

RECOMMENDED ADDITIONAL DATA COLLECTION ANTONITO SOUTHEAST SOLAR ENERGY ZONE

Introduction

The Solar PEIS provides in-depth data collection and environmental analysis for solar energy zones (SEZs). The primary purpose of this rigorous analysis is to provide documentation from which the BLM can tier future project authorizations, thereby limiting the required scope and effort of project-specific NEPA analyses in these priority areas. As part of the Solar Energy Program, the BLM committed to collecting additional SEZ-specific data and conducting additional analysis in order to more effectively facilitate future development in SEZs. In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the BLM presented an action plan for each SEZ; that action plan, with appropriate updates, was used as the basis for recommended additional data collection for the Antonito Southeast SEZ presented below. Action plans described useful additional data for individual SEZs and proposed data sources and methods for collecting that additional data. Additional data and analyses for SEZs will be publicly released through the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov>) as they become available.

The Antonito Southeast SEZ has a total area 9,712 acres (39.3 km²). It is located in Conejos County on the southern Colorado state boundary with New Mexico. The largest nearby town, Alamosa, is located about 34 mi (55 km) to the north of the SEZ. Several small towns lie closer to the SEZ, with Antonito, Colorado about 2 mi (3 km) to the northwest of the SEZ.

Recommended Additional Data Collection for the Antonito Southeast SEZ

Recreation

Additional information on the potential impacts on hunting for big game species would help further characterize impacts on recreation. In addition, the San Luis Valley-wide effort to promote recreational use could warrant additional consideration. The status of off-highway vehicle use designation in the area may also warrant additional consideration.

Military and Civilian Aviation

The BLM should continue to consult with the U.S. Department of Defense regarding potential issues with military training routes.

Minerals

Additional information to inform the Department of the Interior's decision on a proposed 20-year withdrawal of SEZ lands has been provided through six Mineral Reports addressing each SEZ (one report for each state in the study area). The Mineral Report for Colorado addresses the status of Minerals within the Antonito Southeast SEZ (BLM 2012).

Water Resources

The Final Solar PEIS provided a planning-level water resources inventory of the southern portion of the San Luis Valley, an assessment of ephemeral stream reaches sensitive to land disturbance, and a simplified one-dimensional groundwater modeling analysis of potential groundwater withdrawal impacts associated with solar development. The following additional data and actions would help further characterize potential impacts on water resources for the Antonito Southeast SEZ. A more detailed discussion of each of these activities is included in the water resources action plan.

- Identify additional ephemeral stream channels and wetland features for non-development areas through consultation with Colorado Division of Water Resources (CDWR) (Division 3), Colorado Division of Wildlife (CDOW), U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers (USACE) with a focus on:
 - Taos Valley Canal and its tributaries (western half of SEZ),
 - Unnamed tributaries to Cove Lake Reservoir (western half of SEZ), and
 - Ephemeral channels flowing southwest to northeast on the eastern half of the SEZ.
- Conduct a field survey to:
 - Survey Taos Valley Canal and ephemeral channels for surface elevations, high water marks, and sediment conditions, and
 - Conduct hydrologic rainfall-runoff-routing analyses to identify 100-year floodplain areas.
- Coordinate with the USACE (Albuquerque District) regarding jurisdictional water determinations for the SEZ. Water features to be considered include:
 - Taos Valley Canal and its tributaries (western half of SEZ),
 - Unnamed tributaries to Cove Lake Reservoir (western half of SEZ), and
 - Ephemeral channels flowing southwest to northeast on eastern half of SEZ.
- Identify 100-year floodplain exclusion areas for the SEZ. This task would require coordination with the Federal Emergency Management Agency and the Colorado Water Conservation Board.
- Monitoring and adaptive management for the SEZ should include the formation of a stakeholder committee to conduct long-term monitoring of water resources. This activity would entail:
 - Identifying key stakeholder agencies,
 - Discussing general features of a monitoring program, and
 - Working with the U.S. Geological Survey and the CDWR (Division 3) to develop groundwater monitoring well design and numerical groundwater models. (Groundwater monitoring should coordinate with the Rio Grande Decision Support System through the CDWR [Division 3].)

Ecological Resources

Vegetation and Plant Communities. The following additional data-gathering action would help further characterize potential impacts on vegetation and plant communities for the Antonito Southeast SEZ:

- Identify and map the location and areal extent of dry wash and wetland communities within the SEZ. Identify and map the location and areal extent of these habitats, as well as riparian and greasewood flats habitats, outside the SEZ that may be affected by hydrologic changes, including groundwater elevations, and changes in water, sediment, and contaminant inputs associated with runoff.. Such effort could help determine habitat characteristics, including water source, hydrologic regime, and dominant plant species.

Wildlife. The following additional data-gathering actions would help further characterize potential impacts on wildlife resources for the SEZ:

- Conduct pre-disturbance surveys within the SEZ to determine the use of the SEZ as a movement/migratory corridor or as important habitat for elk and pronghorn.

Aquatic Biota. Investigations recommended under the water resources action plan would be useful in characterizing and protecting habitat available to aquatic biota. Alta Lake likely contains aquatic biota and has been identified a non-development area. Therefore, a preliminary survey of Alta Lake is not necessary. However, if it is determined that Alta Lake could be affected indirectly by water withdrawals, changes in drainage patterns, and construction activities, the potential for aquatic communities to be affected in these areas could require further investigation prior to development. Ephemeral streams and wetlands within the SEZ are typically dry and contain water only for brief periods. They may or may not contain aquatic biota; therefore, preliminary evaluations of these surface water features could be conducted to determine the potential for aquatic communities to be present.

Special Status Species. The following additional data-gathering actions would be useful in further characterizing and protecting habitat available to special status species:

Conduct pre-disturbance surveys within the SEZ to determine the presence and abundance of those special status species that are (1) federally listed, proposed for listing, or candidates for listing under the Endangered Species Act (ESA); or (2) listed by the State of Colorado as threatened or endangered; or (3) designated as sensitive by the Colorado BLM State Office. These species are listed in Table 1. Surveys should focus on areas identified as potentially suitable, and the suitability of these habitats to support these special status species should be determined in the field. All field-determined suitable habitats for special status species should be mapped. Target species and survey protocols should be developed in coordination with the U.S. Fish.

Antonito Southeast SEZ Data Needs

TABLE 1 Special Status Species That May Occur on the Antonito Southeast SEZ^a

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Plants			
Brandegee's milkvetch	<i>Astragalus brandegeei</i>	BLM-S	Sandy or gravelly banks, flats, and stony meadows within pinyon-juniper woodlands. Substrates are usually sandstone with granite or occasional basalt. Elevation ranges between 5,400 and 8,800 ft. ^d Nearest occurrences are approximately 10 mi ^e west of the SEZ. About 1,628,700 acres ^f of potentially suitable habitat occurs within the analysis area.
Ripley's milkvetch ^g	<i>Astragalus ripleyi</i>	BLM-S	Mixed conifer woodlands on rocky volcanic substrates at elevations above 8,000 ft. Known to occur approximately 5 mi west of the SEZ. About 1,819,100 acres of potentially suitable habitat occurs within the analysis area.
Fish			
Rio Grande chub	<i>Gila pandora</i>	BLM-S	Clear, cool, fast-flowing water over rubble or gravel substrates. Quad-level occurrences intersect the affected area north of the SEZ. The nearest potentially suitable habitat is located in the Rio San Antonio, approximately 1 mi north (downgradient) of the SEZ. Approximately 29.3 mi of potentially suitable habitat in the Rio San Antonio, Rio de los Pinos, and the Conejos River occurs within the area of indirect effects.
Rio Grande sucker	<i>Catostomus plebeius</i>	CO-E	Restricted to streams of the Rio Grande Basin in channels and backwaters near rapidly flowing waters. Nearest potentially suitable habitat is located in the Rio San Antonio, approximately 1 mi north (downgradient) of the SEZ. Approximately 29.3 mi of potential habitat in the Rio San Antonio, Rio de los Pinos, and the Conejos River occurs within the area of indirect effects.
Reptiles			
Milk snake	<i>Lampropeltis triangulum</i>	BLM-S	Shortgrass prairie, sandhills, shrubby hillsides, pinyon-juniper woodlands, and arid river valleys at elevations below 8,000 ft. The species is known to occur in Conejos County, Colorado. About 42,000 acres of potentially suitable habitat occurs in the affected area.
Birds			
American peregrine falcon	<i>Falco peregrinus anatum</i>	BLM-S	Year-round resident in the SEZ region. Open spaces associated with high, near vertical cliffs and bluffs above 200 ft in height overlooking rivers. Nearest occurrences are from the Rio Grande National Forest approximately 20 mi west of the SEZ. About 3,747,350 acres of potentially suitable habitat occurs within the analysis area.
Bald eagle	<i>Haliaeetus leucocephalus</i>	CO-T	Year-round resident in the SEZ region. Seldom seen far from water, especially larger rivers, lakes, and reservoirs. Occurs locally in semiarid shrubland habitats where there is an abundance of small mammal prey. Known to occur in riparian habitats along the Rio Grande as near as 7 mi east of the Antonito Southeast SEZ. About 96,000 acres of potentially suitable habitat occurs in the affected area.
Barrow's goldeneye	<i>Bucephala islandica</i>	BLM-S	Winter resident in the SEZ region on larger lakes and rivers. Known to occur in the San Luis Valley. About 150,000 acres of potentially suitable habitat occurs in the affected area.

Antonito Southeast SEZ Data Needs

TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
Birds (Cont.)			
Ferruginous hawk	<i>Buteo regalis</i>	BLM-S	Summer resident in the affected area, but year-round resident in the SEZ region. Grasslands, sagebrush, and saltbrush habitats, as well as the periphery of pinyon-juniper woodlands throughout the project area. Nests in tall trees or on rock outcrops along cliff faces. Known to occur approximately 10 mi east of the Antonito Southeast SEZ. About 28,000 acres of potentially suitable habitat occurs in the affected area.
Mexican spotted owl	<i>Strix occidentalis lucida</i>	ESA-T; CO-T; CO-S1	Inhabits deep, sheer-walled canyons in old-age, mixed coniferous forests. Known to occur in Conejos County, Colorado. About 698,700 acres of potentially suitable habitat occurs in the SEZ region.
Mountain plover	<i>Charadrius montanus</i>	BLM-S	Summer resident in the SEZ region. Prairie grasslands and arid plains and fields. Nests in shortgrass prairies associated with prairie dogs, bison, and cattle. More than 50% of the global population nests in the states of Colorado and New Mexico. Known to occur about 5 mi east of the Antonito Southeast SEZ. About 100,000 acres of potentially suitable habitat occurs in the affected area.
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	ESA-E; CO-E	Nests in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands in the Alamosa National Wildlife Refuge along the Rio Grande, approximately 25 mi northeast of the SEZ. About 4,400 acres of potentially suitable habitat occurs in the affected area.
Western burrowing owl	<i>Athene cunicularia hypugaea</i>	BLM-S; CO-T	Open grasslands and prairies, as well as disturbed sites such as golf courses, cemeteries, and airports throughout the SEZ region. Nests in burrows constructed by mammals (prairie dog, badger, etc.). Known to occur in Conejos County, Colorado. About 1,984,700 acres of potentially suitable habitat occurs in the SEZ region.
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	ESA-C	Breeds in scattered areas along the lower Colorado River and larger bodies of water in the southwestern United States. Primarily associated with riparian cottonwood and willow forests with dense understory foliage. Known to occur in Conejos County, Colorado. About 2,800 acres of potentially suitable habitat occurs in the SEZ region.
Mammals			
Big free-tailed bat	<i>Nyctinomops macrotis</i>	BLM-S	Roosts in rock crevices on cliff faces or in buildings. Forages primarily in coniferous forests and arid shrublands. Known to occur in Conejos County, Colorado. About 2,790,500 acres of potentially suitable habitat occurs in the SEZ region.
Fringed myotis	<i>Myotis thysanodes</i>	BLM-S; FWS-SC	Summer or year-round resident in wide range of habitats, including woodland, riparian, and shrubland habitats. Roosts in caves, crevices, and buildings. About 3,500,000 acres of potentially suitable habitat occurs within the SEZ region.
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>	ESA-C	Mountain valleys, plateaus, and open brush habitats in the project area at elevations between 1,000 and 12,000 ft. Known to occur in the SEZ affected area in Colorado and northern New Mexico. About 83,000 acres of potentially suitable habitat occurs in the affected area.

TABLE 1 (Cont.)

Common Name	Scientific Name	Listing Status ^b	Habitat ^c
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- ^a The listings for (1) federally listed, proposed for listing, or candidates for listing under the ESA, and (2) Colorado BLM State Office sensitive species have been updated since the release of the Draft Solar PEIS.
- ^b BLM-S = listed as a sensitive species by the BLM; CO-E = listed as endangered by the State of Colorado; CO-T = listed as threatened by the State of Colorado; ESA-C = candidate for listing under the ESA; ESA-E = listed as endangered under the ESA.
- ^c For plant species, potentially suitable habitat was determined by using Southwest Regional Gap Analysis Project (SWReGAP) land cover types (USGS 2005). For terrestrial vertebrate species, potentially suitable habitat was determined by using SWReGAP habitat suitability and land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.
- ^d To convert ft to m, multiply by 0.3048.
- ^e To convert mi to km, multiply by 1.609.
- ^f To convert acres to km², multiply by 0.004047.
- ^g Species in bold text have been recorded or have designated critical habitat in the affected area.

and Wildlife Service (USFWS) and CDOW. The BLM has conducted surveys for various special status species (e.g., mountain plover, western burrowing owl, Gunnison prairie dog) within the State of Colorado. In areas where these surveys overlap with the Colorado SEZs and areas of direct effects, the BLM survey information should be used to make appropriate determinations regarding the potential occurrence of species and their habitats. Additional survey efforts may be necessary, as appropriate.

The Draft Solar PEIS presents a table of special status species for which potential impacts need to be evaluated prior to development in the proposed Antonito Southeast SEZ. The list of species presented in Table 10.1.12.1-1 of the Draft Solar PEIS also includes species listed by the states of Colorado or New Mexico and species ranked by the States of Colorado or New Mexico as S1 or S2 or species of concern. No additional special status species were identified as potentially present in the SEZ in the Final Solar PEIS. On the basis of the design features presented in the Final Solar PEIS, the potential for impacts on these additional species will also need to be addressed before development could occur in the SEZ.

- Identify and map the location and areal extent of grassland habitat within the SEZ. The suitability of this habitat for special status species should be determined. Species potentially associated with grassland habitat include the milk snake, mountain plover, and western burrowing owl.
- Identify and map the location and areal extent of aquatic, wetland, and riparian habitats within the SEZ. The suitability of these habitats for special

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status species should be determined. Species potentially associated with these habitats include the Rio Grande chub, Rio Grande sucker, milk snake, bald eagle, Barrow's goldeneye, ferruginous hawk, and southwestern willow flycatcher.

- Identify and map the location and areal extent of woodland habitats within the SEZ. The suitability of these habitats for special status species should be determined. Species potentially associated with woodland habitats include the Brandegees' milkvetch, Ripley's milkvetch, milk snake, and ferruginous hawk.
- Identify and map the location and areal extent of active Gunnison prairie dog colonies within the SEZ. Associated burrows also could be used by western burrowing owls

Visual Resources

A summary of the Final Solar PEIS visual contrast analysis for the Antonito Southeast SEZ is provided in Table 2. This table includes only the sensitive visual resource areas (SVRAs) and sensitive viewing locations (SVLs):that would be subject to moderate or strong visual contrast from solar energy development in the Antonito Southeast SEZ, which are the following:

- San Antonio Wilderness Study Area (WSA)
- San Luis Hills WSA
- Los Caminos Antiguos Scenic Highway
- Cumbres & Toltec Railroad Corridor Area of Critical Environmental Concern (ACEC)
- San Luis Hills ACEC

In addition, the following other lands and resource areas would be subject to moderate or strong visual contrasts from solar development:

- Community of Antonito
- West Fork of the North Branch of the Old Spanish Trail.

TABLE 2 Summary of Potential Visual Impacts on SVRAs and SVLs within the 25-mi (40 km) Viewshed of the Antonito Southeast SEZ^a

Feature Type	Feature Name (Total Acreage/ Linear Distance) ^b	Feature Area or Linear Distance ^c		
		Visible within 5 mi	Visible Between	
			5 and 15 mi	15 and 25 mi
WSAs	San Antonio (7,321 acres)	3,193 acres (44%)	3,727 acres (51%)	0 acres
	San Luis Hills (10,896 acres)	0 acres	5,254 acres (48 %)	4 acres
Scenic Highways ^d	Los Caminos Antiguos	8 mi (13km)	18 mi (29 km)	12 mi (20 km)
ACECs designated for outstanding scenic values	Cumbres & Toltec Railroad Corridor	1,818 acres (47%)	1,410 acres (36%)	0 acres
	San Luis Hills (39,421 acres)	0 acres	12,516 acres (32%)	0 acres

^a As revised for the Final PEIS, assuming a target height of 650 ft (198.1 m).

^b To convert acres to km², multiply by 0.004047.

^c Percentage of total feature acreage or road length viewable.

^d Source: America’s Byways (2011).

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The following steps could be taken to better understand potential impacts on these areas from solar development in the Antonito Southeast SEZ:

- Identify key observation points (KOPs) within these areas through working with the management agency or other local stakeholders.
- Conduct viewshed analyses from the KOPs to determine how much of the SEZ would be in view from each KOP.
- As deemed necessary, based on viewshed analysis results, prepare wireframe Google Earth™ visualizations of hypothetical solar facilities in the SEZ depicting the 80% development scenario to better estimate potential impacts.

This additional analysis may help judge potential visual contrast more accurately for most KOPs. For KOPs of particularly high sensitivity, a site visit with photography and superimposition of the wireframe models onto the photos might be required or desired.

Paleontological Resources

The BLM Regional Paleontologist may have additional information regarding the paleontological potential of the SEZ. Most of the SEZ has a Potential Fossil Yield Classification (PFYC) of Class 1 as noted in the Draft Solar PEIS. Only about 4 acres (0.016 km²) is currently classified as Class 4/5 in an area in the northern part of the SEZ. Prior to development, the depth of the potentially paleontologically significant Alamosa Formation would need to be determined in that small area, and the remainder of the SEZ should be field checked to verify the PFYC classification of Class 1.

Cultural Resources and Native American Concerns

Several linear features have been noted in the Draft Solar PEIS as being within the SEZ, and, more recently some of these features were spotted on light detection and ranging (LIDAR) imagery during a Class III inventory. These features may be associated with former railroads, irrigation features, and general trail routes.

The following additional data collection efforts could reduce the uncertainty about potential impacts on cultural resources:

- Conduct a Class I literature file search to better understand (1) the site distribution pattern in the vicinity of the SEZ; (2) trail networks through existing ethnographic reports; and (3) overall cultural sensitivity of the landscape.
- Conduct a Class II Stratified Random Sample Survey of the SEZ to obtain a 10% sample (roughly 971 acres [3.9 km²]). Areas of interest, as determined through a Class I review, should also be identified prior to establishing the

survey design and sampling strategy. A Class III inventory of linear features detected using LIDAR in the Antonito SEZ is currently under way and will account for a portion of the recommended sample.

- Prepare a cultural sensitivity map based on results of the Class II survey, the Class I review, and the Class III inventory of linear features.
- Identify the integrity and historical significance of the portion of the West Fork of the North Branch of the Old Spanish Trail in the vicinity of the SEZ, and conduct viewshed analyses from key points along the trail. If this portion of the trail is determined significant, a mitigation strategy would need to be developed to address unavoidable impacts on the trail.
- Continue with government-to-government consultation, including follow-up to recent ethnographic studies covering some SEZs in Nevada and Utah with Tribes not included in the original studies to determine whether those Tribes have similar concerns. The Antonito Southeast SEZ was used by Tribes historically for hunting and trading rather than long-term settlement. The Ute, Jicarilla Apache, Navajo, Kiowa, Comanche, Arapaho, Pueblo groups, and Cheyenne may all have traditional interests in the valley. Potentially significant sites and landscapes for the Navajo, Upper Rio Grande Pueblo (Tewa), and Taos Pueblo are present in the San Luis Valley (Blanca Peak, Great Sand Dunes, San Luis Lakes). Potential topics to be discussed during consultation include the above-mentioned places, trail systems, mountain springs and other water sources, mineral resources, burial sites, ceremonial areas, and plant and animal resources. An ethnographic study of the SEZs in the San Luis Valley is currently proposed; results of the study will be incorporated into the BLM Solar Energy Program Web site (<http://blmsolar.anl.gov>) to the extent they can be made publicly available.

References

BLM and DOE, 2011, *Supplement to the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States*, DES 11-49, DOE/EIS-0403D-S, Oct.

BLM, 2012, *Assessment of the Mineral Potential of Public Lands Located within Proposed Solar Energy Zones in Colorado*, prepared by Argonne National Laboratory, Argonne, Ill., July. Available at <http://solareis.anl.gov/documents/index.cfm>.

ATTACHMENT A: WATER RESOURCES ACTION PLAN

As part of the Solar Energy Program, the BLM committed to collecting additional SEZ-specific data and conducting additional analysis in order to more effectively facilitate future development in SEZs. In the Supplement to the Draft Solar PEIS (BLM and DOE 2011), the BLM presented a water resources action plan applicable for each SEZ; that action plan is presented below with appropriate updates. Additional data and analyses obtained on the basis of recommendations in this water resources action plan will be publicly released through the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov>) as they become available.

The main action plan items relating to water resources applicable for all SEZs were discussed in the water resources action plan presented in the Supplement to the Draft Solar PEIS. The following sections explain each action plan item, identify items that were completed as part of the Final Solar PEIS, and provide some additional consideration for consultation with other federal, state, and local agencies and feasible timelines for the additional work.

1 Planning-Level Inventory of Water Resources

The Draft Solar PEIS summarized surface water and groundwater resources for individual SEZs at the programmatic level, but a more in depth or planning-level inventory was needed to provide a common resource for developers of individual SEZs. The following planning-level inventory data was provided in the Final Solar PEIS for all of the SEZs (sources in parentheses):

- Maps of basin valley and surrounding mountain ranges
 - All canals and perennial, intermittent, ephemeral streams (U.S. Geological Survey [USGS] National Hydrography Dataset [NHD])
 - HUC8 (8-digit, 4th-level hydrologic unit code) watersheds (USGS NHD)
 - Groundwater wells (USGS National Water Information System [NWIS] and Water Science Centers, National Resources Conservation Service [NRCS])
 - Springs (USGS NWIS)
 - Groundwater basin(s) (state water agency)
 - Wetlands (USFWS National Wetlands Inventory [NWI] or state agency)
 - Playas and dry lakes (USGS NHD or state agency)
 - Meteorological station locations (USGS NWIS, Western Regional Climate Center [WRCC], state agency climate stations, e.g., California Irrigation Management Information System [CIMIS] in California)
- Tabular information
 - Canals and perennial and intermittent streams (USGS NHD)
 - Total length of ephemeral stream channels (USGS NHD)
 - Total length of stream channels by stream order (USGS NHD)
 - Annual, seasonal, peak discharge values (USGS NWIS and Water Science Centers)
 - HUC8 watershed areas (USGS NHD)

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- Groundwater basins—area, generic properties (state water agency, PEIS, USGS NWIS and Water Science Centers, NRCS)
- Wetlands—areas, types (USFWS NWI or state agency)
- Springs—names, elevations, flows (USGS NWIS or state agency)
- Climate—precipitation, snowfall, evapotranspiration (USGS NWIS, WRCC, state agencies)

The following planning-level inventory data were not provided in the Final Solar PEIS, but would be useful to assemble prior to solar development in any SEZ:

- Google Earth™/geographic information system (GIS) data files, providing links to datasets (USGS NWIS)
 - Stream gages—flows and water quality
 - Groundwater wells—depth to groundwater and water quality
 - Meteorological stations—temperatures, precipitation, snowfall, etc.

2 Floodplain Determinations

In May 27, 1977, the President signed Executive Order 11988 “Floodplain Management,” which states that federal agencies should avoid surface disturbance activities within identified 100-year floodplains (*Federal Register*, Volume 42, page 117, May 27, 1977). Only a few SEZs (Afton, Dry Lake, Imperial East, and Gillespie) have prior floodplain analyses available to map exclusion floodplain areas. Identifying 100-year floodplain areas must be performed in order to define non-development areas within SEZs. Given the episodic and sometimes catastrophic nature of rainfall-runoff events in the desert southwest, floodplain analyses could extend beyond the 100-year floodplain to regions susceptible to extreme flooding events (e.g. alluvial fans, high gradient areas).

Except for the SEZs listed above, floodplain determinations had not been completed at the time of publication of the Final Solar PEIS and are still needed. Floodplain determinations require field surveys, consultations with the Federal Emergency Management Agency (FEMA) and state/local flood control agencies, and hydrologic analyses. The primary steps to identifying floodplain areas include the following:

- Identifying of main surface drainage pathways within and adjacent to SEZs
- Consulting with FEMA and state/local flood control agencies regarding floodplain mapping protocols
- Conducting field surveys
 - Channel geometries
 - High-water-mark indicator maps
 - Ground-truthing NHD channel networks
- Performing hydrologic analyses
 - Analysis of flood frequency
 - Hydraulic modeling of runoff routing

- Determination of inundation areas
- Obtaining approvals (BLM-coordinated)
 - FEMA/agency for floodplains

3 Jurisdictional Waters Determinations

Section 404 of the Clean Water Act (CWA) requires a permitting process for dredging and filling activities affecting “jurisdictional waters” of the United States. The U.S. Army Corps of Engineers (USACE) and EPA oversee the permitting process and make determinations on what constitutes jurisdictional water on a case-by-case basis. Jurisdictional water determinations can be made by using a variety of techniques, including topographic maps and aerial photographs, field surveys, and hydrologic analyses. The appropriate method for jurisdictional water determinations must be coordinated with the appropriate offices of the USACE and EPA. If field surveys are required, coordination with field surveys for floodplain determinations should be made. Jurisdictional water determinations for the SEZs had not been completed at the time of publication of the Final Solar PEIS and are still needed. Jurisdictional water determinations will not define non-development areas within SEZs but will determine where CWA Section 404 permitting will be required.

4 Significant Ephemeral Waters Determinations

In addition to floodplains and jurisdictional waters, several commenters and cooperators on the Draft Solar PEIS had concerns regarding the loss of ephemeral stream networks because of their importance to hydrology, geomorphology, and habitat. The Draft Solar PEIS identified significant washes to be excluded from development that showed physical evidence of conveying substantial flood flows (these areas will likely overlap with 100-year floodplain mapping). The Final Solar PEIS identified sensitive stream reaches for each SEZ on the basis of available geospatial datasets and professional judgment. Further analyses should be performed to identify dense ephemeral stream networks that overlap with critical habitat, provide significant groundwater connectivity, or constitute critical geomorphic features necessary for maintaining connected features (e.g., dunes, eolian transport corridors, and active alluvial fans). These additional analyses should use high-resolution imagery to identify stream reaches not accounted for in FPEIS analysis, as well as include consultation with local BLM offices, cooperating federal agencies, and state agencies regarding critical ephemeral stream networks for habitat, hydrologic, and geomorphic value.

5 Monitoring and Adaptive Management Programs

Careful siting and planning of solar facilities can reduce adverse impacts on surface water and groundwater resources, but there are many unknowns regarding both surface water and groundwater processes. Establishing a robust monitoring program and analysis tools for SEZs would gain important information on whether surface water or groundwater resources are being affected by solar facilities. Monitoring programs would need to incorporate stakeholder involvement including appropriate federal/state/local agencies (e.g., local BLM offices, USGS Water Science Centers, USFWS, National Park Service [NPS], state water resources agencies)

that conduct water resources monitoring. The Final Solar PEIS recommended a process and methods and tools for developing SEZ monitoring programs for water resources. The process should include identifying a stakeholder monitoring committee including agencies involved with water rights and resources. The committee should oversee the development and implementation of a monitoring program. The basic components of surface water and groundwater monitoring programs should include recommended monitoring parameters, measuring frequency, a plan for stakeholder involvement. The monitoring program could also include new or modified design features for the SEZ, such as a requirement to have water flow meters on groundwater pumps to accurately measure extractions (to be used in groundwater models and analyses to support long, term monitoring programs).

6 Groundwater Analyses

Utility-scale solar energy facilities have the potential to affect groundwater. For the Final Solar PEIS, an analysis of potential groundwater impacts for each SEZ was done quantitatively using a simple one-dimensional groundwater modeling approach (BLM and DOE 2012, Appendix O) and qualitatively by summarizing available information relative to groundwater processes and comparing that information to estimates of potential groundwater extractions for the four main solar energy technologies evaluated. The level of groundwater analysis needed for each SEZ will vary depending on the proposed level of water use (e.g., less detailed analyses may be needed for photovoltaic [PV] facilities than for higher water use facilities such as parabolic trough).

Seven SEZs were identified in the Final PEIS that would benefit from a more quantitative analysis: Afton, Amargosa Valley, Brenda, Dry Lake, Dry Lake Valley North, Imperial East, and Riverside East. At these seven SEZs, numerical groundwater models are being used to better address two major concerns: potential drawdown impacts on surface water features (e.g., loss of springs, change in river discharge) and drawdown impacts on other groundwater users and groundwater processes. Where there are existing groundwater models, the following will be added:

- Groundwater model refinements for SEZ analysis, and
- Analyses of full build-out pumping scenarios.

Where there are not existing groundwater models, the following will be provided:

- Simplified, superposition-based, groundwater modeling; and
- Analyses of full build-out pumping scenarios.

The groundwater models and reports for these SEZ will be released through the SEZ pages of the Solar Energy Program Implementation Web Site (<http://blmsolar.anl.gov/sez>) as they become available.