduction in access to some public lands. These changes would primarily impact hunting in

the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists and access to public lands would be restored, there should be no long-term adverse impacts on recreation.

The long-term economy of the region would be enhanced as a result of the Proposed Action and Alternative 1. The Proposed Action and Alternative 1 would extend the life of the Eagle Butte Mine from eight to 12 years (Table 2-1).

3.19 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the mining and consumption of 203.0 million tons (Proposed Action) up to a maximum of 299.9 million tons (Alternative 1) of coal to be used for electrical power generation. CBNG that is not recovered prior to mining would also be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBNG to the atmosphere in Section 3.18). It is estimated that one to two 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 1,333 acres (Proposed Action) up to a maximum of approximately 2,308 acres (Alternative 1) 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.

Direct and indirect wildlife deaths caused by mining operations or associated activity would be an irreversible loss.

Loss of life may conceivably occur due to the mining operations 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.