

Riverside East SEZ Draft Management Questions, Management Goals, Monitoring Objectives, and Indicators

Management Questions	Management Goals	Monitoring Objectives	Indicators
Physical Environment			
Soil Resources			
<p>QP1: How much soil erosion by wind and water is occurring onsite before, during, and after construction?</p> <p>QP2: Are on-site ground disturbances and facilities design and construction, altering natural patterns and volumes of offsite soil erosion by wind or water?</p>	<p>Minimize soil erosion impacts to:</p> <p>GP2: desert pavement, GP3: dry lakes, GP4: sand dunes, and GP5: fluvial and aeolian sand transport corridors, and sand source areas.</p> <p>GP6: Minimize soil erosion on and offsite.</p> <p>GP7: Control fugitive dust to minimize airborne particulates</p>	<p>Detect increases in soil erosion rates and loss of soil within X mi of the SEZ of XX%</p> <p>Detect changes in basin-scale average infiltration and permeability rates of more than XX%</p> <p>Detect increases in basin-scale losses of desert pavement of XX%</p> <p>Detect changes in sand dune size and location of XX%</p> <p>Detect changes to sand penetrability, surface coarseness, and surface stabilization downwind of solar facilities of XX%.</p> <p>Detect changes in sand transport rate of XX%</p> <p>Detect changes in off-site dust of greater than XX%</p>	<p><u>Core Indicators:</u> None</p> <p><u>Supplemental Indicators:</u> SIP1: soil aggregate stability (numerical rating)</p> <p><u>Other:</u> SIP2: Remote sensing of land cover area types (including desert pavement; acres), SIP3: number of rills (count), and SIP4: dune size (acres)and SIP5: dune movement SIP6: Soil texture (particle size distribution), FTL habitat: sand size range between 0.1 and 1.0 mm) SIP7: Soil depth (cm) SIP8: Water erosion (cm/year vertical accumulation) SIP9: Project dust/Total dust (grams/unit time downwind) SIP10: Sand penetrability SIP11: Surface coarseness SIP12: Surface stabilization [SIP10-12 were variables measured in Effects of Reduction in Windblown Sand on the Abundance of the Fringe-Toed Lizard (Turner et al. 1984)]</p>

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			<p>SIP13: Annual sediment yield to the fluvial system</p> <p>SIP14: Sand-transport rates (Taken from: Long-Term Sand Supply to Coachella Valley Fringe-Toed Lizard (Griffiths et al. 2002).</p> <p>SIP15: Soil infiltration (bulk density)</p>
Hydrology			
<p>QP3: Do solar facilities significantly alter surface water flow away from the site?</p> <p>QP4: Is solar related groundwater withdrawal affecting surface water hydrology?</p> <p>QP5: Is/are the groundwater basin(s) in overdraft?</p>	<p>GP8: Maintain offsite surface water flow volumes and patterns in intermittent and perennial water bodies.</p> <p>GP11: Maintain natural balance of the groundwater supply (recharge/discharge)</p> <p>Maintain the hydrology of</p> <p>GP12: seeps and springs</p> <p>GP13: groundwater dependent streams</p> <p>GP16: dry lakes</p>	<p>Detect increases or decrease in runoff volumes from the SEZ of more than XX% compared to pre-development</p> <p>Detect changes in annual sediment yield to the fluvial system in and outside of the SEZ of XX%</p> <p>Detect changes in channel location and morphology of more than XX% compared to pre-development runoff</p> <p>Detect XX% deviations from baseline surface hydrology in intermittent wetland, stream and lacustrine habitat</p> <p>Detect whether basin-scale groundwater withdrawals exceed a defined sustainable yield (xx acre feet per year)</p> <p>Detect decreases in groundwater surface elevations of XX ft in monitoring wells on or near projects (can vary this by position in the basin as needed)</p>	<p><u>Core Indicators (indirect):</u></p> <p>CIP1: Bare Ground (% of total groundcover);</p> <p>C1P2: Proportion of soil surface in large intercanopy gaps (% of total groundcover);</p> <p>CIE4:Vegetation composition (density; % cover);</p> <p><u>Other:</u></p> <p>SIP8: Water erosion (cm/year vertical accumulation)</p> <p>SIP16: Stream discharge (cfs)</p> <p>SIP17: Soil infiltration (bulk density)</p> <p>SIP18: Siltation (change in sediment particle size distribution; cm/year vertical accumulation)</p> <p>SIP19: Bankfull width (m)</p> <p>SIP20: Stream gradient (m/km)</p> <p>SIP21: Streambank stability (multiple methods)</p> <p>SIP22: Residual pool depth (m)</p> <p>SIP23: Temperature (C°)</p>

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			<p>SIP24: channel location, SIP25: Channel depth (m), SIP3: number of rills (count) SIP26: Ground water elevation (m) SIP27: Groundwater] flow(m³/s) SIP28: Soil nutrients (µg/g) SIP29: Soil moisture (bars) SIP30: Groundwater discharge\recharge(m³/s) SIP31: Surface water dissolved oxygen (mg/L) SIP32: Groundwater salinity (as total dissolved solids) SIE18: percent cover based on wetland status codes (OBL, FACW, FAC, FACU, UPL)</p>
Air Quality			
QP6: Is solar development affecting regional air quality?	GP13: Minimize solar related changes in regional air quality	<p>Detect changes in ozone of greater than XX DU</p> <p>Detect changes in PM within all Class I areas of XX %</p>	<p>SIP33: Ozone (Dobson units), SIP9: Project Total Dust (grams/unit time downwind) SIP34: PM10 monitoring (µg/m³) SIP35: NOX Concentrations</p>
QP7: Is solar development releasing significant amounts of carbon sequestered in soils?	GP14: Minimize carbon releases from soils	Detect carbon releases of X ppm from disturbed areas	<p>SIP7: Soil depth (cm) SIP36: Soil carbon (mg/g) SIP37: CO₂ release from soil SIP38: Soil temperature</p>

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Ecological Resources			
Plants			
<p>QEP1: What is the baseline status and trend of vegetation communities (including community structure and phenology) inside and outside the SEZ?</p> <p>QEP2: Are solar facility operations affecting vegetation communities (including community structure and phenology) in offsite areas?</p> <p>QEP3: Are solar facility operations affecting biological crusts?</p> <p>QEP4: Have changes in surface hydrology related to solar facility construction affected offsite vegetation alliances downslope of solar facilities (e.g., creosote bush scrub) and riparian vegetation communities particularly desert dry wash</p>	<p>GEP1: Ensure facility operations do not promote the spread of invasive plant species</p> <p>GEP2: Maintain vegetation communities, especially those that depend on groundwater or function as important habitats</p> <p>GEP3: vegetation physiological functions</p> <p>GEP4: Preserve vegetation communities that are rare (e.g., CNPS alliance rarity ranking of S1, S2, and S3) or with rare species</p> <p>GEP5: Preserve vegetation communities that have high species richness,</p> <p>GEP6: Preserve important vegetation habitats for wildlife</p>	<p>Detect changes of $\geq X\%$ in bare ground cover, $\geq X\%$ in total plant cover, and $> X\%$ of intercanopy gaps, and $> X\%$ in woody plant height within a XX mi buffer of SEZ</p> <p>Detect changes $\geq X\%$ of high priority vegetation communities with in a XX mi buffer of the SEZ</p> <p>Detect changes $\geq X\%$ in plant pollination</p> <p>Detect changes $\geq X\%$ in seed dispersal</p> <p>Detect $\geq X\%$ changes in plant phenology with in a XX mi buffer of the SEZ</p> <p>Detect increases or introductions of $\geq X\%$ in invasive species in and surrounding the SEZ relative to control site (regional)</p> <p>Detect changes in plant litter</p> <p>Detect increases in basin-scale losses of biological soil crust of XX%</p>	<p><u>Core Indicators:</u></p> <p>CIE1: Non-native invasive plant species (density; % cover)</p> <p>CIP1: Bare Ground (% cover);</p> <p>CIP2: Proportion of soil surface in large intercanopy gaps (% cover)</p> <p>CIE4:Vegetation composition (density; % cover);</p> <p>CIE5: Vegetation height (m)</p> <p><u>Other:</u></p> <p>Remote sensing or field measurements of :</p> <p>SIE1: biological crusts (acres),</p> <p>SIE2: vegetation cover (% cover),</p> <p>SIE3: Vegetation biomass (dry mass/unit area; RM metric),</p> <p>SIE4: Plant moisture (remote sensing),</p> <p>SIE5: (Plant) phenology (multiple measures),</p> <p>SIE6 (Plant) productivity (mass/unit time) or photosynthesis</p> <p>SIE7 (Vegetation) density (leaf area index x cover?)</p> <p>SIE8: Seedbank location</p> <p>SIE9: seed density ($\#/m^2$)</p> <p>SIE10: Plant litter mass (g)</p>

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Ecological Resources			
<p>woodlands (e.g., <i>Parkinsonia florida</i>—<i>Olyneya tesota</i> alliance), a NECO Plan special status community?</p> <p>QEP5: Is solar related water withdrawal affecting riparian habitats and ground water dependent (phreatophytes) vegetation communities?</p>	<p>GEP8: vegetation productivity</p> <p>GEP9: nutrient cycling;</p> <p>GEP11: Maintain riparian vegetation cover</p> <p>GEP12: Minimize impacts to biological soil crusts.</p>		<p>SEI11: (litter) decomposition rates (decay rate)</p> <p>SIE12: percent dieback</p> <p>SIE13: live crown density</p> <p>SIE14: crown height and width</p> <p>SIE15: percent cover of live (versus dead or residual) vegetation</p> <p>SIE17: percent composition of native versus non-native species</p> <p>SIE18: percent cover based on wetland status codes (OBL, FACW, FAC, FACU, UPL)</p> <p>SIE19: Species richness (Covered by AIM methods)</p> <p>SIE20: Species diversity (Covered by AIM methods)</p>
Wildlife			
<p>QEW6: How are solar facilities affecting migratory bird populations and migration patterns?</p> <p>QEW7: How are solar facilities affecting plant pollination (rare pollinators of rare plants) and</p> <p>QEW8: seed dispersal processes?</p>	<p>GEP14: Minimize solar-related mortalities</p> <p>GEP15: Ensure long term habitat use and maintenance of habitat used by migratory bird populations</p> <p>GEP16: Maintain suitable habitats and habitat connectivity</p>	<p>Detect increases or introductions of >X% in invasive species in and surrounding the SEZ relative to control site</p> <p>Detect decreases in habitat connectivity that are more than X% at X scale</p> <p>For an indicator species, detect decreases in the amount or quality of habitat more than X% at X scale</p> <p>Detect changes in indicator species</p>	<p>Proposed Aquatic Indicators:</p> <p>CIE6: Macroinvertebrate ratio (several metrics)</p> <p><u>Other:</u> See plant, sand dune, and surface hydrology indicators</p> <p>SIE21: corridor stability (quantified using remote sensing)</p> <p>Species specific monitoring endpoints such as:</p>

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Ecological Resources			
<p>QEW9: Have changes in surface hydrology related to solar facility construction affected offsite aquatic communities?</p> <p>QEW10: Is solar related water withdrawal affecting ecological structure and function of aquatic communities?</p> <p>QEW11: are solar facilities affecting migration corridors for terrestrial species?</p> <p>QEW12: Is noise from solar facilities adversely affecting wildlife habitat, predatory processes, or reproduction?</p>	<p>GEP17: Maintain groundwater dependent animal communities and habitat</p>	<p>populations of $\geq XX\%$ relative to control sites (or maintain populations within historical ranges)</p> <p>Detect decreases in the amount or quality of habitat for migratory birds of more than X% at X scale</p> <p>Detect changes in habitat use by migratory birds of $\geq XX\%$ relative to control sites</p> <p>Determine the position of solar developments in relation to migratory bird pathways</p>	<p>SIE22: abundance, SIE23: location, SIE24: reproduction SIE25: health SIE26: Solar related mortalities (cumulative over multiple facilities)- Birds SIE27: Solar related mortalities (cumulative over multiple facilities) - Other wildlife SIE28: Solar-related mortality affecting insects (can include aerial insects, pollinators and seed dispersing animals) SIE29: Acres of potential subterranean wildlife habitat lost</p>
Special Status Species			
<p>QESS1: What is the condition of habitats for special status species in and near the SEZ relative to control sites before and</p>	<p>GEES19: Ensure solar development does not impede the recovery of desert tortoise populations specified in the recovery plan.</p>	<p>Detect reductions in habitat quality and connectivity for special status species of $\geq XX\%$ within X mi of SEZ (Can make this objective specific to individual or groups of habitat characteristic variables)</p>	<p><u>Core Indicators:</u> Plant species of management concern</p> <p><u>Other:</u> See plant and wildlife for applicable indicators of distribution, abundance,</p>

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Ecological Resources			
<p>after solar facility construction and operations?</p> <p>QESS2: What are the impacts to habitat connectivity between the Chuckwalla and Chemehuevi DWMAs, especially within the higher valued habitat (USGS desert tortoise habitat model) on the west side of the Chuckwalla Valley. This area was identified by the USFWS as being an important connectivity area in the biological opinions for First Solar and Desert Harvest solar projects.</p> <p>QESS3: Is solar development leading to increasing populations of tortoise predators (e.g., ravens and coyotes)?</p> <p>QESS4: What is the impact of disease in kit fox populations subject to disturbance from large-</p>	<p>GESS19b: From NECO Plan: Recover populations of the desert tortoise in the Chuckwalla and Chemehuevi DWMAs identified in the USFWS plan by meeting the criteria for recovery as specified in the plan</p> <p>GESS19c: From NECO Plan: Mitigate effects on tortoise populations and habitat outside DWMAs to provide connectivity between DWMAs.</p> <p>GESS19d: From NECO Plan: Reduce tortoise direct mortality resulting from interspecific (e.g., raven predation) and intraspecific (e.g., disease) conflicts that likely result from human-induced changes in ecosystem processes.</p> <p>GESS20: Close unused routes and minimize routes crossing desert tortoise habitat areas</p> <p>GESS21: Ensure long term viability of big horn sheep</p>	<p>Maintain special status species population targets specified in land management plans</p> <p>connectivity study: Detect an increase in genetic differentiation among individual desert tortoises and populations to assess whether developments and habitat barriers affect the genetic structure of the population in the Chuckwalla Valley. Monitor individual movement and coincident locations of desert tortoises and subsequent overlap of home ranges throughout the corridor; the rates of contact would be compared to rates of contact and connectivity in uncompromised habitats.</p> <p>Detect a change in the density of desert tortoises within the Chuckwalla DWMA. Detect a change in raven numbers in the Chuckwalla DWMA,</p> <p>Detect a change in the prevalence of disease (e.g., upper respiratory tract disease, herpesvirus, cutaneous dyskeratosis)</p> <p>Detect change in use of designated wildlife corridors (DRECP and Solar EIS) by</p>	<p>and health</p> <p>Remote sensing of special status species:</p> <p>SIE21: “corridor stability” (quantified using remote sensing)</p> <p>SIE30: Monitoring indicators from a proposed USGS to address tortoise connectivity from Stateline (Nussear et al. 2013): Genetic variation; genetic structure; individual movement and coincident locations of desert tortoises; rates of contact.</p> <p>SIE31: Habitat indicators for vegetation alliances upon which a special status species depend (See Vegetation Description Variables, above, including several core indicators)</p> <p>SIE32: Raven and coyote numbers.</p> <p>SIE33: Desert tortoise densities within the Chuckwalla DWMA (USFWS line distance sampling).</p> <p>SIE34: Demographics/ disease (USGS long-term study plots—Chuckwalla Bench and Chuckwalla Valley).</p>

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scale renewable energy development?	<p>populations and habitat</p> <p>GESS23: maintain big horn sheep habitat connectivity within and between demes</p> <p>GESS22: Maintain special status species population targets specified in land management plans (regional to ecoregional)</p> <p>GESS24: From NECO Plan: “Protect essential blowsand habitat and sand source for populations of Mojave fringe-toed lizard (a BLM Sensitive Species), including within the Palen and Ford dry lake/ dune system.”</p>	<p>bighorn sheep and burro deer.</p> <p>Detect occurrence and spread of canine distemper virus, and population status and trends of the desert kit fox across the eastern Riverside County area.</p>	<p>SIE35: Bighorn sheep/ burro deer use of designated wildlife corridors (from the DRECP or Solar PEIS).</p> <p>SIE36: kit fox mortality monitoring, monitoring prevalence and spread of disease (e.g., canine distemper virus)(California Department of Fish and Wildlife eastern Riverside kit fox monitoring study).</p>

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Human Elements			
<p>Does site construction, operations and increased site access and visitation negatively affect:</p> <p>QH1: existing site uses, QH2: user experiences and cultural values QH3: recreational value experience or use QH4: Native American concerns, QH5: transportation, QH6: military activities QH7: Does site construction and operations allow for the maintenance of wilderness characteristics?</p>	<p>GH1: Minimize removal of cultural artifacts, fossil resources, and impacts to traditional use areas (e.g., lithic tool stone sources, vegetation resources for basket making, arrow making, medicinal plants, etc.)</p> <p>Maintain baseline GH2: recreational opportunities, GH3: [recreational] uses, and GH4: quality of experiences GH5: Preserve visual resource inventory class to landscapes /scenic values GH6: Manage adjacent lands to improve conservation and balance other uses GH7: Minimize acoustic impacts GH8: Minimize light impacts</p>	<p>Detect changes $\geq X\%$ in number of visitors at the LTVA and Joshua Tree NP</p> <p>Detect changes $\geq X\%$ in the amount, location, type or recreations uses in the xx-mile buffer area (not defined) around the facility</p> <p>Detect changes $\geq X\%$ in the reported recreational user experience in the xx-mile buffer area (not defined) around the facility</p> <p>Detect changes $\geq X\%$ in the cultural user (including native American) experience in the xx-mile buffer area (not defined) around the facility</p> <p>Detect $\geq X\%$ change in the number of authorized and unauthorized uses in Specially Designated Areas (SDAs) and lands with wilderness characteristics, as well as disturbances and restoration</p> <p>Detect $\geq X\%$ increased traffic and access</p> <p>Detect changes in the visual character of the landscape including night sky</p> <p>Detect increase in noise levels $\geq X\%$ dBA</p>	<p>For indicators of impacts to culturally significant plants see “Plant” indicators above</p> <p>SIH1: Number of visitors to parks and SDAs SIH2: Number of permits issued SIH3: Reported user experience at parks and SDAs SIH4: Reported impacts to sacred or other cultural areas SIH5: Remote sensing of changes in parks and SDAs SIH6: Recreational maintenance costs parks and SDAs SIH7: Traffic amount and location SIH8: Night time Illumination (Night sky) SIH9: Glare glint measurements SIH10: Noise level SIH11: Record viewer response to the introduced contrasts SIH12: Visual Resource Inventory score SIH13: Visual contrast metrics (form, line, color, and texture) SIH14: Changes in the balance of uses SIH15: reports from military installations of use impacts</p>

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		<p>within a XX mi radius of project</p> <p>Detect increased glint/glare levels above visual impairment threshold</p> <p>Detect changes in scenic value related solar facilities of $\geq X\%$ for locations of scenic value that include solar facilities within their viewsheds.</p> <p>Detect cumulative impacts to military uses</p>	<p>SIH16: Number of OHV trails</p> <p>SIH17: reports of aviation or human health issues related to glare/glint</p>
<p>QH8: How is solar development affecting the integrity of cultural and paleontological sites</p>	<p>Protect cultural and paleontological resources from solar related impacts from</p> <p>GH9:wind;</p> <p>GH10: water erosion</p> <p>GH11: Maintain integrity of cultural and</p> <p>GH12:paleontological resources</p> <p>GH13:Minimize erosion to sacred areas and trails</p>	<p>Detect changes in the contextual integrity of cultural sites</p>	<p>See applicable Indicators of Soil Erosion and Hydrologic alteration in the Physical Environment section</p> <p>SIH18:Remote sensing of changes in physical characteristics of areas containing cultural and paleontological sites</p> <p>SIH19:Number of incidents of theft , vandalism, damage, and destruction of cultural and fossil resources</p> <p>SIH20: Number of incidents of eroded cultural resources (water and wind)</p>
<p>QH9: How is human health being affected by solar development?</p>	<p>GH14:Ensure solar development does not adversely affect human health</p>	<p>Detect changes in human health (regional)</p>	<p>SIH21:Health outcomes</p> <p>SIH22:Hospital visits</p> <p>SIH23:Reported conditions (i.e.</p>

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Human Elements			
<p>QH9a: Is wind driven surface soil erosion related to solar development affecting ecological and human health?</p>			<p>respiratory problems linked to dust) SIH24: Missed work days SIH25: Reported cases of valley fever, SIH26: residual mineral development contamination from ground disturbance</p>
<p>QH10: Is solar development complying with federal requirements for environmental justice?</p> <p>QH10a: How are minority incomes being affected by solar development?</p>	<p>Ensure changes to the local economy and environment related to solar development do not disproportionately affect:</p> <p>GH15: minority populations; GH16: low-income populations</p> <p>Ensure changes related to solar development do not disproportionately affect the health of:</p> <p>GH17: minority populations; GH18: low-income populations</p>	<p>Detect changes in the health of low-income and minority populations</p> <p>Detect changes in the human environment in relation to low-income and minority populations</p> <p>Detect changes in the income and employment of low-income and minority populations</p>	<p>SIH:19-24 <u>Other</u> SIH27: Minority income SIH28: Minority employment SIH29: Minority poverty rates SIH30: Minority Employment in the energy sector SIH31: Indirect employment SIH32: Induced employment SIH33: Regional poverty rates SIH34: Housing costs</p>