
TABLE OF CONTENTS

Chapter

Page

5.	CUMULATIVE IMPACTS	5-1
5.1	Introduction	5-1
5.1.1	Cumulative Analysis Methodology.....	5-1
5.1.2	Past, Present, and Reasonably Foreseeable Future Actions	5-2
5.2	Scoping Comments on Cumulative Impacts.....	5-8
5.3	Resources and Resource Uses	5-8
5.3.1	Air Quality and Air Quality-Related Values	5-8
5.3.2	Greenhouse Gas Emissions and Climate Change	5-11
5.3.3	Cultural Resources.....	5-12
5.3.4	Energy and Minerals	5-15
5.3.5	Environmental Justice.....	5-17
5.3.6	Fish and Wildlife.....	5-18
5.3.7	Land Use and Realty.....	5-22
5.3.8	Livestock Grazing	5-24
5.3.9	Native American Interests and Heritage Resources.....	5-27
5.3.10	Noise	5-29
5.3.11	Paleontological Resources.....	5-30
5.3.12	Recreation and Travel Management.....	5-32
5.3.13	Socioeconomics	5-34
5.3.14	Soil Resources	5-36
5.3.15	Special Designations.....	5-40
5.3.16	Special Status Species.....	5-41
5.3.17	Vegetation.....	5-45
5.3.18	Visual Resources	5-50
5.3.19	Water Resources.....	5-51
5.3.20	Wild Horses and Burros.....	5-54
5.3.21	Wilderness Characteristics	5-57

FIGURES

Page

5-1	Existing and Proposed Renewable Energy, Transmission, and other Development	5-7
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TABLES

Page

5-1	Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions.....	5-4
5-2	Summary of Developable Land.....	5-23
5-3	Potential Soils Impacts in the Planning Area	5-38
5-4	Potential Vegetation Impacts in the REDA for Alternative 1.....	5-46
5-5	Potential Vegetation Impacts in the REDA for Alternative 2.....	5-47
5-6	Potential Vegetation Impacts in the REDA for Alternative 3.....	5-48
5-7	Potential Vegetation Impacts in the REDA for Alternative 4.....	5-48
5-8	Potential Vegetation Impacts in the REDA for Alternative 6.....	5-49

CHAPTER 5

CUMULATIVE IMPACTS

5.1 INTRODUCTION

This chapter presents the likely cumulative impacts on the human and natural environment that could occur from implementing the alternatives presented in **Chapter 2**, Description of Alternatives and the Reasonably Foreseeable Development Scenario. This chapter is organized by topic, similar to **Chapter 3**, Affected Environment, and **Chapter 4**, Environmental Consequences.

Cumulative impacts are effects on the environment that result from the impact of implementing any one of the RDEP alternatives in combination with other actions outside the scope of this plan, either within the planning area or adjacent to it. Cumulative impact analysis is required by CEQ regulations because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation, but must be determined by considering the likely result of that action in conjunction with many others. Evaluation of potential impacts considers incremental impacts that could occur from the proposed project, as well as impacts from past, present, and reasonably foreseeable future actions. Management actions could be influenced by activities and conditions on adjacent public and non-public lands beyond the planning area boundary; therefore, assessment data and information could span multiple scales, land ownerships, and jurisdictions. These assessments involve determinations that often are complex and, to some degree, subjective.

5.1.1 Cumulative Analysis Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment – specifically, actions that occur outside the scope and geographic area covered by the planning area. Cumulative impact analysis is limited to important issues of national, regional, or local significance; therefore, not all resources identified for the direct and indirect impact analysis in this EIS are analyzed for cumulative impacts. Resources not

discussed in detail include geology and seismicity, national trails, and public health and safety.

Because of the programmatic nature of the RDEP EIS and cumulative assessment, the analysis tends to be broad and generalized to address potential effects that could occur from a reasonably foreseeable management scenario combined with other reasonably foreseeable activities or projects. Consequently, this assessment is primarily qualitative for most resources because of lack of detailed information that would result from project-level decisions and other activities or projects. Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact. The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the naturally occurring baseline as depicted in the affected environment (see **Chapter 3, Affected Environment**) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, nonfederal, and private actions.
- Potential for synergistic effects or synergistic interaction among or between effects.
- Potential for effects across political and administrative boundaries.
- Other spatial and temporal characteristics of each affected resource.
- Comparative scale of cumulative impacts across alternatives.

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2010. The temporal scope of this analysis is a 20-year planning horizon.

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., deer populations) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading.

5.1.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify whether and to what extent the environment has been degraded or enhanced, whether ongoing activities are causing impacts, and trends for activities in and impacts on the area. Projects and activities are

evaluated on the basis of proximity, connection to the same environmental systems, potential for subsequent impacts or activity, similar impacts, the likelihood a project will occur, and whether the project is reasonably foreseeable.

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperators and BLM employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions. Additional information was obtained through discussions with agency officials and review of publicly available materials and websites.

Effects of past actions and activities are manifested in the current condition of the resources, as described in the affected environment (see **Chapter 3, Affected Environment**). Reasonably foreseeable future actions are actions that have been committed to or known proposals that would take place within a 20-year planning period.

Reasonably foreseeable future action scenarios are projections made to predict future impacts – they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in factors such as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

Other potential future actions have been considered and eliminated from further analysis because there is a small likelihood these actions would be pursued and implemented within the life of the plan or because so little is known about the potential action that formulating an analysis of impacts is premature. In addition, potential future actions protective of the environment (such as new potential threatened or endangered species listings or regulations related to fugitive dust emissions) have less likelihood of creating major environmental consequences alone, or in combination with this planning effort. Federal actions such as species listing would require BLM to reconsider decisions created from this action because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce

potential cumulative impacts in accordance with law, regulations, and BLM RMPs.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts when added to the RDEP alternatives are displayed in **Table 5-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions, and **Figure 5-1**, Existing and Proposed Renewable Energy, Transmission, and other Development.

Table 5-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions

Human Actions	
Energy and minerals development	<p>Northern Arizona Proposed Withdrawal Environmental Impact Statement. The Draft EIS was released for public comment in February 2011; BLM is reviewing comments and revising the Draft EIS based on comments. Proposed Action is to withdraw 1,010,776 acres of BLM and USFS federal locatable mineral estate in northern Arizona from the location of new mining claims under the General Mining Law of 1872.</p> <p>Active Mines/Pits/Plants – 153 (BLM 2011b)</p>
Vegetation management	<p>Forestry. Past, current, and foreseeable forestry uses include personal and commercial harvest of pinyon and juniper fuel wood, poles, and posts for fence building, wildings (live trees), and Christmas trees.</p> <p>Vegetation treatments. Mechanical treatments of vegetation (e.g., chaining, rollerchops, Dixie-harrow, drill seeding, hydro-axing, brush mowing) were very common in the past on public and private rangelands in the planning area. These treatments and maintenance of these vegetation treatments are still fairly common and will likely continue.</p> <p>Hazardous Fuels Reduction. Fuels treatments, including prescribed fires, chemical and mechanical treatment, and seeding, would likely continue and potentially increase in the future.</p> <p>Biomass. Future forestry use of woody biomass for energy production could occur.</p>
Lands and realty	<p>The BLM is moving toward the consolidation of BLM lands to benefit the public. To achieve this goal, candidates for land tenure adjustment through disposal, sale, or exchange include parcels that are difficult to manage or that do not have public access, relatively small parcels adjacent to other federal- or state-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access and use of BLM lands. Residential development in the areas surrounding major metropolitan areas in Arizona has been increasing, and many state lands are being planned for master communities.</p> <p>Designation of Energy Corridors on Federal Lands in the 11 Western States Programmatic EIS (2007). This multi-federal agency Programmatic EIS analyzes the environmental impacts of designating federal energy corridors on federal lands in 11 western states and incorporating those designations into relevant land use and resource management plans.</p>

Table 5-1 (continued)
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions

	Solar applications – 31 applications, totaling 463,587 acres
	Wind applications – 9 applications, totaling 172,018 acres
	Built wind projects – 1 (Dry Lake Wind Farm), totaling 12,918 acres
	Proposed Transmission lines greater than 230 kV – 3 proposals (SunZia, Southline, Centennial West), totaling approximately 1,859,000 acres
	Existing Transmission lines greater than 230 kV – approximately 1,900,000 acres
Recreation and visitor use	Arizona's population has grown significantly in the past 10 years, and an increasing number of people are living near or seeking local public lands for a diversity of recreational opportunities. The primary recreational activities in Arizona are motorized vehicle touring, big and small game hunting, backpacking, horseback riding, mountain biking, sight-seeing, pleasure driving, and hiking. Recreation-based visitor use in Arizona has increased in most areas in recent years and is expected to continue to increase on BLM and non-BLM lands.
Livestock grazing	<p>Livestock grazing has a long history in the region. Generally, livestock use has decreased over the past 100 years. Grazing in portions of the Cumulative Impacts Analysis Area has either remained stable or declined in the recent past. Approximately 10.9 million acres of BLM-administered lands are open to grazing in the planning area; this represents approximately 89 percent of the BLM-administered land in the state. A total of 1.3 million acres (11 percent) are closed to grazing. Recent land use plan amendments have increased the number of acres closed to grazing due to other resource concerns. As of 2010, the total number of grazing permits and leases on BLM-administered lands in the planning area was 769, of which 405 were authorized as Section 3 permits, and 364 were authorized as Section 15 leases. A total of 635,731 AUMs have active status as of 2011. Grazing on private lands within the Cumulative Impact Analysis Area is expected to remain stable or slightly decrease as residential and industrial development increases.</p> <p>Based on the most recent BLM-administered land statistics for monitored rangeland, resource conditions on a total of 2.1 million acres in Arizona were determined to be improving, 3.6 million acres static and 640 thousand acres declining on public grazing lands in Arizona.</p>
Roadway development	Road construction has occurred in association with timber harvesting, energy development, and mining on BLM lands, private lands, State of Arizona lands, and U.S. Forest Service lands. The bulk of new road building is occurring for community expansion and energy development. Road construction is expected to continue at the current rate on BLM and U.S. Forest Service lands; the future rate is unknown on private and State of Arizona lands.
Water diversions	The planning area and BLM-administered lands have been and will continue to be affected by irrigation and diversions for municipal and industrial (M&I) uses. A recent report by the Arizona Water Resources Development Commission projected that future agricultural water use will remain stable and increased demand for M&I to be met by conservation and new groundwater pumping (WRDC 2011). Reservoir operations have affected water supply, aquatic

Table 5-1 (continued)
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions

	<p>conditions, and timing. Irrigation rights are expected to continue being bought and sold in the future, with some new property owners changing how the right was historically used. Due to population growth and land sales, more agricultural water rights may be converted to municipal and industrial uses.</p> <p>Central Arizona Project (total) – 43,505 acres</p>
Natural Processes	
Spread of noxious/invasive weeds	<p>Noxious weeds have invaded and will continue to invade many locations in the planning area. Noxious weeds are carried by wind, humans, machinery, and animals. The Arizona BLM currently manages weed infestations through integrated weed management, including biological, chemical, mechanical, and educational methods. The 1991 and 2007 Records of Decision for Vegetation Treatment on BLM Lands in Thirteen Western States, and the 2007 Programmatic Environmental Report guide the management of noxious weeds in western states, including Arizona. Noxious and invasive weeds are expected to continue to spread on all lands. Due to their ability to tolerate certain conditions, some species are expected to remain a serious long-term challenge in Arizona.</p>
Wildland fires	<p>Fires within the planning area are both naturally occurring and used as a management tool. Naturally occurring fires have been widely distributed in terms of frequency and severity, and a number of major fires (e.g., the Wallow Fire that burned approximately 538,00 acres and the Horseshoe 2 fire that burned 222,950 acres) have occurred in the past decade. Increasing recurrence and severity of drought conditions have been predicted for this area as a result of climate change. This could, in turn, increase the occurrence and severity of wildfires on BLM land.</p>
Drought	<p>For much of the last decade, most of the Western US has experienced drought. Inflows to the Lower Colorado Basin have been below average since 2000, and Arizona regularly goes through periods of drought that may be statewide, region-wide, or within a more localized area. Agriculture, drinking water supplies, and wildland fires are all impacted by drought.</p>
Climate change	<p>Increased concern over greenhouse gas emissions and climate change issues may lead to future federal and state regulations limiting the emission of associated pollutants.</p>



Existing and Proposed Renewable Energy, Transmission, and other Development



Proposed project data are generalized and not an authoritative source of the location of a project.

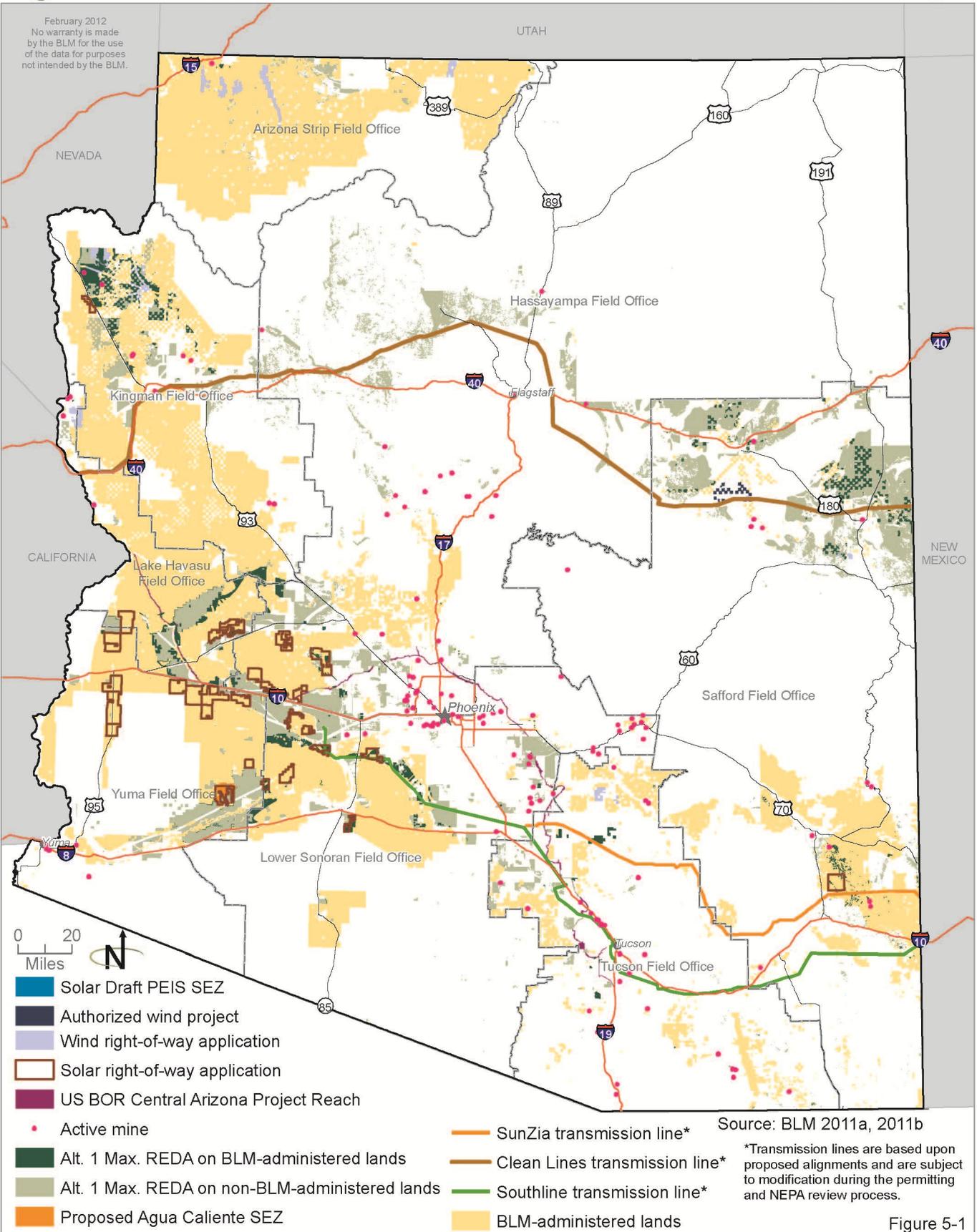


Figure 5-1

5.2 SCOPING COMMENTS ON CUMULATIVE IMPACTS

In addition to scoping comments related to direct and indirect impacts on resources, the BLM received public comments regarding cumulative impacts of renewable energy development and its associated infrastructure on a landscape scale. Following are the topics and issues that BLM will address in the cumulative impacts analyses:

- Commenters request that BLM comply with relevant CEQ guidance to analyze cumulative impacts.
- BLM should analyze cumulative impacts (including likely development of other energy resources) to land use, water, wildlife habitat, recreation, cultural resources, socioeconomics, visual resources, and other resources and values.
- BLM should produce a coordinated plan for additional legislative or administrative protection of lands alongside designation of development zones (similar to the California Desert Renewable Energy Conservation Plan).
- BLM should consider and analyze impacts on climate change, including anticipated benefits, from solar development.
- BLM should describe and estimate emissions from off-highway vehicle use and any mitigation measures to minimize those emissions. Emissions from off-highway vehicle use can be considered a cumulative impact on air quality.

5.3 RESOURCES AND RESOURCE USES

This section contains a description of the biological and physical resources and those resource uses of Arizona and follows the order of topics addressed in **Chapter 3**, Affected Environment and **Chapter 4**, Environmental Consequences.

5.3.1 Air Quality and Air Quality-Related Values

Impacts Common to All Alternatives

Cumulative impacts from past, present, and reasonably foreseeable actions have affected and could continue to affect air quality. Population growth and concentration have played a large role in determining the air quality in different parts of the planning area, with urban areas tending to have reduced air quality. In addition, past mining and industrial practices historically contributed to poor air quality conditions in some parts of the planning area. Improved understanding of the effects of human actions on air quality, regulation of sources of pollutant emissions, and the establishment of air pollution regulating agencies to manage the attainment status of a region have resulted in a trend towards improved air quality.

Solar, wind, and transmission line development, road development, wildland fire, and increased visitor use on BLM-administered lands all contribute to short-term or long-term impacts on air quality. Solar, wind, and transmission line development, road development, and other earth-disturbing development projects result in short-term particulate matter emissions that can combine with naturally occurring dust generation to create temporary cumulatively degraded visibility conditions. Approved solar energy development could disturb up to 5,684 acres, with 457,903 acres of additional solar applications pending. Solar development under each REDA alternative could affect another 76,000 acres state-wide, including 12,000 acres of BLM-administered land and 64,000 acres of non-BLM-administered land. Projects that occur simultaneously could contribute to violations of PM₁₀ and PM_{2.5} ambient air quality standards, with greatest potential cumulative effect in PM₁₀ nonattainment and maintenance areas. Equipment and vehicle exhaust emissions during construction, though short term, contribute to regional ozone conditions. Operation of solar, wind, and transmission line development would have limited individual or cumulative effect on air quality.

Population growth in Arizona has and will likely continue to increase the demand for energy. Meeting the increased energy demand through renewable sources would limit the cumulative effect on air quality that would otherwise occur through the construction and operation of additional fossil fuel-burning power plants within the planning area.

Population growth also increases recreational use on public lands. This increased use increases dust emissions on unpaved roads, particularly from off-highway vehicle use, and increases exhaust-related emissions along travel routes. This increase in emissions may cumulatively affect air quality in public land areas, particularly in the form of fugitive dust and associated visibility impacts. The ability of resource management planning to reduce or avoid emissions associated with such use would determine the cumulative impact on air quality associated with use of public lands.

The effects of climate change on air quality could include increased dust generation in areas receiving less rainfall or undergoing more extreme drought conditions. To the extent that climate change increases the likelihood of wildland fire, this would also increase the impacts on regional air quality through generation of particulates.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives for the REDA, above. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis. Appropriate evaluation of cumulative impacts would be required during the ROW application process to determine the cumulative impacts associated with proposed solar and wind

energy development projects and to ensure that appropriate design measures and best management practices are implemented to reduce cumulative air quality impacts.

Impacts from Alternatives 1 through 6

Impact from REDAs

Impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts could result from the construction, operation, and decommissioning of solar energy development projects within the proposed Agua Caliente SEZ in combination with other past, present, and reasonably foreseeable future projects in the area. The level of effect would depend upon the size, number, and location of proposed solar projects and the types of technology that would be employed. There is one solar facility under construction adjacent to the proposed Agua Caliente SEZ, one pending solar application within the proposed SEZ, and three pending solar applications on BLM-administered lands within an approximately 20-mile radius of the proposed SEZ.

The most likely potential cumulative impacts associated with solar development would be short-term impacts related to construction from projects with overlapping construction periods. The level of this effect would be determined by the proximity of such projects to one another as well as the travel routes to access the sites by worker vehicles and delivery trucks. The development of multiple utility-scale solar facilities in the area could have a regional benefit by offsetting the need for energy production from oil, gas, and coal power plants that results in higher levels of criteria and toxic air pollutants.

Impacts from Alternatives 2 and 6, Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives, above. With a smaller SEZ area than described under Alternative 1, the level of development is likely to be less, with fewer potential cumulative impacts on air quality.

Impacts from Alternative 5, Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives, above. With a smaller SEZ area than described under the other alternatives, the level of development is likely to be the least, with fewer potential cumulative impacts on air quality.

5.3.2 Greenhouse Gas Emissions and Climate Change

Impacts Common to All Alternatives

Past, present, and reasonably foreseeable future actions have and will continue to produce GHG emissions. In Arizona, GHG emissions have historically increased. Between 1990 and 2005, the net GHG emissions increased by nearly 56 percent, and GHG emissions are forecasted to increase by 148 percent by 2020. Electricity use accounts for nearly 40 percent of Arizona's gross GHG emissions (ACCAG 2006).

Solar, wind, and transmission line development, road development, and other earth-disturbing development projects result in short-term generation of GHG emissions from permanent removal of vegetation, which releases carbon stored (sequestered) in the cleared vegetation, and from fuel combustion associated with heavy construction equipment and vehicle and truck use. Greenhouse gas emissions associated with operation of solar and wind facilities would be much less than under construction and would not be a cumulatively significant contribution to other GHG-producing actions on BLM-administered lands or other private and public lands in the planning area. Operation of other reasonably foreseeable future actions would produce varying levels of GHG emissions depending on the nature of the action.

Population growth in Arizona has and will likely continue to increase the demand for energy. Meeting the increased energy demand through renewable sources would limit the production of GHGs that would otherwise be required through the construction and operation of oil, gas, or coal-fired power plants. In Arizona, an estimated 1,700 pounds of CO₂ would be displaced annually per megawatt-hour of renewable energy produced (EPA 2007). The proposed action and alternatives in combination with other reasonably foreseeable future renewable energy projects could help offset the increase in GHG emissions resulting from population growth.

The availability of additional renewable sources of energy resulting from proposed and reasonably foreseeable future renewable energy projects, together with any legislation aimed at controlling GHGs, would have an incremental cumulative effect on climate change.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives for the REDAs, above. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis. Appropriate evaluation of cumulative impacts would be required during the ROW application process to determine the cumulative impacts associated with proposed solar and wind energy development projects and to ensure that

appropriate design measures and best management practices are implemented to reduce emissions of GHGs.

Impacts from Alternatives 1 through 6

Impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred.

5.3.3 Cultural Resources

Cultural resources are finite, limited, and nonrenewable resources. The evaluation methodology for cumulative impacts on cultural resources is based upon the following:

- Location of the proposed REDAs;
- Proximity to water;
- Proximity to urban areas;
- Previous disturbance to the REDAs; and
- Relative amount of land in each REDA.

Assumptions include the following:

- The geographic scale of the cumulative area of effect is the entire state of Arizona.
- The Class I record searches that have been conducted for the REDAs were limited to NRHP-listed properties, and the actual number of previously recorded sites in each REDA is unknown.
- The direct effects of the RDEP planning project would not result in impacts on cultural resources, so the discussion of cumulative effects is focused on the indirect effects (i.e., the potential for ground-disturbing activities in the REDAs).
- The anticipated development of each REDA would be proportionate to the initial size of the REDA (i.e., a large REDA would have a larger proportion of the area be developed than other smaller REDAs).
- There are differences in impact levels between solar and wind renewable energy projects with regard to cultural resources, which would result in different kinds of cumulative impacts. Given that the future type of development is unknown, the cumulative impacts would be treated the same regardless of type of renewable energy project.
- It is assumed that no cultural resource studies have been completed for any of the REDAs. It is further assumed that prior to future ground-disturbing activities, studies would need to be completed to

meet Section 106 compliance requirements. It is also assumed that appropriate mitigation procedures would be applied to address the adverse effects on-NHRP eligible sites.

Impacts Common to All Alternatives

Cultural resources are subject to loss during construction of solar and wind energy facilities and associated roads and transmission lines. Historic properties, including prehistoric and historic archaeological sites, structures, features, and traditional cultural properties, that have been listed in or are eligible for listing in the NRHP are of concern. The types of impacts would be the same as described in **Section 4.2.3**, Cultural Resources. Cumulative effects on cultural resources from foreseeable development in the planning area are expected to occur over a very small fraction of the total planning area. Of the several contributors to impacts on cultural and heritage resources noted in **Table 5-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions renewable energy development could be a major contributor to these impacts due to the amount of area usually involved in utility-scale energy production. However, facilities could, and would wherever possible, be sited away from areas rich in cultural resources due to the required design features that are proposed as part of the RDEP. Such areas would include individual properties (sites, structures, features, traditional cultural properties) and districts listed in the NRHP, National Historic Landmarks, National Historic Trails, and prehistoric and historic sites possessing significant scientific, heritage, or educational values. With more projects proposed and/or constructed, there would be more areas surveyed for cultural resources and new sites discovered, thereby adding to the historic record and making more scientific information available to help understand the region's cultural history.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives, above. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis. The trends in **Table 5-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions note that many of the factors that result in impacts on cultural resources will continue to increase, including increasing recreation demand, increasing road development and increasing renewable energy development, resulting in continued site discoveries, new scientific information added to the cultural records, and the increased likelihood for looting and vandalism.

Impacts from Alternative I

Impacts from Maximum REDA

Alternative I would have cumulative effects of the type and nature described above due to the location of the components of the REDA includes a larger land area, and the alternative is close to urban centers, water, and near areas that

have high sensitivity for cultural resources. Given these reasons, Alternative 1 would have a substantial indirect impact on significant cultural resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

The project would have cumulative effects of the type described above in the proposed Agua Caliente SEZ due to the fact that there are large World War II military training ranges that have the potential to be impacted by this alternative. In addition, private and state lands adjacent to the SEZ along the lower Gila River would be identified as REDAs, allowing for further potential development and impacts on cultural resources.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Alternative 2 would have less of a cumulative effect on cultural resources since the ground-disturbing activities would be directed to areas that have been previously disturbed or will be disturbed through the construction of existing and future transmission projects.

Impacts from Proposed Agua Caliente Solar Energy Zone

The project would have a cumulative effect on cultural resources in the Agua Caliente Solar Energy Zone as described under Alternative 1.

Impacts from Alternative 3

Impacts from Load Offset REDA

Alternative 3 would have a greater cumulative effect than Alternatives 2, 4, 5, and 6 given its proximity to urban centers. As mentioned previously, urban localities in Arizona have significant historic resources that could be impacted by the development of this alternative.

Impacts from Proposed Agua Caliente Solar Energy Zone

The project would have a cumulative effect on cultural resources in the Agua Caliente Solar Energy Zone as described under Alternative 1.

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Alternative 4 would have less of a cumulative effect on cultural resources than Alternatives 1, 2, and 3. Significant cultural resources are generally located in close proximity to water (i.e., large habitation areas). Therefore, the removal of these water areas from the REDA would result in a lower cumulative effect on cultural resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

The project would have a cumulative effect on cultural resources in the Agua Caliente Solar Energy Zone as described under Alternative 1.

Impacts from Alternative 5*Impacts from Land Tenure REDA*

Alternative 5 would have less of a cumulative effect on cultural resources than other alternatives. This alternative encompasses areas that have already been disturbed or have low potential for resources to be present. Therefore, the cumulative effect of the development of this alternative on cultural resources is insignificant.

Impacts from Alternative 6*Impacts from Collaborative-Based REDA*

The cumulative effects on cultural resources for Alternative 6 would be less than the other alternatives because it combines areas that have the least impact on resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

The project would have a cumulative effect on cultural resources in the Agua Caliente Solar Energy Zone as described under Alternative 1.

5.3.4 Energy and Minerals**Impacts Common to All Alternatives**

The primary indicators of impacts on the availability of mineral resources are the amount of land made unavailable for mineral resource activities and the restrictions that may be placed on mineral claiming, leasing, or development activities. Potential impacts on the availability of mineral resources could occur if the proposed alternatives in combination with past, present, and reasonably foreseeable future actions resulted in a substantial reduction in federal leasing and development of oil and gas or potash or a substantial reduction in exploration for or development of locatable or salable minerals. Cumulative impacts from past, present, and reasonably foreseeable actions, such as mineral exploration and development activities and management actions that withdraw lands from mineral entry, have affected and could continue to affect the availability of mineral resources.

Leasable Minerals

As noted in **Chapter 4**, Environmental Consequences under all alternatives, the impacts on oil, gas, and geothermal development from solar and wind energy development is expected to be negligible. Also, lands with potential for potash development have been eliminated from consideration as the REDA making the impact on potash development negligible. As the impact on leasable minerals is expected to be negligible under all alternatives, no cumulative impact is anticipated.

Locatable Minerals

As noted in **Chapter 4**, Environmental Consequences the elimination of metallic mineral districts and areas with high potential of known mineral

deposits from consideration minimizes the impacts on the availability of locatable minerals from solar and wind energy development under all alternatives. However, cumulative impacts on the availability of mineral resources could occur if future actions result in lands being withdrawn from mineral entry (e.g., the proposed northern Arizona uranium withdrawal currently under NEPA analysis) or if solar and wind energy development, including right-of-ways, restrict new mineral development activities.

Saleable Minerals

Cumulative impacts may occur if solar and wind energy development combined with other future actions restricts the availability of saleable minerals on a local or regional scale over the short or long term. However, as the known occurrences and prospects for saleable minerals are abundant and wide spread, the cumulative impacts on the availability of saleable minerals under all alternatives is expected to be negligible.

For all mineral resources, the increased development of renewable energy could potentially restrict the availability of mineral resources on public or private lands since the intensive coverage of land surface required by solar and wind energy facilities may render the land used incompatible for other uses such as mineral development. Additionally, an increase in renewable energy could potentially slow the growth of the nonrenewable energy sector by reducing the need for nonrenewable sources of fuel (e.g., coal, oil, and gas).

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives for the REDAs, above.

Impacts from Alternatives 1 through 6

Impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred.

Impacts from Proposed Agua Caliente Solar Energy Zone

As discussed in **Section 4.2.4**, Energy and Minerals there are currently no active oil and gas or geothermal leases within the proposed SEZ, and there are no mining claims or active mines. There is one pending solar application within the proposed SEZ and three pending solar applications on BLM-administered lands within an approximately 20-mile radius of the proposed SEZ. There are currently no wind or geothermal applications within this distance. Because of the generally low level of mineral production in the proposed SEZ and surrounding area and the expected low impact on mineral accessibility of other foreseeable actions within the geographic extent of effects, no cumulative impacts on mineral resources are expected.

5.3.5 Environmental Justice

Impacts Common to All Alternatives

Environmental justice is concerned with addressing disproportionately high and adverse human health or environmental effects of agency programs, policies, and activities on minority and low-income populations. Four counties in the planning area contain minority populations as defined by CEQ guidance (Apache, Navajo, Santa Cruz, and Yuma). Cumulative impacts could occur were these populations to be disproportionately affected by development. Past, present, and reasonably foreseeable future actions and conditions within the planning area that have affected and will likely continue to affect environmental justice include those described for socioeconomics, below. Potential effects on environmental justice may arise from air pollution, noise, land use, cultural, or socioeconomic impacts. These effects may be negative, as in the case of increased noise levels or altered land use patterns, or positive, as in the case of local or regional economic benefits resulting from increased jobs and revenue.

Impacts from renewable energy construction would be short-term and therefore not likely cumulative for any of the planning area. Operations and maintenance impacts would be minimal, as post-construction, overall demands for site operations and maintenance would be minimal. Cumulative impacts could result from the long-term implications of the presence of renewable energy in the area: noise from transmission lines, changes in public land access, visual changes to the environment, and changes in local community economic resources or social structure. Mitigation measures would reduce potential impacts.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on environmental justice if approved.

Impacts from Alternatives 1 through 6

Impacts from REDAs

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Cumulative effects on environmental justice populations from renewable energy development would likely be negligible, due to the sparse populations in solar and wind development areas, measures included in design features and BMPs which minimize potential threats to human health and mitigate impacts on air quality and noise. Additional measures provide requirements to involve local communities in the development process.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. A significant minority population was found through the study of county and census tract data for the proposed SEZ, though the SEZ is located away from large population centers. Fugitive dust, traffic, noise, and visual impacts could affect minority populations in the short term, but the contribution to cumulative impacts is likely to be negligible after the implementation of design features and BMPs. Development of the SEZ may provide a minor cumulative contribution to employment for environmental justice population areas in the region due to construction and operations employment needs.

5.3.6 Fish and Wildlife***Impacts Common to All Alternatives***

Potentially affected wildlife in the planning area includes numerous species of amphibians and reptiles, birds, mammals, and aquatic biota. Impacts would vary by species. Special status species are discussed further in **Section 5.3.16, Special Status Species**. Past, present, and reasonably foreseeable future actions and conditions within the planning area that have affected and will likely continue to affect fish and wildlife habitat include but are not limited mineral exploration and energy development, vegetative treatments, livestock grazing, recreation, road construction and utility corridor development, water diversions such as the Central Arizona Project (CAP), commercial and residential development, prescribed and wildland fires, land planning efforts, and habitat improvement projects. Site-specific effects would depend on the affected habitat, species present, and extent of disturbance. In general, resource use activities that alter habitat or increase human presence may change habitats so that they are no longer suitable for particular fish or wildlife species. Activities that may enhance wildlife habitat or increase protection for fish and wildlife include designation of protective areas such as wildlife refuges, or development of long-term management plans for specific species or habitats.

Approved solar energy development could cause up to 5,684 acres of habitat removal. Additionally, 457,903 acres of additional solar applications are pending. Most solar energy development has been proposed in the southwestern portion of the state within the Yuma, Lower Sonoran, and Lake Havasu Field Offices. Habitat within the approved and pending solar applications is primarily lower and upper Sonoran desert scrub, therefore fish and wildlife species within this habitat are the most likely to be impacted. Wind energy has been developed on 12,918 acres throughout Arizona with pending wind applications totaling an additional 172,018 acres; a small portion of that acreage (estimated at 10 percent) would likely be permanently lost as wildlife habitat. Transmission line development would cause the disturbance of a corridor around lines and permanent removal of habitat in small areas associated with pole or tower structures. Total proposed transmission lines may cover around 1,859,000 acres

and existing transmission has disturbed an additional 1,900,000 acres. Renewable energy facilities on all lands in the planning area could affect bird migration patterns. Transmission towers and site infrastructure could provide nesting and perching sites for predators such as ravens and raptors. Site infrastructure for wind power plants present collision hazards to birds and bats. Aquatic species could be affected by changes in drainage patterns due to site grading and infrastructure. In addition, depletion of groundwater would impact riparian and wetland areas as well as streams, seeps, and other areas hosting aquatic species.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect vegetation conditions and water availability and thus alter habitat suitability conditions.

Stipulations and permitting requirements, including timing and no surface occupancy limitations, would minimize the impacts associated with development. There could be a cumulative effect from removal of small patches of habitat that can add up to a notable acreage and fragment suitable habitat and movement corridors.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives above. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on fish and wildlife if approved. Without development of the REDA, solar and wind energy development may be scattered throughout the planning area, and approval of such applications may contribute to the cumulative fragmentation of habitats and movement corridors.

Impacts from Alternative I

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative I would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the location and technology that would be developed, fish and wildlife habitat could be removed or fragmented over large areas and over the long term.

Design features to address impacts include but are not limited to timing of activities to avoid affecting breeding seasons and winter use areas, use of noise reduction devices, use of fencing to protect wildlife, traffic control, and

preservation of wetlands. These design features would reduce but not eliminate the contribution to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres and would contribute to the loss of potential wildlife habitat within Arizona.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,680,600 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives above. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres and would contribute to the loss of potential wildlife habitat within Arizona.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,737,000 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the technology that would be developed, fish and wildlife habitat could be removed or fragmented over large areas and over the long term. Utility-scale development may be more likely under this alternative due to siting of projects nearer to load centers. Therefore, impacts may be concentrated on larger tracts of land.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The

proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres and would contribute to the loss of potential wildlife habitat within Arizona.

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts, such as changes in habitat conditions, would be reduced under this alternative, as the REDA is sited to protect groundwater resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5

Impacts from Land Tenure REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives above. Alternative 5 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development.

Impacts from Alternative 6

Impacts from Collaborative-Based REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development. Alternative 6 would reduce cumulative impacts on fish and wildlife by combining the protective features of all the alternatives. This would reduce new habitat disturbance, removal, and fragmentation from renewable energy development.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.7 Land Use and Realty

Impacts Common to All Alternatives

Contributions of renewable energy development to cumulative impacts on land use and realty would be in addition to those from other ROWs for transmission lines, roads, and other facilities on public lands and from other energy development on public and private lands that would further affect and limit other land uses within a given region. The intensive coverage of land surface required by solar facilities renders the land used incompatible for most other uses, including grazing, mineral development, and recreation. Although wind facilities also encompass large areas, they are generally more compatible with such other uses, because they require less land and can accommodate multiple uses.

The magnitude of land use effects from solar development could be fairly large locally, but smaller on a statewide basis. On a local scale, solar facilities would dominate several square miles of land lying in basin flats and would introduce an industrial land use in an otherwise rural area. On a statewide basis, while facilities would affect areas of similar topography, thus increasing their relative impacts on such land types, the percentage of such land types affected would remain quite small for the amount of land required to meet the RFDS.

Cumulative impacts would be associated with changes in existing uses on public, state, and private lands that are converted to solar or wind energy, or are near solar and wind energy facilities. Indirect impacts could include conversion of land in and around local communities from agricultural, open space, or other uses to solar or wind facilities, or to provide services and housing for employees and families who move to the region in support of solar or wind energy development on public and private lands.

Renewable energy development, transmission lines and facilities, and urban development are the most likely new future uses of rural lands. Solar energy development, because of its intensive land use and outstanding resource potential in Arizona, would be a major contributor to those impacts; more so than wind energy developments due to its lesser quality resource potential.

There is potential for impact on land values in areas near solar energy facilities and associated ROWs. Some reasons that land values could be reduced include aesthetic concerns, changes in the amount of vehicular traffic, or changes in current operations (e.g., the removal of a substantial or critical part of a grazing operation). Alternatively, land values could increase because of additional demand for developable private lands to support solar and wind development. The increase in land value would likely increase the local tax base (see **Section 4.2.16**, Socioeconomics, for additional detail).

Impacts from Alternatives 1 through 6

The type of impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred. **Table 5-2**, Summary of Developable Land summarizes the type of public and private lands potentially impacted by future solar and wind energy development in the REDA based on screening and mapping.

Table 5-2
Summary of Developable Land

Agency	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
BLM	321,500	218,600	129,800	321,500	43,700	237,100
Forest Service	4,100	1,600	1,600	4,100	0	2,500
BOR	13,500	13,200	9,800	13,500	0	13,400
State	878,600	646,200	439,200	878,400	0	687,400
County	2,300	2,100	300	2,300	0	2,200
Local	1,500	1,400	1,400	1,500	0	1,500
Private	1,418,100	984,600	650,400	1,418,100	0	1,051,900

Renewable Energy

The primary indicator of impacts on renewable energy is whether an alternative restricts the availability of BLM-administered lands to a level below that of the acreage estimated in the RFDS Report (see **Appendix A**, Reasonably Foreseeable Development Scenario for Renewable Energy in Arizona) anticipated to be developed by 2025. The RFDS Report estimates that 15,600 acres of BLM-administered lands would be developed to produce a total of 1.63 GW of electrical capacity from wind and solar energy. None of the alternatives would result in changes to land use allocations that would preclude renewable energy projects.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts would result from the construction, operation, and decommissioning of solar energy development projects within the proposed Agua Caliente SEZ when added to other past, present, and reasonably foreseeable future actions described in **Section 5.1.2**, Past, Present, and Reasonably Foreseeable Future Actions. Because of the uncertain nature of future projects in terms of size, number, and location within the proposed Agua Caliente SEZ, and the types of technology that would be employed, the impacts are discussed qualitatively.

Development of the proposed Agua Caliente SEZ for utility-scale solar energy production would expand industrial areas that are currently under development and would exclude many existing and potential uses of the land. Since the area already includes one large solar facility that is under construction and one large-capacity transmission line, utility-scale solar energy development within the

proposed Agua Caliente SEZ would not introduce a new land use in the area; instead, any additional development would convert rural land to industrial use. It also is possible that state and private lands located adjacent to the proposed Agua Caliente SEZ, with landowner agreement, would be developed in a similar or complementary manner as the public lands.

The development of utility-scale solar projects in the proposed Agua Caliente SEZ in combination with other past, ongoing and foreseeable actions within a 20-mile geographic extent of effects could result in small cumulative effects on land use through impacts on land access and use for other purposes (primarily recreation), on groundwater availability, and on visual resources, especially if the proposed Agua Caliente SEZ is fully developed with solar facilities. Cumulative impacts on land use could rise if a large portion of the pending solar applications in the region were to result in actual projects, but projects within the proposed Agua Caliente SEZ would make only a small contribution to regional cumulative impacts because of its size.

5.3.8 Livestock Grazing

Impacts Common to All Alternatives

Approximately 10.9 million acres of BLM-administered lands are open to grazing in the planning area; this represents approximately 89 percent of the BLM-administered land in the state. As discussed in **Section 3.9**, Livestock Grazing, a historically important land use in the planning area, has demonstrated a trend towards decreased number of permits and leases. Cumulative impacts on livestock grazing are those that affect available forage, water, and land available for grazing. Past, present, and reasonably foreseeable future actions and conditions within the planning area that have affected and will likely continue to affect livestock grazing include loss of grazing lands to other resource uses such as recreation or energy development, vegetation treatments, and wildlife habitat enhancement, as well as a gradual reduction of suitable available land due to land disposal, wildfire, drought, and urban and commercial development.

Impacts on livestock grazing from renewable energy development would be dependent upon the site-specific development in relation to existing permits and leases. Approved solar energy development could cover to 5,684 acres, and solar applications covering an additional 457,903 acres are pending. Impacts from development include disruption of livestock movement or access to water sources. Much of the proposed development is concentrated in the Yuma, Lower Sonoran, and Lake Havasu Field Offices in the Sonoran Desert. Due to lack of forage vegetation for much of the habitat in this area, the number of affected allotments may be small or limited to ephemeral leases. Wind energy development and transmission lines may be compatible with livestock grazing for much of the site. Wind energy has been developed on 12,918 acres throughout Arizona with pending wind applications totaling an additional 172,018 acres; a small portion of that acreage would not be compatible with livestock grazing.

Similarly, transmission line development would cause potential disturbance of grazing areas during construction and the permanent removal from suitability of small areas associated with pole or tower structures.

In addition, climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would potentially alter forage available for livestock grazing and the AUMs that public lands may support. The proposed RDEP program would not exacerbate climate change impacts, as the program would contribute to the availability of renewable sources of energy.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on livestock grazing if approved.

Impacts from Alternative 1

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 1 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. A total of 1,511,800 acres of grazing allotments are located within the REDA. Depending on the location of development and the technology that would be developed, forage for livestock grazing could be removed, water sources diminished, and allotments lost or decreased in acreage.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres all of which is within an ephemeral grazing allotment, therefore impacts on livestock grazing would be negligible.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives above. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,680,600 acres of non-

BLM-administered lands that could be suitable for renewable energy development. A total of 1,101,500 acres of grazing allotments are located within the REDA. Depending on the location of development and the technology that would be developed, forage for livestock grazing could be removed, water sources diminished, and allotments lost or decreased in acreage. Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives above. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres, all of which is within an ephemeral grazing allotment; therefore, impacts on livestock grazing would be negligible.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,121,500 acres of non-BLM-administered lands that could be suitable for renewable energy development. A total of 764,300 acres of grazing allotments are located within the REDA. Depending on the technology that would be developed, forage for livestock grazing could be removed and allotments lost or decreased in acreage.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres, all of which is within an ephemeral grazing allotment; therefore, impacts on livestock grazing would be negligible.

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. A total of 1,511,800 acres of grazing allotments are located within

the REDA. Depending on the location of development and the technology that would be developed, forage for livestock grazing could be removed and allotments lost or decreased in acreage. Impacts on water availability would be reduced under this alternative, however, as the REDA is sited to protect groundwater resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5

Impacts from Land Tenure REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development. A total of 42,100 acres of grazing allotments are located within the REDA. Because this alternative focuses on lands suitable for disposal, there is the potential that high-value grazing lands would be less likely to be affected.

Impacts from Alternative 6

Impacts from Collaborative-Based REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development. A total of 1,191,600 acres of grazing allotments are located within the REDA. Alternative 6 would reduce cumulative impacts on disturbance of livestock, and forage, water, and land available for livestock grazing by combining the protective features of all the alternatives.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.9 Native American Interests and Heritage Resources

Impacts Common to All Alternatives

Renewable energy development areas lie on or near lands of current and historical interest to numerous Native American tribes. Renewable energy facilities could be of concern to tribes because of visual, aural, or atmospheric settings of traditionally important places, which would be dramatically altered by solar or wind facilities. Other resources of concern include trails, sacred sites, and burial sites, as well as traditionally collected plants and game. Water bodies

and aquatic habitats are also of concern. Consultation with affected tribes is required prior to siting and construction of wind or solar facilities.

Mitigations of impacts would involve any and all mitigations otherwise identified for the affected resources. It may be difficult to mitigate impacts on places or resources that are important in sustaining traditional beliefs or practices. In consulting with Indian tribes to address the mitigation of adverse impacts in such cases, BLM may consider creative approaches proposed at the Tribal Summit on Renewable Energy, sponsored by the Advisory Council on Historic Preservation at Palm Springs, California, in January 2011. Potential options for mitigation include support for museum exhibits or native language revitalization programs; funding of ethnographic studies; restoration or interpretive development of sites within or near the project area; funding of regional studies to address cumulative impacts; or support for tribal scholarship programs for cultural resource management training. Such mitigation measures would be considered in consultation with tribes, the SHPO, and the project applicant.

Cumulative impacts on Native American concerns from foreseeable development in Arizona are currently unknown as consultation is still ongoing. However, many tribes are concerned that the cumulative impacts of multiple, large renewable energy projects could disrupt extensive areas of their traditional territories and the associated cultural values. Renewable energy development could make a significant contribution to impacts, when considered with other types of developments such as mining or planned communities. Other future development that would affect the visual landscape, ecological communities, water resources, or cultural resources would also contribute to cumulative impacts.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives, above. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis. The trends in **Table 5-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions note that many of the factors that result in impacts on tribal interests and heritage resources will continue to increase (e.g., increasing recreation demand, increasing road development and increasing renewable energy development), resulting in continued visual, aural, and atmospheric intrusions to the landscape setting.

Impacts from Alternatives 1 through 6

Although the nature and types of impacts would be similar as those described under Impacts Common to All Alternatives, development would be directed away from many areas of traditional use. Specifically, the REDAs would reduce the cumulative impacts on traditional territories by focusing development on areas of relatively low resource sensitivity (as opposed to the No Action Alternative) and in disturbed zones or areas near existing infrastructure.

5.3.10 Noise

Impacts Common to All Alternatives

Solar and wind energy facilities generally would be sited in rural areas within Arizona with few sensitive receptors nearby (with the possible exception of Alternative 3, which would develop facilities closer to load centers). Ambient noise levels in these areas are likely to be low and characterized by naturally produced sounds such as wind, by traffic on area roads and trails, and by aircraft overflights. Few stationary noise-sensitive receptors are likely to be present, though recreationists on BLM-administered lands could be present in the vicinity of renewable energy facility locations.

Solar, wind, and transmission line development, road development, and increased visitor use on BLM-administered lands would contribute to short-term or long-term impacts on the acoustic environment. Solar, wind, and transmission line development, road development, and other earth-disturbing development projects would result in a short-term increase in ambient noise levels; the proximity of the projects and construction timing would determine the degree of the cumulative short-term noise impacts. Cumulative noise impacts could occur on area roadways if multiple projects caused a marked short-term or long-term increase in traffic along these roadways. Operation of solar facilities and transmission lines would have limited individual or cumulative noise impact. Noise sources associated with renewable energy facilities are described in **Section 3.12, Noise**.

Noise resulting from other reasonably foreseeable future actions such as increased recreational use of public lands could elevate daytime ambient noise levels both on public lands and along public roadways used to access these lands. Noise-generating use in these areas are unlikely to combine with noise from operation of renewable energy projects, though there is the potential for an incremental noise increase along travel routes from recreational users and workers commuting to renewable energy facilities.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives for the REDAs. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis. Appropriate evaluation of cumulative impacts would be required during the ROW application process to determine the cumulative impacts associated with proposed solar and wind energy development projects and ensure that appropriate design measures and best management practices are implemented to avoid or reduce cumulative noise impacts.

Impacts from Alternatives 1 through 6*Impacts from REDAs*

Impacts under Alternatives 1, 2, 4, 5, and 6 would be the same as those described under Impacts Common to All Alternatives, regardless of where development occurred.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative noise impacts under Alternatives 1, 3, 4, and 5 could result from the construction, operation, and decommissioning of solar energy development projects within the proposed Agua Caliente SEZ in combination with other past, present, and reasonably foreseeable future projects in the area. There is one pending solar application within the proposed Agua Caliente SEZ and three pending solar applications on BLM-administered lands within an approximately 20-mile radius of the proposed Agua Caliente SEZ. Development of these projects would have a cumulative impact depending upon construction schedule and proximity to one another. Because there are limited sensitive receptors in or near the SEZ, cumulative impacts would likely focus on short-term noise increases along travel routes to access the sites by worker vehicles and delivery trucks.

Impacts from Alternative 2 and 6*Impacts from Proposed Agua Caliente Solar Energy Zone*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. With a smaller SEZ area, the level of development is likely to be less, with fewer potential cumulative noise impacts.

Impacts from Alternative 3*Impacts from Load Offset REDA*

Cumulative noise impacts would be similar to those described above for Impacts Common to All Alternatives. Limiting development to within 10 miles of load centers could encourage development closer to populated areas, resulting in potential short-term cumulative noise impacts on sensitive receptors depending upon what other reasonably foreseeable future actions were occurring in the area.

5.3.11 Paleontological Resources***Evaluation Methodology, Resource Indicators, and Assumptions***

Paleontological resources are finite, limited, and nonrenewable. The assumptions for cumulative impacts on paleontological resources include the following:

- The direct effects of the project would not result in impacts on paleontological resources, so the discussion of cumulative effects is focused on the indirect effects (i.e., the potential for ground-disturbing activities in the REDAs).

- It is assumed that no paleontological resource studies have been completed for any of the REDAs. It is further assumed that prior to future ground-disturbing activities, studies would need to be completed and that appropriate mitigation procedures would be applied to address any adverse effects on paleontological resources.

Impacts from the No Action Alternative

There would be no cumulative impacts on paleontological resources as a result of the No Action Alternative.

Impacts from Alternative 1

Impacts from Maximum REDA

Alternative 1 would not have cumulative impacts on paleontological resources because paleontological resources are generally localized. Paleontological resources vary according to the geological units that contain them. Geological units may vary over short distances, effectively limiting the geographic range of any impacts on specific paleontological resources. Therefore, potential impacts on paleontological resources associated with the development of one renewable energy generation project would be unlikely to have cumulative impacts on paleontological resources associated with the development of another project. Any reasonably foreseeable future projects with potentially significant impacts on paleontological resources would be required to comply with federal and state regulations and ordinances protecting paleontological resources. Non-BLM-administered lands included in the planning area of Alternative 1 would include 1,127,900 acres of land with geological units assigned to PFYC Levels 3, 4, or 5 (Moderate/Undetermined to High Sensitivity).

Impacts from Proposed Agua Caliente Solar Energy Zone

The proposed Agua Caliente SEZ has a low to undetermined potential for paleontological resources. Alternative 1 would, therefore, not have a cumulative impact on paleontological resources in the area of the Agua Caliente SEZ.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts would be similar for Alternative 2 as those that would occur under Alternative 1, as described above, and would include 633,600 acres of non-BLM-administered lands with geological units assigned to PFYC Levels 3, 4, or 5 (Moderate/Undetermined to High Sensitivity).

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts would be the same for Alternative 2 as those that would occur under Alternative 1, as described above.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts would be similar for Alternative 3 as those that would occur under Alternative 1, as described above, and would include 405,900 acres

of non-BLM-administered lands with geological units assigned to PFYC Levels 3, 4, or 5 (Moderate/Undetermined to High Sensitivity).

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts would be the same for Alternative 3 as those that would occur under Alternative 1, as described above.

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Cumulative impacts would be similar for Alternative 4 as those that would occur under Alternative 1, as described above, and would include 766,500, 138,000, and 193,900 acres of non-BLM-administered lands with geological units assigned to PFYC Levels 3, 4, or 5 for Water Protection Levels 1, 2, and 3, respectively (Moderate/Undetermined to High Sensitivity).

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts would be the same for Alternative 4 as those that would occur under Alternative 1, as described above.

Impacts from Alternative 5

Impacts from Land Tenure REDA

Cumulative impacts would be similar for Alternative 5 as those that would occur under Alternative 1, as described above.

Impacts from Alternative 6

Impacts from Collaborative-Based REDA

Cumulative impacts would be similar for Alternative 6 as those that would occur under Alternative 1, as described above, and would include 353,000, 127,700, and 190,600 acres of non-BLM-administered lands with geological units to PFYC Levels 3, 4, or 5 for Water Protection Levels 1, 2, and 3, respectively (Moderate/Undetermined to High Sensitivity).

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts would be the same for Alternative 6 as those that would occur under Alternative 1, as described above.

5.3.12 Recreation and Travel Management

Impacts Common to All Alternatives

Under the REDA alternatives, special recreation management areas have been excluded from solar development, so these areas could be affected only indirectly by renewable energy facilities located close to their boundaries. Special recreation management areas are identified as public lands with many of the BLM's most well-known and highly used recreational opportunities, so excluding special recreation management areas from solar or wind development would limit the significance of impacts on recreation. High levels of intensive recreational use generally do not occur within the basin flats suitable for solar

development but can occur in more broken or hilly terrain where wind developments may be feasible. The presence of solar or wind facilities would affect mainly off-highway vehicle (OHV) use and low levels of hunting, camping, and photography. In addition, access to recreational areas could be restricted by renewable energy facilities. The level of renewable energy development projected by the RFDS would occupy a relatively small portion of the BLM-administered lands in the planning area. Since alternative locations for such recreation are generally abundant within Arizona, direct impacts from facilities on the overall availability of recreation opportunities are anticipated to be low. Future site-specific analyses for project facilities would identify measures that would reduce anticipated impacts on local recreational use patterns and public access needs, which would further mitigate potential impacts on recreation opportunities. Other renewable energy facilities would also affect areas of low recreational use, as would most other types of foreseeable development in the region, including mining, agriculture, and linear transmission facilities. Thus, cumulative impacts on recreation from foreseeable development are expected to be small.

Effects on the transportation systems would occur mainly during construction of facilities and would affect primarily local road systems and traffic flow. Such effects would be temporary and could be mitigated through minor road improvements at access points and through reduction in traffic congestion through carpooling and coordination of shift changes. Only minor contributions to cumulative effects on transportation would be expected in the planning area during the development of solar facilities. Because of the small number of workers required to operate renewable energy facilities and the relatively low level of delivery traffic to and from facilities required for operation, cumulative impacts on transportation systems during facility operations would be minimal. There is also the potential to sever, alter or improve existing access routes due to new development, potentially requiring construction of new or realigned access routes. Increased traffic and access to previously remote areas also could change the overall character of the landscape, including the visual quality of large areas.

Impacts from the No Action Alternative

Under the No Action Alternative, solar and wind energy projects would be developed on a case-by-case basis in accordance with current BLM land use plan decisions. In the absence of identifying the REDA, solar and wind project development would likely result in fragmented and segregated land uses and access, and thereby have a greater impact on recreation than if development was more coordinated and concentrated. Because recreation is the management focus in special recreation management areas, those areas are unlikely to experience solar and wind energy developments, but other undesignated areas of high recreational value may experience a decline in recreational access and experiences through future energy development.

Impacts from Alternatives 1 through 6

Impacts from REDAs

The nature and types of impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred. However, there are slight differences in location of REDAs that would either increase or decrease the intensity of the cumulative impacts. For example, Alternative 3 focuses REDAs within specific radius around load centers, including towns and cities. By keeping development in close proximity to cities and/or towns regardless of jurisdiction or administrative responsibilities, there could be more rural, open space areas available for recreational experiences.

Impacts from Proposed Agua Caliente Solar Energy Zone

Under all alternatives, the area covered by the proposed Agua Caliente SEZ is located within a portion of the Yuma East Undeveloped Special Recreation Management Area. This area provides several recreational opportunities, including OHV use and hunting. However, a 290-MW solar facility is under construction on private land within the proposed SEZ, and this facility has the potential to alter a user's recreational experience in the area.

As shown in **Figure 5-1**, Existing and Proposed Renewable Energy, Transmission, and other Development there is one pending solar application within the proposed Agua Caliente SEZ and three pending solar applications on BLM-administered lands within an approximately 20-mile radius of the proposed SEZ. There are currently no wind or geothermal applications within this distance. The other foreseeable projects (identified in **Section 5.1.2**, Past, Present, and Reasonably Foreseeable Future Actions) on private and public land near the proposed Agua Caliente SEZ are most likely to be few in number and would have few additional impacts on recreation near the proposed Agua Caliente SEZ.

If continued solar energy development were to occur anywhere within the proposed Agua Caliente SEZ, current access routes could be modified, eliminated, or added to depending on the specifics of a proposal. As the area within and around the proposed SEZ is known to be a valued recreation area by local users, any renewable energy proposals would be considered with careful route planning to ensure continued recreational access to the area.

5.3.13 Socioeconomics

Impacts Common to All Alternatives

Past, present, and reasonably foreseeable future actions and conditions within the planning area that have affected and will likely continue to affect socioeconomics include factors that change the availability or type of jobs and industry in the planning area, alter the social composition of planning area communities, or otherwise change quality of life for area residents. Factors

include but are not limited to, mineral exploration and energy development (including renewable energy), road construction, and infrastructure development. In addition, population growth in Arizona has and will likely continue to increase residential and commercial development; which in turn increases the demand for energy, water, and other resources; and putting additional demands on public lands for recreational use.

As discussed in **Chapter 4**, Environmental Consequences potential socioeconomic impacts from renewable energy development include employment, wages, tax revenues, and property value change resulting from project construction and operation, as well as population change related to immigration of workers and their families and the subsequent social and economic changes in communities. Impacts would vary by technology employed, but cumulative contributions to the planning area economy from renewable energy are likely to be negligible due to the short term nature of construction jobs and small number of permanent operations and maintenance employees required.

Based on the solar RFDS for the project (**Appendix A**, Reasonably Foreseeable Development Scenario for Renewable Energy in Arizona), development in the planning area can be expected to result in a generating capacity of 9,500 MW, including 1,500 MW on BLM-administered lands by 2025. Using the estimates provided above, the RFDS for the planning area may result in a low of 5,700 jobs to a high of 13,110 jobs for construction (average 9,405) and 475 to 4,465 jobs for operations and maintenance (average 1,853), while the projections for BLM-administered lands include a low of 900 jobs to a high of 2,070 jobs for construction (average 2,850) and 75 to 705 for operations and maintenance (average 293).

Based on the wind RFDS for the project (**Appendix A**, Reasonably Foreseeable Development Scenario for Renewable Energy in Arizona), development in the planning area can be expected to result in a generating capacity of 820 MW, including 130 MW on BLM-administered lands by 2025. Using the estimates provided above, the RFDS for the planning area may result in a low of 328 jobs to a high of 3,075 jobs for construction (average 1,083 jobs) and 41 to 164 for operations and maintenance (average 74 jobs), while the projections for BLM-administered lands include a low of 52 to a high of 487 jobs for construction (average 172 jobs) and 6.5 to 26 jobs for operations and maintenance (average 12 jobs).

Development projects, including renewable energy, could also contribute to a cumulative decrease in open space due to site infrastructure. Loss of open space could result in an overall loss of recreation opportunities, a degradation of visual resources, and an overall changing of the landscape as well as loss of lands for agriculture, livestock grazing, mineral uses, or other resource uses. Overall social perceptions and conceptualizations of certain landscapes, including regional and community identity, could shift (e.g., a community that is

historically known for mineral extraction or grazing could be thereafter thought of as a wind farm community). Approved solar energy development could cause disturbance on up to 5,684 acres, and an addition 457,903 acres of additional solar applications are pending. Wind energy has been developed on 12,918 acres throughout Arizona with pending wind applications totaling an additional 172,018 acres. Transmission line development would cause the disturbance of a corridor around lines and permanent removal of habitat in small areas associated with pole or tower structures. Total proposed transmission lines may disturb approximately 1,859,000 acres and existing transmission has disturbed an additional 1,900,000 acres. Overall, renewable energy development and associated infrastructure would have minor to negligible contributions to cumulative impacts due to the small number of acres impacted in relation to the acres of public lands available in the planning area.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on socioeconomics and environmental justice if approved.

Impacts from Alternative 1 through 6

Impacts from REDAs

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Depending on the site of development, technology that would be developed, existing land uses and related economics, as well as the social structure of communities, socioeconomics could be impacted to varying degrees. Under Alternative 1, impacts on other land uses, recreation, and open space are likely to be negligible since much of the renewable energy development would take place on previously disturbed sites or on areas of low resource sensitivity.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres and would contribute to the changes in socioeconomics in Yuma and surrounding counties.

5.3.14 Soil Resources

Impacts Common to All Alternatives

Cumulative impacts on soil resources include ground disturbing actions which increase potential for erosion due to soil compaction, degradation of biological soil crusts, removal of topsoil, changes or loss of vegetative cover, or other factors. Changes in past, present, and reasonably foreseeable future actions and

conditions within the planning area that have affected and will likely continue to affect soil resources include but are not limited to mineral exploration and energy development, vegetation treatments, grazing, recreation including off-highway vehicle use, road construction, water diversion and withdrawals, wildland fires, commercial and urban development, and drought.

Solar development, particularly utility-scale development, requires the grading of large acreages resulting in soil disturbance and permanent changes to soil resources where development occurs. While the topography of suitable areas is necessarily flat, the entirety of areas where solar fields are built would have to be graded to produce a smooth, very flat surface for solar collectors. Such grading would render large areas susceptible to soil erosion. This would be particularly of concern in areas where biological soil crusts would be degraded due to construction activities. Approved solar energy development could cause up to 5,684 acres of habitat removal, and an additional 457,903 acres of additional solar applications are pending.

Most solar energy development has been proposed in the southwestern portion of the state within the Yuma, Lower Sonoran, and Lake Havasu Field Offices. Soils within this region are predominantly within the Aridisols soil order, have low organic content, and are susceptible to erosion, particularly from wind. While soil erosion mitigation measures including stipulations and permitting requirements for development would generally be required to minimize impacts on soil resources, some soil loss would be unavoidable with solar development, given the large acreages disturbed and typically dry soil conditions in the region.

In addition, wind energy has been developed on 12,918 acres throughout Arizona with pending wind applications totaling an additional 172,018 acres; while grading and soil disturbance are not required on the same scale as would be required for solar development, soils may be disturbed on a small percentage of this area. Similarly, transmission line development (1,859,000 acres and existing 1,900,000 acres proposed development) would cause potential compaction and of a corridor around lines and permanent alternation of soil conditions in small areas associated with pole or tower structures.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions as well as vegetative cover and water flows, which could have secondary impacts on erosion.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on soil resources if approved. Without a programmatic approach to solar and wind energy development or development of standard design features and BMPs, approval of such applications may increase impacts on soil resources.

Impacts from Alternative 1*Impacts from Maximum REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 1 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the location and soil type and technology that would be developed, soil resources could be disturbed and potential for erosion increased to a varying degree.

The acres of land in the REDAs by soil order are shown in **Table 5-3**, Potential Soils Impacts in the Planning Area. It should be noted that acres below represent the REDA and actual contributions to cumulative impacts on soil disturbance would be based on location of on the ground development and are likely to be significantly less.

Table 5-3
Potential Soils Impacts in the Planning Area

Soil Order	Acres of REDA for lands of all ownership				
	Alternatives 1 and 3	Alternative 2	Alternative 4	Alternative 5	Alternative 6
Alfisols	31,900	8,500	1,800	--	10,300
Aridisols	2,286,600	1,735,300	1,118,700	41,400	1,814,500
Entisols	213,100	99,300	87,800	1,800	131,100
Inceptisols	1,200	200	1,000	--	1,000
Mollisols	71,800	34,600	19,800	--	41,400
Vertisols	45,900	1,600	12,300	--	13,900
Miscellaneous	38,900	19,700	9,900	500	20,200

Source: NRCS 2011a

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres and would contribute to the increased potential for soil disturbance and erosion in the proposed SEZ.

Impacts from Alternative 2*Impacts from Transmission Line and Utility Corridor REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres and would contribute to the potential for disturbance of soil resources within the planning area.

Impacts from Alternative 3*Impacts from Load Offset REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,121,500 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the location and soil type and technology that would be developed, soil resources could be disturbed and potential for erosion increased to a varying degree.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres and would contribute to the potential for disturbance of soil resources within the planning area.

Impacts from Alternative 4*Impacts from Water Conservation and Protection REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy

development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Under this alternative, potential for soil subsidence would be reduced, as the REDA is sited to protect groundwater resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5

Impacts from Land Tenure REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 5 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development.

Impacts from Alternative 6

Impacts from Collaborative-Based REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development. Alternative 6 would reduce cumulative impacts on soil resources by combining the protective features of all the alternatives. This would reduce disturbance of soil and include measures to minimize erosion of soils.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.15 Special Designations

Impacts Common to All Alternatives

Lands suitable for solar energy development in the planning area, whether public or private, are typically basin flats or nearly flat areas surrounded by mountains. These lands are often located near one or more specially designated areas or lands with wilderness characteristics, which often lie in the surrounding mountains but also include protected desert areas. Potential effects of nearby renewable energy facilities on these sensitive areas include visual impacts, reduced access, impacts on wildlife that use the developed areas, and fugitive dust during construction, which may affect visibility (see the relevant sections for further discussion of these impacts).

Cumulative impacts on these sensitive areas would be from increased development, and visual clutter in the surrounding areas, reduced local and regional visibility due to construction-related air particulates, light pollution, road traffic, and impacts on wildlife and plants. Mining, off-road vehicle use, military and civilian aviation, new transmission lines and other linear facilities, urban development and renewable energy development are the major foreseeable contributors to cumulative impacts on special designations, with solar energy the primary contributor in many areas. Most such developments would affect the viewshed and would produce fugitive dust emissions during construction, while mining and aviation would also have noise and vibration effects. While all wind and solar technologies would produce visual effects, other impacts would depend on the employed technology, such as PV having generally the lowest overall impact as compared to other technologies such as solar towers or very large wind turbines. Because of the general vastness of the affected area and considering the foreseeable impacts on specially designated areas in the planning area under the RFDS, overall disturbance would be relatively minor, but could be more pronounced in areas near potential development. Several design features required under the action alternatives would minimize the impacts from renewable energy development, including (1) siting facilities as far as possible from key observation points (KOPs) and (2) limiting fugitive dust generation during construction through best management practices and proper timing of work.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to adding to the visual clutter and atmospheric and aural intrusions which would be mitigated on a case-by-case basis without a suite of standard design features and BMPs.

Impacts from Alternatives 1 through 6

Impacts from REDAs and Proposed Agua Caliente Solar Energy Zone

The nature and types of impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred. The extent of cumulative impacts would be similar to those described for visual resources (**Section 5.3.18**, Visual Resources).

5.3.16 Special Status Species

Impacts Common to All Alternatives

Cumulative impacts on special status species would be similar to those described for vegetation (**Section 5.3.17**, Vegetation) and wildlife (**Section 5.3.6**, Fish and Wildlife). Loss of habitat is an important factor contributing to the increase in the number of species listed as threatened or endangered in recent years. Past, present, and reasonably foreseeable future actions and

conditions within the planning area that have affected and will likely continue to affect special status species include, but are not limited to, mineral exploration and energy development, forestry, grazing, recreation, road construction, water diversion and withdrawals, weed invasion and spread, prescribed and wildland fires, land use planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes habitat, and affected areas are then more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread, whereas land use planning efforts and vegetation, habitat, and weed treatments have countered these effects by improving habitat connectivity, productivity, diversity, and health.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests. Since special status species often inhabit very specific microhabitats, small changes could cause large effects.

Stipulations and permitting requirements, including appropriate compliance with the Endangered Species Act, would minimize the risk of directly taking listed species, but there could be a cumulative effect from removal of small patches of habitat that can add up to a notable acreage, reducing available habitat for use by wildlife while potentially fragmenting suitable habitat and movement corridors. Activities on BLM lands would be required to protect BLM sensitive species, which would prevent the need to list these species.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on special status species if approved. Without a programmatic approach to solar and wind energy development, approval of such applications may increase fragmentation of special status species' habitats.

Impacts from Alternative I

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative I would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis

of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the technology that would be developed, special status species' habitat could be removed or fragmented over large areas and over the long term.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres and would contribute to the loss of potential habitat for special status species within Arizona.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,680,600 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres and would contribute to the loss of potential habitat for special status species within Arizona.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,121,500 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the technology that would be developed, special status species habitat could be removed or fragmented over large areas and over the long term.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres and would contribute to the loss of potential habitat for special status species within Arizona.

Impacts from Alternative 4*Impacts from Water Conservation and Protection REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Adverse impacts on habitat conditions would be reduced under this alternative, as the REDA is sited to protect groundwater resources, having impacts as described in **Section 4.2.19**, Special Status Species.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5*Impacts from Land Tenure REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 5 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development.

Impacts from Alternative 6*Impacts from Collaborative-Based REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development. Alternative 6 would reduce cumulative impacts on special status species by combining the protective features of all the alternatives. This would reduce new habitat disturbance, removal, and fragmentation.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.17 Vegetation

Impacts Common to All Alternatives

Cumulative impacts from past, present, and reasonably foreseeable actions could have a variety of effects on vegetation. Vegetation management; solar, wind, and transmission line development; roads; and fires would remove vegetation over the short term and potentially the long term. Site-specific effects would depend on the affected vegetation community, revegetation efforts, if any, and extent of disturbance. Approved solar energy development could cause up to 5,684 acres of vegetation removal, and an addition 457,903 acres of additional solar applications are pending. Most solar energy development has been proposed in the southwestern portion of the state within the Yuma, Lower Sonoran, and Lake Havasu Field Offices. It is likely that lower and upper Sonoran desert scrub would be the most affected vegetation communities within this area. Wind energy has been developed on 12,918 acres throughout Arizona; a small portion of that acreage has been cleared of vegetation over the long term. Pending wind applications total 172,018 acres. Transmission line development would cause the removal of small areas of vegetation associated with pole or tower structures. The total amount of vegetation removed would depend on the number of these structures.

All ground disturbing activities would increase the likelihood of invasive or noxious weeds becoming introduced or spread into an area. All permitted activities would require weed control and prevention measures to reduce this impact.

Vegetation community composition could be influenced or changed by vegetation management and forestry actions, grazing, recreation, groundwater withdrawals for domestic or irrigation use, drought, and climate change. Certain species could be favored, or invasive species could become dominant. Such changes in vegetation could alter habitat suitability for wildlife or special status species.

Some BLM activities would have the potential to improve or preserve existing vegetation communities. Vegetation management and weed treatments would be implemented on a site-specific basis to achieve desired vegetation community composition and remove invasive and noxious weeds. Land tenure adjustments and consolidation of BLM lands would ideally improve the effectiveness and efficiency of BLM land management, including vegetation management. Establishment of energy corridors would concentrate development and vegetation removal in certain areas, thereby preventing the widespread fragmentation and removal of vegetation for transmission line projects.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Under the

No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on vegetation if approved. Without a programmatic approach to solar and wind energy development, approval of such applications may increase fragmentation of vegetation communities.

Impacts from Alternative 1

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 1 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development (see **Table 5-4**, Potential Vegetation Impacts in the REDA for Alternative 1). Depending on the technology that would be developed, vegetation could be removed over large areas and over the long term.

Table 5-4
Potential Vegetation Impacts in the REDA for
Alternative 1

Vegetation Community	All Lands within REDA
Arizona/New Mexico Mountains	202,600
Arizona/New Mexico Plateau	882,000
Chicahuan Desert	2,900
Madrean Archipelago	16,400
Mojave Basin and Range	294,600
Sonoran Desert	1,265,400
Colorado Plateaus	25,400

Source: BLM 2011a, EPA 2011a

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 1 would cover 20,600 acres and would contribute to the loss of lower Sonoran desert scrub within Arizona.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis

of low resource sensitive areas found approximately 1,680,600 acres of non-BLM-administered lands that could be suitable for renewable energy development (see **Table 5-5**, Potential Vegetation Impacts in the REDA for Alternative 2). Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Table 5-5
Potential Vegetation Impacts in the REDA for
Alternative 2

Vegetation Community	All Lands within REDA
Arizona/New Mexico Mountains	85,900
Arizona/New Mexico Plateau	341,700
Chicahuan Desert	2,900
Madrean Archipelago	10,100
Mojave Basin and Range	280,300
Sonoran Desert	1,159,600
Colorado Plateaus	18,700

Source: BLM 2011a, EPA 2011a

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres and would contribute to the loss of lower Sonoran desert scrub within Arizona.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,121,500 acres of non-BLM-administered lands that could be suitable for renewable energy development (see **Table 5-6**, Potential Vegetation Impacts in the REDA for Alternative 3). Depending on the technology that would be developed, vegetation could be removed over large areas and over the long term.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres and would contribute to the loss of lower Sonoran desert scrub within Arizona.

**Table 5-6
Potential Vegetation Impacts in the REDA for
Alternative 3**

Vegetation Community	All Lands within REDA
Arizona/New Mexico Mountains	60,300
Arizona/New Mexico Plateau	184,500
Chicuhuan Desert	2,900
Madrean Archipelago	9,900
Mojave Basin and Range	82,500
Sonoran Desert	894,700
Colorado Plateaus	16,400

Source: BLM 2011a, EPA 2011a

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives, above. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development (see **Table 5-7**, Potential Vegetation Impacts in the REDA for Alternative 4). Impacts such as changes in vegetation community composition would be reduced under this alternative, as the REDA is sited to protect groundwater resources, having impacts as described in **Section 4.2.21**, Vegetation.

**Table 5-7
Potential Vegetation Impacts in the REDA for
Alternative 4**

Vegetation Community	All Lands within REDA
Arizona/New Mexico Mountains	202,600
Arizona/New Mexico Plateau	882,000
Chicuhuan Desert	2,900
Madrean Archipelago	16,400
Mojave Basin and Range	294,600
Sonoran Desert	1,265,400
Colorado Plateaus	25,400

Source: BLM 2011a, EPA 2011a

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5*Impacts from Land Tenure REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 5 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development on.

Impacts from Alternative 6*Impacts from Collaborative-Based REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development (see **Table 5-8**, Potential Vegetation Impacts in the REDA for Alternative 6). Alternative 6 would reduce cumulative impacts on vegetation by combining the protective features of all the alternatives. This would reduce new vegetation disturbance and removal.

Table 5-8
Potential Vegetation Impacts in the REDA for
Alternative 6

Vegetation Community	All Lands within REDA
Arizona/New Mexico Mountains	116,400
Arizona/New Mexico Plateau	413,300
Chicahuan Desert	2,900
Madrean Archipelago	11,700
Mojave Basin and Range	280,800
Sonoran Desert	1,185,100
Colorado Plateaus	22,000

Source: BLM 2011a, EPA 2011a

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.18 Visual Resources

Impacts Common to All Alternatives

Impacts from REDAs

Projects described in **Table 5-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that make up the past, present, and reasonably foreseeable actions that collectively define the cumulative impact scenario. This scenario involves components, including facilities, new roads, transmission lines, pipelines, and canals, that have or could diminish the visual quality and sensitivity of the landscape and could be significant given the infrastructure required to support urbanization and growing population in Arizona and the West. Impacts on visual resources can compound as the landscape is modified making the cumulative result greater than the additive impact of each new modification. As noted in **Section 4.2.22**, Visual Resources, because of the experiential nature of visual resources, the human response to visual changes in the landscape cannot be quantified and the perceived impact varies by viewer and by project type.

The RDEP project, when compared to the cumulative impact scenario is not expected to contribute a significant impact to visual resources considering that, per the RFDS (**Appendix A**, Resource Potential and Reasonably Foreseeable Development Scenario Report) a total of 15,600 acres of BLM-administered land is projected to be utilized for solar and wind energy development by 2025, which is less than 1 percent of both BLM-administered land in Arizona and all land in Arizona. It should be noted that the estimated 15,600 acres of disturbance is only for the installations themselves and does not account for new transmission lines, roads, or other facilities that might be needed in association with the solar or wind facility.

Impacts from the Proposed Agua Caliente Solar Energy Zone

There is one solar facility adjacent to the proposed Agua Caliente SEZ on private land, First Solar's Agua Caliente Solar Project. There is one pending solar application within the proposed SEZ and three pending solar applications on BLM-administered lands within an approximately 20-mile radius of the proposed SEZ; all are proposing CSP trough facilities ranging in size from 325MW to 600MW of generation.

While the contribution to cumulative impacts in the area of potential projects would depend on the locations of facilities that are actually built, it may be concluded that the general visual character of the landscape within the region would continue to be significantly altered by the presence of solar facilities, transmission lines, and other new infrastructure. Currently, the VRI for the area within the proposed SEZ is Class III; with continued development, it is possible that a new VRI would result in changes to the classification, such as lowering it to a VRI Class IV. Outside the proposed SEZ, to the north and west, the VRI is a Class II; again, considering the reasonably foreseeable actions in the area of

the proposed SEZ, it is possible that should a new VRI be undertaken, it may also change in the area immediately adjacent to the proposed SEZ to a lower class, such as Class III or Class IV. Additionally, developments would be visible from surrounding mountains and highlands, which include sensitive viewsheds (e.g., Sears Point ACEC and Eagletail Mountains, Signal Mountain, and Woolsey Peak Wilderness Areas). Given the proximity of the pending solar applications to the proposed SEZ and to each other, it is possible that two or more solar facilities would be viewable from a single location. However, the pending projects would be away from major roadways and would be visible mostly by local traffic.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on vegetation if approved. Without a programmatic approach to solar and wind energy development, approval of such applications may increase fragmentation of vegetation communities.

Impacts from Alternatives 1 through 6

Impacts from REDAs and Proposed Agua Caliente Solar Energy Zone

The type and nature of impacts under each alternative would be the same as those described under Impacts Common to All Alternatives regardless of where development occurred or the size of the REDA or proposed SEZ.

5.3.19 Water Resources

Impacts Common to All Alternatives

Cumulative impacts from past, present, and reasonably foreseeable actions could have a variety of effects on water resources, as described in **Section 4.3.23**, Water Resources. Water Resource management; solar, wind, and transmission line development; and roads would result in land surface disturbance over the short term and potentially the long term. Site-specific effects would depend on the extent of disturbance. Approved solar energy development could result in up to 5,684 acres of surface disturbance, and an addition 457,903 acres of additional solar applications are pending. Most solar energy development has been proposed in the southwestern portion of the state within the Yuma, Lower Sonoran, and Lake Havasu Field Offices.

Wind energy has been developed on 12,918 acres throughout Arizona; a small portion of that acreage would result in land surface disturbance over the long term. Pending wind applications total 172,018 acres. Transmission line development would cause land disturbance in small areas associated with pole or tower structures. The total amount of land disturbance would depend on the number of these structures.

Ground disturbing activities associated with construction and operations would increase the likelihood of water use and potential for reductions in water quality and quantity. All permitted activities would require sedimentation and erosion control measures to reduce this impact. Surface water and groundwater could be influenced or changed by water diversions, grading activities, groundwater withdrawals for domestic or irrigation use, drought, and climate change.

Some BLM activities would have the potential to improve or preserve existing vegetation communities. Vegetation management and weed treatments would be implemented on a site-specific basis to achieve desired vegetation community composition and remove invasive and noxious weeds. Land tenure adjustments and consolidation of BLM lands would improve the effectiveness and efficiency of BLM land management, including the protection of water quality and quantity. The use of energy corridors would concentrate development and groundwater withdrawals in certain areas, thereby minimizing impacts on water resources associated with transmission line projects.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which would contribute to cumulative impacts on water resources if approved. Without a programmatic approach to solar and wind energy development, approval of such applications may increase groundwater level drawdown.

Impacts from Alternative I

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative I would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the technology that would be developed, water resources could be impacted over large areas and over the long term. There is potential for energy facilities to concentrate in areas with abundant solar and wind energy resources, which could contribute to cumulative depletion of water resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative I would cover 20,600 acres and

would contribute to cumulative impacts on groundwater if the added use of groundwater demand is nearing the available groundwater supply.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 2 would contribute to cumulative impacts by making 218,600 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,680,600 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts from transmission line construction would be reduced under this alternative, since the REDA would be sited close to existing transmission lines and utility corridors.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 2 would cover 6,770 acres and would contribute to cumulative impacts on groundwater if any new use of groundwater affected the sustainability of groundwater supply in the local basin.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 3 would contribute to cumulative impacts by making 129,800 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,121,500 acres of non-BLM-administered lands that could be suitable for renewable energy development. Depending on the technology that would be developed, cumulative impacts on groundwater resources could be reduced over the long-term by using the design features identified in **Section 2.3.2**, Elements Common to All Action Alternatives.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ under Alternative 3 would cover 2,760 acres and would contribute to cumulative impacts on groundwater if the added use of groundwater demand is nearing the available groundwater supply.

Impacts from Alternative 4*Impacts from Water Conservation and Protection REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 4 would contribute to cumulative impacts by making 321,500 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 2,367,900 acres of non-BLM-administered lands that could be suitable for renewable energy development. Impacts such as changes in groundwater would be reduced under this alternative, as the REDA is sited to protect groundwater resources and would avoid or reduce long term cumulative impacts on groundwater resources by siting projects in areas with lower groundwater vulnerability levels.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 4 would be similar to those described for Alternative 1.

Impacts from Alternative 5*Impacts from Land Tenure REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 5 would contribute to cumulative impacts by making 43,700 acres of BLM-administered lands available for solar and wind energy development.

Impacts from Alternative 6*Impacts from Collaborative-Based REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Alternative 6 would contribute to cumulative impacts by making 237,100 acres of BLM-administered land available and a priority for solar and wind energy development. Looking beyond the BLM-administered lands, GIS spatial analysis of low resource sensitive areas found approximately 1,795,300 acres of non-BLM-administered lands that could be suitable for renewable energy development. Alternative 6 would reduce cumulative impacts on water resources by combining the protective features of all the alternatives. This alternative would reduce land disturbance and water consumption.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ under Alternative 6 would be similar to those described for Alternative 2.

5.3.20 Wild Horses and Burros**Impacts Common to All Alternatives**

Cumulative impacts on wild horse and burros are those that would directly disturb wild horses and burros or affect available forage, water, habitat or

movement corridors. Past, present and reasonably foreseeable future actions and conditions within the planning area that have affected and will likely continue to affect wild horse and burros include changes in forage or water or availability of acres of grazing lands due to action such as vegetation treatments, land disposal, wildfire, drought, and urban and commercial development.

Impacts on wild horse and burros from renewable energy development would be dependent upon the site specific location of development in relation to heard management areas (HMAs). Facilities would generally not be sited directly within HMAs. Wild horse and burro HMAs could be affected by renewable energy facilities if management areas are located adjacent to areas of development, nominally within 5 miles (8 kilometers) of the facilities. Impacts from renewable energy development include disturbance of horse and burros, disruption of movement corridors, changes in vegetation forage, or access to water sources.

In addition, climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter potentially alter forage available for wild horse and burros and the number of animals that HMAs may support on a sustainable basis, therefore the appropriate management level for HMAs would need to be adjusted should significant changes in climate occur.

Impacts from the No Action Alternative

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impact Common to All Alternatives. Under the No Action Alternative, solar and wind energy development applications would be processed on a case-by-case basis, which could contribute to cumulative impacts on wild horse and burros if approved.

Impacts from Alternative I

Impacts from Maximum REDA

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. Depending on the location of development in relation to HMAs and the technology that would be developed, water available for wild horses or burros could be impacted. A total of 234,200 acres of HMAs are located within five miles of the REDA. No development would occur directly on HMAs, and design features require measures that may protect horse and burros such as traffic management, and fencing. As a result, contributions to cumulative impacts would be negligible.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from past, present, and reasonably foreseeable actions would be as described under Impacts Common to All Alternatives. The proposed Agua Caliente SEZ is not located within or adjacent to a HMA, therefore contributions to cumulative impacts would be negligible.

Impacts from Alternative 2*Impacts from Transmission Line and Utility Corridor REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be similar to those described under Alternative 1.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1.

Impacts from Alternative 3*Impacts from Load Offset REDA*

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1. A total of 96,600 acres of HMAs are located within five miles of the REDA. As this alternative focuses on utility-scale, community, or dispersed development projects near load centers, this would likely be farther away from the HMAs and result in fewer cumulative impacts when combined with other reasonably foreseeable future actions.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1.

Impacts from Alternative 4*Impacts from Water Conservation and Protection REDA*

Cumulative impacts from past, present, and reasonably foreseeable actions would be similar to those described under Alternative 1. Impacts on water availability would be reduced under this alternative, as the alternative proposes additional water design features anticipated to protect vulnerable groundwater resources.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1.

Impacts from Alternative 5*Impacts from Land Tenure REDA*

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1. A total of 8,300 acres of HMAs are located within five miles of the REDA.

Impacts from Alternative 6*Impacts from Collaborative-Based REDA*

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative 1. A total of 265,500 acres of HMAs are located within five miles of the REDA. Alternative 6 would reduce cumulative impacts on disturbance and water availability by combining the protective features of all the alternatives.

Impacts from Proposed Agua Caliente Solar Energy Zone

Cumulative impacts from the proposed Agua Caliente SEZ would be similar to those described for Alternative I.

5.3.21 Wilderness Characteristics***Impacts Common to All Alternatives***

As discussed in **Section 4.2.25**, Wilderness Characteristics the proposed project will indirectly impact lands with wilderness characteristics as well as reduce the number of areas currently managed to maintain wilderness characteristics. Current trends in vegetation management, recreation and visitor use, roadway development, wildland fires and climate change are likely to impact lands with wilderness characteristics in a similar manner (See **Table 5-1**, Past, Present and Reasonably Foreseeable Projects, Plans, or Actions).

In the past ten years Arizona's population has grown significantly and is expected to continue to grow in the future. Along with a larger population may come an increase in commercial and personal forestry, participation in outdoor recreation and an increase in the construction of roads. Areas with wilderness characteristics are likely to be utilized for outdoor recreation. This would impact areas with wilderness characteristics as an increase in evidence of human presence would decrease the experience of solitude and naturalness.

Roadway development throughout Arizona is expected to continue at the current rate, likely resulting in increased noise and light pollution, and evidence of human activity thereby influencing visitor experience of wilderness characteristics.

An increase in wildland fires due to climate change is also expected. While wildland fires would not lessen the solitude or naturalness of an area with wilderness characteristics, it would impact visitors' ability to access the area for primitive and unconfined recreation.

The cumulative impacts of these current trends and the impacts of solar and wind development could diminish the naturalness of the area and the opportunities for solitude and primitive or unconfined recreation to the degree they may cease to exist in the area, resulting in a reduction of the total acres of lands with wilderness characteristics.

The cumulative impacts of the above trends and the proposed project are likely to affect the size and number of areas with wilderness characteristics, both managed and unmanaged. Though solar and wind development would not be constructed on areas with wilderness characteristics, the cumulative indirect impacts of any solar or wind development could affect these areas to the point that they no longer provide experiences of wilderness. While these trends all have the potential to have significant impacts on areas with wilderness characteristics, the actual impacts on lands with wilderness characteristics will

depend on the proximity of the actions to these areas and the extent of the disturbance and development.

Impacts from the No Action Alternative

If no action occurs, the current trends discussed above will continue to pose a threat to areas with wilderness characteristics. Other planning projects will continue according to BLM discretion. However, since the BLM has no comprehensive approach to solar and wind energy development, other projects could impact lands with wilderness characteristics through proximity or by fragmenting Arizona's landscape.

Impacts from Alternative 1

Impacts from Maximum REDA

Cumulative impacts from the past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 1, 65,200 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more likely to be impacted by solar or wind development and consequently more sensitive to cumulative impacts. Similarly, 439,300 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas particularly vulnerable to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

Under Alternative 1, 9,450 acres of land with wilderness characteristics managed and not managed to maintain wilderness characteristics would be within the proposed Agua Caliente SEZ. These acres of land with wilderness characteristics will be particularly vulnerable to cumulative impacts. Cumulative impacts from past, present and reasonably foreseeable actions are described under Impacts Common to All Alternatives.

Impacts from Alternative 2

Impacts from Transmission Line and Utility Corridor REDA

Cumulative impacts from the past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 2, 58,400 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more likely to be impacted by solar and wind development and consequently more sensitive to cumulative impacts. Similarly, 375,800 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas also particularly vulnerable to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

Under Alternative 2, 1,700 acres of land with wilderness characteristics not managed to maintain wilderness characteristics would be within the proposed Agua Caliente SEZ. These acres of land with wilderness characteristics will be

particularly vulnerable to cumulative impacts. Cumulative impacts from past, present and reasonably foreseeable actions are described under Impacts Common to All Alternatives.

Impacts from Alternative 3

Impacts from Load Offset REDA

Cumulative impacts from the past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 3, 65,200 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more likely to be impacted by solar or wind development and consequently more sensitive to cumulative impacts. Similarly, 439,300 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas particularly vulnerable to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

Under Alternative 3, 370 acres of land with wilderness characteristics not managed to maintain wilderness characteristics would be within the proposed Agua Caliente SEZ. These acres of land with wilderness characteristics will be particularly vulnerable to cumulative impacts. Cumulative impacts from past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives.

Impacts from Alternative 4

Impacts from Water Conservation and Protection REDA

Cumulative impacts from the past and present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 4, 53,900 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more likely to be impacted by solar or wind development and consequently more sensitive to cumulative impacts. Similarly, 298,800 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas particularly vulnerable to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

The Proposed Agua Caliente SEZ analysis area is the same as described in Alternative 1. As such, impacts would be the same as those described under Alternative 1.

Impacts from Alternative 5

Impacts from Land Tenure REDA

Cumulative impacts from the past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 5, 1,100 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more

likely to be impacted by solar and wind development and consequently more sensitive to cumulative impacts. Similarly, 4,500 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas particularly vulnerable to cumulative impacts.

Impacts from Alternative 6

Impacts from Collaborative-Based REDA

Cumulative impacts from the past, present, and reasonably foreseeable actions are described under Impacts Common to All Alternatives. Under Alternative 6, 58,400 acres of lands with wilderness characteristics managed to protect their characteristics are within five miles of the proposed REDA, making them more likely to be impacted by solar and wind development and consequently more sensitive to cumulative impacts. Similarly, 393,100 acres of lands with wilderness characteristics not managed to protect their characteristics are within five miles of the proposed REDA, making these areas particularly vulnerable to cumulative impacts.

Impacts from Proposed Agua Caliente Solar Energy Zone

The Proposed Agua Caliente SEZ analysis area is the same as described in Alternative 2. As such, impacts would be the same as those described under Alternative 2.