

E. ENVIRONMENTAL IMPACTS OF THE PROPOSED ALTERNATIVES

This section provides a description of the effects on the environment that could be caused by the agency's action under Alternative 1 or Alternative 2 (described in Sections C.1 and C.2, respectively). An action can have direct or indirect effects, and it can incrementally contribute to cumulative effects. Direct and indirect effects of the alternatives are presented in Section E.1 below. Cumulative effects are addressed in Section E.2.

Direct effects are effects that “are caused by the [proposed] action and occur at the same time and place.” (40 Code of Federal Register [CFR] 1508.8(a)). Indirect effects are effects that “are caused by the [proposed] action and are later in time or farther removed in distance, but are still reasonably foreseeable.” (40 CFR 1508.8(b)). For example, indirect effects could include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. However, NEPA does not require an agency to engage in speculation regarding the cause of effects or the results of an action. Moreover, where an agency has no jurisdiction to prevent or reduce certain environmental effects, such effects are not a direct effect or an indirect effect of the proposed action for purposes of NEPA because the proposed action is not the legal cause of the effect.

Therefore, effects attributed to the alternative proposals in this Environmental Assessment, whether directly, indirectly or cumulatively, are those effects reasonably predicted to be caused by OSM's permit renewal. In deciding whether to renew or deny renewal of the Kayenta Mine permit, OSM's authority to consider environmental factors is constrained by SMCRA and its implementing regulations. Under SMCRA, once a mining permit is granted, the coal mine operator has a right to successive renewal within the approved mine permit boundaries. OSM may deny the permittee's application for renewal only if one of six specific criteria is present (See Section A, Description of the Proposed Action). One of OSM's approval criteria requires the surface coal mining and reclamation operations to be in compliance with SMCRA's environmental protection standards; however, the standards exclusively concern the surface coal mining operation and govern the conduct of the mining operation itself. Unless OSM finds that the mining operator is in violation of the standards, or another one of the statutory criteria is present, OSM must renew the permit.

Consistent with SMCRA's focus and OSM's authority, this section addresses the environmental effects of the alternatives, including direct, indirect and cumulative effects, but does not address the effects of the transportation and use of coal mined at Kayenta Mine. Neither SMCRA nor its implementing regulations permit OSM to consider the effects of coal transportation or the use of coal on the environment, or impose measures to remedy those effects, in deciding whether to renew or deny renewal of the Kayenta permit. OSM only has regulatory jurisdiction over coal mining and reclamation operations and has no legal authority to prevent the effects of the transportation and use of coal mined at Kayenta. OSM's action is not the legal cause of those effects, and those effects are beyond the scope of analysis in this EA.

CEQ regulations implementing NEPA require agencies evaluating effects on the human environment to identify incomplete or unavailable information, if that information is essential to a reasoned choice among alternatives (43 CFR 1502.22). For the analysis in this EA, site-specific data are used to the extent possible but may not be entirely available; however, these data are not essential for a reasoned choice among alternatives. The best available information was used to develop this EA. Considerable effort has been made to acquire data from both PWCC and other sources such as NNDFW. However, detailed data were unavailable for all resources, because inventories have not been conducted or are not complete. For these resources, estimates were made regarding the number, type, and significance of these resources based on previous surveys and existing knowledge. Data unavailable for this analysis is recreation visitation based on actual use and economic expenditure data associated with such use.

E.1 RESOURCE VALUES

Resource specialists considered the following impact levels in qualitative and quantitative terms. The environmental consequences of each impact topic are defined on the basis of type of effect, duration, context, and intensity. Type refers to an effect that either can improve or degrade the resource and the terms major, moderate, minor, or negligible describe the anticipated magnitude, or importance, of impacts, including those on the human environment. Because definitions of magnitude vary by resource topic, separate intensity definitions are provided for each impact topic. Table E-1 provides definitions of impact thresholds for resources. The table does not describe impact thresholds for those resources where no impacts are anticipated. Impacts on resources are described in terms of duration. Impacts are described as either permanent, long-term effects that persist beyond mine operations or reclamation, or short-term, those effects that persist during mine operation and reclamation activities 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. The thresholds and logic for the intensity of impacts and significance are presented for each resource accordingly in Table E-1. Impact significance may range from negligible to major (Table E-1), and impacts can be significant during mining but may be reduced to insignificant following completion of reclamation. The level of detail in the environmental impacts analysis corresponds to the context and intensity of the impacts anticipated for each resource.

Table E-1 Intensity of Impacts for Resources Analyzed in Detail

Impact Topic	Negligible	Minor	Moderate	Major
Cultural Resources	Properties listed in or eligible for the National Register will not be directly or indirectly affected. For purposes of Section 106, the determination will be no effect.	Properties listed in or eligible for the National Register might be directly or indirectly affected but the effects are unlikely to be adverse, that is, they will not diminish the location, design, setting, materials, workmanship, feeling, or association that qualify a property for the National Register. For purposes of Section 106, the determination will be no effect or no adverse effect.	Properties listed in or eligible for the National Register can be directly or indirectly affected in a manner that will diminish the integrity of a property's location, design, setting, materials, workmanship, feeling, or association that qualify the property for the National Register. For the purposes of Section 106, the determination will be adverse effect, but there is good potential that the effect can be adequately mitigated by treatment developed in consultation with parties participating in the Section 106 review of the Project.	Properties listed in or eligible for the National Register can be directly or indirectly affected in a manner that will diminish the integrity of a property's location, design, setting, materials, workmanship, feeling, or association that qualify the property for the National Register. For the purposes of Section 106, the determination will be adverse effect, and consulting parties are unlikely to concur that treatment can be implemented to adequately mitigate those impacts.

Impact Topic	Negligible	Minor	Moderate	Major
Hydrology	<p>Impacts will be considered negligible if there was 1 to 10 percent increase in pumping costs.</p> <p>Impacts will be considered negligible if the saturated thickness of an aquifer was reduced 20 percent or less.</p> <p>Impacts will be considered negligible if groundwater discharge was reduced 10 percent or less.</p> <p>Impacts will be considered negligible if water quality changes are within the range of background levels and do not change the present or potential use within the permit area.</p> <p>Impacts will be considered negligible if changes in sediment loads or yields are less than or equal to the range of background levels within the permit area.</p> <p>Impacts will be considered negligible if the watershed area controlled by impoundments is less than 10 percent of the total drainage area.</p>	<p>Impacts will be considered minor if there was 11 to 25 percent increase in pumping costs.</p> <p>Impacts will be considered minor if the saturated thickness of an aquifer was reduced by 21 to 30 percent.</p> <p>Impacts will be considered minor if there was an 11 to 20 percent reduction in groundwater discharge.</p> <p>Impacts will be considered minor if water quality changes occasionally exceed the range of background levels and do not change the present or potential use within the permit area.</p> <p>Impacts will be considered minor if changes in sediment loads or yields occasionally exceed the range of background levels within the permit area.</p> <p>Impacts will be considered minor if the watershed area controlled by impoundments is between 10 and 30 percent of the total drainage area.</p>	<p>Impacts will be considered moderate if there was 26 to 50 percent increase in pumping costs.</p> <p>Impacts will be considered moderate if the saturated thickness of an aquifer was reduced by 31 to 50 percent.</p> <p>Impacts will be considered moderate if there was a 21 to 30 percent reduction in groundwater discharge.</p> <p>Impacts will be considered moderate if water quality changes consistently exceed the range of background levels and do not change the present or potential use within the permit area.</p> <p>Impacts will be considered moderate if changes in sediment loads or yields are consistently greater than the range of background levels within the permit area.</p> <p>Impacts will be considered moderate if the watershed area controlled by impoundments is between 30 and 50 percent of the total drainage area.</p>	<p>Impacts will be considered major if there was a greater than 50 percent increase in pumping costs.</p> <p>Impacts will be considered major if there was a greater than 50 percent reduction in the saturated thickness of an aquifer.</p> <p>Impacts will be considered major if there was a 31 percent or greater reduction in groundwater discharge.</p> <p>Impacts will be considered major if water quality changes consistently exceed the range of background levels and change the present or potential use outside of the permit area.</p> <p>Impacts will be considered major if changes in sediment loads or yields are consistently greater than the range of background levels and extend a measurable distance outside of the permit area.</p> <p>Impacts will be considered major if the watershed area controlled by impoundments is greater than 50 percent of the total drainage area.</p>

Impact Topic	Negligible	Minor	Moderate	Major
Vegetation	There will be no measurable or perceptible changes in plant community structure or composition.	Direct effects on vegetation community structure and composition will be limited to areas disturbed by mining activities. There will be no changes in plant community structure or composition elsewhere in the permit area.	Direct effects on vegetation community structure and composition will be limited to areas disturbed by mining activities. There can be changes in plant community structure or composition elsewhere in the permit area.	Direct effects on vegetation community structure and composition will be limited to areas disturbed by mining activities. There will be changes in plant community structure or composition elsewhere in the permit area.
Wildlife	Wildlife species will not be affected or the effects on wildlife species will not have perceptible changes to the population.	The effects on wildlife species will be detectable and short-term. The effects will be limited to local changes to the population.	The effects to wildlife species will be detectable and long-term. The effects will be limited to local changes to the population.	The effects to wildlife species will be detectable and long-term. The effects can result in regional changes to the population.
Special Status Species (Federal and Navajo Nation listed species)	No federally listed or Navajo Nation listed species will be affected. A negligible effect will equate with a “no effect” determination from the U.S. Fish and Wildlife Service and Navajo Nation.	The effects on an individual or population of federally listed or Navajo Nation listed species or its critical habitat will be detectable and short-term. Minor effect will equate with a "may affect" determination from the U.S. Fish and Wildlife Service and Navajo Nation. The determination will be accompanied by a statement of “not likely to adversely affect” the species.	The effects on an individual or population of a federally listed or Navajo Nation listed species, or its critical habitat will be detectable and long-term. Moderate effect will equate with a "may affect" determination from the U.S. Fish and Wildlife Service and Navajo Nation. The determination will be accompanied by a statement of “may affect, but not likely to adversely affect” the species.	The effects on an individual or population of a federally listed or Navajo Nation listed species, or its critical habitat will result in a loss of species presence or habitat and long-term. Major effect will equate with a U.S. Fish and Wildlife Service and Navajo Nation determination of “is likely to adversely affect” the species or its critical habitat.
Soils	Soils will not be affected by erosion. The effects on soil productivity or fertility will be below levels of detection with no long-term effects.	The effects on soil productivity or fertility from gullies and sheet erosion will be detectable and short-term but will not result in sediment loss exceeding background levels within the permit area.	The effects on soil productivity or fertility from gullies and sheet erosion will be detectable and long-term but will not result in sediment loss exceeding background levels within the permit area.	The effects on soil productivity or fertility from gullies and sheet erosion will be detectable and long-term and will result in sediment loss exceeding background levels beyond the permit area.

Impact Topic	Negligible	Minor	Moderate	Major
Recreation	Recreation activities will not be affected or changes in use and/or experience will be below or at the level of detection by the recreation user.	Changes in recreation activities and/or experience will be detectable and short-term. The recreation user experience will change, but location of the recreation activity will not change within the permit area.	Changes in recreation activities and/or experience will be detectable and long-term. The recreation user experience and location of the recreation activity will change within the permit area.	Changes in recreation activities and/or experience will be detectable and long-term. The recreation user experience and location of the recreation activity will change outside of the permit area.
Air Quality	The maximum for each pollutant is 60% to 70% of the national ambient air quality standards	The maximum for each pollutant is 71% to 80% of the national ambient air quality standards.	The maximum for each pollutant 81% to 90% of the national ambient air quality standards.	The maximum for each pollutant is greater than 90% of the national ambient air quality standards.
Noise and Vibration	Noise levels (dBA) will not be detectable (3 dBA increase) from current levels.	Noise levels (dBA) will be detectable from current levels but will not exceed 35 dBA at residences at night or exceed 55 dBA other than from temporary sources during daytime hours.	Noise levels (dBA) will increase more than 3 dBA but will not exceed 35 dBA at residences at night or exceed 55 dBA other than from temporary sources during daytime hours.	Noise levels (dBA) will increase more than 3 dBA and will exceed 35 dBA at residences at night or 55 dBA during daytime hours.
Landforms and Topography	Changes to topography will not be detectable.	Changes in slope, elevation or the landform complexity will be detectable and long-term, but will resemble the approximate original contour of undisturbed landforms within the permit area.	Changes in slope, elevation or the landform complexity will be detectable and long-term within the permit area but will satisfy postmine land use requirements.	Changes in slope, elevation or the landform complexity will be detectable and long-term, will not resemble the topography of surrounding undisturbed landforms within the permit area, and will not meet postmine land use requirements.
Geology and Mineral Resources	Changes will not result in a loss of scientific and educational values for geologic and paleontological resources or potential mineral resource development.	Changes will result in a loss of geologic and paleontological resources or potential mineral resource development, but will not result in the loss of unique geologic and paleontological resources or economic benefits from mineral resources.	Changes will result in a loss of geologic and paleontological resources or potential mineral resource development, but mitigation will reduce loss of unique geologic and paleontological resources or economic benefits from mineral resources.	Changes will result in a loss of geologic and paleontological resources or potential mineral resource development and mitigation will not reduce loss of unique geologic and paleontological resources or economic benefits from mineral resources.

Impact Topic	Negligible	Minor	Moderate	Major
Land Use	There will be no changes to existing or future land use or change in planned projects. For livestock grazing, there will be no change in the number of livestock raised within the permit area.	There will be short-term changes to existing land uses within coal resource areas but there will not be any adjustment or change to planned projects. For livestock grazing, changes in the number of livestock raised within the permit area can be discernable from changes caused by economics or seasonal vegetation factors. Changes in livestock numbers will not be discernable at the Navajo Chapter or Hopi Tribe level.	There will be long-term changes to existing land uses within the permit area but there will not be any adjustment or change to planned projects. For livestock grazing, changes in the number of livestock raised within the permit area will be discernable from changes caused by economics or seasonal vegetation factors, but changes in livestock numbers will not be discernable at the Navajo Chapter or Hopi Tribe level.	There will be long-term changes to existing land uses within the permit area and there will be adjustment or changes to planned projects. For livestock grazing, changes in the number of livestock raised within the permit area will be discernable from changes caused by economics or seasonal vegetation factors and changes in livestock numbers will be discernable at the Navajo Chapter or Hopi Tribe level.
Socioeconomic environment	The effects on the socioeconomic environment will not be distinguishable from changes that were occurring from other social and economic activities within the surrounding counties, communities, and tribal areas.	The effects will be a less than 1 percent change in population, employment, dependency ratio, or housing and a less than 5 percent change in household income.	The effects will be a 1 to 3 percent change in population, employment, dependency ratio, or housing and a 5 to 10 percent change in household income.	The effects will be a more than 3 percent change in population, employment, dependency ratio, or housing and a more than 10 percent change in household income.
Visual Resources	The change to the visual appearance of the site will not be noticeable.	The change to the visual appearance of the site will generally be noticeable but subtle. It will usually be subordinate, but will be noticed by viewers without being pointed out.	The change to the visual appearance of the site will be distracting. It will be visually co-dominant; the change will compete for attention of viewers and will be equally conspicuous with other features.	The change to the visual appearance of the site will be dominant, distracting, and will demand attention. The change to the landscape is the focus of attention and will become the primary focus of the viewer.

Impact Topic	Negligible	Minor	Moderate	Major
Human health and safety	Human health and safety will not be affected, or the effects will not be measurable or perceptible using standard scientific tests.	The effect will be detectable and temporary, but will not be measurable or perceptible using standard scientific tests.	The effects will be detectable and short-term, and will be measurable or perceptible using standard scientific tests.	The effects will be detectable and long-term, and will be measurable or perceptible using standard scientific tests.

Although present in the project area solid or hazardous materials and waste is not affected by the alternatives because no chemicals subject to Superfund Amendments and Reauthorization Act (SARA) Title III in amounts greater than 10,000 pounds would be used in the mine operations or at the associated facilities. No hazardous substances above threshold planning quantities, as defined by 40 CFR 355, will be used for mine operations or at the associated facilities. Trash receptacles are in place and would remain on site for the full duration of the project. PWCC and contractors responsible for the storage and handling of solid or hazardous materials and wastes, including diesel fuel, are required to meet applicable federal, state, and local regulations. Therefore, this impact topic was dismissed from further analysis.

E.1.1 Cultural Resources

Examples of the types of adverse effects on cultural resources that might occur at the Kayenta Mine include the following:

- Physical destruction, damage, or alteration of all or part of a cultural resource
- Removal of a cultural resource from its historic location
- Change of a cultural resource’s use or setting that contributes to its historic significance
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of a cultural resource’s significant historic features [see 36 CFR 800.5(a)(2)]

E.1.1.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

PWCC estimates that 1,159 acres (1.8 square miles) within the three coal resource areas (488 acres in N-9, 295 acres in J-19, and 376 acres in J-21) would be disturbed by mining activities during the 5-year permit renewal period (refer to Table C-1). That ground disturbance could disturb or destroy some of the 36 prehistoric archaeological sites and 20 historic Navajo sites recorded in those areas. Two archaeological sites in coal resource area J-19 have been identified as having potential human burials and if burials are present, they could be disturbed by coal mining during the permit renewal period. Two possible sacred and ceremonial sites recently identified within the J-21 coal resource area, as well as others that might be identified during the permit renewal period, also could be disturbed. To mitigate the identified adverse effects of coal mining, PWCC sponsored the 20-year Black Mesa Archaeological Project between 1967 and 1986 to recover and preserve information and artifacts to mitigate the impacts of coal mining on archaeological and historical sites within the Black Mesa and Kayenta mines.

Therefore, the anticipated impacts on archeological sites in coal resource areas N-9, J-19, and J-21 have already been identified and mitigated, and no additional studies to recover information and artifacts are proposed.

Since 1990, PWCC has considered and mitigated impacts on new discoveries of cultural resources, including traditional cultural resources, and removed and reburied human remains associated with unexcavated archeological and historical sites in accordance with standard conditions and terms that OSM has attached to the Mining Permit AZ-0001C and AZ-0001D issued pursuant to the Surface Mining Control and Reclamation Act of 1977 (SMCRA). If Alternative 1 is implemented, PWCC would continue to comply with those standard conditions and permit terms.

The permit terms require PWCC to report the discovery of any previously unrecorded cultural resources that might be made during the permit renewal period and to suspend work in the vicinity to protect discoveries until OSM determines appropriate disposition.

The permit terms also require PWCC to address the potential effects on sacred and ceremonial sites that might be identified during the 5-year permit renewal period. As per the permit terms, PWCC will address any human remains that might be disturbed in accordance with the Native American Graves Protection and Repatriation Act, and the Navajo Nation policy for the Protection of Jishchaá: Gravesites, Human Remains, and Funerary Items. If Alternative 1 is implemented, PWCC will sponsor testing at two known archaeological sites in coal resource area J-19 that have been identified as having potential for human burials. If human remains and associated funerary objects are found, they would be documented, removed, and reburied in accordance with the ongoing program that has been established to comply with the permit terms. No similar sites are known in the N-9 and J-21 coal resource areas.

As mining has continued, additional cultural resources have been occasionally discovered and additional discoveries could be made during the permit renewal period. By definition, it is not possible to predict unexpected discoveries, but PWCC's experience since 1990 suggests that continued coal mining through 2015 is unlikely to result in more than one or two additional unanticipated discoveries of archaeological, historical, or traditional cultural resources that could be affected by coal mining.

Although continued mining in the permit renewal area could have impacts on cultural resources, it is expected that continued implementation of the standard conditions and permit terms described in Section D.2.1 will satisfactorily mitigate any such impacts and impacts on cultural resources would be minor and would not be considered significant.

To accommodate continued mining in the J-21 coal resource area, four of the 83 occupied houses within the Kayenta Mine permit area would be relocated during the permit renewal period. Those relocations could affect any traditional aspects of the lifeways of those residents, such as use of ceremonial hogans, use of prayer or offering locations, or collection of traditionally used plants minerals and other materials. The residents of the four occupied houses have not indicated that they have concerns about impacts on traditional cultural resources. If any such impacts are identified, they would be addressed in accordance

with permit terms and the relocation compensation program will reduce the effects. During the past 2 years, PWCC has been coordinating with the four Navajo households that would be relocated during the permit renewal period to discuss relocation arrangements and a mutually acceptable relocation site has been identified within the customary use areas of those households in the southern part of the J-21 coal resource area that will not be mined. PWCC would conduct the relocations in accordance with established procedures that would compensate the households for replacement of all structures and any lost grazing acreage and work to reduce any impacts on any traditional cultural resources (refer to Section D.2.12 for more information about those procedures). Effects from these relocations on traditional uses would be minor and would not be considered significant.

E.1.1.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, mining operations in N-9, J-19, and J-21 would cease. Mining facilities would be removed and reclamation operations would begin at coal resource areas N-9, J-19, and J-21 in accordance with the provisions of the current Kayenta Mine Permit closure plan and SMCRA regulations. Facility removal and reclamation operations would occur in previously disturbed areas of N-9, J-19, and J-21, and no households would be relocated. No additional effects on cultural resources are anticipated under this alternative. No additional impacts to cultural resource would be expected from reclamation activities and the impacts on cultural resources would be negligible and would not be considered significant.

If Alternative 2 were implemented, no impacts on cultural resources are anticipated, but if any were identified during the course of facility removal and reclamation operations, mitigation measures would be implemented pursuant to standard and special permit conditions.

In summary, previously implemented mitigation measures implemented pursuant to standard conditions and terms of the permit will mitigate impacts on cultural resources, and the residual impacts are expected to be negligible and would not be considered significant.

E.1.1.3 Unavoidable Adverse Impacts

The studies to recover and preserve information and artifacts have been completed, the collected artifacts and project documentation are curated at Southern Illinois University, and ongoing programs are in place to mitigate impacts on unanticipated cultural resources that could be discovered in the future pursuant to standard conditions and terms of the permit. These programs include the removal and mitigation of human remains and funerary items in accordance with Navajo and Hopi tribal requirements, and evaluation and treatment, as warranted, of any new discoveries of cultural resources or recognition of sacred and ceremonial sites. Therefore, no unavoidable adverse impacts to cultural resources are anticipated.

E.1.2 Hydrology

Impacts on surface-water and groundwater quantity and quality can occur as a result of coal mining and other related surface activities. These activities have the potential to impact the flow and quality of surface water and the shallow groundwater system, and the deeper D and N aquifers. Impacts are

measured by changes in water flows and water quality and are generally limited to an area within a few miles of the mining operations.

Impacts on surface water and groundwater due to pumping of the N aquifer for mining-related water supplies are the result of changes in the water levels in the aquifers. These changes can occur over relatively large areas, especially in the confined portions of the aquifer systems. Data and measurements used to assign degrees of impact are discussed in Appendix B.

E.1.2.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Impacts on Surface Water

Surface water was evaluated for potential impacts to flow and water quality that could occur from mining operations within the Kayenta Mine permit area. Changes in surface water quality were evaluated by considering impounded water quality, seep discharges to surface water and the potential for increased suspended sediment loads in runoff. Changes in surface water flow were evaluated by considering modifications to the contributing drainage basin, surface runoff characteristics and conveyance including sediment control and channel restoration. The restoration of channel geometry, morphology, or location resulting from the destruction and reconstruction of drainage channels and the use of sediment control structures to manage discharge of surface water from the mine areas would not alter surface flows into regional drainages beyond the short-term. These impacts would be minor and would not be considered significant.

The water quality of proposed permanent impoundments should reflect the quality of runoff from reclaimed areas and be comparable to stream runoff after reclamation activities have been completed and vegetation becomes established, which could take upwards of ten years. OSM requires PWCC to monitor water quality in proposed permanent impoundments in order to determine whether the impounded water is suitable on a permanent basis to support livestock grazing and wildlife habitat at final bond release (PWCC 2005b). If the data indicate a proposed permanent impoundment does not meet the performance standards at 30 CFR 816.49(b) including applicable Tribal water quality standards, OSM will require PWCC to reclaim the impoundment. Therefore, the impact of the permanent impoundments on surface water quality would be short-term and negligible, and would not be considered significant.

The release of constituents to surface water could occur by formation of seeps downstream of existing and/or new sediment ponds. If seeps form, some degradation of surface-water quality could occur locally, however, the impact on overall surface-water quality would be negligible, as the volume of seep water released into the ephemeral streams would be diluted by the stormwater runoff volume (PWCC 2005b). Any potential released seep water would also encounter alkaline soils, causing the pH in the water to rise and any metals present would tend to precipitate or be absorbed in the soils. At proposed sediment ponds, PWCC will use design and construction methods that minimize seep formation by identifying geochemically inert materials for constructing the embankments, compacting the embankments based on engineering design standards, and siting embankments at locations with low permeability geologic units to the extent practicable. The NPDES permit requires all discharges from NPDES outfalls, including

those associated with the N-9, J-19, and J-21 mining areas, meet specific effluent limitations and applicable water quality standards for receiving streams. Therefore, discharges from new ponds would result in negligible impacts to surface water quality and would not be considered significant.

Sediment ponds are designed to treat the equivalent volume of runoff generated by a 10-year, 24-hour precipitation event. The capacity of ponds also includes an additional amount of volume for storing sediment. Ponds proposed for construction during the permit period that would serve as NPDES outfalls will be subject to the requirements of a modified Seepage Management Plan in the renewed NPDES permit. Of these ten proposed ponds, ponds N9-A, N9-J, and J21-I would be added to the list of outfalls in the NPDES permit. Future ponds where seeps develop will also be evaluated in accordance with the Seepage Management Plan. The minor short-term and localized impacts of the existing seeps associated with existing sediment ponds and seeps that could occur below new sediment structures on surface water quality would not be considered significant.

Erosion rates are typically high on areas disturbed by mining and could increase the amount of suspended sediment in stormwater runoff. The potential increase in suspended sediment load from the mined areas would be minimized using engineering controls such as sedimentation ponds and/or other sediment control structures. Design and operation of sedimentation ponds would result in lower sediment loads than are generated by the natural flow regimes of the various washes and channels within and adjacent to the PWCC lease area. Erosion of the sides and channel bottom of washes downstream of sediment ponds would be expected for a short distance as the wash adjusts to lower contributions of sediment from the upstream watershed. Sediment control structures are designed in anticipation of this behavior, and allow the water (using grade-control structures, gabion aprons, and bank stabilizers) to discharge with minimal erosion. In all cases, rates of erosion or deposition of sediment would reach a balance with natural rates in receiving streams over relatively short distances (i.e., several hundred yards), well before the washes exit the PWCC lease area. In addition, performance standards are monitored and corrected by PWCC as they are observed, confirmed by regular OSM and tribal inspection, and monitored by BIA to ensure compliance with lease terms and conditions. Therefore, the effects of erosion and sediment loads from control structures would be negligible, short-term and limited to short distances in receiving streams within the permit area. These impacts would not be considered significant.

The diversion and reconstruction of natural streamflow also would be designed to preserve geomorphic and fluvial stability and prevent uncontrolled erosion or sedimentation. Where this is not possible, engineered durable structures, such as rip-rap grade-control structures, would be designed and constructed in the channel to prevent uncontrolled erosion or sedimentation. Similar to the pond discharges, these channels and structures are regularly inspected and maintained by PWCC and reviewed by OSM and tribal inspectors.

PWCC would ensure, per the approved permit, that any effects of the mine's drainage system on the natural stream patterns in the affected environment would be confined to the Kayenta Mine permit area. Reclaimed watersheds would be constructed using similar ranges of naturally occurring geomorphic features such as drainage density, hillslope lengths and slopes, and channel gradients. These constructed

features would be similar to natural variability of the unmined watersheds within and adjacent to the PWCC lease area. The impact of the mine on the landform geometry, morphology, stream channel systems including drainage patterns and channel characteristics would be minor within the permit area and would not be considered significant.

The temporary diversion and impoundment of runoff water for sediment control could reduce stream flow volumes and peak flows downstream of the mined lands. Impounded water could be used on the mine site for dust control, livestock and wildlife use, or lost because of infiltration and evaporation and would not be released downstream. However, to maintain adequate storage volume in the sedimentation ponds, the impounded water is discharged when it meets permit effluent limitations.

Within the Kayenta Mine permit area, the use of sediment ponds results in some surface water being lost, either through infiltration into the subsurface, evaporation from the surface of the pond, or use by livestock and wildlife. This loss of potential surface flow represents a diminution of surface-water quantity a short distance below the Kayenta Mine permit area, relative to the reaches of the regional drainage system outside of this area. Decrease of runoff also occurs where existing streams in the permit area are diverted from their channels to allow surface-mine excavations and reclamation to proceed. As of 2010, approximately 0.6 percent of the Dinnebito drainage area and 2.6 percent of the Moenkopi drainage area were controlled by drainage control structures. The structures have the potential to impound 36.5 acre-feet of runoff, or about 1.2 percent of the total runoff in the entire Dinnebito basin (3,034 acre-feet). Drainage control structures in Moenkopi Wash, in 2010 have the potential to impound 532.8 acre-feet of runoff, or about 5.5 percent of the total runoff in the entire Moenkopi basin (9,727 acre-feet).

Estimates comparing the change in potential runoff controlled by ponds reflect the potential volumetric loss on downstream water quantities for the five-year mine plan. These estimates indicate there would be a net reduction of 655 acres within the Moenkopi drainage of area controlled by ponds and a net increase of 580 acres within the Dinnebito drainage of area controlled by ponds. The estimates within the Moenkopi drainage take into account plans to reclaim 29 ponds and construct 7 new ponds ((N9-A, N9-A1, N9-A2, N9-J, N9-J1, N9-J2, and N9-J3). The Dinnebito drainage estimates account for plans to reclaim three ponds and construct three new ponds (J21-I, J21-I1, and J21-I2). Overall, the changes during the term of the mine plan would be negligible, resulting in less than 1 percent increase in potential runoff loss in the Dinnebito basin, and less than a 1 percent decrease in potential runoff loss in the Moenkopi basin as of December 2014. Negligible effects would not be considered significant.

After mining, about 0.5 percent of the entire Dinnebito basin and 2.2 percent of the entire Moenkopi basin would be impounded permanently. The permanent impoundments are estimated to result in a diminution of flow at the lower end of Dinnebito and Moenkopi Washes of about 1 and 5 percent, respectively, of the average annual runoff (PWCC 2005b). The evaluation concluded that the volume of water retained or detained by the permanent impoundments is a small proportion of average annual runoff at the lower ends of Moenkopi Wash (4.7 percent) and Dinnebito Wash (1.0 percent) in the affected watersheds. Therefore, the effect of permanent impoundments left in the post-mining landscape would be negligible and long-term, and considered not to be significant.

The analysis described above assumes no transmission loss of flow between the PWCC lease area and the downstream USGS streamflow gage near the village of Moenkopi. Historic measurements indicate that loss through infiltration is very high in Moenkopi Wash, with rates of about 1 inch per hour (Peabody 2005b). Using a 644 acre-foot volume (equal to the total impounded volume for 1983 to 1984), the analysis indicated surface flow from the PWCC lease area could travel about 45 miles downstream before it was completely absorbed by the wash bed material. This is short of the 70 miles to the first location of surface water use downstream at the town of Moenkopi, where most irrigation operations are located. This estimate is supported by measurements from a storm event on July 27, 1998, where 206.7 acre-feet of water were gauged at the permit boundary of Moenkopi Wash, and only 14 acre-feet were measured at the USGS gage near Moenkopi from July 27 to 29, 1998.

Based on these observations and other comparisons of flow records (PWCC 2005b), it appears that about 50 percent of runoff events in excess of 1,000 cfs, and up to 100 percent of smaller runoff events can be lost naturally through infiltration in the wash. The change in streamflow, resulting from the added mine operations, would not be detectable approximately 70 miles downstream. The short-term effects of surface water diversions, impoundments and sediment ponds on surface water quantity would be minor within the Kayenta Mine permit area and negligible outside of the Kayenta permit area, and would not be considered to be significant.

Impacts on Groundwater

Groundwater was evaluated for potential impacts that could occur from mining operations within the three coal resource areas during the permit renewal period to dewater coal seams and shallow aquifers or other changes in the flow of shallow groundwater. Groundwater quality was evaluated for potential changes from infiltration of surface water, or spoils leaching and migrating into adjacent groundwater aquifers.

Review of Wepo water level contours developed from data collected between 1995 and 2003 indicated no groundwater inflows would be encountered during mining in the N-9 pit (PWCC 2005b). The groundwater level in Wepo well 52 declined approximately 7 feet following initiation of mining in N-9. Water has been reported in a small portion of the N-9 pit requiring periodic pumping of limited quantities from 2006 into 2010. In some areas, limited perched zones of groundwater in the Wepo formation may result in periodic groundwater inflows to relatively small portions of mine pits where analyses indicate no groundwater inflows will be encountered during mining as observed in the N-9 pit. TDS concentrations in Wepo well 52 declined from approximately 380 mg/L to about 310 mg/L after the water level declined. As mining continues toward the north and northwest in N-9, the elevation of the pit floor could rise above the groundwater level in the Wepo formation.

Limited perched zones of Wepo Formation groundwater could be encountered during the permit period as mining progresses in the southwestern area of the J-21 pit, but significant water has not been encountered in J-21 in the past. Comparison of the planned bottom of the pit and the estimated elevation of the Wepo groundwater suggests that the westernmost part of the pit is more likely to encounter water than the

eastern part of the pit. The water encountered in J-21 is expected to be a small volume that is not measurable.

Mining of J-19 is not expected to encounter water, based on experience from earlier mining of this pit. Comparison of the estimated Wepo groundwater level with the planned elevation of the bottom of the J-19 pit suggests that the easternmost part of J-19 is the most likely to encounter groundwater. However, past mining in this pit in this area has not encountered water in sufficient quantities to require pumping.

In the event springs are mined out in any of the coal resource areas during the 5-year mine plan term, PWCC would be required to provide alternative water supplies to replace the lost water source. Upon completion of backfilling, regrading, topsoiling, and revegetation, the replaced spoil in areas that were previously saturated could resaturate and create a localized change in the potentiometric surface within the Wepo Formation adjacent to the reclaimed mine pit. Based on estimates of the pre-mining hydraulic properties of the Wepo Formation, porosities and hydraulic conductivities within the regraded spoils would be higher, and recharge capacities should be similar or somewhat greater than pre-mining capacities. However, this does not mean that water levels in the Wepo Formation would return to original levels. It is likely that there would be some minimal impact on local groundwater levels in the Wepo Formation and adjacent alluvial aquifers during mining. After reclamation is complete, the hydrologic balance within the shallow aquifers would approach a new equilibrium. Therefore, changes in Wepo water levels due to mine dewatering will be long-term but limited to the local vicinity of the mine pit, resulting in minor impacts on the use of the shallow groundwater system within the permit area and would not be considered significant.

Surface-water flow events recharge the alluvial aquifers associated with the stream channels. Reduced flows in washes could decrease the amount of recharge; however, the impoundment of runoff water and subsequent seepage of sediment pond water into the banks and substrate of the ponds locally enhance recharge. The primary effect is likely to be a local redistribution of where recharge occurs, and the length of time the effect would occur depending on whether sediment ponds are temporary or permanent. It is expected that any reduction in recharge would be immeasurable and there would be negligible impact on the quantity of recharge to the alluvial aquifers from mining activity.

Acid reactions in the spoil water could occur, but are unlikely to be widespread. There are sufficient carbonate minerals in the overburden materials to neutralize most acidic water that could be produced by the oxidation of sulfides. All but one of the overburden core samples taken on the PWCC lease area and Kayenta Mine permit area had excess neutralization potential (PWCC 2005b). These cores also indicate that there are no high concentrations of metals in the overburden. The alkalinity imparted by the dissolution of carbonate minerals slows the dissolution of sulfide minerals, preventing the release of metals. If acidic water is produced and encounters the alkaline overburden, the pH could rise and metals that are present would tend to precipitate in or absorb into the soils. This evaluation is supported by the analysis of groundwater in the Wepo and alluvial aquifer monitoring wells. Water from these wells is near neutral in pH, and concentrations of metals in groundwater at these wells generally do not exceed livestock watering standards (PWCC 2005b).

Although there are specific procedures to minimize and mitigate acid-forming materials, and the presence of carbonate minerals in the Wepo Formation overburden and interburden is sufficient to neutralize any acidic waters formed, some local pockets of acidic water could form. Areas where this occurs could result in the release of trace elements present in the sulfide minerals. These chemical reactions could result in some minor-to-moderate water-quality impacts on local wells, increasing TDS and trace element concentrations in groundwater to a level that decreases their usability. However, the impact of acidic drainage on groundwater quality likely will not be widespread and will be contained to the mine pit and adjacent area, and will not migrate outside the permit area. The potential effects from acid-forming materials on groundwater would be minor and would not be considered significant.

Similarly, spoil water also could discharge to the surface water as springs or seeps. Some degradation of surface-water quality could result, particularly near the springs. As noted above, discharges from springs with low pH water could be neutralized by the alkaline soils. Since streams are ephemeral and generally flow only after precipitation events, the much larger streamflows tend to dilute poor-quality spring or seep water discharges. Streamflow events are generally not suitable for use by livestock because of the high sediment load, high velocities and short durations, resulting in little potential for livestock to be exposed to poor-quality spoil water that could be released into the stream. The potential effects on the overall surface-water quality would be minor in volume of spring or seep water and would not be considered significant.

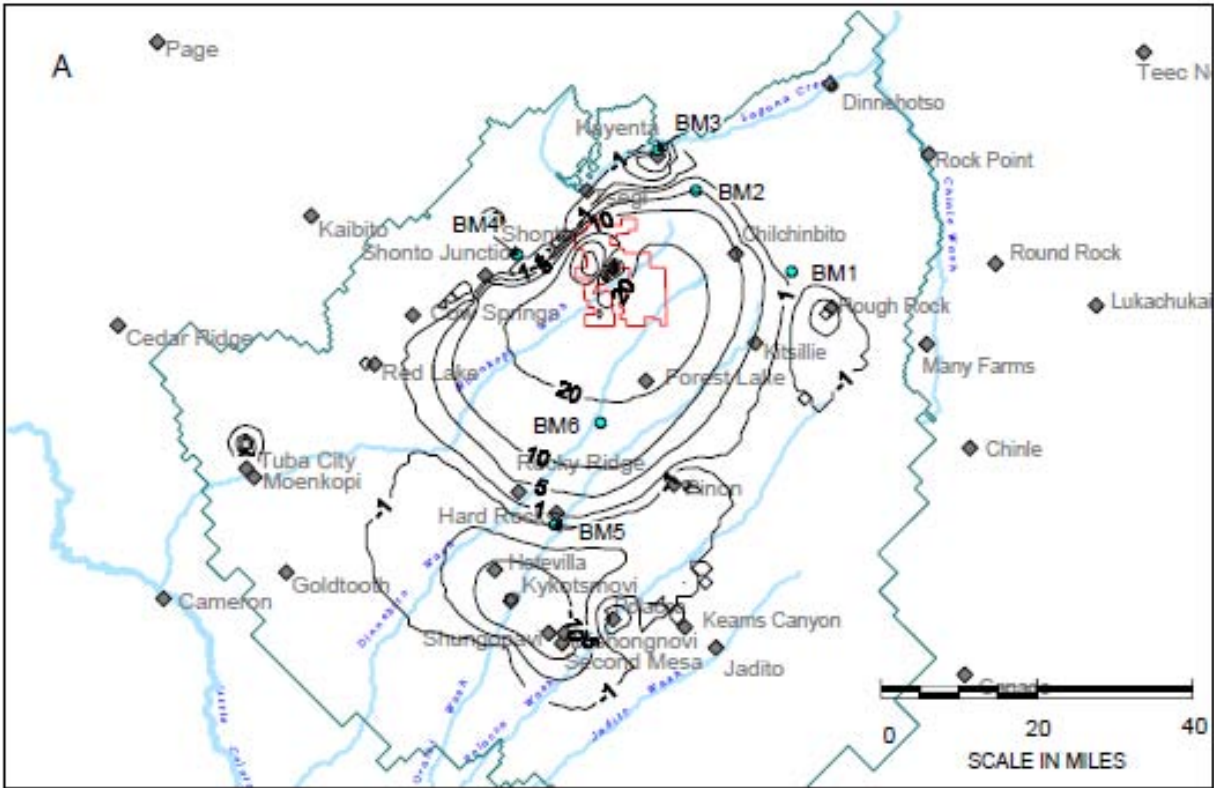
Surface-mining activities could degrade groundwater quality if surface water infiltrates into the subsurface. Controlled surface water would infiltrate to the shallow subsurface in impoundments, sediment ponds, or diversions potentially increasing the concentrations of some soluble ions (Ca, Mg, Na, SO₄, and bicarbonate) and TDS. The potential for formation of acidic seepage and trace-metal migration is minimal because of the high carbonate content of the soils. The magnitude of the impact on groundwater quality should be limited to the immediate pond and pit areas due to low transmissivity and groundwater gradients in the shallow aquifers (PWCC 2005b). The potential effects to groundwater within the Kayenta Mine permit area and the PWCC lease area would be minor and would not be considered significant.

Impacts on Water Supply

There is a potential for the local water supply to be affected by continued use of water from the D and N aquifers by the mine. The impact of groundwater withdrawal is commonly assessed by a measured or projected lowering of the water levels in the pumping wells and in wells located within and outside the cone of depression created by the pumping well(s). Effects from lowering the water level in the D and N aquifers were evaluated for potential increases in the cost of pumping, reduction in the saturated thickness or transmissivity in unconfined or confined aquifers, changes in stream baseflow or spring flow, and the flow of groundwater towards the well field.

Unconsolidated aquifer systems have the potential for subsidence due to compression of fine-grained layers during groundwater withdrawal. In addition, the removal of cavity filling material and dissolution of limestone in some limestone aquifers can foster sinkhole development. These effects are not a concern in this evaluation, because the primary water-bearing units of the D and N aquifers are not composed of unconsolidated sediments or limestone that would be subject to subsidence effects (Appendix B).

The potential impact of continued pumping at the mine site was evaluated by simulating future water level changes in the D and N aquifers within and adjacent to the permit area for the permit period through 2038. The detailed numerical model results are provided in Appendix B. The model predicts that groundwater levels would rise (i.e., recover) beneath the PWCC lease area during the permit period. Groundwater levels are recovering because less groundwater has been used by PWCC since the coal slurry pipeline was discontinued in 2005. In 2015, the simulated recovery in groundwater levels near the PWCC lease area is between 20 and 30 feet (see Figure E-1). The simulated recovery at some of the PWCC's production wells is greater. The simulated groundwater level recovery is relatively small near the boundary between confined and unconfined conditions in the N aquifer, as the total drawdown prior to 2005 was also small near this boundary. The greatest differences in groundwater levels occur near communities, where local pumping is predicted to cause continued drawdown. Continued groundwater drawdown by community pumping could be less than the values predicted by the model if future community water use is less than modeled. By 2025, groundwater level recovery is predicted to be more than 30 feet (relative to 2010 levels) within most of the central part of the basin. Groundwater level recovery would continue until 2038, and possibly beyond, in the central part of the basin where the groundwater levels could recover more than 50 feet relative to 2010 levels (see Figures B-9 and B-10 in Appendix B).



Note: This figure presents PWCC and community pumping.

Figure E-1 Simulated Changes in Water Levels between 2010 and 2015

Table B-4 in Appendix B shows the simulated groundwater drawdown in the N aquifer (relative to July 2010) for selected community wells in 2015, 2025, and 2038. In most of the wells, the simulated groundwater drawdown (with both community and PWCC pumping) increases with time. However, the change in water levels caused by PWCC's pumping is estimated to decrease with time. Local community pumping causes the simulated increases in drawdown. In all instances but one, water is predicted to remain above the top of the screened interval by hundreds of feet. At Rough Rock, the water level was only 40 feet above the top of the screen interval when first measured. The model predicted that PWCC's pumping would cause only 2 feet of drawdown in this well. Pumping by PWCC has caused drawdown in these wells, but has not threatened the ability of these wells to produce water. With the reduction in pumping that occurred at the end of 2005, the effects of PWCC's pumping have become smaller.

At most communities, groundwater drawdown that is attributable to PWCC pumping is predicted to decrease from the baseline value in 2010 (Appendix B, Table B-4). Additional groundwater drawdown is predicted for Kykotsmovi and Keams Canyon, where the increasing drawdown caused by community pumping is larger than the recovery from PWCC's reduced groundwater use since 2005. The largest drawdown increase is predicted to occur in Kykotsmovi, where the original depth to water was 220 feet. The predicted drawdown from PWCC's pumping would increase the lift and power costs about 1.3 percent at Kykotsmovi, resulting in negligible impact on pumping cost. The widespread recovery of water levels from earlier pumping would either reduce or slow the increase in pumping costs expected to

be caused by increases in the effects of community pumping. The effects are regional in scale, and recovery would likely continue for several decades.

Some of the PWCC production wells pump from both the D and N aquifers, with about 3 percent of the water coming from the D aquifer (PWCC 2005b). The communities of Chilchinbito, Kitsillie, and Kykotsmovi, also use D aquifer water but are located far enough from the Kayenta Mine that drawdown due to PWCC pumping is about 1 foot or less. This level of drawdown would have no measurable impact on pumping cost for these communities.

D aquifer uses near the PWCC lease area could be adversely impacted if groundwater levels decline in the wells to a point where pumps must be lowered or the wells deepened to remain productive. The groundwater level in Windmill Well 4T-402 in the D aquifer would be affected most by pumping at NAV5. The model predicts that Windmill Well 4T-402 could experience drawdown of up to 5 feet, which is considered a negligible impact. The predicted drawdown would not require the well to be deepened or the pump to be lowered. SMCRA regulations at 30 CFR 816.41(h) specifically requires PWCC to replace water supplies that have been adversely impacted by mining. Compliance with these regulations resulted in PWCC's commitment to replace three windmill wells that have or would be removed by mining. Any other water supply that could be adversely impacted by mining during the five-year permit term would be replaced by PWCC.

With the anticipated use of the N aquifer, there are no significant predicted changes in the saturated thickness of the D and N aquifers as a result of continued PWCC's pumping. Pumping has been primarily occurring within the confined part of the N aquifer, and water levels are currently rising or are predicted to rise because of the reduction in PWCC's pumping. Near the boundary between the confined and unconfined areas of the aquifer, a small water-level drawdown in the unconfined aquifer is predicted north of the PWCC lease and Kayenta Mine permit areas near Kayenta and Shonto. The effects of mine-related pumping are minor compared to community pumping. Pumping by the communities in the unconfined parts of the aquifer would decrease the saturated thickness near those wells.

Monitoring data shows that PWCC pumping to date has not measurably reduced the monitored N aquifer spring flow. N aquifer spring discharge monitoring data is limited to records collected since the late 1980's at Moenkopi School Spring, Pasture Canyon, and Burro Spring. Discharge measurements measured at both Moenkopi School Spring and Pasture Canyon are strongly influenced by local community pumping stresses. Spring discharges at Burro Spring have been relatively persistent since monitoring began in 1989, and the persistence of flow and absence of a decreasing trend in discharge through 2009 (USGS 2010) indicate PWCC's pumping has not caused measurable discharge to this spring. However, modeling of N aquifer groundwater discharge suggests that as future non-mining-related groundwater pumping near some of these springs increases, flows from springs could be affected (GeoTrans 2006). Historical changes to N aquifer spring flows, which have not been monitored, are not known (Peabody 1999) and are not included in the model. However, the model does predict changes in groundwater discharge to the washes. The greatest predicted effect on groundwater discharge occurs along Begashibito Wash approximately 25 miles west of the Kayenta Mine permit area. This wash

contains the closest area of seeps and springs to the Kayenta Mine permit area and could experience the greatest effect due to mine-related pumping (Appendix B, Table B-6).

Between 2010 and 2015, groundwater discharge to Begashibito Wash is predicted to decrease by 3.4 af/yr, or 0.005 cfs. This predicted decrease in discharge is 0.16 percent of the estimated 2010 discharge (without PWCC pumping) of 2,177 af/yr, and results in a negligible impact. The predicted reduction in discharge as a result of PWCC's pumping in 2025 is 10.5 af/yr (0.014 cfs or 0.49 percent), and in 2038 is 19.0 af/yr (0.026 cfs or 0.88 percent). These regional-scale and long-term changes in discharge are too small to be measured. The impacts of PWCC's pumping in other potential discharge areas are smaller. The maximum predicted impact in 2015 at other washes is 1.9 af/yr (0.05 percent of the 2010 discharge) at Moenkopi Wash, which would be minor and would not be considered a significant impact.

The potential for groundwater leakage from the D aquifer to the N aquifer through the Carmel Formation confining bed was evaluated by comparing present day with predicted sulfate concentrations in the N aquifer in 2038 (PWCC 2005b). Model results predicted that sulfate concentrations would increase in the N aquifer by as much as 0.07 percent (an increase from 30 mg/L to 30.022 mg/L) beneath the lease and permit areas by 2038 (PWCC 2005b). The negligible increase in sulfate concentration in the N aquifer by 2038, if it occurred, would be limited to the immediate area of the PWCC well field and would not change the drinking-water use designation of the N aquifer. The negligible regional scale, long-term impact, if any, would not be considered significant.

E.1.2.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Impacts on Surface Water

Under Alternative 2 surface water runoff controls (i.e., sedimentation ponds) existing as of 2010 would remain in place until reclamation activities are completed and vegetation becomes established. No additional ponds would be built, including several planned beyond the permit term that are proposed as permanent. Similar to Alternative 1, PWCC would remove 32 ponds but on a more accelerated schedule. During the 16-year reclamation period, PWCC would continue to operate under the terms and conditions of the NPDES permit, including compliance with the Seepage Management Plan and procedures to allow removal of all temporary ponds under Western Alkaline Coal Mining regulations. The impacts on local washes and channels from the sediment ponds or any existing seeps would be negligible to minor, and would not be considered significant. Existing impediments to natural drainage patterns would be reduced due to accelerated reclamation of all temporary sediment ponds within the Kayenta Mine permit area. Changes in streamflow after reclamation will be reduced as a result of reclaiming all temporary sediment ponds within the next three years. Fewer permanent sediment ponds would be left in the post-mining landscape, reducing the overall effects on surface water quantity or quality within the Kayenta Mine permit area, PWCC lease area, or within the entire basins of both Moenkopi and Dinnebito Washes. These changes to surface water quantity or quality would be negligible to minor, and would not be considered significant.

Impacts on Groundwater

Under Alternative 2 the permit renewal application would be rejected and coal removal and the associated groundwater impacts would not occur within the PWCC leasehold. Groundwater quantity and quality impacts to the shallow aquifers as a result of mining to date have been negligible. Since mining would cease in the N-9, J-19, and J-21 coal resource areas, and backfilling and grading would occur within the next several years, the potential for additional impacts on groundwater to occur would be further reduced. 30 CFR 780.21 requires PWCC to develop a hydrologic reclamation plan that will ensure the relevant requirements for protecting the hydrologic balance will be met. Chapter 19, Hydrologic Reclamation Plan in the Kayenta Mine permit application package (PAP) summarizes all methods and plans PWCC would use during mining and reclamation for the 5-year permit term, and through bond release to minimize disturbances to the hydrologic balance as required and specifically listed at 30 CFR 816.41 through 816.43. The PAP, including the hydrological reclamation plan, was previously approved by OSM and no revisions to the PAP are part of this renewal application. Pertinent aspects of these plans and methods are presented in Chapter 17, Protection of the Hydrologic Balance of the Kayenta Mine PAP. The potential impacts on groundwater would be negligible to minor, and could be less than described under Alternative 1 and would not be considered significant.

Impacts on Water Supply

Withdrawals from the N aquifer would be reduced from an average rate of 1,236 af/yr to about 500 af/yr to support reclamation activities for the next 13 years. The reduced pumping rate would allow recovery of water levels more quickly in the vicinity of the PWCC well field, and further reduce PWCC's contributions to drawdowns that would continue to occur as a result of community pumping. Reduced pumping from the N aquifer would also lessen the potential for causing considerable drawdown in the D aquifer. These predicted regional-scale reductions in stream baseflows, which are too small to be measured, would be even less. The potential for leakage from the D aquifer into the N aquifer has been judged to be negligible for the permit term, and would be even lower than those described under Alternative 1 as the pumping rate is reduced to 500 af/yr for a 13 year reclamation period.

E.1.2.3 Unavoidable Adverse Impacts

Past, present, and ongoing studies of ground and surface water characterize the hydrologic setting in the study area, and assess whether adverse impacts have or would occur. Potential adverse impacts from mining during the permit renewal period are mitigated in accordance with the requirements of SMCRA with continuing oversight by OSM. Mitigation analysis and commitments to protect the hydrologic balance are contained in the required Hydrologic Reclamation Plan. No unavoidable adverse impacts on hydrology have been identified.

E.1.3 Vegetation

This section describes the analysis of direct and indirect effects on the upland, riparian, and wetland⁷ and aquatic vegetation communities, noxious weeds and invasive plant species, and special status plant species.

E.1.3.1 *Alternative 1: Approve the Renewal of Permit AZ-0001D*

Developing the N-9, J-19, and J-21 coal resource areas during the permit period will have the direct impact of removing 1,159 acres (approximately 0.1 percent or less) of the existing piñon/juniper woodland, saltbush and greasewood, and sagebrush shrubland vegetation types in the study area (Table E-2). However, reclamation will replace the areas mined during the permit renewal period with an all-purpose rangeland composed primarily of native species. The reclamation vegetation will be dominated by grasses and shrubs and scattered groupings of trees. Long-term, this will increase the amount of reclaimed (disturbed) vegetation in the study area by about 6 percent. No lands with mixed conifer or tamarisk riparian shrubland will be removed by coal mining activities during the permit renewal period (Table E-2). The conversion of existing vegetation communities to the reclaimed vegetation community is minor because the mined and reclaimed areas will affect less than one percent of the total available acres of plant communities in the study area. Also reclaimed sites would transition to a stable vegetation community, and the use of native species could provide additional seed sources of native populations of these species in adjacent areas (Peters et al. 2006, Schuman 2002).

Table E-2 Acres of Vegetation Communities Disturbed during the Permit Period (2010 to 2015)

Vegetation Community	Acres ¹ in Coal Resource Area			Total Acres
	N-9	J-19	J-21	
Piñon-Juniper Woodland	464	172	316	952
Saltbush and Greasewood Shrublands	>1	1	1	3
Sagebrush Shrubland	23	122	59	204
Total				1,159

SOURCE: PWCC 2010 GIS data

NOTE: ¹ Acres rounded to nearest whole acre

⁷ The term wetland in this document describes vegetation and does not indicate jurisdictional status.

Existing plans for reclamation activities that mitigate mining related surface disturbance to vegetation resources include reclamation activities that consist of establishment of grasses, forbs and shrubs. Plant species used for revegetation will be mostly native, but some non-native grasses and forbs are used to aid in the post-mine land uses. On reclamation areas, 4 feet of soil and suitable plant growth media are replaced. These areas are seeded with approved seed mixtures that are stipulated to be free of noxious weeds. Seeded areas are mulched with native grass hay. Habitat islands for wildlife will be established in the reclamation areas in which small, periodic clusters of exposed rock are installed, and clusters of piñon, juniper, forbs, and shrubs are planted. Shrubs and woodland vegetation also will be established around ponds, drainage bottoms, and hill slopes. Reclaimed sites will continue to be monitored twice a year for 10 years to evaluate the adequacy of reclamation and the presence of weed species. Prescriptions for reseeding, grazing management, or weed control are made based on the results of statistical sampling or monitoring observations in reclaimed areas.

Cultural plant sites will be established on select sites within reclamation areas. These are developed in areas with a mesic aspect and on coarse-textured skeletal soils and rocky substrates similar to native areas supporting piñon-juniper woodland and historic cultural collection sites. These sites, combined with native shrubland and piñon-juniper planting areas, will comprise approximately 5 percent of reclaimed lands.

Disturbed and reclamation areas will have the indirect impact of being susceptible to invasion by noxious weeds and other invasive plant species. Livestock grazing and reclamation activities to regrade, spread topsoil, and reseed areas disturbed during the permit renewal mining activities could increase the potential for establishment of noxious weeds and invasive species in the short-term (Bryson and Carter 2004, Pyke 1999). Most of the weeds that are present in the Kayenta Mine permit area are annual weeds, which compete poorly with established reclamation vegetation. Additionally, PWCC maintains a twice per year vegetation monitoring and weed program for 10 years after reseeding areas. This program identifies the measures to control noxious weeds that could establish in the Kayenta Mine permit area. With ongoing reclamation and mitigation efforts, potential establishment of invasive plant species or noxious weeds will be temporary and highly localized. With the potential for weed establishment being temporary and localized, the impact would be minor and would not be considered significant.

Settling ponds, impoundments, and other erosion control measures would prevent sediments from moving to riparian vegetation stands within or downstream of the Dinnebito, Moenkopi Wash and Coal Mine Wash drainages. Impoundments developed in association with the N-9, J-19, and J-21 coal resource areas and reclamation sites could augment the small number of wetland areas present at impoundments in previously mined areas in the Kayenta Mine permit area. The impacts to riparian vegetation from the various water impoundments would be negligible and would not be considered significant.

Water withdrawals for mining activities are not likely to affect riparian vegetation in areas downstream as the amount of groundwater and surface water quantity and quality will not change during the permit period. Monitoring during of the N aquifer water withdrawal has not shown impacts on surface water or

effects on riparian vegetation downstream of the Kayenta Mine permit area. Similarly, the results of modeling water withdrawal during the permit period indicate no effects from water withdrawal on surface water downstream of the Kayenta Mine permit area (see Section E.1.2 Hydrology for additional information). The impacts to riparian vegetation from water withdrawal for mining activities would be minor and would not be considered significant.

Special Status Plants

Navajo Sedge. With no potential habitat in the Kayenta mine permit area, the potential effects on the species from the proposed action would come from drawdown of the N aquifer due to pumping, which could potentially affect habitat by decreasing water flow in seeps and springs. The only known populations potentially affected by the proposed action include the Tsegi Canyon population, about 12 miles north of the N-9 coal resource area, and the population where Moenkopi Wash and Ho No Geh Canyon overlap the unconfined portion of the N aquifer. However, the Kayenta mining operation is not predicted to decrease flows in seeps and springs associated with the N aquifer, thus the impacts on the species would be negligible and would not be considered significant.

Alcove bog-orchid. With no potential habitat in the Kayenta mine permit area, the potential effects on the species from the proposed action would come from drawdown of the N aquifer due to pumping, which could potentially affect habitat by decreasing water flow in seeps and springs. The closest population is approximately 12 miles north of the Kayenta Mine permit area in Tsegi Canyon and is associated with seeps and springs originating from the unconfined portion of the N aquifer, which is unaffected by groundwater pumping from the Kayenta mining operations. The impacts on the species would be negligible and would not be considered significant.

E.1.3.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Not authorizing mining in the N-9, J-19, and J-21 coal resource areas will result in retaining 1,159 acres of existing vegetation (approximately 0.1 percent of the total available in the study area). Retaining the existing vegetation will remove the necessity of disturbing and converting these areas to an all-purpose rangeland. Under Alternative 2, the amount of reclaimed (disturbed) vegetation will not increase (see Table E-2). These areas will retain their existing vegetation community state and species composition (ESCO 2010). In comparison, the effects will be negligible under this alternative, which would not be considered significant.

Livestock grazing and vehicles used during reclamation activities of other previously mined areas will retain the possibility of introducing noxious weeds and invasive plant species into the Kayenta Mine permit area. Initiating reclamation for all areas disturbed by mining activity, roads and support facilities could increase the number of vehicles entering and exiting areas within the Kayenta Mine permit area. This could indirectly increase the potential for noxious weed and invasive species establishment in the short-term in comparison to Alternative 1. However, monitoring requirements will be the same as Alternative 1, and the long-term potential for noxious weed and invasive species establishment within the

Kayenta Mine permit area will not differ substantially from Alternative 1. In comparison, the effects would be minor under this alternative, which would not be considered significant.

Similar to Alternative 1, sediment control structures and impoundments will continue to prevent sediments originating in previously mined areas from reaching riparian vegetation downstream from the Kayenta Mine permit area under this alternative. Reclamation will restore natural drainage patterns, and the removal of temporary impoundments will result in a short-term change in vegetation species present in localized areas. Long-term, not authorizing mining will reduce the number of permanent ponds within the study area that could alter the vegetation species present in localized areas relative to Alternative 1. In comparison, the effects would be negligible under this alternative, which would not be considered significant.

Reducing the water withdrawal from the N aquifer to approximately 500 af/yr from 1,236 af/yr will be less than the potential effect described in Alternative 1. As the withdrawal of water from the N aquifer is considered to have a negligible effect on surface water under Alternative 1 (see Section E.1.2.2), the potential effects on vegetation communities would be negligible under this alternative, which would not be considered significant.

E.1.3.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts on vegetation communities will come from the local loss of 1,159 acres of piñon-juniper woodland, saltbush and greasewood shrubland, and sagebrush shrubland during the permit period (Table E-2). In mined areas, reclamation will establish a grass shrubland of mostly native species that is dominated with grasses and secondarily shrubs and some forbs. Long-term successional processes will return additional native species to the reclamation sites, but reclaimed sites will likely maintain a different potential vegetation in comparison to the original site conditions (West 1997). In a broader context, the mine-related disturbance during the permit period will affect only about 0.1 percent or less of the available sagebrush shrublands, piñon-juniper woodlands, and saltbush and greasewood shrublands in the study area. The conversion of existing vegetation including piñon-juniper woodland to a reclaimed vegetation community would be minor and would not be considered significant.

E.1.4 Fish and Wildlife

This section describes the analysis of effects on fish and wildlife resources. The analysis for fish and wildlife resources includes potential impacts of noise and light from the mining activities from the three coal resource areas.

E.1.4.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Developing N-9, J-19, and J-21 coal resource areas will have the direct impact of removing wildlife habitats in about 1,159 acres of upland vegetation communities (Table E-2). Habitats in the N-9, J-19, and J-21 coal resource areas are already disturbed by numerous interlacing roads and other human disturbances. Mining operations will principally result in the direct impact of displacing wildlife adapted to piñon-juniper woodland and secondarily to sagebrush shrubland habitats. Also, mining will have the

direct impact of removing rock outcrops, bluffs, and talus and the indirect impact of replacing these at reclamation with a more uniform reconstructed minesoil and a more gentle and rolling topography. Piñon-mice, brush mice, Colorado chipmunks, Stephen's woodrats, gray foxes, western spotted-skunks (*Spilogale gracilis*), rock squirrels (*Spermophilus variegatus*), porcupine (*Erethizon dorsatum*), woodland adapted bats, sharp-shinned hawks, Cooper's hawks, great horned owls, piñon jay (*Gymnorhinus cyanocephalus*), gray flycatcher (*Empidonax wrightii*), juniper titmice (*Baeolophus ridgwayi*), mountain chickadees (*Poecile gambeli*), black-throated gray warblers (*Dendroica nigrescens*), collared lizards, and sagebrush lizards are some of the more common wildlife species that could be displaced by the loss of woodland and shrubland vegetation or complex, rocky habitats. The loss of wildlife habitats in the N-9, J-19, and J-21 coal resource areas will be minor in comparison to the larger context because the affected habitats for wildlife, regardless of the current quality, will total about 0.1 percent of the available wildlife habitat in shrublands and woodlands within the study area established for the vegetation analysis (see Table E-2) (Brown et al. 2007).

During reclamation, the mined-out N-9, J-19, and J-21 coal resource areas will be replaced primarily with native grasses, forbs, shrubs, and concentrated planting areas with some cultural plants and trees within the reclamation. The reclaimed areas will provide habitat for species adapted to habitat edges, early successional environments, and grassland habitats. Species that are highly adaptable could increase in abundance in reclaimed areas. These species include deer, elk, deer mice, Ord's kangaroo rats, Gunnison's prairie dogs, Navajo mountain vole, black-tailed jackrabbits, desert cottontails, red foxes, coyotes, some bats, eastern fence lizards, prairie falcons, and red-tailed hawks. In the long-term, the breeding potential for all raptors, except the bald eagle, could increase as trees develop in portions of the reclamation. Black Mesa does not have potential breeding habitat for bald eagles, and the reclaimed areas are unlikely to develop breeding habitat characteristics for this species.

Additional indirect impacts to wildlife—particularly to raptors, owls, and other bird species—could come from daily noise associated with mine activity. Noise from vehicles will be ongoing and localized around mining pits, mine facilities, and haul roads and could cause wildlife such as birds, deer, and elk to flush or alter normal behavior patterns within 50 to 100 feet of the source (Barber et al. 2010). Noise from blasting will be intermittent, but the region of influence for blasting at the mines will extend up to several miles from the source. Noise induced behavioral responses could occur (Barber et al. 2010) beyond the N-9, J-19, and J-21 coal resource areas but would be attenuated by distance, topography, and vegetation cover. Some birds and wildlife may flush or increase their alert responses (Barber et al. 2010) within the 2-mile buffer area around the coal resource areas. However, blasting activities have occurred on a regular schedule (twice daily on weekdays between sunrise and sunset) for decades, and some wildlife likely have become accustomed to the ambient noises from mining activities (PWCC 2001).

PWCC will continue to conduct annual wildlife monitoring and special studies within the Kayenta Mine permit area through final reclamation and bond release as part of its permitting stipulations from OSM. These include small mammal studies, passerine and migratory bird observations, raptor monitoring, MSO and wildlife surveys, prairie dog colony monitoring for black-footed ferrets, and special interest

reconnaissance surveys for species listed by the Navajo Nation and USFWS. As part of reclamation, monitoring will continue to be conducted in revegetated areas and prescriptive measures will be applied to help encourage development of desired vegetation and discourage the establishment of noxious weeds or invasive species. The results of these long-term surveys will be submitted to OSM.

Vegetation reclamation plans will continue to include the establishment of all-purpose rangeland for grazing of livestock and big game species and many other wildlife species. The standard rangeland seed mix is comprised of grasses, forbs, and shrubs, which includes fifteen native plant species and six introduced plant species.

Key shrubland and woodland wildlife habitat areas will be established at cultural plant sites, concentrated shrub and tree planting sites and rock habitat features interspersed as patches within the broader reclamation areas. These patches include trees, forbs, and shrubs and an understory of native grasses that do not out-compete the woody species. These areas will be planted with seedlings, container-grown specimens and a light rate seed mix with cultural plant species. PWCC also will create rock piles about every 100 acres to provide some habitat for rock-dwelling species in reclamation areas.

Impacts from habitat loss and mining-related noise during the permit period would be minor on wildlife, within and surrounding N-9, J-19, and J-21 coal resource areas. Also, extensive areas of wildlife habitat will be unaffected by mining noises outside the Kayenta Mine permit area and the larger region. Minor impacts would not be considered significant.

Special Status Animal Species

This section describes the analysis of effects on special status species. The analysis for special status species includes potential impacts of noise and light from the mining activities from the three coal resource areas.

California Condor. There are no unique foraging opportunities (concentrations of large carrion) or distinctive roosting or nesting features (tall cliffs or canyons) within the vicinity of the N-9, J-19, and J-21 coal resource areas to attract condors to the area. As the California condor is highly unlikely to occur in the region and because roosting and foraging habitat is likely inadequate, the effects of mining will be negligible to individuals in the area during the permit period. Negligible impacts would not be considered significant.

Mexican Spotted-Owl. Coal mining in the Kayenta Mine permit area will not remove suitable habitat for the MSO. All suitable habitat and PACs for the species are located in canyons north of the boundary limits of Kayenta Mine permit area (refer to D-5). No suitable, occupied habitat occurs in the vicinity of the J-19 and J-21 coal resource areas, and no MSOs activity has been detected at any of the coal resource areas in the past (PWCC 2001). The closest stands of suitable habitat in mixed-conifer forest are about 11 miles to 12.5 miles north of the J-19 and J-21 coal resource areas. Mixed conifer habitat occurs north and east of the N-9 coal resource area at much closer distances that range between about 2.0 miles and 4.8

miles at the closest point. Although habitat for the spotted owl will not be removed, noise from mining activities and light coming from dragline lights during the night could influence occupied habitat.

Anthropogenic sources of noise could initiate various behavioral responses in MSOs, depending on the distance and source of the noise. Existing studies on noise indicate that the response of wildlife to noise disturbance is complex, being neither uniform nor consistent (Barber et al. 2010). Delaney et al. (1997) reviewed literature on the response of owls and other birds to noise and concluded the following:

(1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season, (2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 feet (61 m) and when sound levels are in excess of 95 dBA, and (3) the tendency to flush from a nest declines with experience or habituation to the noise, although the alert response (i.e., head movements or agitated behavior) cannot be completely eliminated by habituation. The USFWS (2003) has established strict thresholds for noise exposure to spotted owls. The agency estimated the sound-only injury threshold for spotted owls at approximately 92 dBA at nest sites. Disturbance thresholds were estimated at 70 dBA and detectability thresholds were estimated at 44 dBA (USFWS 2003). The intervening topography beyond the N-9 coal resource area will attenuate the impacts from mining-related sources of noise and light.

The loudest noises from typical mining activities at the Kayenta Mine will come from rock drills and blasting (see Table D-8). Surface blasting is conducted an average of twice daily during weekdays, between sunrise and sunset. Other mining activities occur throughout the day and night all days of the week. OSM requires that air-blast levels be limited to a maximum of 134 dB (peak) at the source, and a typical rock drill creates is about 95 dB of noise measured at 50 feet from the source (Minor, Michael & Associates 2000).

Using the inverse square law ($I = P/4\pi r^2$), the estimate of mining-related noise in MSO habitat from rock drills at the N-9 coal resource area would measure about 48.5 dB in MSO habitat 2.0 miles away and 40.9 dB in MSO habitat 4.8 miles away (Davis and Patronis 2006). Blasting noise would measure about 33.5 dB at 2.0 miles and 25.9 dB at 4.8 miles. Rock drills, which are the loudest source of mining noise, operating in the J-19 coal resource area would register at about 34.5 dB in the closest MSO habitat, and rock drills operating in the J-21 coal resource area would register about 33.1 dB in the closest MSO habitat. Noise from mining operations will attenuate further where topography and weather further reduce the amount of noise reaching MSO habitat. The loudest mining noises detectable in MSO habitat could range from the levels of an average quiet residence at night (about 30 dB) to an average office environment (about 50 dB) (see Table D-7).

Rock drills and other heavy machinery operating above 90.5 dB in the N-9 coal resource area produce the only likely detectable sound in the closest MSO habitat about 2.0 miles away and could fall below detectable levels beyond about 3.4 miles. Mining-related noises coming from the N-9, J-19, or J-21 coal resource areas will not reach the disturbance or injury thresholds according to these USFWS standards. Also, noises from mining have been occurring on a regular schedule for decades, and MSOs likely have

adapted to the ambient noises from mining activities (PWCC 2001). Therefore, it is unlikely that MSOs will be exposed to noises that could induce stress, alter behavior, or suppress breeding in the action area.

Studies of light pollution on the MSO do not exist. Light pollution can have substantial effects the annual rhythms of wildlife, which could affect the onset of reproductive behavior, the effectiveness of foraging activities, individual mating patterns, and other essential activities (Kempnaers et al. 2010). Observations of many rodent species indicate that individuals reduce activity or stay under canopy cover to reduce predation risks in response to higher ambient light (O'Farrell 1974, Vickery and Bider 1981, Getz 2009), but MSOs success at catching prey could increase under higher ambient light, as is suggested by observations of other owl species (Daly et al. 1992). However, the potential amount of light coming from the coal resource areas, described previously, is anticipated to be below levels that could affect the natural behaviors of MSOs or prey species.

During the permit renewal period, the dragline excavators work area is illuminated at night with lights mounted to the machinery and focused on the mining surface. Ecological light pollution from the draglines could disrupt the foraging behavior of MSO. Rather than shining directly into MSO habitat, mining lights will most likely produce a visible glare and skyglow outside of active mining areas. At the time of this analysis, no data were available regarding the specifications on lights used at the Kayenta Mine. Assuming that safety standards require illuminating the mining surface within the pit at a level similar to direct sunlight, the amount of light could be as high as 130,000 lux (lumens/m²). Also, conservatively assuming that about half the light is reflected and half is absorbed by the surfaces within the mining pit, about 65,000 lux could be emitted from mining areas.

Using the inverse square law ($I = P/4\pi r^2$), the potential amount of mining-related light reaching the closest MSO habitat, which is 2.0 miles from N-9, could be approximately 0.006 lux and 0.001 lux in MSO habitat 4.8 miles away (Ryer 1998). Light coming from the J-19 coal resource area could result in about 0.00031 lux in the closest MSO habitat, and light from the J-21 coal resource area could result in about 0.00021 lux in the closest MSO habitat. Ambient light on a moonless night is about 0.002 lux, and mining operation lights could decrease to this ambient level at about 3.5 miles. Therefore, mining-related light could be obscured by the ambient level of light with the exception of that coming from the N-9 coal resource area. The topography will shade most of the MSO habitat from mining-sourced light, with only some of the canyon rims being within the line of sight of the mine. Also, the upper tree canopy likely will further block light and reduce the possible impact from mining lights.

Between 1994 and 2000, mining activity was closer to occupied habitat than the areas that will be mined during the permit renewal period and MSOs continued to inhabit and successfully reproduce during previous mining operations (PWCC 2001). The effects of noise and light during the permit period would be less than previous mining operations and MSOs are expected to continue to occupy habitats and successfully reproduce during the permit renewal period mining. During the permit renewal period, no MSO habitat will be removed, noise levels are anticipated to be below the FWS threshold, and indirect light levels would be similar to a moonlight night. The effects from mining during the permit renewal period will be minor on MSOs. Minor impacts would not be considered significant.

Southwestern Willow Flycatcher. Willow flycatchers have been observed infrequently during migration in a limited number of places in the Kayenta Mine permit area and in riparian areas farther away near the confluence of Moenkapi Wash and Dinnebito Wash (LaRue 1994). However, no suitable habitat occurs near the N-9, J-19, and J-21 coal resource areas, and no riparian habitat will be removed as part of the proposed action. Groundwater monitoring of the N aquifer has demonstrated that water withdrawal has not had significant impacts on riparian areas downstream of the Kayenta Mine permit area, which includes stopover habitat for migrating southwestern willow flycatchers (LaRue 1994). As habitat for the southwestern willow flycatcher is limited on Black Mesa, and the species' occurrence would be rare and transient in the Kayenta Mine permit area, and because southwestern willow flycatchers would not use the N-9, J-19, or J-21 coal resource areas, and habitat will not be removed as part of the proposed action; the effects of mining will be minor on the southwestern willow flycatcher in the area during the permit renewal period. Minor impacts would not be considered significant.

Black-Footed Ferret. Wildlife monitoring for prairie dogs in the Kayenta mine permit area has not identified any colonies in the N-9, J-19, or J-21 coal resource areas, and evidence of black-footed ferret use has not been observed during monitoring studies for the species elsewhere within the Kayenta mine area (EMI 2010). In addition, suitable habitats in prairie dog towns southwest of the Kayenta Mine permit area are too small to support a local population of black-footed ferrets. As habitat for black-footed ferrets is lacking, and because no ferrets occur in the PWCC lease area, there will be no impact to black-footed ferrets from mining activities during the permit renewal period.

Sora. Annual wildlife monitoring within the Kayenta Mine permit area has documented this species in a number of reclaimed areas (LaRue 1994). Additional wetland vegetation could develop at impoundments and other freshwater ponds constructed for mining within the N-9, J-19, and J-21 coal resource areas, which could have the direct impact of developing additional habitat resources for the species within the Kayenta Mine permit area during the permit period. This could increase potential habitat for the sora due to mining activities during the permit renewal period these effects would be minor and would not be considered significant.

Bald Eagle. Mining activities will remove piñon-juniper woodlands from the N-9, J-19, and J-21 coal resource areas, which could be used briefly as perch sites by individuals during migration. Transient eagles infrequently occur within the Kayenta Mine permit area (LaRue 1994), and potential roosting habitat in mixed-conifer forests occurs as close as about two miles north of the N-9 coal resource area. Potential roosting habitat could be influenced by blasting noise up to 2 miles distant. Blasting and other mining noises could arouse or flush individual eagles in the Kayenta Mine permit area or arouse individuals at roost sites; however, blasting noise would measure about 33.5 dB at 2.0 miles and 25.9 dB at 4.8 miles, which could be further attenuated by topography and vegetation (Mohamed 2010). Additionally, noise from mine operations and blasting is not predicted to change from 2010 levels and no increase in the severity of the potential impact is anticipated on bald eagles. The effects on bald eagles from noise would be minor because the sources of noise would be intermittent, single events, which are

similar to noises that were occurring while the bald eagle was observed in the study area. Minor impacts would not be considered significant.

Golden Eagle. The golden eagle uses the Kayenta Mine permit area infrequently and occasionally forages near the N-9, J-19, and J-21 coal resource areas (EMI 2010). Blasting could arouse or flush individual eagles in the Kayenta Mine permit area or arouse individuals at perch sites; however, blasting noise will be attenuated by the square of the distance from the source and from obstructions such as topography and vegetation (Mohamed 2010). Additionally, noise from mine operations and blasting is not predicted to change from 2010 levels, and no increase in the severity of the potential impact is anticipated on golden eagles. The effects on golden eagles from noise would be minor because the sources of noise would be intermittent, single events, which are similar to noises that were occurring while golden eagles were observed using the Kayenta Mine permit area. Minor impacts would not be considered significant.

Ferruginous Hawk. Potential foraging habitat occurs in revegetated areas and in prairie dog colonies that could develop in these areas. The N-9, J-19, and J-21 coal resource areas could result in the indirect impact of providing additional foraging habitat after reclamation by creating areas with little tree canopy cover and greater foraging opportunities. However, blasting could arouse or flush individual ferruginous hawks that happen to use the Kayenta Mine permit during foraging; however, blasting noise will be attenuated by the square of the distance from the source and from obstructions such as topography and vegetation (Mohamed 2010). As noise from mine operations and blasting is not predicted to change from previous levels when ferruginous hawks were observed in the vicinity, and because reclamation could develop additional habitat for the ferruginous hawk; there would be no increase in the severity of the potential impacts anticipated on ferruginous hawks during the permit renewal period. The impacts to the ferruginous hawk will be minor and would not be significant during the permit renewal period.

Northern Goshawk. Potential foraging habitat for the species occurs in the N-9 mining area (BIOME 2003), which will be lost with development of this area. Piñon-juniper woodlands are infrequently utilized as post-fledgling foraging habitat by dispersing juveniles (Weins et al. 2006). Monitoring for northern goshawks is conducted annually as part of the advancing mine front surveys and will continue in advance of mining the N-9 coal resource area. To date, no northern goshawks have been detected in the 2-mile survey area around the northern part of the Kayenta Mine permit area. As the habitat removed for mine development likely is of limited quality for goshawks and because the species has not been recorded within or near the Kayenta Mine permit area, the effects of mining in the Kayenta Mine permit area on the northern goshawk will be minor and would not be significant during the permit period.

Peregrine Falcon. Peregrine falcons occasionally forage in the Kayenta Mine permit area, and individual falcons could occur periodically in the N-9 mining area and other places with piñon-juniper woodland (BIOME 2003). Development of the N-9 mining area will remove potential foraging habitat for the species in this coal resource area, but a utilitarian foraging habitat will be replaced by the reclamation and permanent impoundments, which could have greater abundance of prey for any peregrine falcons that forage in the Kayenta Mine permit area. Blasting could arouse or flush individuals in the Kayenta Mine permit area or arouse individuals during foraging; however, noise from mine operations and blasting is

not predicted to change from 2010 levels, and no increase in the severity of this potential impact is anticipated on peregrine falcons. Potential effects on peregrine falcons will be minor because the removal of potential foraging habitat for the peregrine falcon is 0.1 percent or less in comparison to the total available habitat on Black Mesa and foraging opportunities could return after reclamation. In addition, noise would be associated with intermittent, single events, which are similar to likely noises that were occurring when peregrine falcons were previously observed in the Kayenta Mine permit area. The effects of mining in the Kayenta Mine permit area on the peregrine falcon will be minor and would not be significant during the permit renewal period.

Northern Saw-Whet Owl, Northern Pygmy Owl, and Flammulated Owl. These three species could inhabit mixed-conifer forests north and northeast of the N-9 coal resource area. Habitat could be indirectly impacted by noise from blasting and mining activities, and from light pollution coming from dragline lights at the N-9 coal resource area at night. The mining noises could arouse individual owls, the additional light could increase foraging efficiency but decrease prey availability, or both noise and light could affect behavior of individual owls (Barber et al. 2010, Kempnaers et al. 2010, O'Farrell 1974, Vickery and Bider 1981, Getz 2009). However noise and light will attenuate by the square of the distance from the source and from obstructions such as topography and vegetation (Mohamed 2010), and given the distance between the mining areas and the habitat of these owl species, it is not anticipated that noise or light would affect the biology of these species (see impact analysis for the Mexican spotted owl). Thus, impacts on the Northern saw-whet owl, northern pygmy owl, and flammulated owl would be minor, because the proposed action would likely not affect the behavior or ecology of these species during the permit renewal period. Minor impacts would not be considered significant.

Burrowing Owl. Development of the N-9, J-19, and J-21 coal resource areas will not impact potential habitat for the species. However, reclamation activities could increase the amount of habitat for Gunnison's prairie dog, which could create more potential habitat for burrowing owls. However, all prairie dog towns are outside of the Kayenta Mine permit area, and no burrowing owls have been seen on Black Mesa. Coal mining during the permit period would have no anticipated impacts to the burrowing owl, which would not be considered significant.

Navajo Mountain Vole. Development of the N-9, J-19, and J-21 coal resource areas could remove habitat for the species in piñon-juniper woodlands and big sagebrush shrublands during the permit period. Mining activities also could result in the death of some individuals. Reclamation vegetation and habitats planted in these areas would suitably replace the lost habitats. The results of previous studies by LaRue and SWCA Environmental Consultants have shown relatively large populations of Navajo mountain voles in reclaimed areas (PWCC 1992). As reclamation could add additional habitat and reduce the loss of habitat from mining of the N-9, J-19, and J-21 coal resource areas; the effects of mining during the permit period mining will be negligible on the Navajo mountain vole. Negligible impacts would not be significant.

Townsend's Big-eared Bat. Development of the N-9, J-19, and J-21 coal resource areas could remove foraging habitat for the species during the permit period, but reclamation vegetation in these areas may

suitably replace the lost foraging opportunities. As reclamation may eventually add additional habitat, which would offset any loss of habitat from mining of the N-9, J-19, and J-21 coal resource areas, the effects of mining will be minor on Townsend's big-eared bat during the permit period. Minor effects would not be significant.

E.1.4.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [D [No Action]

If authorization is not provided to proceed with mining in the N-9, J-19, and J-21 coal resource areas, there will be no further loss of wildlife habitats in these areas. Blasting will cease and traffic associated with mine activities will decrease, which will reduce the potential for noise impacts in the Kayenta Mine permit area. Reclamation activities, and vegetation and wildlife monitoring will continue until bond release requirements are met. During this time, impacts to fish and wildlife in reclamation areas will be the same as those described in Alternative 1. Wildlife habitat around ponds will continue at a number of local temporary and permanent impoundments sites, even after reclamation is complete. These areas could continue to attract migrating waterfowl, raptors, and shorebirds and could provide localized habitat for resident wildlife species. The availability and influence of these artificial wetlands will decrease compared to Alternative 1 as no additional permanent or temporary ponds (sediment structures) will be constructed. As reclamation activities are completed, temporary ponds will be removed. This would result in a localized reduction in habitat for the sora, migrating waterfowl, and shorebirds within the Kayenta Mine permit area. However, wildlife habitat will still be available at the permanent ponds in the reclaimed areas. Impacts to wildlife overall will be negligible under this alternative. Negligible impacts would not be considered significant.

Under this alternative, impacts to special status animal species would be negligible. Localized noise from vehicles during reclamation of previously mined sites could affect peregrine falcons, ferruginous hawks, northern goshawks, golden eagles, and bald eagles that forage in reclamation sites around the previously mined coal resource areas, but negligible impacts would not be significant.

There will be no impacts to federally listed animal species under this alternative. Noise from blasting that could disrupt MSOs will cease. Groundwater withdrawals from the N aquifer will decrease to approximately 505 acre feet per year through final reclamation. This could help to improve the quality of potential southwestern willow flycatcher habitat in Moenkopi Wash that is downstream of the study area.

Under this alternative, potential habitat for the Navajo mountain vole and Gunnison's prairie dog would decrease with less land moving into reclamation and as woody vegetation begins to replace herbaceous vegetation in land currently under reclamation. About 1,159 acres of foraging habitat will not be available in the future for ferruginous hawks or for deer and elk potentially grazing in reclamation areas. A decrease in the number of available ponds in reclaimed areas could further decrease habitat qualities for deer and elk in the long-term. A loss of some sources of water would be a minor impact that will not eliminate any of the currently documented species from the local area. Minor effects on wildlife and special status species would not be considered significant.

E.1.4.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts on wildlife result from conversion of 952 acres of piñon-juniper woodland to a reclaimed vegetation community dominated by grasses and shrubs. In mined areas, reclamation will establish a grass shrubland of mostly native species that is dominated with grasses and secondarily with shrubs and some forbs. Long-term successional processes would return additional native species to the reclamation sites, but reclaimed sites would likely maintain a different potential vegetation in comparison to the original site conditions (West 1997). Converting areas of piñon-juniper woodlands to reclaimed vegetation could increase habitat mosaic and wildlife species in reclaimed areas. However, the types of wildlife species present in reclaimed areas would be different because the vegetation community structure and uniform slopes alter habitat complexity, favoring early successional or grassland species (Kasner and Slack 2002). Species adapted to woodlands and cliff and outcrop habitats may underutilize reclaimed sites compared to native ones (Ireland et al. 1994). Reproduction also may be lower or absent in reclaimed sites than in adjacent native ones, suggesting that reclaimed areas contain more non-breeding colonizers than in native habitats (LaRue 1994, Chamblin 2002). In a broader context, the mine-related disturbance during the permit period would affect only about 0.1 percent or less (Brown et al. 2007) of the sagebrush-shrubland, piñon-juniper woodland and saltbush and greasewood shrublands that are available for wildlife habitat on Black Mesa, which would constitute a minor impact that would not be considered significant.

E.1.5 Soil Resources

The analysis of potential effects on soil resources include the acres of soils disturbed by mining activities and the potential for soil loss, stability, and productivity.

E.1.5.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Surface-mining activities would blend and homogenize soil resources and the original soil profile would be lost permanently. Surface disturbance of soils and vegetation on approximately 1,159 acres through mining operations and haul road construction could increase short-term erosion and soil movement from the coal resource areas N-9, J-19, and J-21. Temporary or permanent impoundments also could decrease off-site sedimentation and soil movement in localized areas. Surface-mining activities and road or support facilities construction would directly affect soil structure from surface disturbance that blends soil layers resulting in long-term loss of the original soil profile. Indirectly this could reduce short-term soil productivity in these areas.

Slope reclamation operations generally include regrading, smoothing, and slope contouring to approximate the original topographic contours, considering the needs of minimizing erosion and supporting the post-mining land uses of livestock grazing and wildlife.

In coal resource areas, topsoil and suitable subsoil will be removed and replaced immediately for reclamation following backfilling and regrading or stockpiled for use after mining operations. Soil removed during mine operation activities and not used for reclamation would remain in stockpiles. OSM guidelines for reclamation programs and projects identify soil and slope conditions considered acceptable or suitable during reclamation, including soil pH and acid-forming spoils, sodic zones, toxic substance

occurrence in soil, percent and length of slope, and slope stability. Reclamation activities will reduce the loss of soil to erosion. The soil loss on restored land would be approximately 3 to 9 tons/acre/yr after 10 years, which is less than the 7 to 22 tons/acre/yr that can be expected on undisturbed slopes.

By salvaging topsoil and suitable subsoil from areas to be disturbed prior to mining, PWCC estimates approximately 2.1 feet of soil material is available to uniformly cover all reclaimed areas. The Minesoil Reconstruction Plan proposes to salvage the topsoil (as defined in 30 CFR Part 701.5i) together with suitable subsoil and underlying unconsolidated material to provide a topsoil mixture suitable for reclamation. Salvaged material is either redistributed immediately or stockpiled for use as topsoil on future regraded areas. Topsoil stockpiles are protected from wind and water erosion by seeding the stockpiles and placing berms around the perimeter of the stockpile.

In the short-term, soil erosional stability would be maintained by an effective and permanent vegetative cover established during reclamation. Although the reclaimed (postmining) land cannot be restored to pre-mining productive use immediately due to the long timeframe required for plant establishment in the arid climate, soil productivity would be maximized by reclamation procedures that create a suitable 4-foot-deep plant root zone over the entire reclaimed area and establishing a diverse and permanent vegetation cover. Soil reconstruction and revegetation would be undertaken to restore the land to productive use and, in the long-term, soil productivity should exceed premining capability (PWCC 2002). Through incorporation of reclamation and mitigation measures within coal mining areas N-9, J-19, and J-21, soil productivity and stability for post-mining activities would improve. Appendix A Section D provides a summary of the procedures PWCC will follow including adherence to approved soil mitigation plans, use of sedimentation control structures, and revegetation practices. PWCC's mitigation reduces soil loss, improves soil suitability, and increases soil productivity on reclaimed areas compared to native sites (PWCC 2002). Effects on soil productivity, erosion, and soil stability after reclamation for post-mine land uses (livestock grazing and wildlife) would be minor and would not be considered significant.

E.1.5.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Soil resources would remain in their existing condition in the undisturbed areas of N-9, J-19, and J-21. Similar to Alternative 1, reclamation activities would restore the existing disturbed 8,013 acres (see Table C-1), improving soil productivity within these areas. Soil not used in reclamation will remain in stockpiles on a stable site protected from wind and water erosion. Soil resources would remain in their natural condition in the undisturbed areas, which could result in an increase in soil loss from erosion (PWCC 2002). The loss of soils from the 1,159 acres of disturbed lands is less than 1 percent of the soils in the study area. Effects on soil productivity, erosion, and soil stability after reclamation is completed would be minor and would not be considered significant.

E.1.5.3 Unavoidable Adverse Impacts

Surface mining would permanently remove existing soils and their horizons from 1,159 acres within coal resource areas N-9, J-19, and J-21. Reclamation will create a more uniform soil mix that would be more productive for the various post-mining activities; however, the loss of the original soil profile would

result in an unavoidable adverse impact on soil resources. Reclamation will reduce the effects on soil productivity, erosion and soil stability and the unavoidable, adverse impacts on soil would be minor and would not be considered significant.

E.1.6 Recreation

This section evaluates the potential for the alternative to change recreation opportunities. The analysis assumed recreation use within the study area is dispersed, and limited to tribal members or the members of the public with a tribal recreation permit.

E.1.6.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Based on existing data, recreation activities within the permit renewal area are not measurable, and there are no developed recreation sites within the Kayenta Mine permit area. The permit renewal period mining could shift where dispersed recreation activities such as wildlife watching occur. In addition, surface disturbance on 1,159 acres within the three coal resource areas during the permit renewal period would make these areas unavailable for recreation use (refer to Table C-1). The impacts resulting from surface disturbance and mining operations would be short-term and reclamation will restore these areas by regrading slopes and reseeding. As required in the AZ-0001D permit, the disturbed areas would be reclaimed as specified in the approved mining and reclamation plan, but until reclamation is completed and vegetation established, these areas would not be available for recreational activities. If all dispersed recreation use avoided the Kayenta Mine permit area, approximately 2 percent of the study area would be unavailable for recreation use. Long-term disturbed areas would be available for dispersed recreation use by tribal members or the members of the public with a permit to recreate on tribal land after vegetation is established and reclamation completed. As mined areas are reclaimed and available for recreation use, the impacts on recreation from the permit renewal mining would be negligible to minor and would not be considered significant.

E.1.6.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

PWCC would not disturb an additional 1,159 acres within the three coal resource areas, mining operations would cease, and facility removal and reclamation operations would begin as specified in the approved mining and reclamation plan. Similar to Alternative 1, once the vegetation is restored, the land would be available for dispersed recreational use by tribal members or the members of the public with a permit to recreate on tribal land. The cessation of mining activities would reduce the amount of mining-related traffic in the coal resource areas, which could improve the recreational quality of the area, but because no specific data are available on the use of the area for recreation, it would be speculative to conclude that recreational opportunities would improve under Alternative 2. As recreation activities within the permit renewal area are not measurable and reclamation would restore vegetation, regardless of which alternative were implemented. Impacts on recreation under Alternative 2 are also considered negligible because once the area is reclaimed to meet pre-mine conditions, the lands would be available for dispersed tribal recreation use. Impacts on recreation would be negligible and would not be considered significant.

E.1.6.3 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts associated with recreation.

E.1.7 Air Quality

The assessment of air-quality impacts is based on an emissions inventory of predominant criteria pollutant emissions from the Kayenta Mine operations and modeled predictions of ambient air quality impacts by those emissions.

The analysis in this EA is based on metrics from the EPA's program for the prevention of significant deterioration (PSD) of air quality, which defines when an emissions increase that results from a change at a stationary source is "significant" and when the ambient impact from an emissions increase is "significant." PM₁₀ emissions increases of 15 tons per year or more are considered "significant." Similarly, an increase in PM_{2.5} emissions of 10 tons per year or more or an increase in NO_x emissions of 40 tons per year or more also are considered "significant."⁸

Under EPA's PSD program, EPA prescribes "significant impact levels" or "SILs" for PM₁₀, PM_{2.5}, NO_x and other criteria pollutants. The SIL is the level of ambient impact from an emission increase that is deemed significant enough to warrant a complete source impact analysis. That analysis involves modeling the emissions from that source along with emissions from other nearby existing sources to determine whether their cumulative impact will either threaten or exceed a national ambient air quality standard (NAAQS).

E.1.7.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, the air quality impacts would be similar to those from the 2010 Kayenta mining operations, as there are no proposed changes to the current mining methods or coal production rates. Mining activities at surface coal mines are not fixed at a single location from year-to-year, as they move with the progressions of the pits, roads, backfill, and reclamation areas. Fugitive dust from natural wind erosion of disturbed areas and stockpiles, and emissions from reclamation activities and truck haulage would continue until reclamation activities are completed. The current fugitive dust control plan for the Kayenta Mine operations uses emission control practices and low-emission equipment to ensure that emissions from the mining operations do not result in ambient concentrations in excess of the applicable NAAQS (see Appendix D). A comprehensive meteorological and ambient PM₁₀ monitoring program at the Kayenta Mine is used to document the effectiveness of those dust control practices. Should monitoring data of fugitive dust impacts indicate that ambient particulate standards are being threatened by fugitive dust from mining operations, PWCC would adjust the nature, extent and frequency of fugitive dust control measures in order to maintain compliance with the applicable NAAQS. The number and types of emission sources would not change. There would not be additional sources of fugitive dust from

⁸ 40 CFR 52.21(b)(23).

Kayenta Mine, but the relative locations of emission sources such as topsoil removal areas, haul roads, and active pit areas would change.

The annual emissions from mining activities will vary slightly due to changes in the quantities of overburden, disturbed acreages, and haul distances (see Appendix D, Table D-1). The locations of the preparation plants will remain fixed, and their maximum emissions will remain at or near the 2010 levels. Table E-3 summarizes the predicted emissions of PM₁₀, PM_{2.5}, and NO_x from the coal preparation facilities and mining activities.

Table E-3 Pollutant Emission Summary (tons/yr) from Coal Preparation Facilities and Mining Activities

Pollutant	Source	Tons/Year Estimate ¹		
		2010	2012	2018
PM ₁₀	Coal Preparation Facilities			
	J-28	39.04	38.98	38.94
	N-11 Extension	12.46	12.63	12.75
	N-8	65.08	65.17	65.23
	Mining Activities	1,121.79	1,119.66	1,017.73
PM _{2.5}	Coal Preparation Facilities			
	J-28	7.44	7.39	7.35
	N-11 Extension	2.27	2.41	2.52
	N-8	10.22	10.3	10.36
	Mining Activities	155.56	155.37	140.91
NO _x	Coal Preparation Facilities			
	J-28	4.17	4.17	4.17
	N-11 Extension	2.08	2.08	2.08
	N-8	10.33	10.33	10.33
	Mining Activities	360.70	347.43	322.93

SOURCE: Appendix D, Tables D-2 and D-3

NOTE: ¹ The year 2018 was evaluated because that year results in the greatest reasonably foreseeable air polluting emission levels during the permit renewal period.

For the Coal Preparation Facilities, the emissions of PM₁₀, PM_{2.5}, or NO_x either remain at 2010 levels or slightly increase during the permit period. For the Mining Activities, the emissions of PM₁₀, PM_{2.5}, or NO_x either remain at 2010 levels or decrease during the permit period. Any emissions increase from the Kayenta Mine operations would be minor and would not be considered “significant” for these pollutants during the permit period.

Emissions of PM₁₀, PM_{2.5} and NO_x from the Kayenta Mine operations were each modeled to assess the levels of the Mine’s overall ambient air impacts. Table E-4 shows that less than “significant” impacts of PM₁₀ and PM_{2.5} (> 5 µg/m³ for the 24-hour averaging time) are predicted at Navajo National Monument and Monument Valley, the nearest culturally important locations. The modeling analyses confirm that significant impacts of NO₂ would also not occur at the Navajo National Monument or Monument Valley.

The significant impact areas associated with those criteria pollutant emissions from the Kayenta Mine operations do not extend to any Class I areas (see Appendix D, Figures D-1 through D-12).

Table E-4 PM₁₀ and PM_{2.5} from the Kayenta Mine Operations on Local Sensitive Receptors

Receptor	24-Hour Impact (µg/m ³) ¹								
	2010		Above SIL?	2012		Above SIL?	2018		Above SIL?
	PM ₁₀	PM _{2.5}		PM ₁₀	PM _{2.5}		PM ₁₀	PM _{2.5}	
Navajo National Monument	0.86	0.12	No	1.03	0.14	No	1.04	0.15	No
Monument Valley Visitor Center	4.38	0.61	No	3.82	0.54	No	4.14	0.59	No

NOTE ¹The year 2012 is the worst case year in the permit renewal term, but 2018 was included in the analysis because it is the estimated worst case year for determining maximum impacts.

Table E-5 compares the modeled maximum impacts of the Mine's emissions of PM₁₀, PM_{2.5} and NO_x relative to the NAAQS for those criteria pollutants. Modeling results predict the maximum concentrations of PM₁₀ and PM_{2.5}, (24-hour NAAQS) occurred during 2010. The modeling results also indicate the predicted annual maximum annual NAAQS concentrations of PM_{2.5}, and NO₂ occur during 2012, the year of worst-case emissions for these NAAQS. These predicted concentrations are all below the annual and short-term NAAQS standards.

Table E-5 Maximum Criteria Air Pollutant Concentrations and Applicable Standards

Pollutant	Averaging Period	Year	Concentration (µg/m ³)	Concentration with Background (µg/m ³)	National Ambient Air Quality Standard (µg/m ³)	Percent of National Ambient Air Quality Standard
PM ₁₀	24 hour	2010	110.58	124.18	150	83
		2012	97.88	111.48	150	74
PM _{2.5}	24 hour	2010	15.31	22.31	35	64
		2012	13.27	20.27	35	60
	Annual	2010	3.46	10.46	15	70
		2012	4.37	11.37	15	76
NO ₂	Annual	2010	5.29	7.39	100	7
		2012	9.34	11.44	100	11

SOURCE: Peabody Western Coal Company 2011

As shown in Tables E-5 through E-7, concentrations of other criteria pollutants in the region remain well below applicable NAAQS. Given that emissions of these pollutants and their precursors from the proposed action are minor, the proposed action will not pose a threat to ongoing compliance with these national health and welfare standards and would not be significant.

Additionally, an analysis was conducted of the long-range atmospheric deposition of mercury and selenium contained in particulate matter emissions from operations at Kayenta Mine. As discussed in section D.12.4 of Appendix D, AERMOD dispersion modeling was performed to predict the atmospheric deposition of particulate mercury and selenium from coal and overburden operations for seven different drainage basins at Lake Powell and the Colorado River. As shown in Table D-11 in Appendix D, annual deposition rates for selenium are on the order of a few nanograms per square meter per year, and rates for

particulate-phase mercury yet a hundred times less than for selenium across all seven drainage areas. Compared to ecological benchmarks identified by ENVIRON International, these rates of deposition from Kayenta Mine are below ecological screening levels and do not pose a significant risk to aquatic receptors (see Appendix E). Impacts would be negligible and would not be considered significant.

E.1.7.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2, the projected emissions of NO_x, PM₁₀, and PM_{2.5} emissions discussed above for the Kayenta Mine operations would be less, as reclamation activities would not require the same activities for mining coal as described in Appendix D, Table D-3. Under Alternative 2, the effects of fugitive dust from natural wind erosion of disturbed areas and stockpiles, emissions from reclamation activities (scrapers and dozers on spoil) and truck haulage would continue the same as under Alternative 1, until reclamation activities are completed. With the level of emissions-producing activities being less than those described under Alternative 1, the corresponding impacts on air quality would be less than those described under Alternative 1, which would be negligible and would not be considered significant.

E.1.8 Noise and Vibration

Noise and vibration impacts are evaluated based on the extent the alternative could exceed Federal noise regulations or by the potential increase in noise from existing conditions. 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. 30 CFR 816.67 regulates the control of adverse effects resulting from blasting activity in terms of noise and vibration resources.

E.1.8.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Sensitive noise receptors, including residents who live near mine roads and within range of warning signals for blasting during mining operations at coal resource areas N-9, J-19, and J-21 would continue to experience noise from mining activities. The number of warning and all-clear signals produced at blasting sites by an audible-speaker warning device of 100 watts or greater—audible at 0.5 mile—also would remain at 2010 levels as overall coal production per year is not anticipated to increase. There is additional natural topographic screening between mining operations and sensitive noise receptors, which could reduce noise for sensitive receptors. In addition to the distance of the sensitive noise receptors from the permit period mine areas, mining activities occur below grade, the walls of the pit and spoil piles could absorb and attenuate some of the noise from mining activities. The noise reduction measures associated with activities at mining sites will include maintenance of equipment exhaust systems and engine sound controls to manufactures' specifications and limiting blasting to daylight hours. Additionally, measures to reduce noise generated from construction activities when the activities are within 0.5 mile of a noise-sensitive receptor will be implemented in accordance with the Kayenta Mine PAP. Such measures could include the use of temporary sound-baffle walls.

Vibration impacts were determined by using the Blasting Guidance Manual, which was developed by OSM to prevent injury and damage to public and private property outside the mine permit area. OSM requires that airblast levels be limited to a maximum of 134 dB (peak). Ground vibrations cannot exceed

Table E-6 Regional Ozone Monitoring Summary

Monitor Location	State	Monitor ID	Distance from Monitor to Kayenta Mine (km)	Maximum 1-Hour Concentration (ppm)									
				2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mesa Verde NP	CO	080830101	183.0	0.077	0.080	0.088	0.080	0.088	0.094	0.077	0.075	0.081	0.087
Petrified Forest NP	AZ	040170119	188.0	--	0.070	0.084	0.088	0.101	0.093	0.080	0.082	0.073	0.080
Grand Canyon NP	AZ	040058001	104.0	0.074	0.087	0.082	0.082	0.093	0.081	0.080	0.078	0.072	0.080
USBR Shiprock Substation	NM	350451005	172.0	0.087	0.087	0.091	0.080	0.088	0.093	0.086	0.082	0.069	0.080
Canyonlands NP	UT	490370101	226.0	0.072	0.078	0.079	0.080	0.081	0.076	0.082	0.080	0.078	0.081
Zion NP	UT	490530130	262.0	--	--	--	0.083	0.128	0.086	0.083	0.088	0.080	0.078
Glen Canyon	AZ			--	--	--	--	--	--	--	--	--	--
S. Ute Tribe - Ignacio	CO	080677001	253.0	0.068	0.069	0.075	0.077	--	--	0.077	0.078	0.076	0.077
S. Ute Tribe - Hwy 550/Bondad	CO	080677003	231.0	0.066	0.075	0.070	0.068	0.077	0.092	0.086	0.080	0.078	0.083
Cortez	CO	080830006	184.0	--	--	--	--	--	--	--	0.078	0.077	0.088
USFS - Shamrock Mine	CO	080671004	271.0	--	--	--	0.086	0.091	0.092	0.079	0.081	0.093	0.083
Bloomfield	NM	350450009	214.0	0.094	0.091	0.089	0.078	0.087	0.079	0.080	0.076	0.060	0.077
Navajo Dam	NM	350450018	244.0	--	--	--	--	--	0.104	0.094	0.083	0.075	0.080

Monitor Location	State	Monitor ID	Distance from Monitor to Kayenta Mine (km)	4th Highest 8-Hour Concentration (ppm)									
				2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mesa Verde NP	CO	080830101	183.0	0.065	0.070	0.067	0.069	0.076	0.074	0.070	0.069	0.069	0.066
Petrified Forest NP	AZ	040170119	188.0	--	0.055	0.074	0.071	0.070	0.071	0.069	0.072	0.062	0.068
Grand Canyon NP	AZ	040058001	104.0	0.070	0.079	0.073	0.072	0.079	0.070	0.069	0.071	0.066	0.069
USBR Shiprock Substation	NM	350451005	172.0	0.074	0.075	0.075	0.069	0.072	0.071	0.073	0.069	0.059	0.063
Canyonlands NP	UT	490370101	226.0	0.066	0.072	0.074	0.072	0.069	0.070	0.072	0.071	0.068	0.068
Zion NP	UT	490530130	262.0	--	--	--	0.074	0.091	0.072	0.071	0.072	0.068	0.072
Glen Canyon	AZ			--	--	--	--	--	--	--	--	--	0.060
S. Ute Tribe - Ignacio	CO	080677001	253.0	0.052	0.060	0.062	0.063	--	--	0.058	0.067	0.065	0.068
S. Ute Tribe - Hwy 550/Bondad	CO	080677003	231.0	0.051	0.055	0.060	0.060	0.066	0.063	0.071	0.067	0.066	0.067
Cortez	CO	080830006	184.0	--	--	--	--	--	--	--	0.064	0.064	0.064
USFS - Shamrock Mine	CO	080671004	271.0	--	--	--	0.067	0.075	0.074	0.069	0.069	0.071	0.074
Bloomfield	NM	350450009	214.0	0.074	0.076	0.073	0.068	0.075	0.063	0.069	0.064	0.052	0.065
Navajo Dam	NM	350450018	244.0	--	--	--	--	--	0.079	0.079	0.075	0.061	0.069

SOURCE: U.S. Environmental Protection Agency

NAAQS

Ozone 1-hour¹: 0.12 ppm

8-hour²: 0.075 ppm (2008)

8-hour³: 0.08 ppm (1997)

¹ (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.

² To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

³ (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(c) EPA is in the process of reconsidering these standards (set in March 2008).

Table E-7 Regional SO₂ Monitoring Summary

Monitor Location	State	Monitor ID	Distance from Monitor to Kayenta Mine (km)	Highest 24-hour Concentrations (ppm)									
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
USBR Shiprock Substation	NM	350451005	172.0	0.052	0.033	0.020	0.017	0.019	0.014	0.030	0.013	0.013	0.004
Bloomfield	NM	350450009	214.0	0.007	0.010	0.010	0.006	0.006	0.009	0.010	0.003	0.002	0.002

Monitor Location	State	Monitor ID	Distance from Monitor to Kayenta Mine (km)	Annual Average Concentrations (ppm)									
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
USBR Shiprock Substation	NM	350451005	172.0	0.010	0.008	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.001
Bloomfield	NM	350450009	214.0	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001

SOURCE: U.S. Environmental Protection Agency AIRData
 NAAQS: SO₂ 24-Hour: 0.14 ppm (not to be exceeded more than once per year)
 SO₂ Annual: 0.03 ppm

Table E-8 Regional NO₂ Monitoring Summary

Monitor Location	State	Monitor ID	Distance from Monitor to Kayenta Mine (km)	Annual Average Concentrations (ppm)									
				1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
USBR Shiprock Substation	NM	350451005	172.0	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.012	0.010	0.006
S. Ute Tribe - Ignacio	CO	080677001	253.0	0.004	0.005	0.005	--	0.005	0.005	0.004	0.003	0.003	0.003
S. Ute Tribe - Hwy 550/Bondad	CO	080677003	231.0	0.006	0.009	0.009	0.008	0.009	0.006	0.006	0.003	0.003	0.003
Bloomfield	NM	350450009	214.0	0.012	0.011	0.012	0.014	0.013	0.013	0.013	0.014	0.016	0.014

SOURCE: U.S. Environmental Protection Agency AIRData
 NAAQS: NO₂ Annual: 53 ppb (0.053 ppm)

peak particle velocity of 1.25 inches per second at a distance of 300 feet or 0.75 inches per second at 5,000 feet (Rosenthal and Morlock 1987). The nearest occupied residences are located approximately 1 mile from the permit period mine area affiliated with coal resource area J-21 (Map D-8). Although blasting activities would continue to result in periodic intense sound levels, sensitive noise receptors are located at a distance where the noise intensity will typically be within standards established in 30 CFR 816.67. Temporary effects from vibration and airblast levels within standards established in 30 CFR 816.67 are not considered capable of producing injury or property damage, but could cause annoyance depending on the distance to the receptor (Mohamed 2010). With the nearest sensitive receptor at a distance of approximately 1 mile from the active mining area, noise and vibration impacts are not expected to exceed federal regulations. Blasting activities will be conducted in accordance with administrative regulations established to minimize adverse impacts resulting from noise and vibration in 30 CFR 816.61. OSM requires that airblast levels be limited to a maximum of 134 dB. PWCC's blasting program requires 16 hours of training for PWCC employees and contractors, establishes qualification standards for drillers and shooters, and stresses adherence to pattern design and establishes loading procedures.

The anticipated rate of annual coal production, and the related blasting and vehicle traffic, will not increase beyond current levels, impacts from noise and vibration will remain at current levels with no detectable change. As these noise and vibration levels would remain at or near 2010 levels, the impacts would be minor and would not be considered significant.

E.1.8.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Sources of noise and vibration associated with Alternative 2 would decrease and ambient noise levels could have a lower dBA due to cessation of all mining and blasting activities. Similar to Alternative 1, areas where reclamation activities occur, noise sources would continue until reclamation activities are completed.

With mining activities associated with Alternative 2 limited to reclamation activities, nearby sensitive receptors would experience less noise and vibration impacts compared to Alternative 1. These impacts would be negligible to minor and would not be considered significant.

E.1.8.3 Unavoidable Adverse Impacts

Mining operations would result in short-term adverse noise impacts at the active mining sites but within standards established in 30 CFR 816.67. However, as previously discussed, this impact would not result in an adverse impact warranting further mitigation as a result of compliance with existing regulations and PWCC mitigation measures. Alternative 1 and Alternative 2 would have no unavoidable, residual adverse effects to area noise levels.

E.1.9 Landforms and Topography

The analysis of landforms and topography considers the removal of coal resources and non-coal bearing rocks removed from the coal resource areas.

E.1.9.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Mining activities to remove up to 250 feet of overburden and coal resources would directly alter landforms and topography. Mining and reclamation activities would result in local smoothing and flattening of slopes and modified surface-drainage patterns. Short-term grading and spoil stockpiles of crushed overburden rock would result in localized changes to landforms and topography; however, consistent with the requirements of SMCRA, these areas will be regraded and stockpiles removed during subsequent reclamation activities. Prior approved reclamation plans (which are not a part of the proposed action but will apply to the mining areas) have been designed to approximate the natural slope and contours. Since reclamation activities are required to return disturbed areas to their approved post-mine land uses, impacts to landforms and topography would be minor and would not be considered significant.

E.1.9.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Effects from reclamation activities would be similar to those described under Alternative 1 and result in localized changes to landforms and topography. However, reclamation activities would occur over approximately 1,159 fewer acres than the mining areas associated with Alternative 1. Similar to Alternative 1, disturbed areas would be reclaimed to meet postmine land uses, and impacts on landforms and topography would be minor and would not be considered significant.

E.1.9.3 Unavoidable Adverse Impacts

Permanent sediment control facilities and reclaimed overburden piles are long-term modifications of local topography that would have an unavoidable adverse effect. Changes to landforms and topography that result in smoother and less diverse surfaces also would result in an unavoidable adverse impact. During the permit period total disturbance would alter landforms and topography on 1,159 acres of the 44,073 acre Kayenta Mine permit area, which based on the relative extent of the area, would not be considered significant.

E.1.10 Geology and Mineral Resources

The analysis on geology, minerals, and paleontological resources include the coal resources and non-coal bearing rock removed from coal resource areas due to mining activities.

E.1.10.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Geology

Mining would remove about 250 feet of non-coal-bearing rock above and between the coal on approximately 1,159 acres in coal resource areas N-9, J-19, and J-21. Over the long-term, the mined areas will be backfilled with unconsolidated, crushed rock from the strata overlying the coal seams that have been mined (coal combustion products will not be used). This material would be graded to approximate the original topographic contours, considering the needs of minimizing erosion and supporting post-mining land uses. Unconsolidated backfill material would not be placed on steep slopes where geologic hazards such as landslides can develop. The loss of the consolidated stratigraphy is a permanent non-

reversible impact. However there are no unique or valuable geologic resources within the permit renewal period areas mined, and the impacts to geologic resources from the permit renewal period mining are minor and not considered significant.

Mineral Resources

In accordance with SMCRA, coal-mining activities must be conducted in a manner that maximizes recovery of the coal resources and protects the coal resources that remain after mining (Appendix A). Mining activity at the Kayenta Mine permit area removes coal seams in the Wepo Formation. PWCC estimates that approximately 11.6 percent of the coal reserves would be lost during mining activities due to normal overburden stripping. The impact of this permanent loss of coal resources is considered normal for the type of proposed activities, given current mining technology and the stratigraphic nature of the coal being mined. Impacts on coal resource development with this recovery rate would be minor and would not be considered significant.

There would be no effect on coal resources in the Toreva Formation and Dakota Sandstone because these are below 250 feet and cannot be mined by surface-mining methods. Coal-mining operations during the permit renewal period would not affect uranium and vanadium deposits located under the Wepo Formation. These mineral and coal deposits would remain available for future development and effects on these resources would be considered not significant.

If present, oil and gas resources under the Kayenta Mine permit area would occur in sedimentary rock formations below the mineable coal seams. These resources are not likely to be developed in the reasonably foreseeable future, and would remain available for future use. Valuable minerals other than coal are in uneconomical trace amounts and would not be developed during the permit renewal period. The potential effects on oil, gas, and valuable minerals from mining during the permit renewal period are minor and would not be considered significant.

Paleontological Resources

Paleontological resources (fossils) are non-renewable resources that cannot be used for scientific study if damaged, destroyed, or removed without proper scientific documentation. Coal mining activities and road construction for mine operations could damage undiscovered paleontological resources. These activities could improve access to fossil locations, which could increase theft and vandalism. However, mining operations in these areas could also uncover fossil resources that would otherwise remain unexposed and un available for scientific study. These impacts will be minor and would not be considered significant.

Damaging or destroying important fossils are not likely to occur from permit renewal period mining because fossils in these rocks are common throughout Black Mesa. Field surveys in coal resource areas N-9, J-19, and J-21 would document any important fossils that are discovered. In the event that mining activities would result in impacts on fossils not detected prior to mining activity, work in the area would cease and a qualified professional would evaluate the area. PWCC will work with regulatory officials for the recovery of important fossils prior to resuming mining operations. PWCC will recover any important

fossils discovered during mining operations. The impacts to paleontological resources are minor and would not be considered significant.

E.1.10.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Mining coal resources would cease within the Kayenta Mine permit area under this alternatives, and there would be no additional impacts to geologic, mineral, and paleontological resources. Reclamation activities due previous mining activities would restore slopes, and similar to Alternative 1, ceasing coal mining in N-9, J-19, and J-21 would retain existing oil and gas and mineral resources that could be present in the sedimentary rock below the Kayenta Mine permit area. Under Alternative 2, impacts on geology, paleontological resources, and minerals from ceasing mining in the N-9, J-19, and J-21 be negligible and would not be considered significant.

E.1.10.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts under Alternative 1 would result from altering geologic resources and the removal of coal in N-9, J-19, and J-21. The geology in the coal resource areas from the base of the coal to the surface would convert from a consolidated stratigraphy to unconsolidated backfill material. Any potentially rare or unique regionally, diagnostically, or taxonomically important geologic and/or paleontological resources that were not identified and preserved or removed prior to or during mining operations would be lost. However, the 1,159 acres of disturbance from mining during the permit renewal period is less than 1 percent of the geologic resources in the study area. Unavoidable adverse impacts on geology and minerals would be minor and would not be considered significant.

E.1.11 Climate

As explained in Section D.2.11.1 above, attempts to disaggregate global climate models in order to predict the future of local or regional weather patterns is highly uncertain and speculative, particularly as it might apply to the five-year proposed renewal. Moreover, scientific uncertainty remains as to human contribution to global climate change. Virtually all scientific sources agree, however, that it is not possible to attribute complex global climate change reactions within a local region to a particular source of GHG emissions.

Unlike criteria air emissions, which are constituents that are viewed in the context of regional and local concern, greenhouse gases are constituents that, if viewed at all, must be viewed in a global context. Any impacts of GHG emissions would have to be a function of their total atmospheric concentration, and most GHGs are globally well-mixed atmospheric constituents. This means that the location of a particular GHG emission, in contrast to the situation for criteria pollutants, does not change its environmental impact.

On July 11, 2008, the U.S. EPA gave *Advance Notice of Proposed Rulemaking: Regulating Greenhouse Gas Emissions under the Clean Air Act (CAA)*. It reviewed various CAA provisions that could be applicable to regulate GHGs and examined the issues that regulating GHGs under those provisions could raise. It also provided information regarding potential regulatory approaches and technologies for

reducing GHG emissions and raised issues relevant to possible legislation and the potential for overlap between legislation and CAA regulation.

The Mandatory Greenhouse Gas Reporting Rule was promulgated on December 17 and 27, 2010. The Rule requires annual reporting of GHG emissions by certain underground coal mines, stationary combustion sources that emit 25,000 tpy or more CO₂e, and other specific categories of stationary sources. Unlike the proposed Rule, the final Rule does not require reporting by suppliers of fossil fuels. Surface coal mines are also not one of the source categories designated for GHG reporting. Kayenta Mine is not subject to EPA's Mandatory GHG Reporting Rule.

Methane (CH₄) is the predominant GHG emitted from surface coal mines. To date, estimates of CH₄ emissions from surface coal mines can only be roughly approximated based on crude estimates of the representative concentrations of methane in regional coal basins throughout the U.S. On that basis, Kayenta Mine's total CH₄ emissions are roughly approximated to be in the range of 120,000 tpy (109,000 metric tons) CO₂e. Another estimated 60,000 tpy (54,000 metric tons) CO₂e are emitted by fuel combustion at the Mine.

For PSD and Title V applicability purposes, EPA's GHG Tailoring Rule has defined a "major stationary source" of GHG emissions to be one with a potential to emit (PTE) 100,000 tpy CO₂e or more. However, when determining whether a surface coal mine is a "major source," fugitive emissions from mining are not included in calculating the PTE, although fugitive emissions from coal preparation are included in that calculation. Kayenta Mine's non-fugitive emissions of CH₄ are estimated to be about 17,000 tpy CO₂e. Accordingly, Kayenta Mine does not constitute a "major stationary source."

At the present time there is no analytical methodology for quantifying incremental climate change impacts due to GHG emissions from a surface coal mine. Conclusions as to the significance of Kayenta Mine's GHG emissions on climate change cannot be reached because the geographic scope and predicted air emissions of Alternative 1 are too small to allow calculation of any measurable change on global climate under any scenario about whether and how climate might be changing. Although some scientists have postulated potential effects of global climate change as including alteration of water supplies, agriculture, sea levels, ultraviolet radiation levels, and variances in the ecosystem, neither Alternative 1 nor Alternative 2 would alter these effects. Because climate change must be viewed in the context of global conditions, the magnitude of the emissions potentially contributed by Alternative 1 activities need to be viewed in that context. PWCC estimated its GHG emissions from all sources at the Kayenta Mine to be 163,000 metric tons total CO₂e for all of 2009. Globally, CO₂ emissions in 2008 from all sources were estimated 29,000,000,000 metric tons (International Energy Agency [IEA] 2010).

E.1.11.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, the coal production from N-9, J-19, and J-21 would remain at the annual rate of 8.2 million tons per year using existing coal processing facilities (see Appendix D for detailed information on the coal processing facilities). As noted above, Kayenta Mine is not a major source of GHG emissions. The rough approximation of the overall GHG emissions from the Kayenta Mine would

remain relatively constant for the permit term, and that amount is not expected to have a significant impact on climate change under any scenario about whether and how climate might be changing. Because climate change must be viewed in the context of global conditions, the magnitude of the emissions potentially contributed by Alternative 1 activities needs to be viewed in that context. Globally, CO₂ emissions in 2008 from all sources were estimated to be 29,000,000,000 metric tons (IEA 2010). PWCC estimated its footprint to be 163,000 metric tons total CO₂e for all of 2009 using USEPA's tailoring rule method calculation. The contribution of greenhouse gases from Alternative 1 would be negligible when compared to total greenhouse gases produced globally, which would not be considered significant.

E.1.11.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, emissions of CH₄ would decrease due to the cessation of mining. Although an abandoned coal mine continues to emit some methane, the quantity of those emissions would be but a small fraction of CH₄ emitted when the mine was active. Similar to Alternative 1, reclamation activities produce CO₂. However, emissions of that GHG from the Mine would be less, as the coal mining would cease. The overall decrease in GHG emissions under Alternative 2 would remain negligible under this Alternative, which would not be considered significant.

E.1.12 Land Use

This section analyzed potential effects on existing land use practices including residential use, garden plots and livestock grazing. The analysis assumed that post-mine land uses are livestock grazing and wildlife habitat, which are the primary current land uses. The Kayenta Mine operation is the only industry currently within the study area and there are no commercial land uses in the study area.

E.1.12.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

PWCC would continue its ongoing mining operations and use of existing facilities. In accordance with Federal regulations, PWCC will relocate four Navajo households within the J-21 coal resource area that are located on top of coal resources or within 0.5 mile of the coal recovery line during the permit period. PWCC has been coordinating with these households over the past two years regarding this relocation and the selection of alternate sites for the households. PWCC and the four households have agreed to a location that is still in the southern part of the J-21 coal resource area and in the vicinity of the households' customary use areas, but away from the areas to be mined. The householders also will be compensated for the replacement of all structures and any lost grazing acreage in accordance with PWCC's established relocation procedures (refer to Section D.2.12). PWCC also will relocate family garden plots that are currently located on mine property, as needed, to accommodate surface mining activities in accordance with Federal regulations. The four Navajo household relocations will have a negligible effect on land use and the impacts would not be considered significant.

Ongoing mining activities will have a minor effect on traditional land use practices such as livestock grazing. Approximately 1,159 acres of potential rangeland dominated by piñon-juniper woodland with low forage availability and quality would be disturbed as a result of mining in the N-9, J-19, and J-21 coal resource areas during the permit period. In the short-term, this would remove about 11 AUMs based on

the weighted average stocking rate of 107 acres/AUM for piñon-juniper (67%) and sagebrush (33%); however, reclamation would eventually improve the forage productivity and quality of the land by converting the piñon-juniper woodlands to shrubland and grassland vegetation communities that have higher grazing productivity. Reclamation activities occur immediately after an area is mined to completion, returning mined-out areas to productive livestock grazing lands, which is the primary historical land use in the area. With final reclamation, mined-out areas will be re-graded to the approximate original contour, mine soil will replace the topsoil, and vegetation will be replanted according to the approved post-mining land uses of livestock grazing, wildlife habitat, and cultural plant use. The resulting shrub grassland communities will increase the livestock carrying capacity and will improve the potential for grazing management. Mitigation measures will continue to be implemented to control the spread of weeds and noxious weeds in the mine lease area, reducing the effects of weeds on livestock production. Within the Kayenta Mine permit area, seed and mulch are specified to be free of noxious weeds and best practice efforts insure compliance. PWCC routinely controls diffuse knapweed by applying herbicides along roadsides. Reclaimed sites are monitored twice a year for the adequacy of reclamation and the presence of weed species. Prescriptions for reseeding, grazing, mowing, or chemical control are made based on the results from statistical sampling of plots in reclaimed areas. Based on the revegetation monitoring results, forage production for livestock could increase to as much as 10 times over the original forage productivity of the land (OSM 1990). Reclamation activities will result in an increase in the amount and quality of forage available for livestock grazing. The stocking rate after reclamation is managed at 4.6 acres/AUM, which will increase AUMs to 252. Management and reclamation practices in the Kayenta Mine permit area will reduce the presence of noxious weeds and invasive species and their potential to indirectly effect livestock and other traditional or cultural land uses. The moderate effects from the temporary decrease in AUMs is offset by the increase in productivity in reclaimed areas, and because changes on the number of livestock long-term would be negligible and the impacts would not be considered significant.

Water quality at impoundments and ponds within the PWCC permit area could exceed water quality standards for livestock as a result of developing the N-9, J-19, and J-21 coal resource areas. Localized water quality exceedances could include high total dissolved solids, low pH, high levels of sulfate, or high levels of selenium. Permanent water impoundments must meet specific performance standards as outlined in 30 CFR 816.49(b), including making water quality suitable for the intended land use of livestock grazing. PWCC is required to submit information to OSM to demonstrate that each of the permanent impoundments meets these performance standards. If any of the impoundments do not meet the performance standards, OSM will not approve these for retention in the landscape. PWCC's seepage management plan and other mitigation measures to protect water quality will help maintain or improve water-quality standards, protect livestock, humans, and the environment. Localized areas with poor water quality could affect the health of livestock until reclamation of these areas is completed (approximately 6 years); however, mitigation measures using fence enclosures, a seep management plan, and pond reclamation would reduce these effects to negligible levels. Negligible impacts would not be considered significant.

Continued mining activities within the N-9, J-19, and J-21 coal resource areas would disturb 1,159 acres of land used for grazing and traditional land uses, resulting in a localized moderate short-term impact. However, reclamation of these disturbed areas would improve the productivity and quality of grazing lands within the coal resource areas in the long-term, and approximately 20,000 acres in the Kayenta Mine permit area are already in reclamation. In addition, the amount of grazing land that would be disturbed within the resource areas is less than one percent in relation to the approximately 17 million acres of agricultural land within the Navajo Nation and Hopi Reservation (USDA 2007). As required in the AZ-0001D permit, disturbed areas will be reclaimed as specified in the approved mining and reclamation plan to support the anticipated post-mining land uses of livestock grazing, wildlife habitat, and cultural plant use. The reclamation procedures will include stockpiling and redistributing soil, using reclamation seed mixtures approved by OSM, and replacing stock water sources. After completing reclamation, because the areas would meet or exceed the local carrying capacity of pre-mine conditions, these effects would be minor and would not be considered significant.

E.1.12.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, mining operations would cease, and facility removal and reclamation operations would begin according to the requirements of the current Kayenta Mine permit closure plan. No additional disturbance on Navajo households, family garden plots, traditional resources, and grazing lands would occur, however reclamation activities would be the same as Alternative 1.

Short-term livestock production relative to native grazing potential would not be disrupted with the termination of mining in the Kayenta Mine permit area. However, the potential for improving range conditions through reclamation over the long-term would be slightly reduced under this alternative (0 acres versus 1,159 acres under Alternative 1), which is minor in comparison to the 20,000 acres already in reclamation in the coal resource areas. Impacts to livestock resulting from poor water quality in temporary and permanent impoundments and ponds also would not differ substantially from Alternative 1, because of short-term mitigation measures, such as fence enclosures, designed to limit or eliminate these impacts. Like Alternative 1, the effects of Alternative 2 would be negligible on traditional cultural resources and grazing lands because reclamation and mitigation would restore the areas to meet or exceed conditions or resources prior to mining. After completing reclamation, because the reclaimed areas would meet pre-mine conditions for environmental quality and forage production would increase locally, these effects on land use would be negligible. Negligible effects would not be considered significant.

E.1.12.3 Unavoidable Adverse Impacts

Reclamation would restore the landscape to its approximate original contour and would return disturbed areas to meet the post-mining land use of livestock grazing and wildlife. No unavoidable adverse impacts to land use are anticipated.

E.1.13 Social and Economic Conditions

This section addresses the social and economic impacts of the Kayenta Mine operation on the communities within the region of influence. The analysis considered potential effects on revenue,

employment and the future abilities of the various governmental entities to generate revenue (including various revenue sources). Three assumptions were used in the analysis: (1) government legislation and regulations controlling taxation, royalty payments, employment wage rates, and hiring practices will remain in effect through the permit period, and (2) the various rates and the manner in which government agencies receive the revenue will not change; and (3) the revenue to the Navajo Nation and to the Hopi Tribe that is attributable to the Kayenta Mine will be related to the amount of coal extracted from the mine in any given year.

E.1.13.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, employment opportunities, and revenues to the Navajo Nation and Hopi Tribe will continue through the permit renewal period. The number of people employed at the Kayenta Mine during the permit period will increase from 422 in 2010 to 432 in 2015 (Table D-12), while the total annual amount paid in salaries to the employees remains similar to the 2010 value of approximately \$50 million. This will help maintain the employment rate and number of people employed by the mining sector at 2010 levels (see Appendix F, Table F-2 and Table F-4). The salaries paid to the employees pay, in part, for living expenses such as shelter, food, and other necessities; based on the higher dependency ratios on the Navajo Nation and Hopi Reservation (Table D-10), the salaries also provide similar needs for those family members, or non-family members that reside in the home. Continued employment during the permit renewal period will help maintain the existing dependency ratio in the study area.

In addition, the average annual revenue paid to the tribes from 2005-2009 was \$43.2 million; \$15.7 million to the Hopi and \$27.5 million to the Navajo Nation. Coal production rates will remain constant through the permit period, and revenue from PWCC to the Navajo and Hopi tribes will be similar. Likewise, the average annual payment of \$6.2 million from PWCC to NTUA and scholarships funds will also continue at approximately the same rate.

Additional employees needed at the Kayenta Mine may be available from the existing workforce in the Navajo Nation and Hopi Reservation and no influx residents will occur as a result of filling those new positions. Indirectly the continued operation of Kayenta Mine during the permit period will not increase the population within the census-designated places, the Navajo chapters of Chilchinbito, Forest Lake, Kayenta, and Shonto, or Hopi Reservation area. As the employment, population and revenues to Navajo and Hopi tribes will remain at or near 2010 rates. No additional demands on the existing infrastructure or services in the communities on or near the Kayenta Mine permit area are anticipated.

During the permit renewal period four households in the J-21 coal resource area will be relocated at least 0.5 mile from active coal mining. This may alter their existing social network and activities. However, the relocation sites are selected by the households, which may result in no residual effects on each household's existing social network and activities. Long-term residents may return to their original home sites after reclamation is completed and the land is returned to tribal control. Under Alternative 1, employment opportunities, and revenues to the Navajo Nation and Hopi Tribe will continue through the

permit renewal period and impacts on socioeconomics will be negligible and would not be considered significant because there would be no change from current conditions.

E.1.13.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2 employment at Kayenta Mine will be reduced from 432 jobs through 2015 to 172 jobs through 2012; 60 people will be employed from 2013 to 2014; eight people will be employed from 2014 to 2024; and four people will be employed from 2024 to 2025. After 2026, zero people will be employed at the Kayenta Mine. Over the next 15 years, cessation of mining activities will result in a major effect from reduction of the approximately \$50 million in salaries currently paid to mine employees (refer to Table D-11 for detailed employment data). The reduction in employment will directly cause hardship to those employees and their dependents and indirectly affecting the local region in areas such as housing, commerce, travel, and education. The salaries currently paid to the employees pay, in part, for living expenses such as shelter, food, and other necessities; based on the higher dependency ratios on the Navajo Nation and Hopi Reservation (Table D-10), the salaries also provide similar needs for those family members, or non-family members that reside in the home. A loss in employment may also increase the ratio of dependency in the local area. The reduction in salaries will reduce the amount of revenue that is put back into the local economy either through direct royalty payments to tribes or indirectly through the purchase of goods and services.

In recent years, the revenue from the Kayenta Mine operation has been the single largest source of revenue in the Hopi and Navajo tribal budgets. The discontinuation of the mining operations at the Kayenta Mine will significantly influence tribal facilities, such as internal payroll, education, and the tribes' annual operating budget as the recent (2005-2009) average annual payment made from PWCC to the tribes totals \$43.2 million, \$15.7 million to the Hopi Reservation and \$27.5 million to the Navajo Nation. Local mining revenues support as much as 50 percent of the Hopi tribal government revenue, and as many as 500 jobs in the Hopi Tribe and local mining revenue funds as much as 26 percent of the total Navajo Nation non-grant budget. The loss of PWCC's contribution to local mining revenues will reduce the number of employment opportunities within the tribal organizations. As is shown in Table D-11, Public Administration is the second highest employment sector within the Hopi Reservation, employing 26.0 percent of the people; Public Administration on the Navajo Nation is a close third behind construction, and employs 10.8 percent of the people. The total estimated payment made to the tribes beginning in 2012 is \$1.9M, \$1.2M to the Navajo Nation and \$0.7M to the Hopi Tribe. These payments will continue until final reclamation is complete and OSM has terminated federal regulatory jurisdiction. While the Kayenta school district, which receives the most benefits from mining tax revenue, is an Arizona public school district, the majority of the students and employees of the district are American Indian. The loss of employment and revenues paid to Navajo and Hopi tribal governments may be considered a major long-term impact on socioeconomics that would be significant.

E.1.13.3 Unavoidable Adverse Impacts

Under Alternative 1, there will be no unavoidable adverse impacts on social and economic conditions as employment opportunities and tribal revenues will remain near 2010 levels. Unavoidable adverse impacts

to the social and economic conditions under Alternative 2 include the loss of several hundred high-paying jobs at the Kayenta Mine, of which 94 percent are held by American Indians. The direct and indirect impacts of the employment and income loss affect the employees as well as other local areas of commerce. In addition, the tribal governments that are recipients of revenues from coal royalties and bonuses, water use fees, and educational scholarships will be adversely impacted by the Kayenta Mine closure. According to March 2010 written comments made by the Hopi Tribe in response to the Environmental Protection Agency's Advanced Notice of Proposed Rulemaking Regarding Best Available Retrofit Technology for Nitrogen Oxide Emissions at the Navajo Generating Station Docket Number EPA-R09-OAR-2009-0598, Kayenta Mine coal revenues fund as much as 88 percent of the Hopi Tribe's annual governmental budget; Of the fiscal year 2009 Navajo Nation General Fund budget of \$150.5 million, \$20 million (calendar year 2009), or 13.3 percent, is contributed by coal royalties and bonuses paid by PWCC (Table F-7, Appendix F).

E.1.14 Environmental Justice

Executive Order 12898 requires all Federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Executive Order 13045 requires Federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. The alternatives for the Kayenta mine permit renewal was evaluated in accordance with EO 12898 for minority and/or low-income populations within the project area for their potential to be burdened disproportionately by adverse impacts. As discussed in Section D.14, the study area predominately consists of minority and low-income individuals. The minority population in the study area is predominately Native American in composition, which is considerably higher than for Arizona as a whole or Navajo County (see Section D.14 and Table D-11).

American Indian environmental justice populations on or near reservations are the majority population because the reservations are tribal homelands. The environmental justice analysis for this study is being conducted to evaluate whether the Alternatives being considered could result in a disproportionately adverse impacts on minority and/or low-income groups, including Native Americans, as a result of physical location, perception, design, noise, or public health and safety.

E.1.14.1 Alternative 1: Issue an authorization to proceed with the proposed project Approve the Renewal of Permit AZ-0001D

Under Alternative 1, as indicated in Section E.1.13.1, employment opportunities and revenues paid to the Navajo Nation and Hopi Tribe will continue through the permit renewal period. American Indians hold a majority of the jobs at Kayenta Mine and those related to the mining operation. In addition, the Township of Kayenta, which has an economy driven by the mine, the 14 Navajo Chapters within the Western and Chinle agencies that were identified within the area of socioeconomic influence, and the Hopi Village of Moenkopi are American Indian communities. The number of Kayenta Mine employees would remain at or near 2010 levels and there would be no direct or indirect effects on the local workforce. Mine employees would travel from the communities identified in Table E-11 and the continued operation of the

Kayenta Mine will not require employees to move into or closer to the permit area. Directly or indirectly, the Kayenta mine provides the bulk of the jobs available in this low-income area and tribal governments are recipients of many of the mining revenues. During the permit renewal period, employment and revenues to tribes will continue at approximately the same rate and the direct and indirect effects on environmental justice populations will be negligible. Negligible impacts would not be considered significant.

The Black Mesa Review Board, established within the Legislative Branch of the Navajo Nation pursuant to 2 N.N.C. and § 901-920, Title 2, Chapter 3, Section 902, to advocate for fair and just compensation for Navajo families within the Navajo Nation Chapters whose boundaries overlap the leasehold and whose cultural, social, economic, and environmental interests are affected or impacted by the mining operations. The Board consists of a representative from the Navajo Nation, each affected Chapter, and an employee of PWCC. The Board is certified to exercise governance and decision making on behalf of the affected families in each Chapter. The households that will experience the effects of mining on grazing lands are American Indian households, which include largely minority and low-income populations. As described in Section E.1.12, the effects on land use will be negligible after reclamation is completed. Noise from mining operations would remain at or near 2010 levels and the potential effects on environmental justice populations is negligible (see Section E.1.8). Health and safety effects of continued mining operations also could have negligible effects on residents and employees of Kayenta Mine (see Section E.1.18) but would not result in an unequal treatment of environmental justice populations described in Section D.2.14. The required adherence to various occupational health and safety regulations will include the continuation of onsite occupational health-treatment facilities and these effects would not result in a disproportionate effect on environmental justice considerations.

Kayenta mine operations meet NAAQS for air quality. However, PM (e.g., fugitive dust from the mining operations) is the air pollutant that remains a concern of residents in the immediate vicinity of the Kayenta Mine. Alternative 1 would meet all NAAQS standards. Impacts on air quality in the local area are described in Section E.1.7.

The population directly affected by and concerned about the effects of water withdrawals upon the continuing availability of local water for grazing and agriculture is almost entirely an American Indian population. Continuing use of the N aquifer wells by the Kayenta Mine operations would result in a continued concern that withdrawal of water from the N aquifer for mine-related purposes would interfere with water use for grazing, agriculture, and domestic wells. Almost all of the use of the N aquifer water other than by the Kayenta Mine is by the American Indian population. However, impacts on the N aquifer would be considered negligible, as there would be less pumping of the N aquifer than in the past (refer to Section E.1.2 for more information).

No adverse human health or environmental effects are falling disproportionately on minority or low-income populations through the permit period as a result of mining activities at the Kayenta Mine. Potential impacts to environmental justice populations that may result from the implementation of Alternative 1 would be mitigated through compensation for household and family garden plot relocation,

reclamation of land impacted by coal mining activities, and compensation for the temporary loss of grazing lands. To reduce potential impacts to air quality, the Kayenta Mine has an extensive dust-control program (Section E.1.7) and air quality would continue to meet all NAAQS standards. Consequently, mine operations during the permit period would extend the current health and environmental effects created by the Kayenta Mine operations, but would not result in an unequal treatment of environmental justice populations described in Section D.2.14. These effects would not result in a disproportionate effect on environmental justice considerations and the impacts would be negligible and would not be considered significant.

E.1.14.2 Alternative 2: Do not issue an authorization to proceed with the proposed project Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2, mining operations would cease, and facility removal and reclamation operations would begin according to the provisions of the current Kayenta Mine authorizations. As described in Section E.2.13.2 Social and Economic Conditions, the cessation of mining activities in coal resource areas N-9, J-19, and J-21 would have long-term impacts on the economy of the local area of influence if employment and tax revenues are not replaced with new economic activity. Revenues related to coal production paid to both the Navajo Nation and Hopi Tribe would cease, which could result in a long-term reduction in resources and programs that assist with environmental justice populations in the regional and local area of influence. However, this reduction in Navajo and Hopi tribal revenues and employment opportunities are adverse the effects are similar to Alternative 1, but would not result in an unequal treatment of environmental justice populations described in Section D.2.14. These effects would not result in a disproportionate effect on environmental justice considerations and the impacts would be negligible and would not be considered significant.

The tribal people near the Kayenta Mine permit area would no longer be affected by mining traffic and noise and mining would no longer interfere with the availability of plants and other materials used for medicinal, ceremonial, or household needs. Over the long-term, since 1,159 acres of the 44,073 acres within the Kayenta Mine permit area would not be mined and reclaimed, less land would have improved productivity for livestock grazing. This reduction in reclaimed lands and indirectly the amount of forage available for livestock grazing would be minor and would not be considered significant.

E.1.14.3 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts associated with environmental justice under either Alternative 1 or 2.

E.1.15 Indian Trust Assets

This section analyzes the Indian Trust Assets that could be affected by the alternatives. Indian Trust Assets are minerals, water rights, lands, hunting and gathering rights and other natural resources.

E.1.15.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, coal production would continue at the current rate of about 8.2 million tons per year. Mining operations would continue to expand within the limits of coal resource areas N-9, J-19, and J-21, which have been partially disturbed by prior mining and reclamation activities. In accordance with lease agreements, PWCC would make royalty payments to the Hopi Tribe and Navajo Nation for the mined coal. The existing lease agreements, permits, and rights-of-way reflect the opinion of the governments of the Navajo Nation and Hopi Tribe that the use of the land, coal, water, and other natural resources in the Kayenta Mine area are an appropriate and equitably compensated use of the tribe's trust assets. The Navajo Nation reservation land that would be mined under Alternative 1 within coal resource areas N-9, J-19, and J-21 will be reclaimed pursuant to the approved reclamation plan and existing lease agreements. Reclamation will restore the land with greater forage productivity than pre-mining conditions or for other uses as determined appropriate by the tribal government. Renewal of the permit would represent a continuation of the agreements regarding use of trust assets of the Navajo Nation and Hopi Tribe within the Kayenta Mine area. Renewal of the permit would not be considered a significant impact on Indian Trust Assets.

The Kayenta Mine operations pump about 1,236 acre feet of water annually from the N aquifer for mining operations, with a minor amount made available as a potable water supply for local residents. The amount of water project to be pumped from the N aquifer would continue at approximately the same rate during the permit renewal period. As discussed in Section E.1.2.1, potential impacts during the permit renewal period will be negligible on hydrology, and there would be no significant impact on water as an Indian Trust Asset.

E.1.15.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2, mining operations would cease and the land surface in previously mined areas would be reclaimed for grazing and other uses. No additional coal and land assets of the Navajo Nation and Hopi Tribe would be used. Reclamation activities and associated use of pumped groundwater would continue to fulfill requirements of the current lease agreements. As described under Alternative 1, reclamation would return to the post-mine land use of livestock grazing, wildlife habitat, and cultural plant use. The potential effects on Indian Trust Assets will be negligible and would not be considered significant.

E.1.15.3 Unavoidable Adverse Impacts

Unavoidable adverse impacts of Alternative 1 on Indian trust assets would include use of coal and other land and water resources. Extraction of coal is an irreversible and irretrievable commitment of a nonrenewable resource, but the tribal governments, with BIA oversight, have determined that royalty payments are appropriate compensation for use of the coal and a benefit for the tribes. Use of water from the N aquifer for coal mining activities also is an unavoidable adverse impact of Alternative 1. The groundwater is a long-term renewable resource and the amount of water pumped from the N aquifer for mining operations under Alternative 1 is not expected to exceed the amount of recharge. Unavoidable adverse impacts would be negligible to minor and would not be considered significant.

E.1.16 Visual Resources

Potential impacts to visual resources are determined by analyzing the contrast of the proposed permit renewal period mining in N-9, J-19, and J-21 to the existing landscape, the sensitivity of the viewers, and the visibility of the mining operations.

E.1.16.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Continuing mining in the three coal resource areas would result in an additional 1,159 acres of disturbance. This would create high visual contrasts with the surrounding natural and reclaimed landscapes. Short-term visual contrasts that would occur include changes in form and line of the topography, changes in color of the vegetation and soil, changes in texture of the vegetation and soil. However, topography and vegetation screen the most sensitive viewers from the mining operations. Occupied structures that are located in valleys are blocked from viewing mining operations by the valley sides. Occupied structures on elevations above the mining operations in N-9, J-19, and J-21 have topography that blocks their views of the mining operations. Vegetation also could screen views, and the more distant viewers would perceive less contrast. The views of the mining operations from nearly all of the 220 occupied structures would be completely or partially screened by topography and vegetation (PWCC 2011b). Sensitive viewers traveling on Navajo Route 41, from U.S. 160 have most of their views screened by hills. Views of the mining operations would be brief for viewers moving along the road. Views from U.S. 160 and Arizona 564 would be screened by topography.

Reclamation would reduce the short-term contrasts of colors and textures related to vegetation removal. Most of the reclaimed areas would be revegetated with over 20 species of grasses, forbs, and shrubs. Some sections of the reclaimed areas would be chosen for cultural plant, woodland, and wildlife habitat revegetation. These sections would be planted with selections of over 50 species of trees, shrubs, forbs, and grasses.

Reclaimed topography would vary from the natural landscape in scale, complexity, and slopes. This would create contrasts in form, line, and texture. Mine highwalls will be graded to a slope of 3:1 or less, and linear rock features and rock structures will be established for wildlife habitat. Once the vegetation has matured, the newer reclaimed areas would blend into the older ones, and there would be less contrast between the reclaimed landscape and the adjacent undisturbed landscape. The scenic integrity would blend from one landscape to another.

With little visibility of continued mining operations by the moderately and highly sensitive viewers, the relatively short-term high visual contrasts of the mining operations are anticipated to result in minor effects on visual resources. However, after reclamation is completed according to the requirements of as the permit closure plan and SMCRA regulations, impacts on visual resources during the permit renewal period will reduce to a negligible level and would not be considered significant.

E.1.16.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Impacts from reclamation under Alternative 2 would be similar to Alternative 1 except, mining operations would cease, facilities would be removed or turned over to the tribes, and reclamation operations would begin in previously mined areas according to the permit closure plan and SMCRA regulations. With the ending of operations, approximately 1,159 acres of the natural landscape would not be mined and would not be converted to a reclaimed landscape. The short-term visual contrasts from mining operations in the three coal resource areas would cease. The long-term effects on visual contrasts of the reclaimed areas would be similar to Alternative 1. The reclamation activities would reduce the effects on visual resources to a negligible level and would not be considered significant.

E.1.16.3 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts to visual resources because the landscape will be because the landscape will be reclaimed to approach existing conditions.

E.1.17 Transportation

This section describes the impacts that could result from the alternatives on the transportation network. This analysis evaluates traffic volumes from mine operations and changes the transportation network.

E.1.17.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, the existing roads will continue to be used until the mining and reclamation operations are completed. Mining will be an extension of existing operations and would rely on existing transportation facilities. Ancillary roads leading to exploration and development areas, pit, and spoil ramps will be constructed and used to complete mining activities in the three coal resource areas. As the rate of coal production during the permit period will remain constant, vehicle traffic on the Kayenta Mine permit area roads, Navajo Route 41, US Highway 160, and State Route 89 will not increase from 2010 levels. The Kayenta Mine related vehicle traffic will not change during the permit period, and no changes to the transportation network are required from mine related vehicle traffic.

All roads used or built by PWCC on or after December 16, 1977 will be reclaimed to their original state by the conclusion of the reclamation period, unless these have been approved by the regulatory authority as part of the post-mining land use plan. Due to the size and nature of PWCC's mining activities, very few of the roads identified as part of the post-mining land use plan will be reclaimed until the end of mining activities in the Kayenta Mine permit area. Exceptions include roads in the immediate vicinity of pits and ramps, which are created in the spoil and reclaimed as reclamation activities progress within a coal resource area. Consistent with 30 CFR Sections 133 and 150, mitigation measures will continue to be enforced through regulatory inspections and reporting (see Appendix A, Section D). Mitigation requirements will continue through the conclusion of the reclamation period. The potential effects on traffic volumes and the existing transportation network will be negligible and would not be considered significant.

E.1.17.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

If authorization to proceed is not issued, mining operations in N-9, J-19 and J-21 would cease. Although vehicle traffic will be less than Alternative 1, reclamation-related traffic will still need to use the transportation network to complete reclamation activities restoring areas to their original state. However, under Alternative 2, there will be no increase in roadway development within the Kayenta Mine permit area, and roads not identified for retention in the post-mining land use plan will be reclaimed. This could alter the transportation network approved by the regulatory authority. However, as the post-mining land use plan has not been finalized, and there will be changes to the existing transportation network, the potential effects will be negligible and would not be considered significant.

E.1.17.3 Unavoidable Adverse Impacts

An unavoidable adverse impact that will occur under either alternative is the disturbance already created by the roads and traffic in the project area. However, under either alternative, reclamation of the roads will occur, and the lands will be restored to a pre-mine state, resulting in no unavoidable adverse impacts to the transportation network from renewing the permit.

E.1.18 Health and Safety

Health and safety at the Kayenta Mine operation is managed by establishing appropriate policies and procedures and monitoring those procedures to verify that they are properly observed and executed. Kayenta mine operations safety and health standards include requirements for ground support systems, coal piles, electrical systems, combustible fluid storage, shops, equipment specifications and maintenance, explosives storage and handling, dust control, monitoring and reporting requirements, alarm systems, worker personal safety equipment, and restrictions for public access. To comply with MSHA standards, all proposed mining operations during the permit renewal period will require the necessary MSHA mine permit and an MSHA-approved miner training plan, escape and evacuation plan. Since work carried out in the presence of heavy equipment and machinery inherently bears a degree of risk, it is acknowledged that air quality is also a health and safety consideration which is considered in terms of NAAQS under Air Quality Section E.1.7. NAAQS are determined based on the USEPA's assessment of health-protective air quality levels. In addition, transportation at and near the Kayenta mine site also poses risk for workers as well as the public. Along Navajo Route 41, PWCC assists with maintenance of the road surface and slopes and coordinates maintenance with the Navajo Nation Department of Transportation for repaving, seal coating the road or through their own roadway maintenance contract to maintain roadway shoulders and drainage. To ensure public safety along the mine roads, public traffic is excluded from active mine areas by security gates. All roads are signed and maintained by grading and dust suppression, and school buses and deliveries are escorted by PWCC security vehicles.

E.1.18.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, the current health and safety practices, described above, will continue as they do under existing mine operations. Regulatory changes in health and safety requirements will be included in standard operating procedures, and compliance with mandated safety rules will continue to be required.

Similar safety risks will continue to be present, including exposure to dust, noise, heat stress, and chemicals. The opportunity for accidents due to working directly with or in proximity to large equipment will also continue. Blasting operations will continue to occur, and pre-blast surveys will be conducted as requested. Residents will continue to be notified and warned of blasting operations, and notification of the blasting schedule will continue to be posted and advertised. Blasts will continue to be monitored for air blast and ground vibration by the five seismographs located throughout the Kayenta permit area. Kayenta Mine's blasting records will continue to be monitored by OSM on a monthly to quarterly basis. The mine will continue to provide emergency health care services to the workforce and local residents.

If the proposed project is authorized to proceed, neither the type or quantity of any wastes generated and disposed of by the mine would change. Impacts on public health and safety will be negligible and short-term and would not be considered significant.

E.1.18.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2 mining activities in the N-9, J-19, and J-21 mining areas will cease and public health and safety risks related to mining operations and blasting will be eliminated. During the reclamation period, PWCC will continue to comply with all applicable federal, tribal, and state rules and regulations regarding health and safety and handling and disposal of hazardous materials and wastes. Safety procedures regarding truck traffic will continue to be observed through the reclamation activities, although fewer vehicles will be required for these activities. Emergency health care services provided by the mine will continue during the reclamation period but will cease following the completion of reclamation activities (see Section E.13 Social and Economic for additional details). This could increase the response time by trained service providers to medical emergencies in the study area. Impacts resulting from cessation of mining activities on public health and safety in terms of job-related accidents would be minor and would not be considered significant. The loss of community health care services in the area could be moderate, long-term and could be considered significant if these services are not provided by another entity.

E.1.18.3 Unavoidable Adverse Impacts

Under Alternative 1, unavoidable adverse impacts may occur in the form of a serious accident or loss of life. However, if all safety policies and procedures are followed, the probability of this occurring is considered minor.

E.2 CUMULATIVE IMPACTS

The cumulative impact analysis is required to evaluate the incremental impacts of the proposed action when added to other past, present and reasonably foreseeable future actions (40 CFR 1508.7). Cumulative impacts could result from individually minor but collectively significant actions that take place over time. The following analysis identifies those resources where adverse effects from the alternatives identified in Section E.1 may combine with the effects of other past, present and reasonably foreseeable future actions, and assesses the incremental effect of the alternative compared to the combined effect on those resources.

According to the CEQ's *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, "[t]he environmental analysis required under NEPA is forward-looking, in that it focuses on the potential impacts of the proposed action that the agency is considering." With regard to past actions, agencies "look for present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives" (CEQ 2005).

Table E-9 describes each action that was considered for the cumulative analysis; however, not all actions have a combined effect on all resources. As explained above, the following cumulative impact analysis looks only at those resources for which adverse direct and indirect impacts from the alternatives described in Section C would overlap and combine with the effects of those past, present and reasonably foreseeable future actions identified on Table E-9. The future actions described in this analysis are those that are "reasonably foreseeable"; that is, they are ongoing (and would continue into the future), are funded for future implementation, or are included in firm near term plans. Current contracts could obligate PWCC to extract coal at Kayenta Mine from coal resource areas N-9, J-19, and J-21 through 2026 if future renewals are granted by OSM and contract terms are fully exercised. Beyond 2026, coal extraction rates and operational details regarding Kayenta Mine are speculative.

CEQ has further advised that "[t]here may be instances when the time frame of the project-specific analysis will need to be expanded to encompass cumulative effects occurring further into the future" (CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act*, January 1997). For this proposed action, the temporal and geographic scope of cumulative analysis depends upon the affected resource and the extent to which there is a combined effect from the various actions. Consequently, the Cumulative Impacts Analysis Area (CIAA) and the duration of the combined effects are described below in relation to each relevant resource or group of resources. The analysis has included future renewals of the Kayenta mine permit as reasonably foreseeable future actions based upon the existing approved mine plan, to the extent that the effects of those future renewals would overlap or combine with the proposed alternatives. Impacts from continued operation of NGS are not a consequence of OSM's permit renewal action, and are addressed in cumulative effects only to the extent they overlap or combine with those of OSM's action. Nevertheless, any future renewal of the Kayenta mine permit would require additional review prior to approval by OSM.

The analysis has also looked at direct and indirect effects of the alternatives that could potentially combine with the effects from ongoing operations of the Navajo Generating Station (NGS). The Kayenta Mine supplies coal to NGS, located near Page, Arizona, via an 83-mile long railroad. NGS is located approximately 60 miles from the closest boundary of the three coal resource areas subject to the proposed action in Alternative 1. The term "Navajo Project" is used in this EA to encompass both NGS and the railroad. The electric power from NGS is used to serve residential, commercial and industrial customers in Arizona, Nevada and California, and provides most of the pumping energy for Central Arizona Project water deliveries to numerous cities, Indian tribes, and other water users in south-central Arizona. The Navajo Project is partially owned and operated by the Salt River Project Agricultural Improvement and

Power District (SRP).⁹ The NGS obtains all water required for operation through an intake system connected to Lake Powell. Supplied from storage in Lake Powell, NGS water could include a portion of groundwater stored in the Navajo sandstone adjacent to the Lake Powell near the intake system. This water supply is isolated from the N Aquifer in Black Mesa by a groundwater divide that occurs between Black Mesa and Lake Powell.

The environmental effects from the continued operation of the Navajo Project, with the exception of air quality, climate change, and socioeconomic effects, do not overlap with the direct and indirect effects of the two alternatives described in Section C. Combined impacts for cultural resources, vegetation, soil, landforms and topography, geology and mineral resources, land use, and visual resources are not included because the Navajo Project operation does not result in surface disturbance that could directly or indirectly increase effects on these resources. In addition, as there are no cumulative impacts for these resources, there would be no cumulative impacts on the Indian Trust Assets related to these resources.

The CIAA for fish and wildlife does not include NGS because the Navajo Project operation does not result in surface disturbance that could directly or indirectly increase effects to fish and wildlife caused by the mining operations. However, a discussion is included in E.2.3 below regarding the potential effects of atmospheric deposition of metals on fish and wildlife populations.

Cumulative impacts for noise and vibration are not included because the distance between the Navajo Project and the Kayenta Mine operations would be attenuated by the approximately 50-mile distance between the noise and vibration sources from either location, thus the effects do not overlap. Likewise, the cumulative impacts on hydrology are not included in this analysis due to the source of water for the Navajo Project being isolated within the N aquifer by the groundwater divide that occurs between the Black Mesa and Lake Powell.

As discussed in Section E.1 no direct or indirect impacts on recreation, transportation, health and safety or environmental justice would be anticipated from the alternatives described in Section C. Thus, there would be no cumulative effects on these resources from continued operation of the Navajo Project and the alternatives.

The cumulative effects were assessed by considering those projects in the region that may have an effect on the natural or human environment within the CIAA for each resource. Table E-9 describes each project by name and project type, as well as by location and status. Collectively, these projects represent activities with the potential to contribute to a cumulative impact on the environment.

⁹ The owners of the Navajo Project are Arizona Public Service Company, City of Los Angeles Department of Water and Power, Nevada Power Company, SRP and Tucson Electric Power Company, and the U.S. Bureau of Reclamation.

Table E-9 Cumulative Project List

Type	Project	Status	Description
Power Plant	Navajo Generating Station (NGS)	Existing	<p>Located about 5 miles east of Page, Arizona, NGS is a coal-fired power plant with a capacity of 2,250 megawatts from three 750-MW units. NGS provides power to more than one million electric customers in Arizona, California, and Nevada. It began producing commercial power in 1974. Coal mined at PWCC's Kayenta Mine operations (60 miles to the southeast) serve the power plant and is hauled by the Black Mesa and Lake Powell Railroad.</p> <p>The generating station currently employs 553 full- and part-time employees, almost 80 percent of whom are Navajo or Hopi, with a payroll for 2010 that exceeded \$43 million. About 75 percent of the employees live in Page, Arizona, where NGS is located, and about 20 percent live in communities within the Navajo and Hopi reservations. The other 5 percent reside in Gallup, New Mexico; southern Utah; Flagstaff, Arizona; and the Phoenix, Arizona metropolitan area. NGS also employs hundreds of other Native Americans on a part-time basis doing maintenance activities.</p> <p>NGS provides a significant source of revenue to the Hopi Tribe and Navajo Nation through royalties, permit fees, lease payments, scholarships, and other contributions. Between 2005 and 2010 the average annual Environmental Protection Agency Title V Emission Permit fee was \$367,208 and lease payments are \$608,000 per year. NGS also has provided more than \$83,000 in college scholarship funding over the last six years.</p> <p>NGS regularly provides financial support for various community efforts in the City of Page and surrounding Navajo community including the Technology Center at the Page campus of Coconino Community College, and the LeChee Chapter of the Navajo Nation for the LeChee Senior Citizen Center (URS personal communication 2011).</p>
Water Supply Improvements	Manymules	Future	<p>Using two PWCC existing water wells and a portion of a PWCC water line the Manymules project when completed would convey a high-quality sustainable water supply to residences within the Kayenta Mine permit area and enable the use of funds from Indian Health Service and other entities. The project includes 46 miles of water pipeline, two water treatment units, pump stations, and water storage. The total 2030 water demand projected for the Manymules project is about 252 acre feet per year. Based on conceptual level designs, the Navajo Nation Department of Water Resources estimates the project cost is approximately \$10.6 million dollars. PWCC has committed to providing power and water for the project.</p>

Type	Project	Status	Description
Groundwater Use	Community Well Fields	Future	The BIA, Navajo Tribal Utility Authority (NTUA), and Hopi Tribe operate about 70 N aquifer wells that are combined into 28 water supply systems that provide water to communities near Black Mesa. The closest communities to the PWCC wells are Forest Lake, Kitsillie, Chilchinbito, and Kayenta. The largest water users are Tuba City, Kayenta, and Shonto (Truini, Macy and Porter2005). Projected community pumping rate-based data through 1986 found that community pumping would increase at a rate of 2.7 percent annually on average (GeoTrans. 2006). Recent data show that the rate of growth in the area has decreased over the last 10 to 15 years and reported community pumping was approximately 2,900 af/y for 2008 (Macy 2010). In 2009, the reported community pumping was slightly lower (Macy, written communication).
Mineral and Energy Development	Coal Resource Development	Future	Successive permit renewal in not more than five-year increments as established by the SMCRA regulations, for coal production from the N-9, J-19, and J-21 coal resource areas would continue if future applications are approved after review by OSM. Mining in these three coal resource areas would continue through 2026 to meet PWCC contractual agreements. Cumulative surface disturbance and reclamation in these areas would result in approximately 3,079 acres of land disturbed and subsequently reclaimed to sustain current production from coal resource areas N-9, J-19, and J-21. During the permit renewal period 1,159 acres would be disturbed, and between 2015 and 2026 an additional 1,920 acres would be disturbed. All areas disturbed by the mining operations will be reclaimed in accordance with permit requirements to meet post mining land uses of livestock grazing, wildlife habitat, and cultural plant use.

Resources where no cumulative impacts are anticipated are not included in this section. Those resources without cumulative impacts are cultural, recreation, environmental justice, transportation, and health and safety.

E.2.1 Hydrology

The cumulative hydrology analysis area, or CIAA for surface- and groundwater, is the Black Mesa basin area of the N aquifer extending to the gauges on measured streams and other tributary streams and springs located in the unconfined portions of the aquifer. The cumulative actions included in this analysis are reclamation activities, future coal mining through 2026 in the N-9, J-19, and J-21, the proposed Manymules community water supply project, and community well fields (see Table E-9).

E.2.1.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Future changes in the N aquifer groundwater system would be caused by past and future usage of water by PWCC and tribal communities. Thus, the modeling in Appendix B included an evaluation of the cumulative effects of PWCC and community pumping through 2015 and through 2026.

The effects of community pumping on drawdown within the confined portion of the N aquifer can be evaluated by comparison of the two drawdown figures provided for both 2015 and 2026 (Appendix B,

Figures B-8, and B-9, respectively). The figures show simulated water level recoveries of between 20 and 30 feet through 2015, and more than 30 feet through 2026 as a result of combined pumping by both PWCC and nearby communities near the center of the basin (i.e., Forest Lake, the nearest community to the Kayenta Mine permit area). The simulated water levels are relative to July 2010 water levels and largely reflect reduced PWCC pumping since 2005.

Communities produce more water from the confined part of the aquifer than the unconfined part of the aquifer, and the estimated effects of their pumping are summarized in Appendix B, Table B-4. At these locations, estimated drawdown due to PWCC pumping is minimal. For example, the modeling predicts 2 feet of drawdown at Kykotsmovi in 2015, and only 3 feet in 2026 attributable to PWCC pumping. Comparatively, community pumping at Kykotsmovi is predicted to cause drawdowns of 23 feet in 2015 and 53 feet in 2025. In general, the combined drawdown is expected to increase through 2026 because of the community well field pumping (see Appendix B, Figures B-8, and B-9), but is not expected to be large enough to affect use of the aquifer. The drawdown caused by PWCC is only a small part of the total drawdown and the incremental effects caused by future mining through 2026 would decrease and would not be considered significant (see Appendix B, Table B-3 and Table B-4).

The combined pumping of PWCC's and community well field pumping does not result in noticeable movement of the boundary between the confined and unconfined portions of the N aquifer except near the community of Kayenta. There, where the N aquifer is hundreds of feet thick, the boundary may shift several feet. This shift would not impact the productivity of the community wells resulting from the combined pumping (see Appendix B, Tables B-3 and B-4, and Figures B-8 and B-9).

The GeoTrans model is not designed to simulate discharge from individual springs because of the difficulty of accurately simulating these features and limited drawdown in unconfined areas caused by distant pumping (PWCC 2005b). However, cumulative impacts on groundwater discharge into streams were evaluated (Tables B-6 and B-7). Local community pumping is predicted to cause declines in discharge to the streams by up to 2.24 percent by 2025. This decline is predicted at Laguna Creek located north and northeast of the Kayenta Mine. The model predicts a very slight increase in discharge of 0.03 percent as a result of PWCC's reduced pumping since 2005, for a cumulative decline of 2.21 percent. The largest predicted decline in discharge occurs at Pasture Canyon, but PWCC's pumping has no effect on this discharge because the decline at Pasture Canyon is due solely to community well field pumping (see Appendix B, Table B-7).

The Navajo Nation's proposed Manymules Water Supply Project contemplates using N aquifer water provided by PWCC to supply water to local residents within and near the Kayenta Mine leasehold. If started in 2012, the project would initially utilize 154 af/yr then increase to a maximum of 322 af/yr as early as 2026. Consequently pumping from the PWCC well field could increase from 1,236 af/yr to 1,390 af/yr the first year that Manymules started production. Pumping from the PWCC well field for future coal mining and reclamation and the Manymules project would increase to approximately 1,461 af/yr in 2026.

Modeling results provided in GeoTrans (2006) for the Alternate Water Supply/N-aquifer backup (AWS/N-Aq Backup) pumping scenario provide an upper bound for evaluating the effects of the proposed Manymules project. This analysis evaluated the potential effects on the N aquifer and included 1,236 af/yr for the period 2006 through 2009 followed by 2,500 af/yr for the period 2010 through 2026. For the period 2010 through 2026, the analysis evaluates a total volume pumped that is approximately 40 percent higher than the proposed water use by PWCC combined with the proposed Manymules project pumping, producing a conservative cumulative assessment for predicted future use. Actual effects on the N aquifer could be less since recovery of the N aquifer water levels that has been occurring since December 2005.

Based on this conservative cumulative analysis approach, there would be continuing water level recovery at Forest Lake between 2005 and 2026 with no adverse effect on the productivity of the N aquifer. In addition, the effect on discharge to Begashibito Wash (where the highest percentage effect due to PWCC well field pumping was calculated) was predicted to be a 1.02 percent reduction through 2026. The predicted reductions in discharge through 2026 at Begashibito Wash and at all other washes based on cumulative pumping in the AWS/N-Aq Backup modeling scenario are too small for the gauging stations to measure and are considered to be negligible.

Potential effects on the sulfate concentration in the N aquifer, a prime indicator of water quality changes, due to increased leakage through the Carmel confining bed, was predicted to be less than 0.5 mg/L for the time period 1955 through 2038 (see Section C.1.6, Appendix B). This regional, long-term effect on water quality is negligible. The incremental cumulative effect of mining through 2026 is not considered to be significant on groundwater or surface water.

E.2.1.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2, withdrawals from the N aquifer would be reduced from an average rate of 1,236 af/yr to about 500 af/yr to support reclamation activities. After reclamation activities are completed, which includes regrading, spreading topsoil, revegetating disturbed areas, and completing required monitoring, PWCC would cease withdrawals from the N aquifer for industrial uses. During this reclamation period, the Manymules Water Supply Project would continue to pump about 154 af/yr from the N aquifer. By 2026, pumping to support the Manymules project would approach 225 af/yr from the N aquifer near the PWCC well field, which is well below the projected rates evaluated under Alternative 1 where the effects were deemed negligible (GeoTrans 2006). The reduced pumping from the N aquifer under this alternative would be less and would not be considered significant.

E.2.2 Vegetation

The CIAA for vegetation are the communities that overlay the Black Mesa coal field (see Map A-1). This area is described in Section D.2.3 in Table D-5 and is approximately 1.8 million acres. Cumulative projects included in the analysis with the permit renewal period are the future coal mining activities and Manymules (see Table E-9).

E.2.2.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Coal mining during the permit renewal period, and Manymules would result in surface disturbance that convert existing vegetation communities to a reclaimed vegetation community and increase the potential for establishment of noxious weeds and invasive species in the CIAA. Reclamation to restore slopes, spread topsoil, and revegetate 1,159 acres (see Table C-1, total acres disturbed) would continue while additional coal mining in the future mine areas of N-9, J-19, and J-21 continues. The ongoing reclamation activities would restore areas to reclaimed vegetation community of an all-purpose rangeland composed of similar species to existing grassland-shrublands. Increasing the extent of reclaimed vegetation in the CIAA by 3,079 acres (see Table C-1 total acres to be mined and reclaimed in the future) during the permit renewal period and future coal mining activities would increase the amount of this vegetation community within the CIAA to approximately 20,548 acres (see Table D-5). This incremental effect of converting 1,159 acres (see Table E-9) of existing vegetation communities increases the reclaimed vegetation community by approximately 5 percent (see Table D-5). This increase in reclaimed vegetation communities would not be considered significant as the vegetation in reclaimed areas would transition to a stable state and includes native species that could provide a seed source for other areas (Peters et al. 2006).

Vehicles used during the permit renewal period mining, reclamation, and surface disturbance from future coal mining and Manymules could facilitate the establishment of noxious weeds. Weed control measures and monitoring vegetation twice per year in areas reclaimed by PWCC would reduce the potential for noxious weeds and invasive species establishment. The incremental cumulative effects from the permit renewal period mining would not be considered significant because there would be no change in the composition of the vegetation communities from noxious weeds or invasive species.

While emissions vary depending on the amount of equipment operating, during 2012 11.44 micrograms (Appendix D, Table D-10) would be the greatest amount of NO_x emissions during the permit period (see Appendix D, Figures D-10 through D-12). The estimated NO₂ deposition includes a conversion factor based on the Plume Volume Molar Ratio Method (PVMRM) option in the AERMOD dispersion model and while NO₂ could represent a smaller portion of the total nitrogen emissions these values are below the levels where changes in vegetation communities are detected. Future coal mining and reclamation of areas mined during the permit renewal period would result in NO_x emission into the local environment south of the mined coal resource areas, and could affect plant communities at a local level and on a species-specific basis. Nitrogen emissions from reclamation activities for the permit renewal period and future mining in N-9, J-19, and J-21 would occur from 2010 through 2018 and as discussed in Appendix D, Table D-10, the greatest amount of emissions would be 11.44 micrograms per cubic meter from mining activities. Deposition of nitrogen at this rate is far below the 1.5 to 30 kilograms per hectare per year, which according to studies by the National Park Service (NPS), resulted in changes to vegetation community composition (Fenn et al. 2003, National Park Service [NPS] 2009). The incremental cumulative effects of nitrogen emissions from the permit renewal period would not be considered significant.

E.2.2.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Not renewing the permit under Alternative 2, would decrease the extent of surface disturbance and the potential opportunities for noxious weed and invasive species establishment. However, as reclamation activities will continue in all areas disturbed by previous mine operation, this along with the construction of Manymules could increase the number of vehicles and the potential for seed dispersal. This could increase the potential for the localized establishment of noxious weeds or invasive species. However similar to Alternative 1, weed control measures and monitoring vegetation twice per year in areas reclaimed by PWCC would reduce the potential for noxious weeds and invasive species establishment in part of the CIAA.

While reclamation would occur in all of the disturbed areas (see Map D-5) after mining ceased, due to the relatively slow growth rate of vegetation, the effects on vegetation communities would be similar to Alternative 1 (Jacobs 2008). Reclamation would restore 8,013 acres (see Table C-1, total acres active mining and reclamation) of existing disturbed areas to a reclaimed grassland-shrublands vegetation community within the CIAA. This increase results in approximately 5 percent increase of reclaimed (disturbed) vegetation community within the CIAA from post-mining reclamation.

Nitrogen emissions would be from mine reclamation vehicles and Manymules if that project were implemented, which could affect vegetation in localized areas near N-9, J-19, and J-21. However, the nitrogen depositions from reclamation activities and vehicles used during construction for Manymules would be far less than the 9.34 micrograms per cubic meter for Year 2010 (see Appendix D) under Alternative 1. The incremental cumulative effects from reclamation would not be considered significant because there would be no change in vegetation community composition.

E.2.3 Fish and Wildlife

The CIAA for fish and wildlife includes the area that overlies the Black Mesa coal field (see Map A-1). This area is described in Section D.2.3 in Table D-5 and is approximately 1.8 million acres. Cumulative projects included in the analysis with the permit renewal period are the future coal mining activities and Manymules (see Table E-9).

E.2.3.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Surface disturbance in areas mined during the permit renewal period, future coal mining, and Manymules could degrade or remove wildlife habitat in the CIAA. Mine permit renewal under Alternative 1 could increase the extent of degraded or lost wildlife habitat, and increase barriers to wildlife movement in the CIAA. However, reclamation activities to replant these areas with grassland/shrubland species overall and cultural plantings in select areas will reduce these short-term effects, such that these constitute minor impacts that will not eliminate any of the currently documented species from the region. Minor effects on wildlife would not be considered significant.

The 9.34 micrograms per cubic meter nitrogen emissions (Appendix D, Table D-10) from reclamation activities for the permit renewal period and future mining activities would be deposited south of N-9,

J-19, and J-21 coal resource areas (see Appendix D, Figures D-10 through D-12). Nitrogen deposition could potentially lead to habitat degradation in localized areas south of the three coal resource areas, however, the minimal amounts of nitrogen released from the proposed action would not be expected to change the vegetation community composition (Fenn et al. 2003, NPS 2009), which would represent a negligible impact. Negligible impacts would not be considered significant.

Under Alternative 1, reclamation areas disturbed from permit renewal period mining, future coal mining in N-9, J-19, and J-21 coal resource areas, and vehicles used for the Manymules water development project would remove or degrade wildlife habitat in the CIAA. Wildlife species such as collard lizards and sagebrush lizards are some of the more common wildlife species that would be displaced by the loss of woodland and shrubland vegetation or complex, rocky habitats in areas disturbed by these actions. Cumulative impacts would be moderate, depending on the degree to which the habitats are modified by these actions; however, reclamation would reduce these effects to a minor level. Incremental cumulative impacts on wildlife habitats from the permit renewal period would not be significant because the 1,159 acres of disturbance affects approximately 0.1 percent of the approximately 1.6 million acres of these wildlife habitats within the CIAA. The small loss of wildlife habitats relative to the larger CIAA would be a minor impact. The cumulative impacts to wildlife range from minor to moderate. Minor to moderate impacts would not be considered significant.

With regard to atmospheric deposition of metals, ENVIRON conducted an analysis of the emissions, environmental transport, transformation, and aquatic impacts of mercury and selenium emissions from the NGS facility (see Appendix E). ENVIRON summarized the risk to the aquatic and sediment dwelling invertebrate community, fish populations and fish/aquatic invertebrate eating birds and mammals from NGS emissions of mercury and selenium as follows:

- Modeled Se, Hg and MeHg concentrations in sediment are below ecological screening levels.
- Modeled Se, Hg and MeHg concentrations in surface water are below ecological screening with the exception of Se(VI) in Lake Segment 4 where concentrations slightly exceeded only the most conservative screening benchmark.
- All calculated critical body residues resulted in HQs well below one suggesting *de minimis* risk to aquatic receptors including fish and piscivorous birds and mammals.

To correspond with the ENVIRON analysis, PWCC performed atmospheric model runs for TSP emissions from Mine operations handling coal and for TSP emissions from Mine operations handling overburden (see Exhibit D). As shown in Table D-11, modeling of trace concentrations of metals found in the overburden and coal at the Kayenta Complex are shown to be on the order of a few nanograms per square meter per year for selenium and roughly one hundred times less for particulate-phase mercury. In contrast even to the miniscule metals emissions from the NGS facility, the deposition rates of mercury and selenium from the Kayenta Mine are at least two (2) orders of magnitude lower than those attributable to NGS. Therefore, the cumulative effects of mercury and selenium deposition are still below ecological screening levels and do not pose a significant risk to aquatic receptors in the region. With

metal depositions being below levels that could harm wildlife or reduce population sizes, the impacts to wildlife would be minor. Minor effects would be considered insignificant.

E.2.3.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Under Alternative 2, the permit would not be renewed and therefore Kayenta Mine operations would cease after final reclamation is complete. The impacts leading to loss of habitat forage and dispersal barriers to wildlife would be reduced in the CIAA. Similar to Alternative 1, reclamation activities in the 8,013 acres of existing disturbance (see Table C-1 total acres active mining and reclamation) would reduce these effects on wildlife habitat. Under this scenario impacts would be negligible or minor, which would be a smaller impact than Alternative 1. Negligible and minor impacts would not be considered significant.

E.2.4 Soil Resources

The CIAA for soil resources are the soils within the approximately 1.8 million acre Black Mesa coal field (see Table D-5 and Map A-1). Cumulative projects included in the analysis with the permit renewal period mining are the future coal mining activities and Manymules (see Table E-9).

E.2.4.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Coal mining during the permit renewal period, future coal mining, and Manymules water improvement project would disturb soils and alter the existing soil profiles in the CIAA. Soils removed from N-9, J-19, and J-21 during the permit renewal period and future coal mining in these areas would be either directly replaced on the regraded slopes or stockpiled for use during reclamation activities. These stockpiles could result in wind and water erosion in localized areas; however, PWCC reclamation activities of diverting runoff away from stockpiles, placing stockpiled soil on a stable site protected from wind and water erosion, replanting the stockpiles with a stabilizing seed mix and not disturbing them until required for redistribution reduces the potential for soil loss. Soils disturbed by the Manymules project would be temporary in nature, but at this time, it is unknown if stockpiles would be used during construction.

Mined areas are reclaimed using soils replaced directly or stockpiled soils and other mitigation measures such as recontouring slopes including drainages and reestablishing vegetation. Reclamation of the renewal permit areas would improve soil productivity and stability on 4,222 acres (See Table C-1, total acres reclaimed) of the soils within the CIAA. Therefore, the incremental effects of the renewal period mining and reclamation on soil loss and productivity when combined with the other cumulative projects would not be considered significant.

E.2.4.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Ceasing mining in the permit renewal period in N-9, J-19, and J-21 would reduce the amount of soil disturbed within the CIAA. This would result in 1,159 fewer acres (See Table C-1, total acres disturbed) of soil disturbed compared to 2010 conditions, and would reduce the areas where topsoil would be

replaced to meet the 9-12 inch depth during reclamation and reduce the total acres of reclaimed vegetation within the CIAA.

Impacts from reclamation would be similar to Alternative 1, however reclamation in the disturbed areas of N-9, J-19, and J-21 would begin as mining in the permit renewal areas would cease. This would result in 1,159 fewer acres of reclaimed areas within the CIAA, decreasing soil productivity compared to Alternative 1. The cumulative effects of ceasing mining in the permit renewal period areas on soil loss and productivity would not be considered significant.

E.2.5 Air Quality

Cumulative, regional impacts on air quality are quite limited from all surface coal mining operations for two fundamental reasons. First, the only pollutant emitted in substantial quantities is particulate matter. Second, concentrations of airborne particulate matter released from surface mining operations decrease rapidly with distance from mines because they are released at near-or-below surface levels. Because concentrations decrease rapidly with distance, mining-related emissions are not likely to interact significantly with distant, regional sources, regardless of the magnitude of those sources.

As shown in Tables E-5 through E-7 in Section E.1.7.1, existing concentrations of criteria pollutants as measured in the region remain well below applicable National Ambient Air Quality Standards (NAAQS). Thus, emissions from low level releases from mining operations will not significantly impact any existing non-attainment area nor interact significantly with other sources, including NGS.

With regard to atmospheric deposition of metals, ENVIRON conducted an analysis of the emissions, environmental transport, transformation, and aquatic impacts of mercury and selenium emissions from the NGS (see Appendix E). To correspond with the ENVIRON analysis, PWCC provided analytical data describing typical concentrations of mercury (Hg) and selenium (Se) in the coal and in the overburden at Kayenta Mine, and AERMOD model runs were performed separately for TSP emissions from Mine operations handling coal and for TSP emissions from Mine operations handling overburden (see Exhibit D).

As shown in Table D-11, modeling of trace concentrations of metals found in the overburden and coal at the Kayenta Complex were modeled upon seven (7) distant drainage areas representing seven (7) different sections of Lake Powell and the Colorado River. Those deposition rates are shown to be on the order of a few nanograms per square meter per year for selenium and roughly one hundred times less for particulate-phase mercury.

As discussed in Section E.2.3 and in Appendix E in more detail, the risk to ecosystems from mercury and selenium deposition from the NGS facility is well below ecological screening levels. As shown in Table D-11, the deposition rates of mercury and selenium from the Kayenta Mine based on conservative modeling predictions are at least two (2) orders of magnitude lower than those attributable to the NGS facility. Therefore, the proposed action's incremental effect on mercury and selenium deposition is

negligible and the cumulative effects are still below ecological screening levels and do not pose a significant risk to aquatic receptors in the region.

E.2.6 Noise

The CIAA for noise is a 3-mile buffer from the boundary of coal resource areas N-9, J-19, and J-21 (see Section D.2.8). Cumulative actions included in the analysis include mining during the permit renewal period, reclamation, future coal mining, and the Manymules water supply project (see Table E-9).

E.2.6.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Noise from the future coal mining in N-9, J-19, and J-21 and the reclamation activities for the permit renewal period mining is not expected to increase over 2010 levels. If construction of the Manymules water supply project occurs during this same time and construction occurred near N-9, J-19, or J-21, there could be an increase in noise to sensitive receptors. However, at this time, the Manymules water supply project has not identified specific construction areas. Future coal mining activities and permit renewal period reclamation are expected to remain at current levels and noise is not expected to increase, as there are no changes to the mining operation. The incremental effect of potential noise sources from the cumulative actions when added to the permit renewal period mining and associated reclamation activities would not be considered significant.

E.2.6.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Ceasing mining in N-9, J-19, and J-21 would eliminate the noise from mining equipment; however, reclamation activities, as well as the Manymules water supply project, would continue. Permit renewal period reclamation would use heavy equipment to regrade mined areas, spread topsoil, and revegetate the area for approximately three years. Noise levels would decrease after reclamation activities in N-9, J-19, J-21, N-06, N-10, N-11 Extension, and J-16 (see Table D-7) cease using heavy equipment. Similar to Alternative 1, construction for the Manymules project could occur in areas near reclamation activities and increase noise to sensitive receptors. However, at this time, the Manymules water supply project has not identified specific construction areas. The incremental effect from permit renewal period reclamation activities would not be considered significant.

E.2.7 Landforms and Topography

The CIAA for landforms and topography is defined as Black Mesa physiographic feature (see Map A-1). The cumulative actions include mining during the permit renewal period, reclamation, and future coal mining (Table E-9).

E.2.7.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Surface disturbance from permit renewal period coal mining, future coal mining and Manymules would alter existing landforms and topography. Although reclamation activities would restore the landscape and topography to approximate original contours, land surfaces would typically be flatter, with more uniform slopes. Reclamation of the 1,159 acres (see Table C-1) of landforms and topography disturbed during the

permit renewal period would increase the area within the CIAA with flatter and more uniform slopes. Future coal mining in N-9, J-19, and J-21 would increase this area by about 30 percent. These cumulative impacts from the permit renewal period mining on landforms and topography would not be considered significant.

E.2.7.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Impacts would be similar to those described under Alternative 1; however, the disturbance of landforms and topography would be less. Reclamation activities would restore areas disturbed from mining activities increasing the area within the CIAA with flatter and more uniform slopes. These impacts on landforms and topography would not be considered significant.

E.2.8 Geology and Mineral Resources

The CIAA for geology and paleontological resources (fossils) is the Black Mesa coal field (see Map A-1). Cumulative actions that are included in this analysis include mining during the permit renewal period and future coal mining.

E.2.8.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Removing the overburden from the permit renewal period areas and future coal mining alters the existing orientation of the geology, removing coal resources and fossils in the process. The removal of overburden from N-9, J-19, and J-21 would reduce the existing geologic orientation from 4,222 acres (see Table C-1 total acres reclaimed) of the approximately 1.8 million-acre Black Mesa coal field. Disturbing less than 1 percent of the geologic orientation within the CIAA would not be considered significant. When combined with future mining operations, PWCC could potentially remove an additional 131.2 million tons of coal by 2026, about 6.5 percent of the estimated 2 billion tons that are considered suitable for mining (see Map A-1) (Nations, Swift, and Haven 2009). Incremental effects from the permit renewal period of removing approximately 41 million tons of the estimated coal resources available in the CIAA would not be considered significant.

The removal of overburden during the permit renewal period and future coal mining could remove fossils from 4,222 acres (see Table C-1 total acres reclaimed), within the 1.8 million acres of the CIAA. Conversely, mining activities during the permit renewal period and future coal mining could expose areas that contain fossils, which otherwise would have been undetected. If paleontological resources were discovered during the permit period mining or future coal mining, the appropriate land-managing agency would be notified so that the discovery would be addressed in accordance with any applicable regulations. The incremental effects from the 1,159 (See Table C-1, total acres disturbed) acres disturbed during the permit renewal period mining on paleontological resources would not be considered significant.

E.2.8.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Ceasing mining would reduce disturbance to the existing orientation of the geology and retain coal resources within the CIAA. In addition, this would retain the existing fossils in these areas, but could

reduce the possibility of discovering new fossils, as no additional fossil bearing areas of the formations would be exposed. Ceasing the permit renewal period areas and not removing 41 million tons of coal from the estimated 2 billion tons of coal resources from the Black Mesa coal field would not be considered significant.

E.2.9 Climate

As explained in Section D.2.11.1, attempts to disaggregate global climate models in order to predict the future of local or regional weather patterns is highly uncertain and speculative, particularly as it might apply to the five-year proposed renewal. Moreover, scientific uncertainty remains as to human contribution to global climate change. Virtually all scientific sources agree, however, that it is not possible to attribute complex global climate change reactions within the environment to a particular source of GHG emissions.

As previously documented, the International Energy Agency estimated global emissions of CO₂ to be 29,000,000,000 metric tons in 2008. Current GHG emissions from all of Kayenta Mine's stationary and mobile facilities and activities are approximately 163,000 metric tons per year CO₂e.

Annual CO₂, CH₄ and N₂O emissions from NGS in 2009 were 17,175,167 metric tons, 209 metric tons and 258 metric tons, respectively, which total approximately 17,259,639 metric tons of CO₂e.¹⁰ There would be no additional increase in NGS greenhouse gas emissions as a result of renewal of the Kayenta Mine permit. However, continued combustion of coal at NGS will result in a relatively small continued contribution to the global cumulative greenhouse gas emissions described in the previous paragraph. Regardless of the continued operation of NGS, projections anticipate an increased amount of fossil fuel-fired electricity generation, including coal-fired generation in the United States and around the world over the next several decades (IEA 2010).

E.2.9.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

The proposed action would continue the current operation of the Kayenta Mine. The annual level of coal mining would not change, nor would any additional mining equipment with its associated emissions be added during the Mine's operations under this alternative. As previously demonstrated, because the nature and the level of activity at the Kayenta Mine would not change, there will be no significant emissions increase of annual emissions of GHGs or of any other air pollutant during the Mine's operation caused by the proposed action.

The geographic scope and predicted air pollutant emissions of Alternative 1 are too small to allow calculation of any measurable change on global climate given any scenario about whether and how climate might be changing. Although some scientists have postulated potential effects of global climate as

¹⁰ These values were reported to The Climate Registry, where SRP voluntarily reports its GHG emissions. These values were 3rd party verified by Ryerson, Master and Associates, Inc. as required by The Climate Registry.

including alteration of water supplies, agriculture, sea levels, ultraviolet radiation levels, and variances in the ecosystem, neither Alternative 1 nor Alternative 2 would alter these effects. The incremental contribution of greenhouse gases from Alternative 1 would be negligible when compared to total greenhouse gases produced globally. A negligible effect would not be considered significant.

E.2.9.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, all operations at Kayenta Mine would eventually cease. Although a relatively small amount of GHGs continue to be emitted from a closed mine, GHG emissions from the existing permitted area at Kayenta Mine under Alternative 2 would only be a small fraction of the Mine's current estimated emissions. However, an analytical methodology that links changes in climate to reductions in GHG emissions from a specific source does not currently exist. Thus, it is highly unlikely that the GHG emission reductions from Alternative 2 would be sufficient to cause any direct effect on climate change under any scenario about whether and how climate might be changing, especially given the contribution of Kayenta Mine GHG emissions compared to global GHG emissions. Under this alternative, the reduced GHG contributions and the impacts on climate change would remain negligible and would not be considered significant.

E.2.10 Land Use

The CIAA for land use was defined as the boundaries of the Hopi Reservation and Chilchinbeto, Forest Lake, Kayenta, and Shonto Chapters within the Navajo Nation. Cumulative actions included in the analysis are the permit renewal period mining, reclamation, future coal mining, and the Manymules water supply project (see Table E-9).

E.2.10.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Approximately 952 acres of piñon-juniper woodland with low forage availability and quality will be disturbed by mining in the N-9, J-19, and J-21 coal resource areas during the permit period, and up to 11,091 acres (see Table C-1 total acres) of existing vegetation communities will be disturbed by future coal mining. Reclamation activities of regrading, spreading topsoil, and revegetating disturbed areas will increase forage productivity and quality for livestock use by converting the piñon-juniper woodlands to more productive shrubland and grassland vegetation communities. After completing reclamation, reclaimed areas will meet post-mining land uses for livestock grazing, wildlife habitat, and cultural plant use. Reclaiming areas disturbed by coal mining will increase the amount of forage and the quality of forage available for livestock grazing in local areas. The cumulative impacts from mining during the permit renewal period and future coal mining on livestock grazing will not be considered significant because the total reclaimed area is less than 1 percent of the CIAA.

The Manymules will provide a reliable water supply to areas within the CIAA, including the four relocated Navajo Nation households from the J-21 coal resource area during the permit renewal period mining. Manymules may provide piped water to relocated households that currently rely on water hauled in from outside sources and the two water stands within the PWCC lease. Indirectly this could improve residents' quality of life, help maintain family garden plots, and livestock grazing land uses. At the time

of this EA, it is not known which individual households within Kayenta Mine will be connected to a permanent water supply by the Manymules project. However, the four households relocated during the permit renewal period may be provided a permanent water supply from the Manymules project in their new location. Impacts on land use associated with relocations from the permit renewal period mining would not be considered significant.

E.2.10.2 Alternative 2: Disapprove the Renewal of Permit AZ0001 D [No Action]

Ceasing coal mining will result in approximately 952 fewer acres of piñon-juniper woodlands converted to the more productive shrubland and grassland vegetation communities. Reducing the approximately 20,000 acres of reclaimed vegetation community within the Kayenta Mine permit area by 952 acres with the original livestock carrying capacity results in approximately 4 percent less grassland-shrubland vegetation community with improved livestock carrying capacity compared to Alternative 1. The cumulative impacts to livestock grazing would not be considered significant.

Under Alternative 2, cumulative impacts would be similar to Alternative 1 except that the four households in coal resource area J-21 would not be relocated. These four relocated households could have a permanent water supply from the Manymules water supply development project. Although the Manymules project is reasonably foreseeable to occur, at the time of this EA remains uncertain whether or not the subject households will obtain water from this project.

E.2.11 Social and Economic Conditions

The cumulative impact analysis areas studied are the Navajo Nation and Hopi Reservation boundaries. Cumulative actions included in the analysis are the permit renewal period mining, future coal mining in N-9, J-19, and J-21 and NGS (Table E-9). Table E-10 lists the cities and places within the Navajo Nation and Hopi Reservation where Kayenta Mine and NGS employ more than 10 percent of the total population employed.

Table E-10 Arizona City or Place where Kayenta Mine and NGS Employ 10 Percent of the Total Population Employed

City / Place	Population Employed (2000)	Number/Percentage of Employees Residing in Each Place				2010 Total	Total (%)
		Kayenta Mine (2010 total)	Kayenta Mine (%)	NGS (2010 total)	NGS (%)		
Kaibito	350	11	3%	36	10%	47	13%
Kayenta	1,273	229	18%	8	1%	237	19%
Page	3,396	17	1%	414	12%	431	13%
Shonto	206	19	9%	12	6%	31	15%
Tonalea	132	31	23%	13	10%	44	33%

SOURCE: U.S. Census Bureau 2000 (SF3, QT-P24), URS personal communication December 2010

E.2.11.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Under Alternative 1, the permit renewal period mining, future coal mining, and NGS will result in revenues to tribes and employment opportunities. This may help maintain employment levels within the CIAA during the permit renewal period and through 2026 from future coal mining.

During the permit renewal period and future coal mining in N-9, J-19, and J-21 through 2026, the number of employees at the Kayenta Mine will remain at current levels. The total annual amount paid in salaries during the permit renewal period, future coal mining, and NGS will be approximately \$93 million with 985 employees (Table E-9). Employment opportunities and revenues paid to tribes will be similar to the 2010 values as current coal production rates are expected to be 8.2 million tons of coal per year. Kayenta Mine is the sole source of coal for NGS, and continued coal resource mining will result in continued operations at NGS and will maintain the employment rate and salaries paid to the workers in the communities listed in Table E-10. As employment and revenues paid to the tribes will remain near 2010 levels, the incremental effect of the permit renewal period mining will not be considered significant.

E.2.11.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, the Kayenta Mine operations will cease, reducing employment opportunities within the CIAA and revenues paid to tribes. Ceasing operations at Kayenta Mine would reduce employment in towns where Kayenta Mine and NGS employees reside. As shown in Table E-10 there are five cities and towns where 10 percent or more of the total population are employed by either the Kayenta Mine or NGS. This could indirectly increase the unemployment in other communities within the CIAA and the loss of tribal revenues if other businesses close due to the loss of revenues from employees purchasing goods or services. The closure of Kayenta Mine operations could result in a long term moderate effect on socioeconomics that could be considered a significant impact.

E.2.12 Indian Trust Assets

The CIAA for Indian Trust Assets are the Navajo Nation and Hopi Tribe lands, water, and coal within Black Mesa. The cumulative projects included in the analysis are the permit renewal period mining, future coal mining, community well field pumping, and Manymules (Table E-9). The effects on land as an Indian Trust Assets are incorporated into Section E.2.10, and Section E.2.1 addresses water (hydrology). The potential cumulative effects on coal as an Indian Trust Assets are addressed in Section E.2.8, whereas the socioeconomic effects of coal revenues are addressed in Section E.2.11.

E.2.13 Visual Resources

The CIAA for visual resources is a 5-mile buffer from the boundary of the permit renewal areas and future coal mining in N-9, J-19, and J-21 coal resource areas (see Section D.2.16). Cumulative actions included in the analysis are the permit renewal period coal mining, future coal mining activity, reclamation, and the Manymules water development project (Table E-9).

E.2.13.1 Alternative 1: Approve the Renewal of Permit AZ-0001D

Four occupied structures in the J-21 mining area would require relocation (G. Wendt, PWCC personal communication). The relocated structures would be further from the permit renewal period reclamation activities or future coal mining and topography and vegetation could completely or partially screen views from the relocated structures.

Future coal mining in N-9, J-19, and J-19, permit renewal period reclamation, and if implemented construction of Manymules water pipelines and facilities could increase the area where vehicles and equipment are visible. Sensitive viewers, including the relocated households, on higher ground views would be partially or totally screened by the intervening topography and distant viewers would perceive less contrast. Views of the reclamation, future coal mining, and Manymules construction would be partially or completely screened. In addition, the view for travelers on Navajo Route 41, from U.S. 160 to Red Peak Valley Wash, would continue to be brief, as most of their view would be screened by topography and vegetation.

Long-term reclamation from the permit renewal period mining, and future coal mining, would increase visual resource contrast. However, as reclamation of the permit renewal period mining would occur at the same time as future coal mining, the contrast would be similar to the existing landscape conditions. The incremental cumulative effects on visual resources from the permit renewal period mining would not be considered significant.

E.2.13.2 Alternative 2: Disapprove the Renewal of Permit AZ-0001D [No Action]

Under Alternative 2, reclamation activities from the permit renewal period mining and the construction of Manymules water supply project could increase the area where construction vehicles are visible on the landscape. This effect on visual resources would persist during the first two years of reclamation, however, once regrading, spreading topsoil and replanting are completed in N-9, J-19, J-21, N-06, N-10, N-11 Extension, and J-16 (Table C-1) these effects on visual resources from reclamation would cease.

Similar to Alternative 1, reclaimed areas in N-9, J-19, and J-21 and Manymules facilities could increase the visual contrast for sensitive viewers. The reclaimed areas would result in less contrast as these areas would blend in with the approximately 20,000 acres of reclaimed lands within the Kayenta Mine permit area. However, the Manymules facilities such as pump houses and water treatment plants could increase contrasts with existing form, line, and color for some sensitive viewers. However, these views could be completely or partially screened by topography and vegetation. At this time, specific construction plans for the Manymules project are not known. The impacts on visual resources from reclaiming the permit renewal period mining would be not considered significant.