IV.6 GROUNDWATER, WATER SUPPLY, AND WATER QUALITY

IV.6.1 Approach to Impact Analysis

This programmatic analysis considers groundwater basins within the Desert Renewable Energy Conservation Plan (DRECP or Plan) ecoregion subareas for potential risk and severity of impacts from proposed renewable energy development in Development Focus Areas (DFAs). DFAs have variable locations with respect to groundwater basin boundaries and hydrogeological conditions. Most impacts on groundwater resources depend less on developed land area than on technology, technology type, and their respective water requirements.

For renewable energy projects, water use is primarily determined by technology (e.g., solar, wind, or geothermal) and technology type (e.g., photovoltaic versus concentrated solar power). For example, solar thermal plant operations may require substantial amounts of water for steam generation, cooling, and other industrial processes, while wind technology would require relatively smaller water volumes for operation, maintenance, cleaning, and possibly dust suppression. Accordingly, this programmatic analysis uses estimated water use as the primary indicator of potential impacts on groundwater, water supply, and water quality but recognizes that in some locations any increased water use, regardless of technology type, can affect the resource.

Groundwater impacts generally occur at the scale of a groundwater basin rather than at the scale of a DRECP ecoregion subarea or DFA. Some impacts occur at a scale even smaller than a groundwater basin (e.g., springs, streams, wetlands, groundwater-dependent vegetation, or water supply wells within a basin or sub-basin). Quantifying these impacts requires site- and project-specific details, such as:

- Net changes in the basin water balance, particularly in basins already in overdraft.
- Basin adjudication status and availability of imported water.
- The occurrence of subsidence.
- Groundwater connection to other basins or the Lower Colorado River Accounting Surface (LCRAS) region.
- Presence of a spring, stream, wetland, or playa that receives and discharges groundwater.
- Presence of groundwater-dependent vegetation.
- Groundwater quality.

- Existing water supply wells, groundwater users, and contributing sources of water discharged from a basin.
- Hydrogeology of water supply aquifers and any interaction with geothermal resources.
- Presence of sole-source aquifers.

Since many of these details are insufficiently quantified, the DRECP groundwater programmatic analysis uses estimated water use to both identify potential impacts and compare the alternatives; acreage, specifically as it relates to land disturbance, is an additional factor.

IV.6.1.1 General Methods

The DRECP uses DFAs to represent the magnitude and geographic distribution of renewable energy development under different alternatives. The DFAs are also used to identify and map the geographic locations (groundwater basins within the ecoregion subareas) of impacts, the intensity of impacts (as indicated by the estimated magnitude of water consumed by the proposed renewable energy projects in those basins), and the scale of impacts (as represented by the total acreage disturbed by the proposed development). Tables in Appendix R2.6 support this analysis and show various acreages of development and conservation in the Plan Area, by both individual basin and by ecoregion subarea.

The general metrics used to assess impacts and compare the effects of alternatives include:

- The acres affected by construction and operation, which could alter surface runoff and potentially alter rainfall infiltration, groundwater recharge, and water supply.
- The type of technology (particularly solar and geothermal) and its estimated water requirement, which in turn affects the volume of groundwater pumped and the resulting drawdown of groundwater levels. Excessive drawdown can cause overdraft conditions, land subsidence, and mobilization of existing poor-quality groundwater.
- The geothermal development area, which could impact potable water supplies when geothermal fluids are either re-injected or stored.
- The renewable energy technology area, where hazardous materials used during construction and operation could spill or be disposed of in a manner that contaminates groundwater.

The location of overdraft and stressed aquifers affects these metrics because they identify areas where groundwater supplies are severely limited. Overdraft is when the amount of

water discharged from a particular basin or sub-basin (by pumping, evaporation, outflow, etc.) exceeds the amount of water recharging the basin (by precipitation, inflow from connected basins, etc.) Overdraft is characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years; overdraft can lead to increased extraction costs, land subsidence, water quality degradation, and adverse effects on current users. If discharge remains stable, a new basin equilibrium may be reached; however, some impacts, such as groundwater storage capacity, may be diminished permanently. Stressed aquifers share some characteristics with basins experiencing overdraft, but are not formally identified as in overdraft. For purposes of this assessment, stressed basins are characterized by either declining water levels or existing significant groundwater use (i.e., greater than 0.03 ac-ft/acre).

In this programmatic analysis, the volume of water consumed (e.g., acre-feet per year [AFY] or gallons per year) is the key metric for assessing and comparing potential environmental impacts to water resources from renewable energy development among the alternatives, regardless of the quantity of power generated by the consumption of that water (e.g., acre-feet consumed per megawatt [MW] produced). While the amount of solar development and water use varies among the action alternatives, the amount of geothermal development and water use is the same; only the locations of the geothermal projects would vary. The geographical distribution of water use was estimated using typical consumption rates for different energy technologies and the spatial distribution of energy generation within the Plan Area as described in Appendix O (Methods for Megawatt Distribution).

The amount of electricity generated per unit of water consumed is described in the paragraphs below, but these values may change with time as technology improves water-use efficiency in power-production facilities. Subsequent project-specific environmental reviews will more precisely define actual water use based on the specific technology type and actual operational characteristics being considered (e.g., daytime operations, 24-hour operations, etc.).

Typical water consumption rates for solar technologies are provided in Volume II, Chapter III, Section II.3.1.4.1 (Table II.3-21). For solar photovoltaic facilities, regular water usage for cleaning is 0.05 AFY/MW. Solar thermal consumes relatively more water, and the water used for steam generation, cooling, and other industrial processes can be substantial. Solar thermal systems can be wet cooled, hybrid, or dry cooled. Wet-cooled systems use annually up to 14.5 acre-feet of water per megawatt (AFY/MW). Hybrid systems use dry cooling for much of the year, but switch to wet cooling when air temperature rises above approximately 100° F; hybrid systems use 2.9 AFY/MW. Dry cooling further reduces the amount of water used, but also reduces efficiency and output capacity, particularly in hot desert climates. Dry-cooling systems use 1.0 AFY/MW.

The Plan Area is mostly desert with often-scarce water supplies, and future solar thermal systems will likely have to use the best available technology to minimize water use, which presently is a dry cooled system. For the purpose of this analysis, water usage for dry cooled solar thermal systems was assumed 1.0 AFY/MW. Water usage for regular cleaning and other industrial processes of solar thermal systems was assumed to be 0.5 AFY/MW.

Geothermal power plant water use is variable, depending upon technology and water quality. Values have been determined for dry-cooled flash and binary geothermal systems ranging between 10 gallons/megawatt-hour (10 gal/MWh) and 270 gal/MWh. (Clark et al. 2011). Enhanced dry-cooled geothermal systems can consume between 290 and 720 gal/MWh. The DRECP assumes that geothermal facilities require 5.0 acres/MW, and a typical plant capacity of 50 MW (DRECP, Appendix F1, Table F1-1). Assuming a 70% operating capacity, the plant water use values above translate into a range of 0.2 to 70 AFY/MW. While this is the general range, specific plant designs not expected here in the desert (e.g. not re-injecting the cooling water) can push this value over 1900 AFY/MW (Clark et al. 2013).

Geothermal power plants in California with a generating capacity of 20 MW or greater report their water use to the California Energy Commission (CEC), which in turn reports it in the CEC's Quarterly Fuel and Energy Report. The average reported values are higher than expected water use represented by enhanced geothermal systems as reported by Clark et al. 2011. Fifteen plants reporting to the CEC had an average water usage for 2010 through 2012 of 1,748 AFY (CEC 2014). The average annual reported water use was estimated by dividing 1,748 AFY by 56 MW (31 AFY/MW). Similar to solar thermal plants, the water use per MW for dry-cooled geothermal plants in the desert might also be about an order of magnitude less than wet-cooled geothermal plants (3.1 AFY/MW). For the purpose of this analysis, water usage for wet-cooled geothermal systems was assumed to be 31 AFY/MW.

Tables in this chapter show the total acreage of renewable energy technologies for each groundwater basin within each ecoregion subarea. The tables also report the geographic distribution of estimated water use calculated using the energy generation described in Appendix O (Methods for Megawatt Distribution) and the estimated water use rates described above. These acreages, together with estimated water use are utilized to estimate the geographic distribution of potential impacts on groundwater both within basins and between ecoregion subareas.

IV.6.1.2 CEQA Standards of Significance

To determine if impacts on water could occur under provisions of the California Environmental Quality Act (CEQA), Hydrology and Water Quality criteria were applied

from Appendix G of the CEQA Guidelines. Three standard CEQA impacts are relevant to groundwater and water quality issues; the following three questions guide determination of their significance.

(a) Violate any water quality standards or waste discharge requirements?

Any release (e.g., evaporation pond leakage, septic system discharge, chemical spills, brine injection or disposal, and so forth) is significant if the project causes groundwater to exceed water quality standards or waste discharge requirements.

(b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

A decrease in the groundwater supply, whether caused by depleting storage or interfering with the timing, magnitude, or location of groundwater recharge, is significant if: (1) groundwater levels are lowered such that the production rate of pre-existing wells decreases to a level that does not support existing or planned land uses; (2) lowered water levels substantially reduce groundwater discharge to playas, wetlands, surface water features, areas supporting groundwater-dependent vegetation, or adjacent basins; or (3) the depletion of groundwater storage results in compaction of aquifer materials, loss of aquifer storage capacity, and land subsidence.

(f) Otherwise substantially degrade water quality?

Changes in groundwater-flow directions can cause existing poor quality water to migrate into surrounding areas rendering groundwater unusable for meeting its existing beneficial uses.

The CEQA Guidelines (Appendix G) provide additional questions for Hydrology and Water Quality related to runoff, drainage, and flooding issues. The following surface-water related questions are addressed in Chapter IV.5, Flood, Hydrology and Drainage.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site?

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site?

e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

j) Inundation by seiche, tsunami, or mudflow?

IV.6.2 Typical Impacts Common to All Action Alternatives

This section qualitatively describes the primary types of groundwater-related impacts, direct and indirect, common to renewable energy project alternatives in the Plan Area.

Renewable energy projects that grade the land surface, remove vegetation, alter the conveyance and control of runoff and floods, or cover the land with impervious surfaces, alter the relationships between rainfall, runoff, infiltration, and transpiration; this potentially interferes with groundwater recharge. Impacts to recharge in this desert environment are not generally expected to be large and are dependent on such things as soil characteristics, elevation, and slope. However, reduction of recharge can be of concern with solar projects, which occupy large areas and consequently could have a relatively larger increase in runoff and decrease transpiration (the process of water movement through a plant and its evaporation). Geothermal facilities have a smaller facility footprint than solar, and wind facilities have an even smaller footprint.

Groundwater extraction and consumption by renewable energy projects can cause groundwater levels to decline (drawdown) under some circumstances. When drawdown and depletion of groundwater in storage occurs, a number of potentially significant impacts can result:

- Declining water levels increase the needed pumping lift in wells, gradually causing pumping rates to decrease and eventually cease altogether.
- Declining water levels may lower groundwater gradients and can reduce groundwater discharge to springs, streams, rivers, and down-gradient hydraulically connected groundwater basins.

- Lowering the groundwater table can cause decline in the areal extent and vigor of wetland, riparian, or other groundwater-dependent vegetation areas.
- Groundwater discharge to playas can decrease and cause wet or damp lakebeds to dry, causing greater wind scour and dust generation.
- As groundwater levels and fluid pressures decline, certain types of sediments (saturated clay units for example) can dewater and compress. The compression of sediment beds reduces the volume of those sediment beds and can lower land surface elevations (land subsidence). This can potentially cause damage to existing structures, roads, and pipelines; reverse flow in sanitary sewer systems and water delivery canals; and alter the magnitude and extent of flooding. This compression of sediments and geologic units can also permanently reduce aquifer storage capacity.

Some basins have localized areas of highly saline groundwater, particularly closed basins that contain terminal playas and have no surface water discharge. Water-level declines in these basins can reverse existing groundwater gradients and flow directions, causing poor-quality groundwater near the playa to flow into surrounding parts of the basin and increasing salinity in affected areas.

Renewable energy projects produce or use fluids that could contaminate groundwater if introduced to soil or groundwater. Projects typically have spill prevention and response plans to address violations of water quality standards and waste discharge requirements. The most common concerns are vehicle fuels, solvents for equipment maintenance, heat transfer fluids, brines produced by groundwater demineralization (for consumptive use), and brines produced or used as part of geothermal operations. For example, brine produced as a by-product of demineralization of groundwater, typically evaporates in on-site ponds and is removed as a hazardous waste. Some geothermal projects store brine produced by wells or cooling towers in on-site ponds.

IV.6.2.1 Impacts of Renewable Energy and Transmission Development

IV.6.2.1.1 Impacts of Site Characterization

Ground disturbances during site characterization potentially affect both the quantity and timing of groundwater recharge. These disturbances could be caused by grading, clearing vegetation for roads and equipment, and characterization operations. Test borings may be required for structure design, as well as to determine aquifer conditions for water-supply assessments. The impacts apply to all technologies, but are of particular concern for solar projects since they could cover large contiguous areas.

IV.6.2.1.2 Impacts of Construction and Decommissioning

Ground disturbances during construction potentially affect the quantity and timing of groundwater recharge. Relevant activities include grading and clearing vegetation for equipment and operations, and temporary or permanent changes to drainage and flooding characteristics. Projects that grade the land surface, remove vegetation, alter the conveyance and control of runoff and floods, or cover the land with impervious surfaces can alter the relationships between rainfall, runoff, infiltration and transpiration. This is of particular concern for solar projects, which occupy large areas and consequently tend to increase runoff and decrease transpiration.

Installation of water supply wells and the consumption of the water they produce as part of construction or decommissioning of all renewable energy technologies can affect groundwater levels and storage volumes. Typically, the water volumes used during the construction period, particularly for dust control, are greater than the annual water use required during operations. This is particularly true for solar projects, which cover large land areas.

Construction activities use fluids that could contaminate groundwater if introduced to soil or groundwater, and violate water quality standards or waste discharge requirements. The most common concerns are vehicle fuels and solvents for equipment maintenance.

IV.6.2.1.3 Impacts of Operations and Maintenance

The Covered Activities under power plant operations and maintenance include potential groundwater contamination, interference with recharge, depletion of groundwater levels and storage, and other water quality impacts. Improper handling or containment of hazardous materials could disperse contaminants to soil and impact groundwater quality. Evaporation ponds may be required as part of cooling structures, and these may leak and possibly discharge brines and other contaminants to shallow groundwater.

Groundwater consumption affects groundwater levels and storage volumes. Solar thermal and geothermal plant operations may require substantial amounts of water for steam generation, cooling, and other industrial processes; less water is required for cleaning facilities like solar arrays, mirrors, and so forth. In contrast, water use for wind technology would be limited to relatively smaller volumes for operation, maintenance, cleaning activities, and possibly dust suppression.

IV.6.2.1.4 Impacts of Decommissioning

Decommissioning activities can include efforts to abandon water supply and monitoring wells, remediate contaminated soils or groundwater, and remove structures like solar

arrays, mirrors, and so forth. Improperly abandoned wells can create a conduit between land surface and the underlying aquifers, or between one or more aquifers distributed vertically with depth. This is particularly true for geothermal wells, whose casing typically passes through one or more "fresh" water aquifers to deep water-bearing zones that produce high temperature but poor quality groundwater and brines. Decommissioning activities may also consume groundwater, or modify the quantity and timing of groundwater recharge. Reclamation plans typically require decompaction of affected soils, which may improve surface recharge. Also typical are re-vegetation efforts that may increase evapotranspiration or return the rate to predevelopment levels.

IV.6.2.2 Impacts of the Reserve Design

Impacts on groundwater resources are determined by existing conditions within the groundwater basins where the projects are located, activities on the ground surface, and related requirements for groundwater. Conservation actions would have an overall positive effect on groundwater protection since renewable energy facilities would be restricted in conservation areas.

IV.6.2.3 Impacts of BLM Land Use Plan Decisions

IV.6.2.3.1 Impacts of Renewable Energy Development and Transmission on BLM Lands

The typical impacts from the various renewable energy and transmission technologies on BLM lands would be the same as those described in Section IV.6.2.1. However, the specific locations in which energy and transmission development will be allowed will be driven by Land Use Plan Amendment (LUPA) decisions, which may encourage or restrict development in some areas.

IV.6.2.3.2 Impacts of BLM Land Designations and Management Actions

Because the BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect.

The CMAs implemented in these BLM land areas require a Water Supply Assessment for renewable energy projects. This assessment determines if groundwater is available to the project, and identifies water supply or environmental impacts on groundwater and other groundwater users as a result of project groundwater consumption. The CMAs also detail the mitigation required as a result of project groundwater use. The CMAs are described in

detail in Section IV.6.3.2.1.1, Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development.

Details on allowable uses and management within National Landscape Conservation System (NLCS) lands are presented in the proposed LUPA description in Volume II. Details on the goals, objectives, allowable uses, and management actions for each Area of Critical Environmental Concern (ACEC), eligible and designated Wild and Scenic Rivers, and Special Recreation Management Area (SRMA) units are presented in the LUPA worksheets in Appendix H.

IV.6.2.4 Impacts of Natural Community Conservation Plan and General Conservation Plan

The Natural Community Conservation Plan (NCCP) would be administered by the California Department of Fish and Wildlife (CDFW), and apply to the entire Plan Area. The GCP would be administered by the U.S. Fish and Wildlife Service (USFWS) and would apply to nonfederal lands, a subset of the entire Plan Area.

IV.6.2.4.1 Natural Community Conservation Plan

The impacts of renewable energy development permitted under the NCCP would be the same as those defined for the Plan-wide impacts, including the typical impacts described in Section IV.6.2 and for each alternative.

IV.6.2.4.2 General Conservation Plan

The types of impacts resulting from renewable energy development permitted under the GCP would be the same as those defined for the Plan-wide impacts, including the typical impacts described in Section IV.6.2. However, the locations where these impacts would occur would vary by alternative. Any differences in impacts from different locations are described for each alternative.

IV.6.3 Impact Analysis by Alternative

The following sections present impact analyses for the No Action Alternative, the Preferred Alternative, and Alternatives 1 through 4.

IV.6.3.1 No Action Alternative

IV.6.3.1.1 Impacts Within the Entire Plan Area in No Action Alternative

The No Action Alternative assumes that renewable energy and transmission development and mitigation for such projects in the Plan Area would occur on a project-by-project basis

in a pattern consistent with past and ongoing renewable energy and transmission projects. The estimated renewable energy development pattern is intended to be consistent with current development patterns and technology mixes that emphasize the following:

- Solar development in two ecoregion subareas: the Cadiz Valley and Chocolate Mountains subarea and the Imperial Borrego Valley subarea.
- Wind development in the West Mojave and Eastern Slopes ecoregion subarea.
- Geothermal development in the Imperial Borrego Valley ecoregion subarea.

Potential renewable energy development under the No Action Alternative is presented by groundwater basin in Table R2.6-1 (Appendix R2), and the areas are summarized by ecoregion subarea in Table IV.6-1 below (solar only, geothermal only, and total renewable energy development for all technologies combined). Most of the area available for development is within five ecoregion subareas (Cadiz and Chocolate Mountains, Imperial Borrego Valley, Kingston and Funeral Mountains, Providence and Bullion Mountains, and West Mojave and Eastern Slopes); there are also geothermal projects in the Imperial Borrego Valley ecoregion subarea. The Panamint Death Valley ecoregion subarea and Piute Valley and Sacramento Mountains ecoregion subarea have no new development under the No Action Alternative, and are therefore not expected to be directly impacted by renewable energy development.

Table IV.6-1 shows the estimated total new water demand expected within each ecoregion subarea for the No Action Alternative. Total water use was calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods," and results in Table IV.6-1 range from a minimum of 15,000 AFY (dry cooled solar thermal plants and wet cooled geothermal plants) to 54,000 AFY (wet cooled solar thermal and geothermal plants). The most intense water use is in the Imperial Borrego Valley ecoregion subarea (12,000 to 27,000 AFY) due to 1,000 acres of geothermal development; there is no geothermal development in the other subareas.

Table IV.6-1
Renewable Energy Development Area and Estimated Water Use – No Action Alternative

Ecoregion Subarea	Renewable Energy Available Development Area (acres)			MW1	Water Use (AFY)2	
	Solar	*Geothermal*	*Total*[3]		*Minimum*	*Maximum*
Cadiz Valley and Chocolate Mountains	36,000	0	49,000	5,000	1,800	16,000
Imperial Borrego Valley	18,000	1,000	67,000	7,000	12,000	27,000

Table IV.6-1
Renewable Energy Development Area and Estimated Water Use – No Action Alternative

Ecoregion Subarea	Renewable Energy Available Development Area (acres)			MW1	Water Use (AFY)2	
	Solar	*Geothermal*	*Total*[3]		*Minimum*	*Maximum*
Kingston and Funeral Mountains	11,000	0	11,000	500	200	1,800
Mojave and Silurian Valley	10	0	2,000	<10	<10	10
Owens River Valley	0	0	0	0	0	0
Panamint Death Valley	0	0	0	0	0	0
Pinto Lucerne Valley and Eastern Slopes	600	0	4,000	300	50	40
Piute Valley and Sacramento Mountains	0	0	0	0	0	0
Providence and Bullion Mountains	9,000	0	10,000	500	100	1,300
West Mojave and Eastern Slopes	14,000	0	125,000	7,000	800	7,400
Total	**88,000**	**1,000**	**268,000**	**20,000**	**15,000**	**54,000**

1 Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).
2 Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.
3 Total development area is the sum of solar, geothermal, wind, and transmission project areas.

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Renewable energy projects can impact groundwater recharge rates, groundwater elevations, groundwater in storage, the geologic substrata through compaction and land subsidence, or cause water quality impacts from spills and brine disposal.

IV.6.3.1.1.1 Impacts and Mitigation for Renewable Energy and Transmission Development in No Action Alternative

The impacts defined are the types identified by the lead agencies for approved solar, wind, geothermal, and transmission projects.

Impacts Assessment

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Changes in groundwater recharge alter the quantity of groundwater available to the environment, existing users, and proposed projects. Projects that grade the land surface, remove vegetation, alter the conveyance and control of runoff, or cover the land with impervious surfaces alter the relationships between rainfall, runoff, infiltration and evapotranspiration. Total project acreage is an indicator of the magnitude of the land surface disturbance and potential to alter runoff, infiltration and transpiration. As shown in Table IV.6-1, 268,000 acres of land will be disturbed under the No Action Alternative for renewable energy projects, and almost half the affected land area occurs in the West Mojave and Eastern Slopes ecoregion subarea.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

If local groundwater is the source of water to the project, well extractions will cause drawdown of groundwater levels at least on the local level. Total water consumption is an indicator of the potential significance of drawdown impacts. As shown in Table IV.6-1, the greatest water use under the No Action Alternative calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods" (12,000 to 27,000 AFY) is within the Imperial Borrego Valley, primarily due to geothermal technology. The Cadiz and Chocolate Mountains and West Mojave and Eastern Slopes ecoregion subareas also have relatively high water use, primarily from solar technology. Declining groundwater levels as a result of these groundwater uses can have the following effects.

- The energy required extracting the groundwater increases and, gradually over time, the well production rates decrease.
- The extent and vigor of wetland, riparian, or other groundwater-dependent vegetation areas can be at risk when the water table declines beneath these areas and the discharge decreases.
- Groundwater discharge declines to dependent springs, streams, rivers, and playas when the water table declines.
- The surfaces of some playas are wetted by groundwater discharge, and as discharge declines the lakebed dries, increasing wind scour and dust generation.
- Some groundwater basins receive inflow from adjacent basins, and these basins can be located either within or outside the Plan Area. This flow can occur within saturated alluvium that hydraulically connects adjacent basins, groundwater leaking

across an adjoining fault between basins, or as deep groundwater flow within a regionally extensive formation that underlies the relatively shallow alluvial basins. If groundwater is captured from storage in the up-gradient / tributary basin, this may limit outflow into the down-gradient basin and diminish the resource.

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

As shown in Table IV.6-1, new renewable energy water use under the No Action Alternative calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods" could range from 15,000 to 54,000 AFY, with most of the water use attributed to solar and geothermal development in the Imperial Borrego Valley. When groundwater is extracted and groundwater levels decline over time, the pressure of water in pores between mineral grains in the alluvial sediments decreases and can cause certain types of saturated geological materials (e.g., clays) to dewater and compress. Similarly, when geothermal wells extract fluids from geologic strata that are typically thousands of feet deeper than the water supply wells, these deep fluid withdrawals also lower the fluid pressure in deep sediment beds and can cause them to compress. The compression reduces the volume of the sediment beds and lowers land surface elevations, which can damage existing structures, roads, and pipelines; reverse flow in sanitary sewer systems and water delivery canals; and alter the magnitude and extent of flooding along creeks, lakes, and storm management structures. This compression of materials also represents a permanent reduction in storage capacity. Total water consumption and the magnitude of development are indicators of the potential significance of impacts from subsidence.

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

As shown in Table IV.6-1, estimated new renewable energy water use under the No Action Alternative calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods" could range from 15,000 to 54,000 AFY, with most of the water use attributed to geothermal technology in the Imperial Borrego Valley ecoregion subarea. Some basins have localized areas of highly saline groundwater, particularly basins with terminal playas and no surface water outflow. Groundwater extraction and water level drawdown, over time, can change the existing groundwater gradient, causing poor-quality groundwater near the playa to flow into surrounding parts of the basin, increasing salinity in the affected areas. Total groundwater consumption and certain geological settings are indicators of significant potential for drawdowns, gradient changes, and impacts on groundwater quality.

Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies.

As shown in Table IV.6-1, 1,000 acres of geothermal development occur under the No Action Alternative in the Imperial Borrego Valley. Saline water re-injected during geothermal energy project operations can leak into relatively shallow water supply aquifers if the injection well casing fails. The magnitude of geothermal development in a basin is an indicator of its potential impacts on groundwater quality.

Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Renewable energy projects produce or use hazardous fluids. In some circumstances, those fluids would influence groundwater quality if they leaked into an aquifer. The most common fluids are vehicle fuels, solvents for equipment maintenance, heat transfer fluids, brines produced by demineralization, and brines produced from geothermal extraction wells. Typically, reject brine produced by demineralizing groundwater evaporates in on-site ponds and any residue is properly disposed of. Geothermal projects also commonly store excess brine produced by wells or cooling towers in ponds. If the ponds leak or over flow, groundwater quality could be impacted. Additionally, improper handling or containment of hazardous materials associated with transmission facility electrical equipment located inside and outside the Plan Area could disperse contaminants to soil or groundwater.

The total area of renewable energy and transmission development is an indicator of potential groundwater quality impacts from chemical spills or brine disposal. As shown in Table IV.6-1, 268,000 acres of land would be developed under the No Action Alternative for renewable energy projects located in 73 groundwater basins, increasing the potential for contamination in those basins (Table R2.6-1).

Laws and Regulations

Existing laws and regulations would reduce the impacts of renewable energy development projects in the absence of the DRECP. Relevant regulations are presented in the Regulatory Setting in Volume III. Note that because this Environmental Impact Report/Environmental Impact Statement (EIR/EIS) addresses amendments to BLM's land use plans, these plans are addressed separately and are not included in this section. The requirements of relevant regulations would reduce impacts through the following mechanisms:

- Federal regulations (e.g., the Clean Water Act, Resource Conservation Recovery Act, Safe Drinking Water Act, and EPA Sole Source Aquifer Protection Program), state regulations (e.g., the Porter-Cologne Act, State Water Resources Control Board Anti-degradation Policy, and compliance with Waste Discharge Requirements set by the

Water Boards), and ordinances administered by the various counties, municipalities, and water and wastewater agencies would limit groundwater quality impacts. Underground Injection Control (UIC) permits, designed to prevent contamination and other adverse impacts on groundwater and drinking water sources from wastewater injection, would limit impacts from brine injection wells.

- The "Law of the River" for Colorado River Water Accounting, the Wild and Scenic Rivers Act, and watermasters in adjudicated groundwater basins would limit impacts related to groundwater storage depletion. Urban Water Management Plans and Groundwater Management Plans can also influence groundwater use practices.
- The Solar Programmatic EIS (PEIS) includes Design Features (Appendix W) that would reduce the impacts of solar energy development, including: measures to control runoff (defined in WR1-1); measures to quantify groundwater aquifers and sustainable yield (defined in WR1-2); measures to secure a reliable and legally available water supply (defined in WR1-3); and impact reduction measures (defined in WR2-1, WR3-1, and WR4-1 for construction, operation, and decommissioning, respectively). These measures would apply only on BLM Solar Energy Zones and Solar PEIS variance lands.

Mitigation Measures

Mitigation measures adopted for approved projects are assumed to be the same as those applied in the future under the No Action Alternative. These mitigation measures can include the following:

- Groundwater Level, Quality, and Subsidence Monitoring, Mitigation, and Reporting Plans. These plans provide detailed methodology for monitoring background and site conditions. The primary monitoring objective is to establish pre-project groundwater level, water quality, and land surface elevations and trends to compare quantitatively to observed changes resulting from project construction and operations. These plans can include Mitigation Action Plans that identify thresholds of significance and the actions taken if the thresholds are reached.
- Water Supply Assessments. These plans determine the groundwater available for project use. The plans include groundwater budget assessments based on numerical groundwater flow models, statistical analyses, and other hydrologic assessments to determine available groundwater and estimate potential impacts resulting from its use. The plans can include Drought Water Management Programs and Water Conservation Education Programs that describe how water is to be managed and used during droughts. These plans can require mitigation for groundwater use by reducing pre-existing uses in the basin (e.g., increased conservation or transfers of

formally permitted water uses), reducing project use (e.g., requiring the best available technology to minimize water use, like dry cooling technology), or providing an alternative supply (e.g., imported water, recycled water, and so forth). Measures to improve groundwater recharge under project conditions can include, for example, the installation of pervious groundcover to ensure maximum percolation of rainfall, and on-site drainage improvements that direct drainage from impervious surfaces to a common pervious drainage basin to maximize groundwater basin recharge.

- Installing metering devices to measure and report water use, and setting prescribed limits on groundwater use during construction and operations. These water-use restrictions can include pumping reductions when impact thresholds are reached.
- Compensating well owners impacted by project groundwater use, including compensation for increased power costs, well modifications and repair, and well replacement.
- Monitoring groundwater-dependent vegetation, springs, and wildlife within areas potentially affected by groundwater pumping.
- Monitoring brine ponds to prevent leaks and groundwater quality impacts and monitoring emergency plans for accidental geothermal brine or heat transfer fluid spillage and subsequent treatment.

IV.6.3.1.1.2 Impacts from Reserve Design in the No Action Alternative

The No Action Alternative has no reserve design, but without approval of an action alternative, there would be continued protection of existing Legislatively and Legally Protected Areas (LLPAs) like wilderness areas. In addition, under the No Action Alternative, renewable energy projects would continue to be evaluated and approved with project-specific mitigation requirements.

Renewable energy development is excluded from existing LLPAs, thus reducing potential impacts on groundwater. Impacts on existing protected lands under the No Action Alternative could result from adjacent renewable energy development. Potential impacts would be influenced by the size of the developed area, the water required by the development, and the characteristics of the basins where the development occurs.

IV.6.3.1.2 Impacts on BLM Lands of Existing BLM Land Use Plans in No Action Alternative

Table R2.6-2 (Appendix R2) reports the acres of groundwater basins within existing protected areas (LLPAs and Military Expansion Mitigation Lands [MEMLs]) and existing BLM Areas of Critical Environmental Concern (ACECs). Under the No Action Alternative, these

protected areas (about 4.3 million acres) and existing BLM Conservation Designations (about 1.7 million acres) presumably provide ongoing conservation; however, there would be no reserve design established to guide where future BLM Conservation Designations could be established, or where reserves could be assembled to offset the effects of renewable energy or transmission development. Therefore, the conservation areas generated from renewable energy or transmission developments are based solely on mitigation requirements imposed on a project-by-project basis.

Under the No Action Alternative, existing BLM land use plans within the Plan Area would continue on BLM lands. These plans allow for renewable energy development in Solar Energy Zones (SEZs) and Solar PEIS Variance Lands. These projects are approved with a project-specific LUPA, if required. Table R2.6-3 (Appendix R2) reports the total development acres of groundwater basins with potential renewable energy impacts in BLM lands, by ecoregion subarea, under the No Action Alternative (92,000 acres). The resulting impacts from renewable energy development are the same as identified in Section IV.6.3.1.1.1, but smaller in scope because the development area is smaller (92,000 acres versus 268,000 acres).

Solar and geothermal technology in the existing BLM land use plans can utilize large amounts of water and impact groundwater resources; groundwater use can lower groundwater levels and affect basin water supplies and groundwater discharge. As shown in Table R2.6-3, solar and geothermal development on existing BLM land use plans under the No Action Alternative (about 50,000 acres) is about one-half of the solar and geothermal development for the entire Plan Area under the No Action Alternative shown in Table R2.6-1 (almost 90,000 acres). The development is also in a smaller number of overdraft and stressed basins, where stressed basins are defined by declining water levels or extraction rates greater than 0.03 acre-feet/acre (18 basins versus 25 basins, respectively).[1]

The existing land use plans identify various land designations such as existing SRMAs, designated and eligible Wild and Scenic Rivers, and ACECs. These conservation actions are designed to avoid and minimize direct impacts on biological communities, and therefore are not expected to adversely influence groundwater, water supply, and water quality.

[1] A list of overdraft and stressed basins is provided in Table III.6-1 of Volume III "Groundwater, Water Supply, and Water Quality." Maps showing the distribution of overdraft and stressed basins are also presented later in this chapter.

IV.6.3.1.3 Impacts of Natural Community Conservation Plan in No Action Alternative

The NCCP would apply to all lands within the Plan Area. In the absence of Plan implementation, the NCCP would not be approved and no incidental take permits would be issued under the NCCP. Projects would continue to be considered by the appropriate lead agency on an individual basis. The impacts that would occur in the absence of the NCCP would be the same as those described in Section IV.6.3.1.1.1 (Plan-wide analysis).

IV.6.3.1.4 Impacts of General Conservation Plan in No Action Alternative

As described in Appendix M, the General Conservation Plan (GCP) would apply to nonfederal lands in the Plan Area. In the absence of Plan implementation, the GCP would not be approved and no incidental take permits would be issued under the GCP. Projects would continue to be considered by the appropriate lead agency on an individual basis. The impacts that would occur in the absence of the GCP would be the same as those described in Section IV.6.3.1.1.1 (Plan-wide analysis), but would be specific to nonfederal lands.

IV.6.3.1.5 Impacts Outside the Plan Area in No Action Alternative

Under the No Action Alternative, renewable energy development would occur in basins hydraulically connected to adjacent areas outside the Plan Area. As shown in Table R2.6-1, there are renewable energy projects in groundwater basins connected to areas within the State of Nevada (Middle Amargosa Valley, Pahrump Valley, Mesquite Valley, and Ivanpah Valley basins), Arizona (Palo Verde Valley and Palo Verde Mesa basins), and Mexico (the Imperial Valley basin). As a result, groundwater level and water supply changes can extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

Outside the Plan Area, additional transmission lines would be needed to deliver additional renewable energy to load centers (areas of high demand). It is assumed that new transmission lines outside the Plan Area would use existing transmission corridors between the Plan Area and existing substations in the more populated coastal areas of the state. The load centers outside the Plan Area through which new transmission lines might be constructed are San Diego, Los Angeles, North Palm Springs–Riverside, and Central Valley. These areas are described in Chapter III.6, Groundwater, Water Supply, and Water Quality, Section III.6.9.

IV.6.3.1.5.1 Impacts of Transmission Outside the Plan Area

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Transmission lines would not alter groundwater recharge. Transmission towers have small footprints and their footings introduce minimal impervious surface. Access roads would be either existing paved roads or unpaved roads and would not alter the amount of impervious surface in an area. Where the terrain requires leveling, runoff is controlled by implementation of erosion control and site restoration, and the runoff would not be diverted in a way that would not allow recharge.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

The only substantial potential use of water during transmission line construction would be for dust control. The usual practice is that construction contractors obtain water for this purpose from a municipal source with adequate supplies and are prohibited from pumping groundwater.

Other groundwater, water supply, and water quality impacts identified for renewable energy development in the Plan Area are:

- Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.
- Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.
- Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies.
- Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

These impacts would not occur as a result of transmission projects outside the Plan Area. There would be no groundwater pumping or use, no water injection, and the risk of chemical spills would be related to vehicle maintenance and fueling. If these occurred they would be localized and requirements imposed on the project would require immediate clean-up and disposal of any contaminated soil.

IV.6.3.1.5.2 Impacts of Existing BLM Land Use Plans Outside the Plan Area.

Under the No Action Alternative, the existing BLM CDCA land use plan would continue to be implemented on CDCA lands. Renewable energy projects would still be developed through

BLM's existing policies. Impacts on groundwater resources would be of the types described in Section IV.6.2.1, with similar mitigation measures included on a case-by-case basis.

The estimated acres of groundwater basins on BLM land designations outside the Plan Area under the No Action Alternative are summarized in Table R2.6-4 (Appendix R2). Existing land designations such as SRMAs, eligible and designated Wild and Scenic Rivers, and ACECs would continue to protect associated values and resources. These conservation actions are designed to avoid and minimize direct impacts on biological communities, and therefore are not expected to adversely influence pre-project groundwater, water supply, and water quality conditions.

IV.6.3.1.6 CEQA Significance Determination: No Action Alternative

GW-1: Construction of Plan components could alter groundwater recharge. Construction of renewable energy technologies can alter recharge when construction involves grading of the land surface, removal of vegetation, covering the land surface with impervious surfaces (e.g., PV panels, mirrors, and graded surfaces), and potential alteration of the conveyance and control of runoff. Typical mitigation measures include installing pervious ground cover (e.g., gravel) to improve percolation and directing drainage to basins to maximize groundwater recharge. These measures can increase recharge relative to preconstruction conditions and beneficially impact groundwater resources. Participating agencies will require these measures as appropriate during their subsequent review of specific projects. With implementation of these typical mitigation measures, impacts would be less than significant.

GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge. Groundwater use by renewable energy projects will cause significant impacts on water resources. Existing regulations will constrain project water use and reduce the magnitude of these impacts in some areas (e.g., the "Law of the River" for Colorado River Water Accounting, the Wild and Scenic Rivers Act, and watermasters in adjudicated basins). Typical mitigation measures for impacts include Water Supply Assessments that determine available groundwater for use by the project, Groundwater Monitoring and Reporting Plans designed to quantify groundwater level changes and its associated impacts on vegetation and wildlife, and Mitigation Action Plans that identify required actions should thresholds of significance be reached. These plans can require both site-specific and basin-specific hydrogeological investigations. Groundwater use can also be restricted or halted to minimize or prevent impacts (e.g., requiring best available technology to minimize water use, like the use of dry cooling technology), and compensation provided to well owners and water users to alleviate impacts on pre-existing wells and water supply. Unless participating agencies require these measures as

appropriate during their review of specific projects, groundwater pumping and consumption in this desert environment will have an adverse and significant impact.

GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity. When groundwater levels decline certain types of saturated units can dewater and compress, which can lower land surface elevations causing significant impacts. Similarly, when geothermal projects withdraw fluid from deep strata, if the geothermal fluids are not re-injected the deep sediment beds can also compress and cause land subsidence. Typical mitigation measures for impacts include Monitoring and Reporting Plans designed to quantify impacts and Mitigation Action Plans that identify mitigation actions, if significance thresholds are reached. These plans can require both site-specific and basin-specific investigations, and when implemented, the measures reduce the impact to less than significant. Extractions can also be restricted or ceased should impacts occur, and compensation provided to existing landowners to alleviate subsidence-related impacts. Although compressed clay beds represent a permanent loss in storage capacity, prompt actions towards mitigating detected subsidence limits the storage loss to a small fraction of the total storage capacity of the basin. These measures can therefore reduce impacts to less than significant. Participating agencies will require these measures as appropriate during their subsequent review of specific projects.

GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate. Some basins have localized areas of highly saline groundwater, particularly basins where groundwater flow terminates beneath playas. Water-level declines in these basins can reverse the existing groundwater gradient, causing poor-quality groundwater near the playa to flow into surrounding parts of the basin and render groundwater unusable in the affected areas. Any groundwater contamination is significant if it causes the groundwater to exceed a Regional Water Quality Control Board's (RWQCB's) Water Quality Goals and Objectives, or if the water no longer meets its beneficial uses listed in a RWQCB Basin Plan. Typical mitigation measures for impacts include Water Supply Assessments that determine available groundwater for use by the project, Groundwater Monitoring and Reporting Plans designed to quantify groundwater flow and quality changes, and Mitigation Action Plans that identify required actions should water quality thresholds of significance be reached. These plans can require both site-specific and basin-specific hydrogeological investigations. Groundwater use can also be restricted or halted to minimize or prevent impacts (e.g., requiring best available technology to minimize water use, like the use of dry cooling technology), and treatment or compensation provided to existing well owners to mitigate for water quality impacts on their wells and water supply. These measures would reduce the impact to less than significant levels. Participating agencies will require these measures as appropriate during their subsequent review of specific projects.

GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies. Saline water injected for steam generation creates a risk should the injection well casing corrode, potentially leading to a leak that injects brine into a relatively shallow water-supply aquifer. Existing regulations (e.g., Underground Injection Control [UIC] permits) reduce impacts and prevent contamination and adverse impacts on groundwater from wastewater injection. Typical mitigation measures for impacts include Groundwater Monitoring Plans designed to quantify groundwater flow and quality changes, and Mitigation Action Plans that identify required actions should water quality thresholds of significance be reached. These plans can require both site-specific and basin-specific hydrogeological investigations, and when implemented the measures reduce impacts to less than significant. Participating agencies will require these measures as appropriate during their subsequent reviews of specific projects.

GW-6: Chemical spills or brine disposal could contaminate groundwater. Projects can produce or use fluids that would contaminate groundwater if they leaked into an aquifer. Any groundwater contamination is considered significant if it causes the groundwater to exceed RWQCB Water Quality Goals and Objectives or the water no longer meets its beneficial uses listed in a RWQCB Basin Plan. However, regulations specify design criteria for secondary containment structures around fuel and solvent storage sites and lining of brine ponds, and best management practices (BMPs) prevent releases and impacts. These, and required remediation in the event of a spill, would mitigate contamination and reduce the impact to less than significant. Participating agencies will require these measures as appropriate during the permitting process.

IV.6.3.2 Preferred Alternative

IV.6.3.2.1 Plan-wide Impacts of Implementing the DRECP: Preferred Alternative

The Preferred Alternative balances biological and nonbiological (on BLM lands) resource conflicts and renewable energy goals. The DFA component of the Preferred Alternative represents the areas within which renewable energy and transmission Covered Activities are permitted under the DRECP. The DFAs provide moderate development flexibility, have moderate resource conflicts (biological and nonbiological [on BLM lands]), and are aligned with existing and planned transmission networks. Transmission development may also occur outside the DFAs. The estimated renewable energy development pattern emphasizes the following:

- Solar development throughout the Plan Area, but emphasized in the Cadiz Valley and Chocolate Mountains and West Mojave and Eastern Slopes ecoregion subareas.

- Wind development distributed mostly in the West Mojave and Eastern Slopes and Pinto Lucerne Valley and Eastern Slopes ecoregion subareas.
- Geothermal development in the Imperial Borrego Valley and Owen's River Valley ecoregion subareas.

IV.6.3.2.1.1 Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development

Impact Assessment

Potential renewable energy development within Plan Area groundwater basins under the Preferred Alternative is shown in Table R2.6-5 (Appendix R2). Development would occur in 35 groundwater basins, and the total developed area is summarized by ecoregion subarea in Table IV.6-2 (solar only, geothermal only, and total renewable energy development for all technologies, including transmission). Most (97%) of the developed area is within four ecoregion subareas (Cadiz Valley and Chocolate Mountains, Imperial Borrego Valley, Pinto Lucerne Valley and Eastern Slopes, and West Mojave and Eastern Slopes). Geothermal projects would be in the Imperial Borrego Valley and Owens River Valley ecoregion subareas (94% of geothermal development is in the Imperial Borrego Valley ecoregion sub-area). Two ecoregion subareas (Panamint Death Valley and Piute Valley and Sacramento Mountains) have no new development under the Preferred Alternative.

Table IV.6-2 reports the estimated total new water use by solar and geothermal projects within each ecoregion subarea for the Preferred Alternative. Total water use was calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods," and results in Table IV.6-2 indicate an estimated total use of 91,000 AFY, and ranges from a minimum of 50 AFY (Providence and Bullion Mountains ecoregion subarea) to 82,000 AFY (Imperial Borrego Valley ecoregion subarea). Ninety-percent of the estimated water use under the Preferred Alternative is in the Imperial Borrego Valley ecoregion subarea because of 16,000 acres of geothermal projects and 38,000 acres of solar projects. Wet cooled geothermal projects account for almost 87,000 AFY of the total water use under the Preferred Alternative.

Under the Preferred Alternative, renewable energy development can be located in a number of groundwater basins identified in overdraft, or as stressed. Figure IV.6-1 maps the distribution of estimated water use by DFA and groundwater basins in overdraft, and Figure IV.6-2 maps the water use by DFA and groundwater basins in overdraft or stressed condition. Under the Preferred Alternative, development could occur in 14 overdraft and stressed groundwater basins, and the increased groundwater use in these sensitive basins can adversely affect water supplies and exacerbate impacts associated with overdraft conditions and declining groundwater levels.

Some of the developed basins under the Preferred Alternative can be hydraulically connected to areas located outside the Plan Area; a discussion of these potential impacts outside the Plan Area is provided in Section IV.6.3.2.5, Impacts Outside the Plan Area for the Preferred Alternative.

Table IV.6-2
Renewable Energy Development Area and Estimated Water Use – Preferred Alternative

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	*Geothermal*	*Total*[3]		
Cadiz Valley and Chocolate Mountains	25,000	0	94,000	5,000	1,000
Imperial Borrego Valley	38,000	16,000	72,000	7,000	82,000
Kingston and Funeral Mountains	3,000	0	3,000	400	100
Mojave and Silurian Valley	3,000	0	4,000	400	100
Owens River Valley	500	900	2,000	300	6,000
Panamint Death Valley	0	0	0	0	0
Pinto Lucerne Valley and Eastern Slopes	7,000	0	46,000	2,000	300
Piute Valley and Sacramento Mountains	0	0	0	0	0
Providence and Bullion Mountains	1,000	0	1,000	200	50
West Mojave and Eastern Slopes	32,000	0	88,000	5,000	1,000
Total	**110,000**	**16,000**	**310,000**	**20,000**	**91,000**

1 Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).

2 Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.

3 Total development area is the sum of solar, geothermal, wind, and transmission project areas.

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Impacts on groundwater resulting from renewable energy development under the Preferred Alternative follow.

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Impacts on groundwater recharge resulting from land disturbance under the Preferred Alternative would be similar to those shown in Section IV.6.3.1.1.1. The Preferred Alternative potentially affects recharge on 310,000 acres.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

Impacts on groundwater levels would be similar to those shown in Section IV.6.3.1.1.1. The greatest potential water use is within the Imperial Borrego Valley (82,000 AFY) and Owens River Valley (6,000 AFY), mostly for geothermal technology (16,000 acres) and solar technology (38,000 acres). The majority of the remaining water use for the Preferred Alternative is for solar technology located in the Cadiz Valley and Chocolate Mountains, and West Mojave and Eastern Slopes ecoregion subareas. A substantial number of basins within these ecoregion subareas are either in overdraft or characterized as stressed (Figure IV.6-2), and groundwater use for proposed renewable energy projects will likely exacerbate depletion of the water supply and the magnitude and scope of adverse impacts.

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

Land subsidence would cause impacts similar to those shown in Section IV.6.3.1.1.1. As shown in Table IV.6-2, renewable energy water use under the Preferred Alternative can be as great as 91,000 AFY, with most of the water use attributed to geothermal and solar development in the Imperial Borrego Valley (82,000 AFY) and Owens River Valley (6,000 AFY).

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

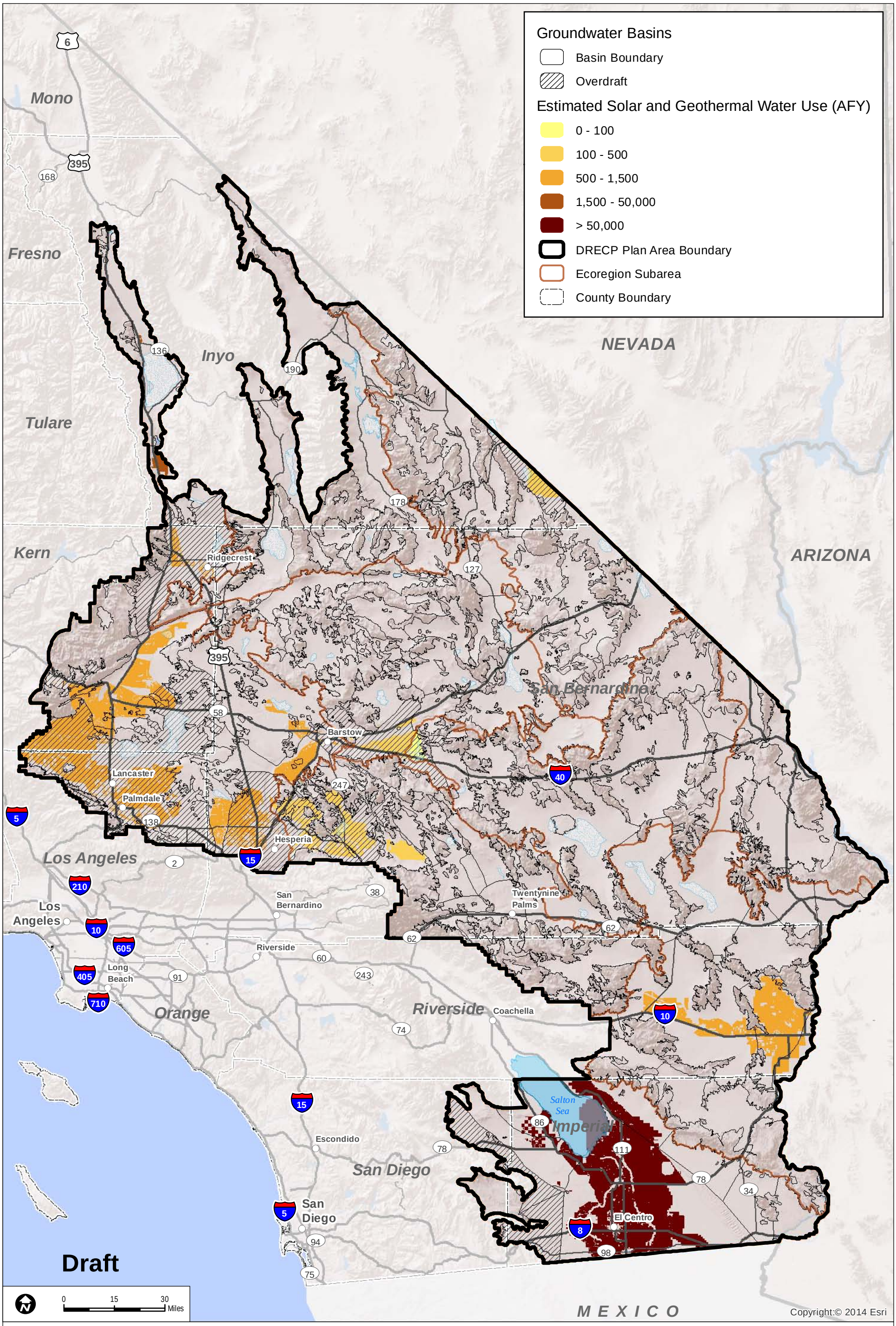
Impacts from the potential migration of poor-quality groundwater would be similar to those shown in Section IV.6.3.1.1.1. The large amount of renewable energy development could affect groundwater quality.

Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies.

The potential for impacts from injection of saline water from geothermal resource water would be as described in Section IV.6.3.1.1.1. Geothermal development increases the potential for contamination, particularly in the Imperial Borrego Valley ecoregion subarea where most of the geothermal development would be built.

Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Groundwater contamination from chemical spills or brine disposal would be as described in Section VI.6.3.1.1.1.

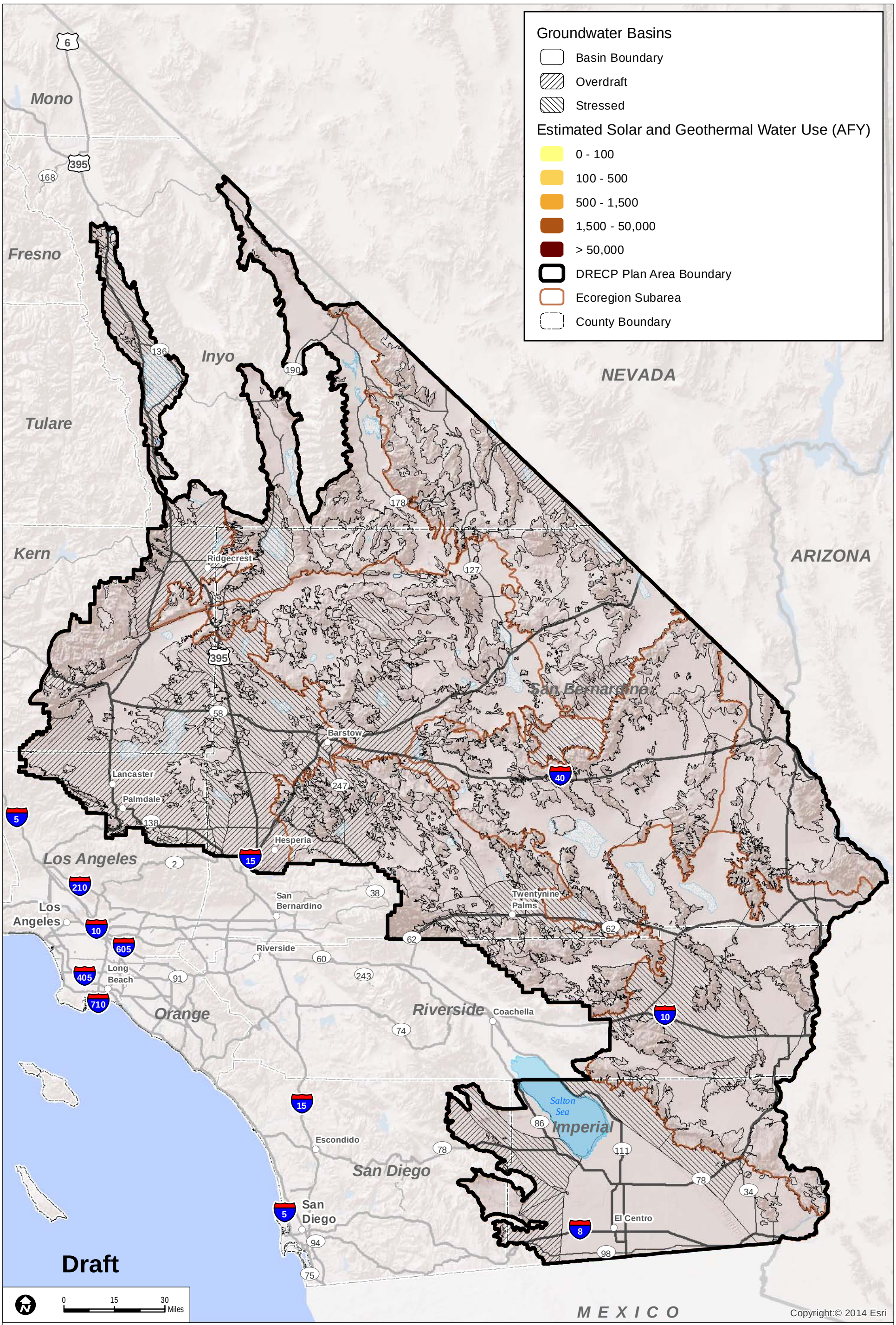


Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-1

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft Groundwater Basins - Preferred Alternative

INTENTIONALLY LEFT BLANK



Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-2

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft and Stressed Groundwater Basins - Preferred Alternative

INTENTIONALLY LEFT BLANK

Impacts in Study Area Lands

Study Area Lands refer to three categories of lands shown on alternative maps: Future Assessment Areas (FAAs), Special Analysis Areas (SAAs) and DRECP Variance Lands.

Future Assessment Areas. Lands within FAAs are neither reserve lands nor DFAs; they are simply areas that are deferred for future assessment. The future assessment will determine their suitability for renewable energy development or for ecological conservation. If renewable energy development occurs on FAA lands, a Land Use Plan Amendment would not be required. FAAs for each alternative are included and located as shown in Table IV.1-2 and Figure II.3-1 in Volume II. The FAAs represent areas where renewable energy development or inclusion to the reserve design could be implemented through an amendment to the DRECP but additional assessment would be needed.

Although some of the FAAs in the Preferred Alternative are in basins experiencing overdraft or stress, development of these FAAs would not likely affect groundwater resources given that additional assessment would be required and measures to reduce impacts would be implemented.

Special Analysis Areas. There are two areas defined as SAAs, representing areas subject to ongoing analysis. These areas (located in the Silurian Valley and just west of Highway 395 in Kern County) have high value for renewable energy development, and also high value for ecological and cultural conservation, and recreation. SAA lands are expected to be designated in the Final EIR/EIS as either DFAs or included in the Reserve Design/Conservation Designation.

DRECP Variance Lands. DRECP Variance Lands represent the BLM Solar PEIS Variance Lands as screened for the DRECP and EIR/EIS based on BLM screening criteria. Covered Activities could be permitted for NCCP purposes only through an NCCP plan amendment. However, development of renewable energy on variance lands would not require a BLM Land Use Plan Amendment so the environmental review process would be somewhat simpler than if the location were left undesignated. Although some DRECP Variance Lands in the Preferred Alternative are in overdraft or stressed basins, development would not likely affect groundwater resources given the overall limited acreage (13,000 acres) and implementation of measures to reduce impacts.

Impact Reduction Strategies and Mitigation

The implementation of the Plan would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Plan would be lessened in several ways. First, the Plan incorporates CMAs for each alternative, including

specific biological reserve design components and LUPA components. These CMAs ensure that no project is approved unless it is shown that the water supply is adequate to support development without causing an adverse impact. In addition, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development. If significant impacts still occur after implementation of CMAs and compliance with applicable laws and regulations, then specific mitigation measures are recommended in this section.

Conservation and Management Actions

The conservation strategy for the Preferred Alternative (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes a definition of the reserve design and specific Conservation and Management Actions (CMAs) for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would be applied also to nonfederal lands.

The CMAs require a Water Supply Assessment for all projects. The purpose of the Water Supply Assessment is to determine whether project groundwater use causes water supply or environmental impacts on the groundwater basins where the development occurs. The assessment evaluates existing extractions, water rights, and water management plans, and requires site- and basin-specific hydrogeological information.

The CMAs require Water Monitoring and Reporting Plans, and Mitigation Action Plans. These plans identify project-related impacts on water quantity and quality affecting other approved domestic or industrial groundwater uses and the environmental requirements for groundwater (e.g., surface water bodies, surface outflow, and riparian or phreatic vegetation), including the period of aquifer recovery after project decommissioning. The plans also detail mitigation measures required because of project-related impacts on groundwater. These measures can include changing pumping rates and the volume or timing of withdrawals, coordinating and scheduling groundwater pumping activities in conjunction with other users in the basin, ceasing pumping and acquiring project water from outside the basin, and replenishing groundwater resources over a reasonably short time frame.

The CMAs are presented below in their entirety:

For any project that proposes to utilize groundwater resources, the following stipulated CMAs shall apply, regardless of project location:

- A project's groundwater extraction shall not contribute to exceeding the estimated perennial yield for the basin in which the extraction is taking place. Perennial yield

is that quantity of groundwater that can be withdrawn from the groundwater basin without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity. It is further clarified arithmetically below.

- Water extracted or consumptively used for the construction, operation, maintenance, or remediation of the project shall be solely for the beneficial use of the project or its associated mitigation and remediation measures, as specified in approved plans and permits.
- If possible, all unavoidable impacts on surface waters shall be mitigated to ensure no net loss of function and value, as determined by the Coordination Group, as the result of project implementation.
- Consideration shall be given to design alternatives that maintain the existing hydrology of the site or redirect excess flows created by hardscapes and reduced permeability from surface waters to areas where they will dissipate by percolation into the landscape.
- All hydrologic alterations shall be avoided that could reduce water quality for all applicable beneficial uses associated with the hydrologic unit in the project area, or specific mitigation measures shall be implemented that will minimize unavoidable water quality impacts, as determined by the Coordination Group. These beneficial uses may include municipal, domestic, or agricultural water supply; groundwater recharge; surface water replenishment; recreation; water quality enhancement; flood peak attenuation or flood water storage; and wildlife habitat.
- A Water (Groundwater) Supply Assessment shall be prepared prior to project certification or authorization. This assessment must be approved by the Coordination Group prior to the development, extraction, injection, or consumptive use of any water resource. The purpose of the Water Supply Assessment is to determine whether over-use or over-draft conditions exist within the project basin(s), and whether the project creates or exacerbates these conditions. The Assessment shall include an evaluation of existing extractions, water rights, and management plans for the water supply in the basin(s) (i.e., cumulative impacts), and whether these cumulative impacts (including the proposed project) can maintain existing land uses as well as existing aquatic, riparian, and other water-dependent resources within the basin(s). This assessment shall identify:
    - All relevant groundwater basins or sub-basins and their relationships.
    - All known aquifers in the basin(s), including their dimensions, whether confined or unconfined, estimated hydraulic conductivity and transmissivity, groundwater surface elevations, and direction and movement of groundwater.

- All surface water basin(s) related to water runoff, delivery, and supply, if different from the groundwater basin(s).
- All sites of surface outflow (springs or seeps) contained within the basin(s), including historic sites.
- All other surface water bodies in the basins(s), including rivers, streams, ephemeral washes/drainages, lakes, wetlands, playas, and floodplains.
- The water requirements of the proposed project and the source(s) of that water.
- An analysis demonstrating that water of sufficient quantity and quality is available from identified source(s) for the life of the project.
- An analysis of potential project-related impacts on water quality and quantity needed for beneficial uses, reserved water rights, or habitat management within or down gradient of the groundwater basin within which the project would be constructed.

The primary product of the Water Supply Assessment shall be a baseline water budget, which shall be established based on the best-available data and hydrologic methods for the identified basin(s). This water budget shall classify and describe all water inflow and outflow to the identified basin(s) or system using best-available science and the following basic hydrologic formula or a derivation:

$$P - R - E - T - G = \Delta S$$

where P is precipitation <u>and all other water inflow or return flow</u>, R is surface runoff or outflow, E is evaporation, T is transpiration, G is groundwater outflow (including consumptive component of existing pumping), and ΔS is the change in storage. The volumes in this calculation shall be in units of either acre-feet per year or gallons per year. The water budget shall quantify the existing perennial yield of the basin(s). Perennial yield is defined arithmetically as that amount such that

$$P - R - E - T - G \geq 0$$

Water use by groundwater-dependent resources is implicitly included in the definition of perennial yield. For example, in many basins the transpiration component (T) includes water use by groundwater-dependent vegetation. Similarly, groundwater outflow (G) includes discharge to streams, springs, seeps, and wetlands. If one or more budget components is altered, then one or more of the remaining components must change for the hydrologic balance to be maintained. For example, an increase in the consumptive component of groundwater pumping can lower the water table and reduce transpiration by

groundwater-dependent vegetation. The groundwater that had been utilized by the groundwater-dependent vegetation would then be considered "captured" by groundwater pumping. Similarly, increased groundwater consumption can capture groundwater that discharges to streams, springs, seeps, wetlands and playas. These changes can occur slowly over time, and may require years or decades before the budget components are fully adjusted. Accordingly, the water/groundwater supply assessment requires that the best-available data and hydrologic methods be employed to quantify these budgets, and that groundwater consumption effects on groundwater-dependent ecosystems be identified and addressed.

The water/groundwater supply assessment shall also address:

- Estimates of the total cone of depression considering cumulative drawdown from all potential pumping in the basin(s), including the project, for the life of the project through the decommissioning phase.
- Potential to cause subsidence and loss of aquifer storage capacity due to groundwater pumping.
- Potential to cause injury to other water rights, water uses, and land owners.
- Changes in water quality and quantity that affect other beneficial uses.
- Effects on groundwater dependent vegetation and groundwater discharge to surface water resources such as streams, springs, seeps, wetlands, and playas that could impact biological resources, habitat, or are culturally important to Native Americans.
- Additional field work that may be required, such as an aquifer test, to evaluate site specific project pumping impacts and if necessary, establish trigger points that can be used for a Groundwater Water Monitoring, Management, and Mitigation Plans.
- The mitigation measures required, if there are significant or potentially significant impacts on water resources, that include but are not limited to, the use of specific technologies, management practices, retirement of active water rights, development of a recycled water supply, or water imports.

- Groundwater Monitoring and Reporting Plans, and Mitigation Action Plans shall be prepared to verify the Water Supply Assessment and adaptively manage water use as part of project operations. This plan shall be approved by the Coordination Group prior to the development, extraction, injection, or consumptive use of any water resource. The quality and quantity of all surface water and groundwater used for the project shall be monitored using this plan. Groundwater monitoring includes

measuring the effects of groundwater extraction on groundwater surface elevations, groundwater flow paths, changes to groundwater-dependent vegetation, and of aquifer recovery after project decommissioning. Surface water monitoring, if applicable, shall monitor changes in the flows, water volumes, channel characteristics, and water quality. Monitoring frequency and geographic scope shall be decided on a site-specific basis and in coordination with the appropriate agencies that manage the water resources of the region. The geographic scope will include at the very least, all basins/sub-basins that potentially receive inflow from the basin where the proposed project may be sited, and all basins/sub-basins that may potentially contribute inflow to the basin where the proposed project is located. The plan shall also detail any mitigation measures that may be required as a result of the project. This plan and all monitoring results shall be made available to the Coordination Group.

- Where groundwater extraction has potential to exceed the basin's perennial yield or has the potential to impact water resources, one or more "trigger points", or specified groundwater elevations in specific wells, shall be established by the Authorizing Officer, where additional mitigation measures would be imposed if the groundwater elevation at the designated monitoring wells falls below the trigger point(s)(or exceeds the trigger).
- Groundwater pumping mitigation shall be imposed if groundwater monitoring data indicate impacts on water-dependent resources that exceed those anticipated and otherwise mitigated for in the NEPA analysis and Record of Decision, even if the basin's perennial yield is not exceeded. Water-dependent resources include riparian or phreatophytic vegetation, springs, seeps, streams, and other approved domestic or industrial uses of groundwater. Mitigation measures may include changes to pumping rates, volume, or timing of water withdrawals; coordinating and scheduling groundwater pumping activities in conjunction with other users in the basin; acquisition of project water from outside the basin; and/or replenishing the groundwater resource over a reasonably short timeframe.
- Water-conservation measures shall be required in basins where current groundwater demand is high and has the future potential to rise above the estimated perennial yield (e.g., Pahrump Valley). These measures may include the use of specific technology, management practices, or both. A detailed discussion and analysis of the effectiveness of mitigation measures must be included. Application of these measures shall be detailed in the Groundwater Monitoring and Reporting Plan, and the Mitigation Action Plan.

- Groundwater extractions from adjudicated basins, such as the Mojave River Basin, may be subject to additional restrictions imposed by the designated authority; examples include the Mojave Water Agency and San Bernardino County (see County Ordinance 3872). Where provisions of the adjudication allow for acquisition of water rights, project developers could be required to retire water rights at least equal in volume to those necessary for project operation or propose an alternative offset based on the conditions unique to the adjudicated basin.
- Projects shall comply with local requirements for any permanent or temporary domestic water use and wastewater treatment.
- The siting, construction, operation, maintenance, remediation, and abandonment of all wells shall conform to specifications contained in the California Department of Water Resources Bulletins #74-81 and #74-90 and their updates.
- The Colorado River Accounting Surface Method, as defined in USGS SIR 2008-5113 and updates, and ordered in the Consolidated Decree by the United States Supreme Court in Arizona v. California, 547 U.S. 150 (2006), shall be the accepted method of determining whether project-related pumping denies the Colorado River of water which it would otherwise receive from its tributary basins. If project-related groundwater drawdown below the Accounting Surface is expected in a basin whose groundwater is tributary to the Colorado River, and all or a portion of that project is on BLM-managed land, that consumption shall be considered subject to the Law of the River (Colorado River Compact of 1922 and amendments). In such cases, BLM shall require the applicant to offset or otherwise mitigate the volume of water causing drawdown below the accounting surface. Details of such mitigation measures and the right to the use of water shall be described in the Water Monitoring, Management, and Mitigation Plan.

Soil, Water, and Water-Dependent Resources CMAs Restricted to Specific Areas on BLM Lands

- **Stipulations for groundwater development in the proximity of Devils Hole**: Any development scenario within 25 miles of Devils Hole shall include a plan to achieve *zero-net* or *net-reduced* groundwater pumping to reduce the risk of adversely affecting senior federal reserved water rights, the designated critical habitat of the endangered Devils Hole pupfish, and the free-flowing requirements of the Wild and Scenic Amargosa River. This plan will require operators to acquire one or more minimization water rights (MWRs) in the over-appropriated, over-pumped, and hydraulically-connected Amargosa Desert Hydrographic Basin in Nevada. The MWR(s) shall be: 1) an amount equal (at minimum) to that which is needed for construction and operations; 2) historically fully-utilized, preferably for agricultural

use; and 3) senior, or closer to Devils Hole than the proposed point of diversion. The MWR(s) shall be retained by the operator for at least five years, during which stakeholders will have the opportunity to demonstrate that development of the MWR(s) will not lead to water level declines in Devils Hole. If a consensus between DOI agencies and these stakeholders is not reached within five years, the MWR(s) shall be cancelled by the operator.

- **Stipulations for groundwater development in the Calvada Springs/South Pahrump Valley DFA:** Developers in this DFA shall be required to acquire one or more MWRs in the Pahrump Valley Hydrographic Basin in Nevada. The acquired MWR(s) must: 1) be at least equal to the amount proposed to be required and actually used for project construction and operations; and 2) be fully-utilized for at least the prior ten years.
- **Stipulations for development in the vicinity of Death Valley National Park, Joshua Tree National Park, or Mojave National Preserve:** Project proponents shall analyze and address any potential impacts which their projects may have on Death Valley National Park, Joshua Tree National Park, or Mojave National Preserve. BLM will consult with the National Park Service on this process. The analysis or analyses shall include:
    - Potential impacts on the water balances of groundwater basins within these parks and preserves.
    - A map identifying all potentially impacted surface water resources in the vicinity of the project, including a narrative discussion of the delineation methods used to discern those surface waters in the field.
    - Any project-related modifications to surface water resources, both temporary and permanent.
    - Analysis of any potential impacts on perennial streams, intermittent streams, and ephemeral drainages that could negatively impact natural riparian buffers.
    - Impacts of any project proposed truncation, realignment, channelization, lining, or filling of surface water resources that could change drainage patterns, reduce available riparian habitat, decrease water storage capacity, or increase water flow velocity or sediment deposition, in particular where stormwater diverted around or through the project site is returned to natural drainage systems downslope of the project.
    - Any potential indirect project-related causes of hydrologic changes that could exacerbate flooding, erosion, scouring, or sedimentation in stream channels.
    - Alternatives and mitigation measures proposed to reduce or eliminate such impacts.

- **Exceptions:** No exceptions will be granted.
- **Modifications:** No modifications will be granted.
- **Waivers:** No waivers will be granted.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.6.3.1.1.1. No further mitigation measures are needed for Impact GW-5 (Injection of water for geothermal steam generation could contaminate potable water supplies) and Impact GW-6 (Chemical spills or brine disposal could contaminate groundwater) if BMPs are implemented.

Mitigation Measures

Most adverse impacts of the DRECP will be minimized by implementation of the CMAs and existing laws and regulations. Further mitigation is required to reduce the following remaining impacts.

Mitigation Measures for Impact GW-1: Construction of Plan components could alter groundwater recharge.

GW-1a **Improve Groundwater Recharge**. The developer shall install pervious groundcover and direct drainage from impervious surfaces to a common pervious drainage basin that maximizes groundwater basin recharge.

Mitigation Measures for Impact GW-2: Groundwater pumping lowers groundwater levels, depletes basin water supplies, and affects groundwater discharge.

GW-2a **Minimize Water Use**. The best available technology (currently dry cooling for solar thermal) shall be employed to minimize water use.

GW-2b **Develop Mitigation Action Plan for Drawdown**. The Mitigation Action Plan shall specify actions if drawdown thresholds are reached in water supply wells, monitoring wells, or wetlands, surface waters, and groundwater-dependent vegetation areas. Actions for impacts on wells include compensation for increased power costs, well modifications and repair, well replacement, and actions to protect wetlands, surface waters and vegetation. These can also include pumping reduction or cessation, and providing an alternative water supply.

Mitigation Measures for Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

If basin and site-specific studies confirm subsidence has occurred, or can potentially occur as a result of development, then the following measures are needed.

GW-3a **Design and implement a Subsidence Monitoring and Reporting Plan**. Provide detailed methodology to establish pre-project land-surface elevations and measure changes that could occur resulting from project construction and operations.

GW-3b **Develop Mitigation Action Plan for Subsidence**. This plan shall identify actions to be taken by the developer if subsidence thresholds are reached. These actions can include restrictions on, or cessation of, project groundwater use and compensation to landowners for impacts resulting from land surface elevation changes; prompt detection and mitigation will limit the permanent loss of storage capacity to a small fraction of the total capacity.

Mitigation Measures for Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

If basin and site-specific studies confirm that water quality impacts can occur, then the following measure is needed.

GW-4a **Develop Mitigation Action Plan to Protect Groundwater Quality**. The developer shall identify actions to be taken if water quality thresholds are reached that include restrictions on project water use and compensation to adjacent landowners for impacts resulting from water quality changes.

Mitigation Measures for Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies. These activities are closely reviewed and monitored by the California Division of Oil and Gas and Geothermal Resources; if projects implement BMPs, no mitigation is needed.

Mitigation Measures for Impact GW-6: Chemical spills or brine disposal could contaminate groundwater. If projects implement BMPs, the risk of groundwater contamination is minimized and no mitigation is needed.

IV.6.3.2.1.2 Impacts of the Reserve Design

The estimated acres of groundwater basins in Reserve Design Lands are summarized in Table R2.6-7 (Appendix R2). Reserve Design Lands include existing protected areas

(LLPAs) and MEMLs), plus the Preferred Alternative existing and proposed BLM conservation lands (NLCS, ACECs, and wildlife allocations), and Preferred Alternative Conservation Planning Areas[2]. No renewable energy development is allowed in over 8.3 million acres of these protected areas, nor is the use of or access to underlying groundwater resources. These areas include more than 3 million acres within 34 groundwater basins identified as either in overdraft or stressed. No adverse impacts are expected to groundwater resources in these basins because of the reserve design, and restricting renewable energy development from these areas would protect and preserve groundwater conditions.

IV.6.3.2.2 Impacts of DRECP Land Use Plan Amendment on BLM Land: Preferred Alternative

This section addresses two components of effects of the BLM LUPA: the development of renewable energy and transmission on BLM land under the LUPA and the impacts of the amended land use plans themselves.

IV.6.3.2.2.1 Impacts from Renewable Energy and Transmission Development on BLM Land

Under the DRECP LUPA, renewable energy development on BLM lands in DFAs would be streamlined with a new framework. The types of impacts would be similar to those shown in Section IV.6.3.2.1 for Plan-wide impacts. The potential acres of groundwater basin impacts on BLM lands by technology type are shown in Table R2.6-8 (Appendix R2). 115,000 acres within 28 basins are assumed to be available for solar, wind, geothermal, and transmission development. Land disturbances caused by renewable energy development can impact groundwater recharge. A smaller proportion of the developed area (6%) is for geothermal development, which is distributed between 5 groundwater basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, Rose Valley, and West Salton Sea).

Renewable energy technologies can utilize large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete water supplies, decrease groundwater discharge, and degrade groundwater quality. Under the Preferred Alternative, development in BLM lands can affect groundwater in 12 basins characterized as either in overdraft or stressed.

[2] Note that Conservation Planning Areas identified on private lands are not mandatory and would only be implemented if there are willing sellers.

IV.6.3.2.2.2 Impacts of Changes to BLM Land Designations

The DRECP LUPA alternative designates new NLCS lands, new ACECs and wildlife allocations. It also expands and reduces existing ACECs, designates new SRMAs and expands and reduces existing SRMAs, and creates buffer corridors along National Scenic and Historic Trails. The BLM LUPA also replaces the multiple-use classes (MUCs) and establishes Visual Resource Management (VRM) classes in the CDCA. More than 5.6 million acres are assumed allocated in the BLM LUPA land designation under the Preferred Alternative. Because the BLM LUPA land designations protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. Groundwater-related CMAs are the same for all action alternatives.

IV.6.3.2.3 Impacts of Natural Community Conservation Plan: Preferred Alternative

The impacts of the NCCP for the Preferred Alternative would be the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis.

IV.6.3.2.4 Impacts of General Conservation Plan

The impacts of the GCP for the Preferred Alternative would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, but they would occur on nonfederal lands only. The potential acres of groundwater basin impacts on GCP lands, by technology type, are summarized under the Preferred Alternative in Table R2.6-9 (Appendix R2); 195,000 acres within 29 groundwater basins could be developed for solar, wind, geothermal, and transmission projects. This represents about two-thirds of the renewable energy development acreage in the Plan Area. Land disturbances caused by renewable energy development can impact groundwater recharge. A small proportion of the area (10,000 acres, or 5%) is for geothermal development, which is distributed between four groundwater basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, and West Salton Sea).

Renewable energy technologies can utilize large amounts of water and impact groundwater resources; groundwater use can also lower groundwater levels, deplete water supplies, reduce groundwater discharge, and degrade groundwater quality. Under the Preferred Alternative, development in GCP lands can affect groundwater in 14 basins characterized as either in overdraft or stressed.

The estimated acres of groundwater basins in GCP Reserve Design Lands under the Preferred Alternative are summarized in Table R2.6-10 (Appendix R2); more than 560,000 acres are contained in GCP Reserve Design Lands in 82 groundwater basins. Because the

GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited in these basin areas.

IV.6.3.2.5 Impacts Outside the Plan Area for the Preferred Alternative

Under the Preferred Alternative, there would be renewable energy development in basins hydraulically connected to adjacent areas located outside the Plan Area (See Figure IV.6-1 for the locations and distribution of development areas). Renewable energy projects are planned in groundwater basins connected to areas within the State of Nevada (the Pahrump Valley basin, located in the Kingston and Funeral Mountains ecoregion subarea), Mexico (the Imperial Valley basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (the Palo Verde Valley and Palo Verde Mesa basins located in the Cadiz Valley and Chocolate Mountain ecoregion subarea). As a result, groundwater level and water supply changes can extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.2.5.1 Impacts of Transmission Outside the Plan Area

The impacts of transmission outside the Plan Area on groundwater, water supply, and water quality would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.6.3.1.5, Impacts of Transmission Outside the Plan Area in No Action Alternative.

IV.6.3.2.5.2 Impacts of BLM LUPA Decisions Outside the Plan Area

Under the proposed BLM LUPA, the only changes outside the Plan Area would be to NLCS lands, ACECs, National Scenic and Historic Trails management corridors, VRM Classes, and to new land allocations to replace MUCs on CDCA lands. The estimated acreage of groundwater basins in BLM LUPA lands located outside the Plan Area under the Preferred Alternative is summarized in Table R2.6-11 (Appendix R2). Because the BLM LUPA land designations outside the Plan Area protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.2.6 CEQA Significance Determination for the Preferred Alternative

GW-1: Construction of Plan components could alter groundwater recharge. Construction of renewable energy technologies can alter recharge when construction grades the land surface, removes vegetation, covers land surface with impervious surfaces (e.g., photovoltaic (PV) panels, mirrors, and graded surfaces), and potentially alters the conveyance and control of runoff and floods. Mitigation Measure GW-1a would reduce the

impact to a less than significant level by installing pervious groundwater cover to improve percolation and directing drainage in basins to maximize groundwater recharge. These measures can increase recharge.

GW-2: Groundwater pumping lowers groundwater levels, depletes water supplies, and affects groundwater discharge. Groundwater use by renewable energy projects would cause drawdown of groundwater levels, negatively impacting water resources. If not for CMAs and Mitigation Measure GW-2a, the adverse impacts would be significant for all technologies. Specifically, CMAs ensure that no project is approved unless it is shown that the water supply is adequate for development without causing an adverse impact. Solar water use impacts would be reduced to less than significant by Mitigation Measure GW-2a (Minimize Water Use) that requires the best available technology be utilized to minimize water use, and Mitigation Measure GW-2b (Mitigation Action Plan for drawdown) that quantifies and monitors groundwater level changes and their impacts and takes corrective actions. These actions can include reducing or halting groundwater extractions and providing compensation to well owners and water users. Geothermal water use impacts would remain significant because of current limitations to the use of dry cooling.

GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity. When fluid pressures decline, certain types of saturated units can dewater and compress, which can in turn lower land surface elevations. Mitigation Measures GW-3a (Subsidence Monitoring and Reporting Plan) and GW-3b (Mitigation Action Plan for Subsidence) would reduce impacts to less than significant levels by requiring both site-specific and basin-specific investigations, prompt identification when subsidence occurs, restricting or eliminating fluid withdrawals, and providing compensation to landowners. Although compressed clay beds represent a permanent loss in storage capacity, prompt detection and mitigation would ensure that permanent storage capacity loss is only a small fraction of the total capacity of the aquifer, and therefore less than significant.

GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate. Some basins have localized areas of highly saline groundwater, particularly in basins where groundwater discharge creates playas. Water-level declines in these basins can reverse the existing groundwater gradient and cause poor-quality groundwater near the playa to flow into surrounding parts of the basin and render groundwater unusable. Any groundwater contamination is significant if it causes the groundwater to exceed RWQCB Water Quality Goals and Objectives, or if the water no longer meets its beneficial uses listed in the RWQCB Basin Plan. Mitigation Measures GW-2a and GW-2b, and GW-4a (Mitigation Action Plans to Protect Water Quality) would reduce the impact to a less than significant level by minimizing water use, determining available groundwater for use, quantifying groundwater flow and quality changes, and

requiring corrective actions including pumping reductions, pumping cessation, or providing an alternative water supply.

GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies. Saline water injected for steam generation creates a risk if the injection well casing corrodes, potentially creating a leak that injects brine into a shallow water supply aquifer. Existing regulations (e.g., UICs) are designed to prevent contamination and adverse impacts on groundwater from wastewater injection, and CMAs would reduce impacts on a less than significant level without additional mitigation.

GW-6: Chemical spills or brine disposal could contaminate groundwater. Projects can produce or use fluids that would contaminate groundwater if they leaked into an aquifer. Any groundwater contamination is considered significant if it causes the groundwater to exceed RWQCB Water Quality Goals and Objectives or the water no longer meets its beneficial uses listed in the RWQCB Basin Plan. However, this impact would be less than significant without additional mitigation since regulations specify design criteria for secondary containment structures around fuel and solvent storage sites and lining of brine ponds, and require appropriate handling and disposal of hazardous materials.

IV.6.3.2.7 Comparison of the Preferred Alternative with No Action Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of the Preferred Alternative with the No Action Alternative.

IV.6.3.2.7.1 Preferred Alternative Compared With No Action Alternative for Plan-wide DRECP

Based on technology mix assumptions, the Preferred Alternative proposes to develop 14% more area than the No Action Alternative (310,000 acres versus 268,000 acres, respectively). The greater land disturbance associated with development increases the potential to alter groundwater recharge, and, with mitigation, the greater acreage for the Preferred Alternative may increase groundwater recharge relative to the No Action Alternative (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Under the Preferred Alternative, the potential for chemical spills and groundwater quality impacts is greater because the developed area is larger. However, existing regulations and CMAs (Preferred Alternative) reduce these potential impacts in both alternatives.

The Preferred Alternative proposes to develop 16 times more acreage for geothermal energy projects, increasing potential adverse impacts from water consumption, subsidence, and groundwater contamination. However, with existing regulations, implementation of

CMAs, and additional measures required for renewable energy projects, these impacts would be mitigated.

Renewable energy projects in the Preferred Alternative are estimated to use six times more water than under the No Action Alternative.

Geographic Distinctions

Unlike in the Preferred Alternative, in the No Action Alternative renewable energy development is assumed in the Providence and Bullion Mountains ecoregion subarea. Under existing conditions, more than 99% of the basin areas within this ecoregion subarea is undisturbed and has no existing renewable energy development.

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. The No Action Alternative assumes 37,000 acres of solar and geothermal development in 25 of the 37 overdraft or stressed basins in other portions of the Plan Area; the Preferred Alternative assumes 43,000 acres of development in only 14 of the same 37 basins (Figure IV.6-2). The Preferred Alternative therefore has more concentrated development in a fewer number of overdraft and stressed basins.

Under the Preferred Alternative, renewable energy projects could occur in groundwater basins connected to areas adjacent to the Plan Area. These areas are located in the State of Nevada (the Pahrump Valley basin located in the Kingston and Funeral Mountains ecoregion subarea), Mexico (the Imperial Valley basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (Palo Verde Valley, located in the Cadiz Valley and Chocolate Mountain ecoregion subarea). Groundwater level and water supply changes can therefore extend across these boundaries and impact areas outside the Plan Area and the Colorado River. For example, the Pahrump Valley is in overdraft (Figure IV.6-1) due to development in Nevada. Further, the hydraulic connection between groundwater in the alluvial basin and deep groundwater in the regional carbonate aquifer system (and their relative contributions to Amargosa River flows and spring flows) is not understood. Development within the Pahrump Valley must therefore consider these connections when identifying and quantifying potential impacts.

In comparison with the Preferred Alternative, the No Action Alternative could affect more areas located outside the Plan Area. For example, Table R2.6-1 shows that the No Action Alternative has more development in basin areas located adjacent to the State of Nevada (1,000 acres in the Mesquite Valley, 1,000 acres in Ivanpah Valley, and 5,000 acres in the Middle Amargosa Valley). Similar to the Pahrump Valley basin, groundwater in deep limestone formations beneath these areas can flow to springs along the east side of the

Death Valley Basin (e.g., the Greenwater Valley and Middle Amargosa Valley basins). Development under the Preferred Alternative therefore avoids these sensitive basins and provides an overall environmental benefit relative to the No Action Alternative.

IV.6.3.2.7.2 Preferred Alternative Compared With No Action Alternative for the BLM Land Use Plan Amendment

The Preferred Alternative proposes to develop 25% more BLM land than the No Action Alternative (115,000 acres versus 92,000 acres, respectively). The greater land disturbance associated with development under the Preferred Alternative increases the potential to alter groundwater recharge, and with mitigation, the greater disturbed acreage may increase groundwater recharge relative to the No Action Alternative (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). The Preferred Alternative has greater potential to impact groundwater quality from chemical spills due to the larger area; however, regulations and CMAs (Preferred Alternative) reduce potential impacts of groundwater contamination in both alternatives.

The Preferred Alternative proposes almost 7,000 acres more geothermal development than the No Action Alternative, resulting in substantially more water use. Geothermal development is located in the East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, and Rose Valley basins.

Geographic Distinctions

The geographic locations of the projects and their associated groundwater use are also important to consider. Development in BLM lands under the Preferred Alternative is within 28 groundwater basins, and 12 of these basins are in overdraft or stressed (Figure IV.6-2). In contrast, under the No Action Alternative development is in 56 basins, and 18 of them are in overdraft or stressed. The Preferred Alternative therefore concentrates more development in a fewer number of overdraft and stressed basins. The CMAs ensure that no project is approved unless it is shown the water supply is adequate to support development without causing an adverse impact

IV.6.3.2.7.3 Preferred Alternative Compared With No Action Alternative for NCCP

The impacts of the NCCP for the Preferred Alternative are the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis. As a result, the comparison of the Preferred Alternative with the No Action Alternative for the NCCP is the same as described for Plan-wide DRECP.

IV.6.3.2.7.4 Preferred Alternative Compared With No Action Alternative for the GCP

In the No Action Alternative, the GCP would not be approved and projects would be considered by the appropriate lead agency on an individual basis. The impacts that would occur in the absence of the GCP would be the same as those described in Section IV.6.3.1.1.1 (Plan-wide analysis), but would be specific to nonfederal lands.

The impacts of the GCP for the Preferred Alternative would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, and they would occur only on nonfederal lands. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy project water needs would likely be limited. The GCP areas in the Preferred Alternative therefore provide an environmental benefit relative to the No Action Alternative.

IV.6.3.3 Alternative 1

IV.6.3.3.1 Plan-wide Impacts of Implementing the DRECP: Alternative 1

Alternative 1 integrates renewable energy components, BLM LUPA components, and the conservation components of the DRECP Preferred Alternative. Alternative 1 includes geographically confined DFAs with a focus on private lands and solar and geothermal technologies. It also includes Reserve Design Lands. Transmission development and operation would be acceptable both inside and outside the DFAs. The estimated renewable energy development pattern emphasizes the following:

- Solar development in the Imperial Borrego Valley, Pinto Lucerne Valley and Eastern Slopes, and West Mojave and Eastern Slopes ecoregion subareas.
- Wind development in the West Mojave and Eastern Slopes, and Pinto Lucerne Valley and Eastern Slopes ecoregion subareas.
- Geothermal development in the Imperial Borrego Valley ecoregion subarea.

IV.6.3.3.1.1 Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development

Impact Assessment

Potential renewable energy development within Plan Area groundwater basins under Alternative 1 is shown in Table R2.6-12 (Appendix R2). Development would occur in 29 groundwater basins, and the total developed area is summarized by ecoregion subarea in Table IV.6-2 (solar only, geothermal only, and total renewable energy development for all

technologies including transmission). Most of the developed area (63%) is within two ecoregion subareas (Imperial Borrego Valley and West Mojave and Eastern Slopes), with another 28% in the Cadiz Valley and Chocolate Mountains and Pinto Lucerne Valley and Eastern Slopes ecoregion subareas. Geothermal projects are only in the Imperial Borrego Valley ecoregion subarea. Three ecoregion subareas (Kingston and Funeral Mountains, Panamint Death Valley, and Piute Valley and Sacramento Mountains) have no planned development under Alternative 1.

Table IV.6-3 shows the estimated projection of total water use by solar and geothermal projects within each ecoregion subarea. Total water use was calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods," and results in Table IV.6-3 indicate an estimated total use of 91,000 AFY, and ranges from 100 AFY (Providence and Bullion Mountains and West Mojave and Eastern Slopes ecoregion subareas) to 88,000 AFY (Imperial Borrego Valley ecoregion subarea). Wet cooled geothermal projects account for almost 87,000 AFY of the total water use under Alternative 1. Ninety-seven percent of the water use under Alternative 1 is in the Imperial Borrego Valley ecoregion subarea's 16,000 acres of geothermal projects and 42,000 acres of solar projects.

Under Alternative 1, renewable energy development can be built in a number of overdraft or stressed groundwater basins. Figure IV.6-3 maps the distribution of estimated water use by DFA and overdraft groundwater basins, and Figure IV.6-4 maps the water use by DFA and overdraft and stressed groundwater basins. Development occurs in 14 overdraft and stressed groundwater basins, and the increased groundwater use in these sensitive basins can adversely affect water supplies and exacerbate impacts associated with overdraft conditions and declining groundwater levels.

Table IV.6-3
Renewable Energy Development Area and Estimated Water Use – Alternative 1

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[1]
	Solar	*Geothermal*	*Total*[2]		
Cadiz Valley and Chocolate Mountains	22,000	0	33,000	3,000	1,000
Imperial Borrego Valley	42,000	16,000	72,000	9,000	88,000
Kingston and Funeral Mountains	0	0	0	0	0
Mojave and Silurian Valley	5,000	0	7,000	700	500
Owens River Valley	6,000	0	8,000	800	300
Panamint Death Valley	0	0	0	0	0
Pinto Lucerne Valley and Eastern Slopes	11,000	0	25,000	2,000	500
Piute Valley and Sacramento Mountains	0	0	0	0	0

Table IV.6-3
Renewable Energy Development Area and Estimated Water Use – Alternative 1

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[1]
	Solar	*Geothermal*	*Total*[2]		
Providence and Bullion Mountains	2,000	0	3,000	300	100
West Mojave and Eastern Slopes	35,000	0	56,000	5,000	1,000
Total	**123,000**	**16,000**	**204,000**	**21,000**	**91,000**

[1] Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).

[2] Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.

[3] Total development area is the sum of solar, geothermal, wind, and transmission project areas.

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

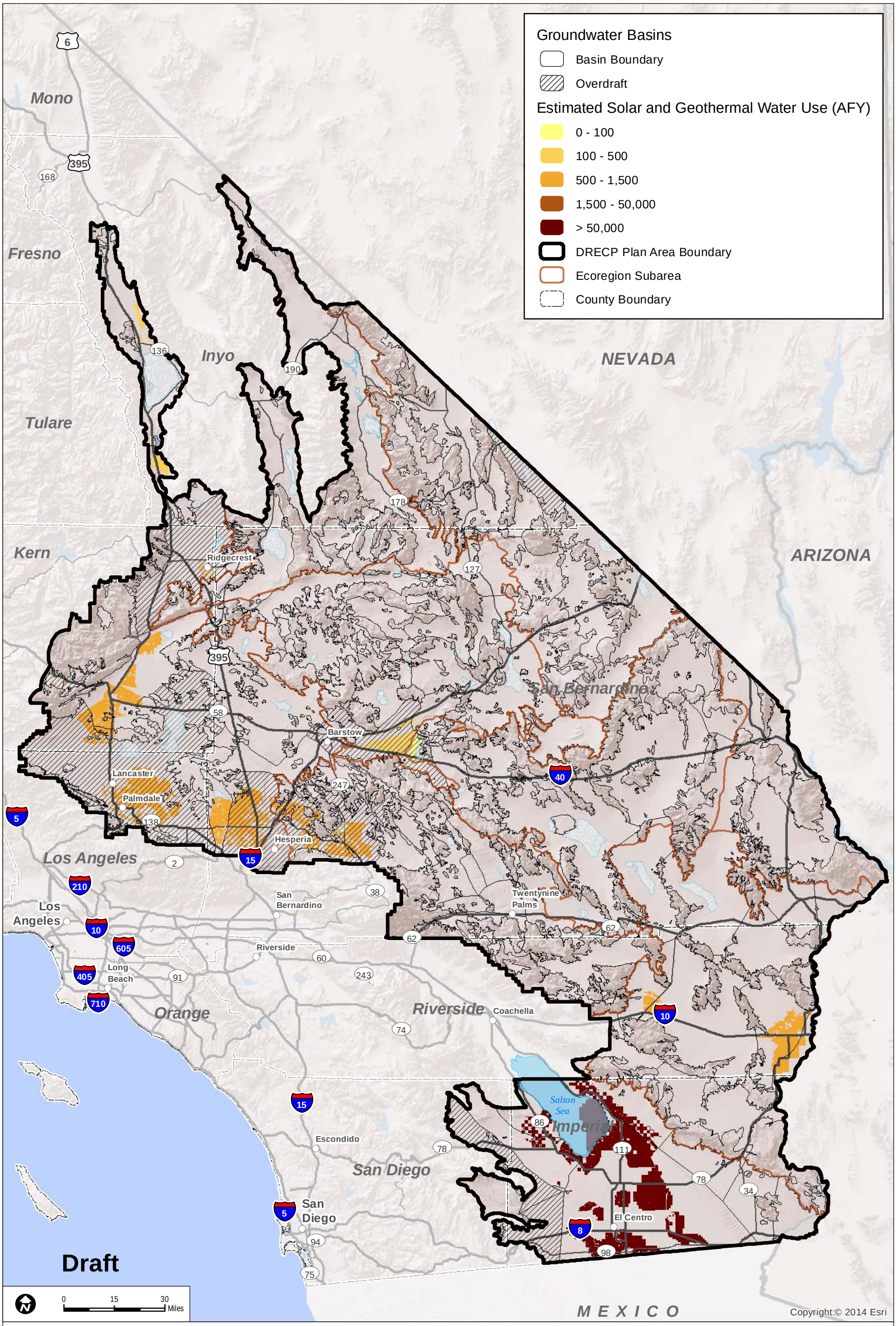
Some of the developed basins under Alternative 1 can be hydraulically connected to areas located outside the Plan Area; a discussion of these potential impacts outside the Plan Area is provided below in Section IV.6.3.3.5 Impacts Outside the Plan Area for Alternative 1.

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Impacts on groundwater recharge resulting from land disturbance under Alternative 1 would be similar to those shown in Section IV.6.3.1.1.1. Alternative 1 potentially affects recharge on 204,000 acres.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

Impacts on groundwater levels would be similar to those shown in Section IV.6.3.1.1.1. The greatest potential water use is in the Imperial Borrego Valley ecoregion subarea (10,000 AFY), mostly for geothermal technology (16,000 acres) and solar technology (42,000 acres). The remaining water use is mostly for solar technology in the Cadiz Valley and Chocolate Mountains, Mojave and Silurian Valley, Owens River Valley, Pinto Lucerne Valley and Eastern Slopes, Providence and Bullion Mountains, and West Mojave and Western Slopes ecoregion subareas. A substantial number of basins within these ecoregion subareas are in overdraft or are stressed (Figure IV.6-4), and groundwater use for renewable energy projects would likely exacerbate depletion of the water supply and the magnitude and scope of adverse impacts.

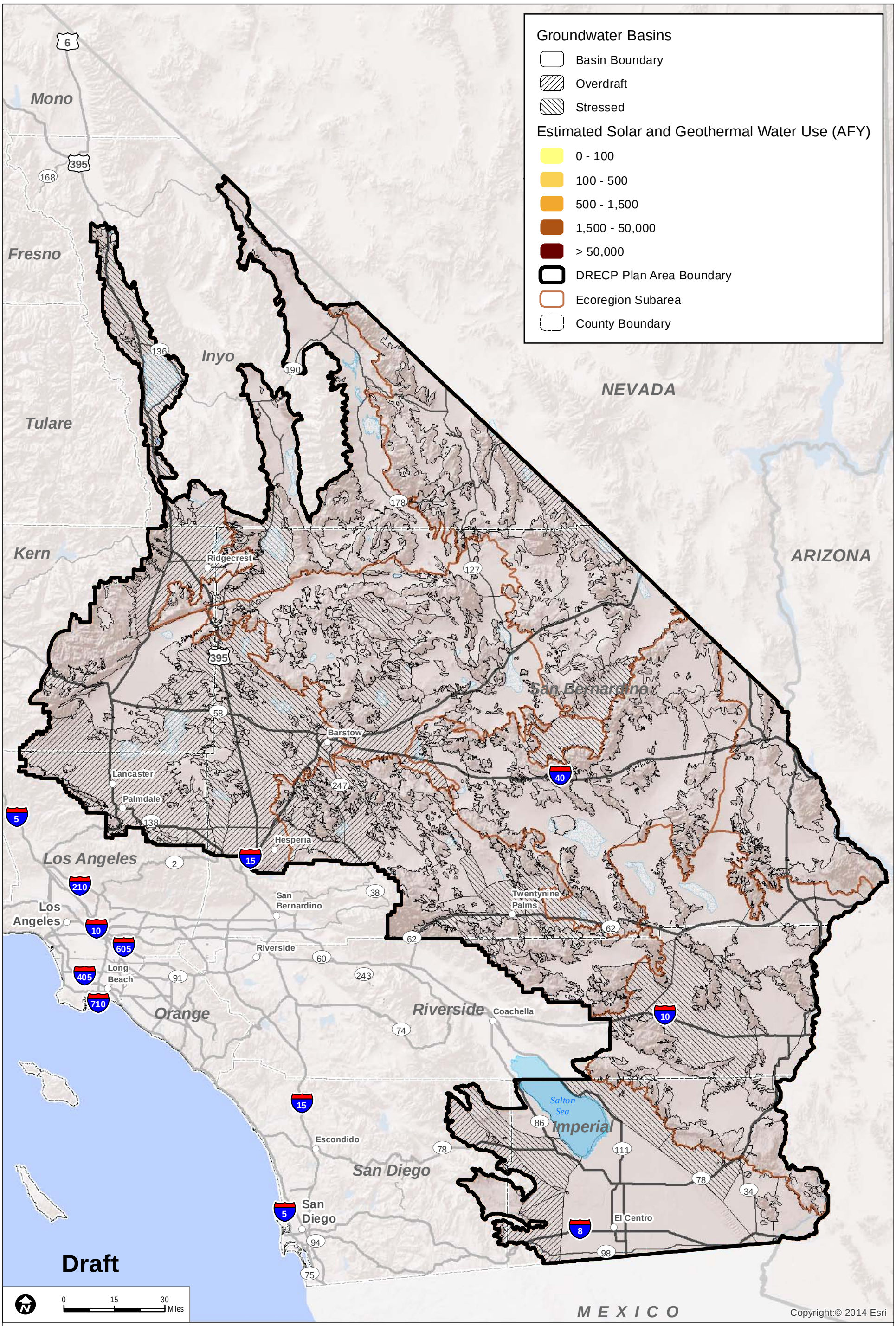


Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-3

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft Groundwater Basins - Alternative 1

INTENTIONALLY LEFT BLANK



Sources: ESRI (2013); California Department of Water Resources (2003)

FIGURE IV.6-4

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft and Stressed Groundwater Basins - Alternative 1

INTENTIONALLY LEFT BLANK

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

Land subsidence would cause impacts similar to those shown in Section IV.6.3.1.1.1. As shown in Table IV.6-3, renewable energy water use under Alternative 1 is 14,000 AFY, with most of the water use attributed to geothermal and solar development in the Imperial Borrego Valley.

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

Impacts from the potential migration of poor-quality groundwater would be similar to those shown in Section IV.6.3.1.1.1. The large amount of renewable energy development could affect groundwater quality.

Impact GW-5: Injection of water from geothermal steam generation could contaminate potable water supplies.

The potential for impacts from injection of saline water for geothermal steam water would be as shown in Section IV.6.3.1.1.1. Geothermal development increases the potential for contamination, particularly in the Imperial Borrego Valley ecoregion subarea where most of that development would be located.

Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Groundwater contamination from chemical spills or brine disposal would be as shown in Section VI.6.3.1.1.1.

Study Area Lands

Future Assessment Areas. There are no FAAs in Alternative 1.

Special Analysis Areas. There are two areas defined as SAAs, representing areas subject to ongoing analysis. These areas (located in the Silurian Valley and just west of Highway 395 in Kern County) have high value for renewable energy development, and also high value for ecological and cultural conservation, and recreation. SAA lands are expected to be designated in the Final EIR/EIS as either DFAs or included in the Reserve Design/Conservation Designation. Designating the SAAs as conservation in Alternative 1 would not impact groundwater resources.

DRECP Variance Lands. DRECP Variance Lands represent the BLM Solar PEIS Variance Lands as screened for the DRECP and EIR/EIS based on BLM screening criteria. Covered

Activities could be permitted for NCCP purposes only through an NCCP plan amendment. However, development of renewable energy on variance lands would not require a BLM Land Use Plan Amendment so the environmental review process would be somewhat simpler than if the location were left undesignated. Although some DRECP Variance Lands in Alternative 1 are in overdraft or stressed basins, development would not likely affect groundwater resources given the overall limited acreage (37,000 acres) and implementation of measures to reduce impacts.

Impact Reduction Strategies and Mitigation

The implementation of the Plan would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Plan would be lessened in several ways. First, the Plan incorporates CMAs for each alternative, including specific biological reserve design components and LUPA components. The implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development. If significant impacts still result after implementation of CMAs and compliance with applicable laws and regulations, then specific mitigation measures are recommended in this section.

Conservation and Management Actions

The conservation strategy for Alternative 1 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the reserve design and specific CMAs for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would also be applied to nonfederal lands. The CMAs described in Section IV.6.3.2 apply to Alternative 1.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations applicable to Alternative 1 are the same as those summarized for the No Action Alternative in Section IV.6.3.1.1.1.

Mitigation Measures

After implementation of the CMAs and existing laws and regulations, mitigation measures will further reduce some of the DRECP's adverse impacts. Mitigation Measures GW-1a,

GW-2a, GW-2b, GW-3a, GW-3b, and GW-4a, summarized in Section IV.6.3.2.1.1 for the Preferred Alternative, apply to Alternative 1.

IV.6.3.3.1.2 Impacts from Reserve Design

The estimated acreage of groundwater basins in Reserve Design Lands is summarized in Table R2.6-13 (Appendix R2). Reserve Design Lands include existing protected areas (LLPAs and MEMLs), plus Alternative 1 existing and proposed BLM conservation lands (NLCS lands, ACECs, and wildlife allocations), and Alternative 1 Conservation Planning Areas. No renewable energy development is allowed in existing protected areas, and the use of or access to groundwater resources to meet renewable energy project water requirements would be limited. No adverse impacts are therefore expected to groundwater resources from the reserve design. Under Alternative 1, renewable energy development is restricted on over 3 million acres within 31 overdraft or stressed groundwater basins, protecting and preserving groundwater and water-supply conditions in these areas.

IV.6.3.3.2 Impacts of DRECP Land Use Plan Amendment on BLM Land: Alternative 1

This section addresses two components of effects of the BLM LUPA: the streamlined development of renewable energy and transmission on BLM land under the LUPA and the impacts of the amended land use plans themselves.

IV.6.3.3.2.1 Impacts from Renewable Energy and Transmission Development on BLM Land

The types of impacts from renewable energy development on BLM lands in DFAs would be similar to those shown in Section IV.6.3.2.1 for the Plan-wide impacts. The potential acres of groundwater basin impacts on BLM lands under Alternative 1, by technology type, are shown in Table R2.6-14 (Appendix R2); 29,000 acres within 24 basins are assumed to be developed for solar, wind, geothermal, and transmission projects. Land disturbances caused by renewable energy development can impact groundwater recharge. A small proportion (14%) of the developed area is for geothermal, and the geothermal development area is distributed between four basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, and West Salton Sea). Renewable energy technologies can utilize large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 1, solar and geothermal development on BLM lands would be in five overdraft basins and four basins identified as already stressed.

IV.6.3.3.2.2 Impacts of Changes to BLM Land Designations

Alternative 1 designates new NLCS lands, ACECs, and wilderness allocations, expands and reduces existing ACECs, designates new SRMAs and expands and reduces existing SRMAs, creates buffer corridors along National Scenic and Historic Trails, and manages lands with wilderness characteristics. The BLM LUPA also replaces the MUCs, and establishes VRM Classes in the CDCA. More than 4.7 million acres are assumed to be in the BLM LUPA land designation under Alternative 1. Because BLM LUPA land designations protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would be limited. Groundwater-related CMAs are the same for all alternatives.

IV.6.3.3.3 Impacts of Natural Community Conservation Plan: Alternative 1

The impacts of the NCCP for Alternative 1 would be the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis.

IV.6.3.3.4 Impacts of General Conservation Plan

The impacts of the GCP for Alternative 1 would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, but they would occur on nonfederal lands only. The potential acres of groundwater basin impacts on GCP lands under Alternative 1, by technology type, are summarized in Table R2.6-15 (Appendix R2); 173,000 acres are assumed to be developed for solar, wind, geothermal, and transmission projects. Land disturbance by renewable energy projects can affect groundwater recharge, and construction and operation of the projects can affect groundwater quality as a result of chemical spills or leakage of brines from storage ponds.

More than 60% of the developed area in GCP lands is for solar energy projects in 26 groundwater basins (108,000 acres), and about 6% of the developed area is for geothermal development distributed between four basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, and West Salton Sea). Solar and geothermal technology can utilize large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 1, 50,000 acres of planned solar and geothermal development in GCP lands would be in five overdraft basins; four additional basins are considered stressed.

The estimated acres of groundwater basins in GCP Reserve Design Lands under Alternative 1 are summarized in Table R2.6-16 (Appendix R2); almost 590,000 acres are allocated to GCP Reserve Design Lands. These lands include all or portions of 26 groundwater overdraft or stressed groundwater basins. Because the GCP Reserve Design Lands protect ecological,

historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited in these basin areas.

IV.6.3.3.5 Impacts Outside the Plan Area for Alternative 1

Under Alternative 1, planned renewable energy development would be in basins hydraulically connected to adjacent areas located outside the Plan Area (See Figure IV.6-3 for the locations and distribution of development areas). Renewable energy projects occur in groundwater basins connected to areas within Mexico (the Imperial Valley basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (Palo Verde Valley, located in the Cadiz Valley and Chocolate Mountain ecoregion subarea). Groundwater level and water supply changes can therefore extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.3.5.1 Impacts of Transmission Outside the Plan Area

The impacts of transmission outside the Plan Area on groundwater, water supply, and water quality would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.6.3.1.5, Impacts of Transmission Outside the Plan Area in No Action Alternative.

IV.6.3.3.5.2 Impacts of BLM LUPA Decisions Outside the Plan Area

Under the proposed BLM LUPA, the only changes outside the Plan Area would be the designation of NLCS lands, ACECs, National Scenic and Historic Trails management corridors, VRM Classes, and new land allocations to replace MUCs on CDCA lands. The estimated acreage of groundwater basins in BLM LUPA lands located outside the Plan Area under the Preferred Alternative is summarized in Table R2.6-17 (Appendix R2). Because the BLM LUPA land designations outside the Plan Area protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.3.6 CEQA Significance Determination for Alternative 1

The CEQA significance determinations for the impacts from Alternative 1, described in Section IV.6.3.2.1.1, are the same as those described for the Preferred Alternative in Section IV.6.3.2.6.

IV.6.3.3.7 Comparison of Alternative 1 With Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 1 with the Preferred Alternative.

IV.6.3.3.7.1 Alternative 1 Compared With Preferred Alternative for Plan-wide DRECP

Alternative 1 develops 106,000 acres less area for renewable energy projects than the Preferred Alternative (204,000 acres versus 310,000 acres, respectively). This lowers the potential for chemical spills and groundwater contamination, but existing regulations and BMPs would reduce potential groundwater contamination impacts in both alternatives. Renewable energy development can potentially alter groundwater recharge; but with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Because the developed area is smaller under Alternative 1, there is less potential to increase groundwater recharge, relative to the Preferred Alternative.

Renewable energy projects in Alternative 1 are estimated to use slightly more water than in the Preferred Alternative (92,000 AFY versus 91,000 AFY, respectively), with most of the water use for both alternatives from geothermal and solar technologies concentrated in the Imperial Borrego Valley. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts under both alternatives. However, impacts from geothermal water use would remain significant for both the Preferred Alternative and Alternative 1.

Geographic Distinctions

Solar and geothermal technologies account for most renewable energy related water use, so the geographic locations of these projects are important to consider. Alternative 1 develops 53,000 acres of solar and geothermal projects in 14 of the 37 overdraft or stressed basins identified in the Plan Area (Figure IV.6-4); the Preferred Alternative develops 43,000 acres in a slightly different set of 14 basins (Figure IV.6-2). Alternative 1 therefore develops more area but affects the same number of sensitive groundwater basins. Existing regulations, implementation of the CMAs, and additional measures required for renewable energy projects would mitigate impacts from development under both alternatives.

Under Alternative 1, no development is proposed in the Kingston and Funeral Mountains ecoregion subarea (specifically the Pahrump Valley), whereas under the Preferred Alternative 3,000 acres would be developed in the Pahrump Valley. Groundwater in deep limestone formations beneath the Pahrump Valley may flow to springs along the east side

of the Death Valley Basin. Alternative 1 requires no water use in the Pahrump Valley. The developed area is smaller adjacent to Mexico and Arizona (the Imperial Valley and Palo Verde Valley basins, respectively), reducing the potential for groundwater level and water supply changes that extend across their boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.3.7.2 Alternative 1 Compared With Preferred Alternative for the BLM LUPA

Alternative 1 proposes to develop 77% less BLM land than the Preferred Alternative (29,000 acres versus 115,000 acres, respectively). Alternative 1 therefore has less potential for groundwater quality impacts from chemical spills, but existing regulations and BMPs reduce potential groundwater contamination in both alternatives. Because less land is disturbed under Alternative 1, it has a lower potential to alter groundwater recharge and, with mitigation, the Preferred Alternative may increase groundwater recharge relative to Alternative 1 (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins).

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. Alternative 1 develops 9,000 acres of solar and geothermal projects in 9 overdraft or stressed basins; the Preferred Alternative develops 17,000 acres of solar and geothermal projects in 12 overdraft or stressed basins. The BLM LUPA for Alternative 1 therefore minimizes development in sensitive groundwater basins relative to the Preferred Alternative. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

IV.6.3.3.7.3 Alternative 1 Compared With Preferred Alternative for NCCP

The impacts of the NCCP for Alternative 1 are the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis. As a result, the comparison of Alternative 1 with the Preferred Alternative for the NCCP is the same as described for Plan-wide DRECP.

IV.6.3.3.7.4 Alternative 1 Compared With Preferred Alternative for the GCP

The impacts of the GCP for Alternative 1 and the Preferred Alternative would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, and would be only on nonfederal lands. Alternative 1 allocates 11% less total area to renewable energy projects (173,000 acres versus 195,000 acres, respectively), which lowers the potential for chemical spills and groundwater contamination, but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge, and with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff

flows from a greater area to percolation basins). Because the developed area is smaller under Alternative 1, there is less potential to increase groundwater recharge relative to the Preferred Alternative.

Solar and geothermal technologies account for most renewable energy related water use, so the locations of these projects are important to consider. Under Alternative 1, solar and geothermal development occurs in 14 overdraft or stressed groundwater basins (50,000 acres); solar and geothermal development under the Preferred Alternative occurs in 14 slightly different overdraft or stressed basins (35,000 acres). The GCP for Alternative 1 therefore develops more solar and geothermal project areas and associated water use in sensitive groundwater basins than the Preferred Alternative. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

Table R2.6-16 (Appendix R2) reports the acres of groundwater basins in GCP Reserve Design Lands under Alternative 1, and shows that more land is allocated to the reserve design relative to the Preferred Alternative shown in Table R2.6-10 (587,000 and 561,000 acres, respectively). Under Alternative 1, these lands include all or portions of 26 overdraft or stressed basins, relative to the 28 overdraft or stressed basins included under the Preferred Alternative. Because GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet water requirements would be limited. The GCP reserve design in Alternative 1 therefore protects and preserves a greater area and number of sensitive groundwater basins from development relative to the Preferred Alternative.

IV.6.3.4 Alternative 2

IV.6.3.4.1 Plan-wide Impacts of Implementing the DRECP: Alternative 2

Alternative 2 integrates renewable energy components, BLM LUPA components, and other conservation components of the DRECP Preferred Alternative. It includes geographically dispersed and maximized DFAs on public and private lands with expanded wind opportunities. The estimated renewable energy development pattern emphasizes the following:

- Dispersed solar and wind.
- Geothermal in two ecoregion subareas: Imperial Borrego Valley and Owens River Valley.

IV.6.3.4.1.1 Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development

Impact Assessment

Potential renewable energy development within Plan Area groundwater basins under Alternative 2 is shown in Table R2.6-18 (Appendix R2). Development would be in 50 groundwater basins, and the total developed area is summarized by ecoregion subarea in Table IV.6-2 (solar only, geothermal only, and total renewable energy development for all technologies including transmission). Most (90%) of the developed area is within four ecoregion subareas (Cadiz Valley and Chocolate Mountains, Imperial Borrego Valley, Pinto Lucerne Valley and Eastern Slopes, and West Mojave and Eastern Slopes). Geothermal projects are in the Imperial Borrego Valley and Owens River Valley ecoregion subareas. One ecoregion subarea, Piute Valley and Sacramento Mountains, has no development under Alternative 2.

Table IV.6-4 shows the estimated projection of total water use by solar and geothermal projects within each ecoregion subarea. Total water use was calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods," and results in Table IV.6-4 indicate an estimated total use of 90,000 AFY, and ranges from a minimum of 40 AFY (Panamint Death Valley ecoregion subarea) to 81,000 AFY (Imperial Borrego Valley ecoregion subarea); there is no development and therefore no renewable energy water use in the Piute Valley and Sacramento Mountains ecoregion subarea. Wet cooled geothermal projects account for almost 87,000 AFY of the total water use under Alternative 2. Ninety percent of the water use under Alternative 2 is in the Imperial Borrego Valley ecoregion subareas because there are 16,000 acres of geothermal technology and 32,000 acres of solar technology.

Table IV.6-4
Renewable Energy Development Area and Estimated Water Use – Alternative 2

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	Geothermal	Total[3]		
Cadiz Valley and Chocolate Mountains	16,000	0	85,000	4,000	700
Imperial Borrego Valley	32,000	16,000	99,000	7,000	81,000
Kingston and Funeral Mountains	1,000	0	6,000	300	70
Mojave and Silurian Valley	3,000	0	15,000	700	300
Owens River Valley	1,000	1,000	6,000	400	6,000
Panamint Death Valley	800	0	2,000	100	40

Table IV.6-4
Renewable Energy Development Area and Estimated Water Use – Alternative 2

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	Geothermal	Total[3]		
Pinto Lucerne Valley and Eastern Slopes	7,000	0	63,000	2,000	300
Piute Valley and Sacramento Mountains	0	0	0	0	0
Providence and Bullion Mountains	1,000	0	12,000	500	70
West Mojave and Eastern Slopes	33,000	0	94,000	5,000	1,000
Total	**95,000**	**16,000**	**381,000**	**20,000**	**90,000**

1 Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).

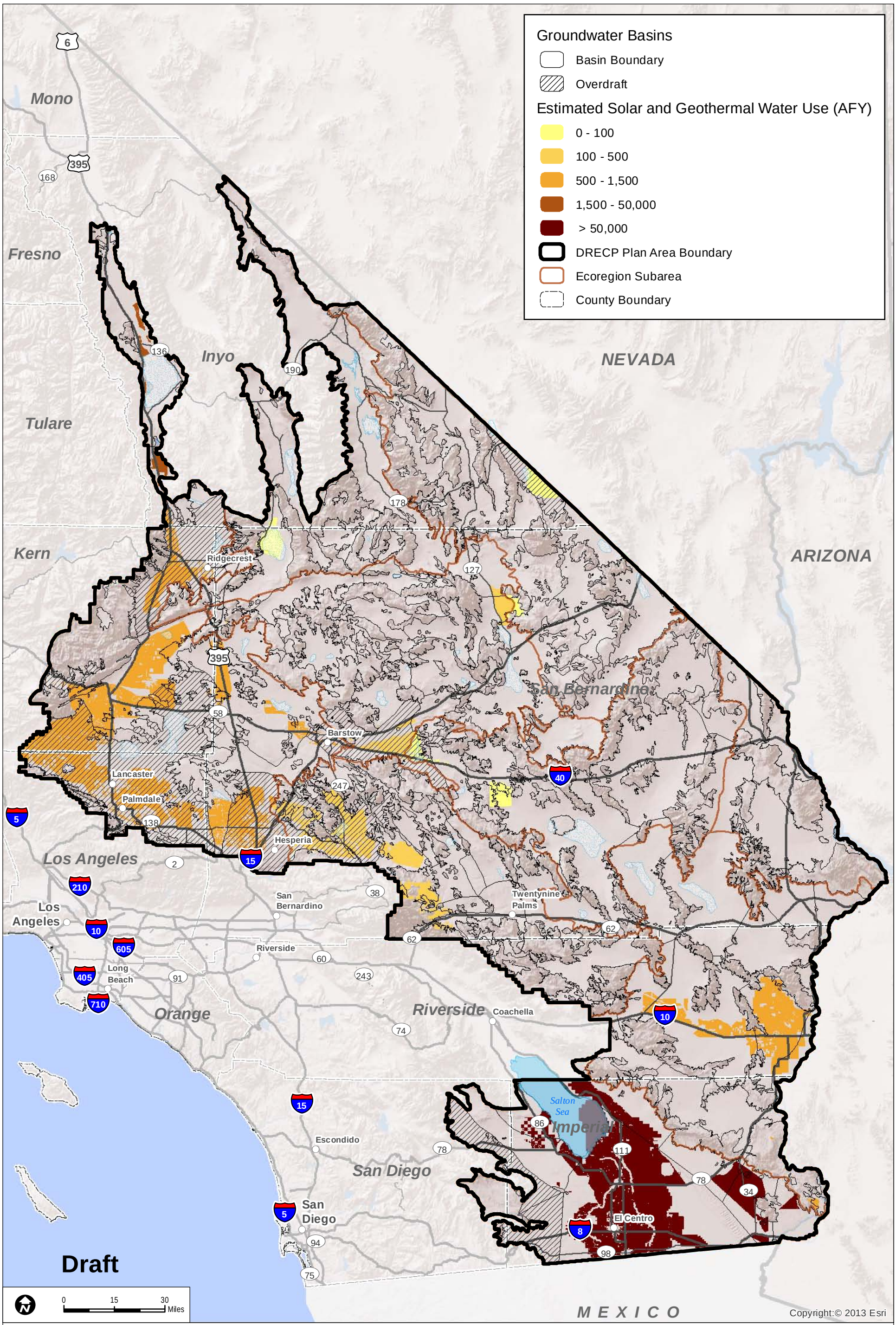
2 Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.

3 Total development area is the sum of solar, geothermal, wind, and transmission project areas.

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Under Alternative 2, renewable energy development can occur in a number of overdraft basins and groundwater basins identified as stressed. Figure IV.6-5 maps the distribution of estimated water use by DFA and overdraft groundwater basins, and Figure IV.6-6 maps the water use by DFA and by overdraft and stressed groundwater basins. Development occurs in 18 overdraft and stressed groundwater basins, and increased groundwater use in these sensitive basins can adversely affect water supplies and exacerbate impacts from overdraft conditions and declining groundwater levels.

Some of the developed basins under Alternative 2 can be hydraulically connected to areas located outside the Plan Area; a discussion of these potential impacts outside the Plan Area appears in Section IV.6.3.4.5, Impacts Outside the Plan Area for Alternative 2.

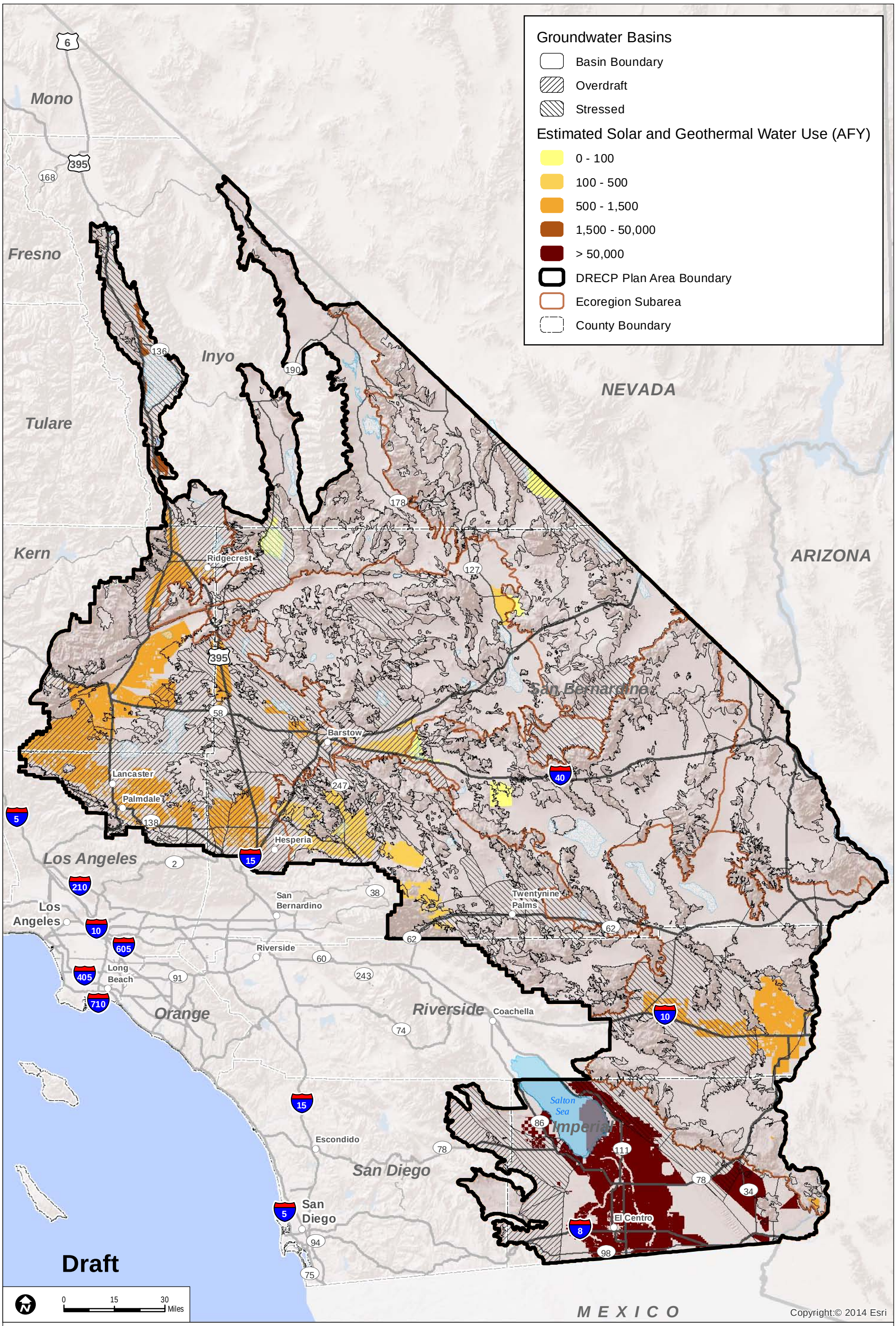


Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-5

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft Groundwater Basins - Alternative 2

INTENTIONALLY LEFT BLANK



Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-6

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft and Stressed Groundwater Basins - Alternative 2

INTENTIONALLY LEFT BLANK

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Impacts on groundwater recharge from land disturbance under Alternative 2 would be similar to those shown in Section IV.6.3.1.1.1. Alternative 2 potentially affects recharge on 381,000 acres.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

Impacts on groundwater levels would be similar to those shown in Section IV.6.3.1.1.1. The greatest water use is in the Imperial Borrego Valley and Owens River Valley ecoregion subareas (87,000 AFY), where most of the water use is for geothermal technology (16,000 acres) and solar technology (33,000 acres). The remaining water use is mostly for solar technology in the Cadiz Valley and Chocolate Mountains, Kingston and Funeral Mountains, Mojave and Silurian Valley, Panamint Death Valley, Pinto Lucerne Valley and Eastern Slopes, Providence and Bullion Mountains, and West Mojave and Western Slopes ecoregion subareas. A substantial number of basins within these ecoregion subareas is in overdraft or are characterized as stressed (Figure IV.6-6), and groundwater use for renewable energy projects will likely exacerbate depletion of the water supply and the magnitude and scope of adverse impacts.

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

Land subsidence would cause impacts similar to those shown in Section IV.6.3.1.1.1. As shown in Table IV.6-4, renewable energy water use under Alternative 2 is 11,000 AFY, with most of the water use attributed to geothermal and solar technologies in the Imperial Borrego Valley.

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

Impacts from the potential migration of poor-quality groundwater would be similar to those shown in Section IV.6.3.1.1.1. The large amount of potential groundwater use could cause poor-quality groundwater to migrate.

Impact GW-5: Injection of water from geothermal steam generation could contaminate potable water supplies.

The potential for impacts from the injection of saline water for geothermal steam water would be as shown in Section IV.6.3.1.1.1. Geothermal development increases the potential

for contamination, particularly in the Imperial Borrego Valley and Owens River Valley ecoregion subareas where geothermal development would occur.

Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Groundwater contamination from chemical spills or brine disposal would be as shown in Section VI.6.3.1.1.1.

Study Area Lands

Future Assessment Areas. Lands within FAAs are neither reserve lands nor DFAs; they are simply areas that are deferred for future assessment. The future assessment will determine their suitability for renewable energy development or for ecological conservation. If renewable energy development occurs on FAA lands, a Land Use Plan Amendment would not be required. FAAs for each alternative are included and located as shown in Table IV.1-2 and Figure II.5-1 in Volume II. The FAAs represent areas where renewable energy development or inclusion to the reserve design could be implemented through an amendment to the DRECP but additional assessment would be needed. Development of the FAAs in Alternative 2 would not affect groundwater resources given that additional assessment would be required and measures to reduce impacts would be implemented.

Special Analysis Areas. Designating the SAAs as development would result in impacts similar to those identified for the DFAs for the Plan-wide Impacts. The SAA west of Highway 395 is in a stressed basin; however, CMAs and other measures to reduce impacts would be implemented.

DRECP Variance Lands. There are no DRECP Variance Lands in Alternative 2.

Impact Reduction Strategies and Mitigation

The implementation of Alternative 2 would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Plan would be lessened in several ways. First, the Plan incorporates CMAs for each alternative, including specific biological reserve design components and LUPA components. The implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development. If significant impacts still result after implementation of CMAs and compliance with applicable laws and regulations, then specific mitigation measures are recommended in this section.

Conservation and Management Actions

The conservation strategy for Alternative 2 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the reserve design and specific CMAs for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would be applied also to nonfederal lands. The CMAs described in Section IV.6.3.2 apply to Alternative 2.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.6.3.1.1.1.

Mitigation Measures

After implementation of CMAs and existing laws and regulations, mitigation measures will be applied to further reduce some of the DRECP's adverse impacts. The Mitigation Measures GW-1a, GW-2a, GW-2b, GW-3a, GW-3b, and GW-4a, summarized in Section IV.6.3.2.1.1 for the Preferred Alternative, apply to Alternative 2.

IV.6.3.4.1.2 Impacts from Reserve Design

The estimated acreage of groundwater basins in Reserve Design Lands is summarized in Table R2.6-19 (Appendix R2). Reserve Design Lands include existing protected areas (LLPAs and MEMLs), plus Alternative 2 existing and proposed BLM conservation lands (NLCS lands, ACECs, and wildlife allocations), and Alternative 2 Conservation Planning Areas. No renewable energy development is allowed on existing protected areas, and the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. Accordingly, no adverse impacts are expected to groundwater resources because of the reserve design. Under Alternative 2, renewable energy development is restricted on over 3 million acres within 35 overdraft or stressed groundwater basins, thereby protecting and preserving groundwater and water-supply conditions in these sensitive areas.

IV.6.3.4.2 Impacts of DRECP Land Use Plan Amendment on BLM Land: Alternative 2

This section addresses two components of effects of the BLM LUPA: the streamlined development of renewable energy and transmission on BLM land under the LUPA and the impacts of the amended land use plans themselves.

IV.6.3.4.2.1 Impacts from Renewable Energy and Transmission Development on BLM Land

Under the DRECP LUPA, renewable energy development on BLM lands in DFAs would be streamlined. The types of impacts would be similar to those shown in Section IV.6.3.2.1 for the Plan-wide impacts. The potential acres of groundwater basin impacts on BLM lands under Alternative 2, by technology type, are shown in Table R2.6-20 (Appendix R2); 179,000 acres within 44 groundwater basins can be developed for solar, wind, geothermal, and transmission projects. Land disturbances caused by renewable energy projects can affect groundwater recharge. Almost 30% of the developed area is for solar technology, and 4% of the developed area is for geothermal technology; most of the development (71%) is for wind technology. The geothermal development area is distributed between six basins (Cuddeback Valley, Fremont Valley, Ocotillo-Clark Valley, Owens Valley, Rose Valley, and West Salton Sea).

Renewable energy technologies can utilize large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 2, solar and geothermal development on BLM lands would occur in 15 basins in overdraft or characterized as stressed.

IV.6.3.4.2.2 Impacts of Changes to BLM Land Designations

Alternative 2 designates new NLCS lands, new ACECs and wildlife allocations, expands and reduces existing ACECs, designates new SRMAs, expands and reduces existing SRMAs, creates buffer corridors along National Scenic and Historic Trails, and manages lands with wilderness characteristics. The BLM LUPA also replaces MUCs, and establishes VRM Classes in the CDCA. More than 6.6 million acres are assumed allocated in the BLM LUPA land designation under Alternative 2. Because the BLM LUPA land designations protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. Groundwater-related CMAs are the same for all alternatives.

IV.6.3.4.3 Impacts of Natural Community Conservation Plan: Alternative 2

The impacts of the NCCP for Alternative 2 would be the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis.

IV.6.3.4.4 Impacts of General Conservation Plan

The impacts of the GCP for Alternative 2 would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, but they would be on nonfederal lands only. The potential acreage of groundwater basin impacts on GCP lands, by technology type, under Alternative 2 is summarized in Table R2.6-21 (Appendix R2); about 199,000 acres are planned for solar, wind, geothermal, and transmission development. Land disturbances by renewable energy projects can affect groundwater recharge, and project construction and operation can affect groundwater quality from chemical spills or brine storage pond leakage.

Thirty-five percent of the developed area is for solar and geothermal projects, which have the greatest demand for water. Five percent of the developed area is for geothermal, distributed between four basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, and Warren Valley). Solar and geothermal technologies utilize large amounts of water and can impact groundwater resources. Groundwater use lowers groundwater levels, depletes basin water supplies, decreases groundwater discharge, degrades groundwater quality, and can cause land subsidence. Projects under Alternative 2 are distributed between 46 groundwater basins, and 17 of these basins are either in overdraft or are considered stressed. The acreage of groundwater basins in GCP Reserve Design Lands under Alternative 2 is summarized in Table R2.6-22 (Appendix R2); over 600,000 acres are allocated to GCP Reserve Design Lands located in 83 basins. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited in these basin areas.

IV.6.3.4.5 Impacts Outside the Plan Area for Alternative 2

Under Alternative 2, planned renewable energy development would occur in basins hydraulically connected to adjacent areas located outside the Plan Area (See Figure IV.6-5 for the locations and distribution of development areas). Renewable energy projects are planned in groundwater basins connected to areas within Nevada (the Pahrump Valley basin, located in the Kingston and Funeral Mountains ecoregion subarea), Mexico (the Imperial Valley basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (Palo Verde Valley, located in the Cadiz Valley and Chocolate Mountain ecoregion

subarea). As a result, groundwater level and water supply changes can extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.4.5.1 Impacts of Transmission Outside the Plan Area

The impacts of transmission outside the Plan Area on groundwater, water supply, and water quality would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.6.3.1.5, Impacts of Transmission Outside the Plan Area in No Action Alternative.

IV.6.3.4.5.2 Impacts of BLM LUPA Decisions Outside the Plan Area

Under the proposed BLM LUPA, the only changes outside the Plan Area would be the designation of NLCS lands, ACECs, and National Scenic and Historic Trails management corridors, VRM Classes, and new land allocations to replace MUCs on CDCA lands. The estimated acres of groundwater basins in BLM LUPA lands located outside the Plan Area under the Preferred Alternative are summarized in Table R2.6-23 (Appendix R2). Because the BLM LUPA land designations outside the Plan Area protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.4.6 CEQA Significance Determination for Alternative 2

The CEQA significance determinations for the impacts from Alternative 2 described in Section IV.6.3.2.1.1 are the same as those described for the Preferred Alternative in Section IV.6.3.2.6.

IV.6.3.4.7 Comparison of Alternative 2 With Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 2 with the Preferred Alternative.

IV.6.3.4.7.1 Alternative 2 Compared With Preferred Alternative for Plan-wide DRECP

Alternative 2 develops 71,000 acres more land for renewable energy projects than the Preferred Alternative (381,000 acres versus 310,000 acres, respectively). This increases the potential for chemical spills and groundwater contamination, but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Land disturbances resulting from renewable energy development have the potential to alter groundwater recharge, but with mitigation these changes may increase groundwater

recharge. Alternative 2 therefore has greater potential to increase groundwater recharge over a greater area relative to the Preferred Alternative.

Renewable energy projects in Alternative 2 are estimated to use slightly less water than the Preferred Alternative (90,000 AFY versus 91,000 AFY, respectively), with most of the use for both alternatives concentrated in solar and geothermal technologies in the Imperial Borrego Valley ecoregion subarea. The CMAs and associated mitigation apply to either alternative, and ensure that no project is approved unless it is shown that the water supply is adequate to support development without causing an adverse impact.

Geographic Distinctions

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. Alternative 2 develops 44,000 acres of solar and geothermal projects in 18 of the 37 overdraft or stressed basins identified in the Plan Area (Figure IV.6-6); the Preferred Alternative develops 43,000 acres in 14 overdraft or stressed basins (Figure IV.6-2). Alternative 2 therefore develops slightly more area in a greater number of sensitive groundwater basins. The CMAs and associated mitigation apply to either alternative, and ensure that no project is approved unless it is shown that the water supply is adequate to support development without causing an adverse impact.

Development occurs in the Pahrump Valley basin under both alternatives. Groundwater in deep limestone formations beneath the Pahrump Valley and surrounding areas may support groundwater discharge to the Amargosa River and springs located along the east side of the Death Valley Basin. The two alternatives also plan for development in the Imperial Valley basin and the Palo Verde Valley basin, creating the potential for groundwater level and water supply changes that extend across the Plan Area boundaries and impact areas in Mexico, Arizona, and the Colorado River.

IV.6.3.4.7.2 Alternative 2 Compared With Preferred Alternative for the BLM LUPA

Alternative 2 proposes to develop 56% more BLM land for renewable energy projects than the Preferred Alternative (179,000 acres versus 115,000 acres, respectively). Alternative 2 therefore has more potential for water quality impacts from chemical spills, but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Because more land is disturbed under Alternative 2, it has a greater potential to alter groundwater recharge; but, with mitigation, Alternative 2 may increase groundwater recharge relative to the Preferred Alternative (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins).

Solar and geothermal technologies account for most renewable energy related water use, so the locations of these projects are important to consider. Alternative 2 develops 20,000 acres of solar and geothermal projects in 15 overdraft or stressed groundwater basins; the Preferred Alternative develops 17,000 acres of solar and geothermal projects in 12 overdraft and stressed basins. The BLM LUPA for Alternative 2 therefore develops more area and associated water use in sensitive groundwater basins than the Preferred Alternative. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

IV.6.3.4.7.3 Alternative 2 Compared With Preferred Alternative for NCCP

The impacts of the NCCP for Alternative 2 are the same as those shown in Section IV.6.3.2.1 for the Plan-wide analysis. As a result, the comparison of Alternative 2 with the Preferred Alternative for the NCCP is the same as described for Plan-wide DRECP.

IV.6.3.4.7.4 Alternative 2 Compared With Preferred Alternative for the GCP

The impacts of the GCP for Alternative 2 and the Preferred Alternative would be similar to those shown in Section IV.6.3.2.1 for the Plan-wide analysis, and would occur only on nonfederal lands. Alternative 2 allocates 2% more total area to renewable energy projects than the Preferred Alternative (199,000 acres versus 195,000 acres, respectively), which slightly increases the potential for chemical spills and groundwater contamination. However, existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge; with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Hence, because the developed area is slightly larger under Alternative 2, it has a slightly greater potential to increase groundwater recharge relative to the Preferred Alternative.

Solar and geothermal technologies account for most renewable energy-related water use, so the geographic locations of these projects are important to consider. Under Alternative 2, development occurs in 17 overdraft or stressed groundwater basins (23,000 acres); development under the Preferred Alternative occurs in 14 overdraft or stressed basins (35,000 acres). The GCP for Alternative 2 therefore develops less area than the Preferred Alternative and distributes that development over a greater number of basins. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

Table R2.6-22 (Appendix R2) shows the acres of groundwater basins in GCP Reserve Design Lands under Alternative 2, and shows that more land is allocated to the reserve design compared to the Preferred Alternative, shown in Table R2.6-10 (602,000 versus 561,000 acres, respectively). These lands include all or portions of 27 overdraft or stressed basins under Alternative 2, relative to 28 overdraft or stressed basins under the Preferred Alternative. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet water requirements would be limited. The GCP reserve design in Alternative 2 therefore protects and preserves a greater area and number of sensitive groundwater basins from development, relative to the Preferred Alternative.

IV.6.3.5 Alternative 3

IV.6.3.5.1 Plan-wide Impacts of Implementing the DRECP: Alternative 3

IV.6.3.5.1.1 Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development

Alternative 3 integrates renewable energy, BLM LUPA, and conservation components of the DRECP Preferred Alternative in the Plan Area. It includes geographically dispersed DFAs on public and private lands, and emphasizes solar and geothermal technologies. The estimated renewable energy development pattern follows:

- Dispersed solar with emphasis in two ecoregion subareas: Imperial Borrego Valley and West Mojave and Eastern Slopes.
- Emphasis on wind in two ecoregion subareas: Pinto Lucerne Valley and Eastern Slopes and West Mojave and Eastern Slopes.
- Geothermal in two ecoregion subareas: Imperial Borrego Valley and Owens River Valley.

Impact Assessment

Potential renewable energy development within Plan Area groundwater basins under Alternative 3 is shown in Table R2.6-24 (Appendix R2). Development would occur in 33 groundwater basins, and the total developed area is summarized by ecoregion subarea in Table IV.6-2 (solar only, geothermal only, and total renewable energy development for all technologies including transmission). Most (94%) of the developed area is within four ecoregion subareas (Cadiz Valley and Chocolate Mountains, Imperial Borrego Valley, Pinto Lucerne Valley and Eastern Slopes, and West Mojave and Eastern Slopes). There are geothermal projects in the Imperial Borrego Valley (15,000 acres) and Owens River Valley (1,000 acres) ecoregion subareas. Two ecoregion subareas (Kingston and Funeral Mountains and Piute Valley and Sacramento Mountains) have no development under Alternative 3.

Table IV.6-5 shows the estimated projection of total water use by solar and geothermal projects within each ecoregion subarea. Total estimated water use was calculated using the projected megawatt distribution and water use factors as described above in Section IV.6.1.1 "General Methods," and results in Table IV.6-5 indicate an estimated total use of 92,000 AFY, and ranges from 100 AFY (Panamint Death Valley and Providence and Bullion Mountains ecoregion subareas) to 81,000 AFY (Imperial Borrego Valley ecoregion subarea). Wet cooled geothermal projects account for almost 87,000 AFY of the total water use under Alternative 3. Ninety-six percent of the water use under Alternative 3 is in the Imperial Borrego Valley and Owens River Valley ecoregion subareas because there are 16,000 acres of geothermal projects and 44,000 acres of solar projects.

Under Alternative 3, renewable energy development can be sited in a number of overdraft basins and groundwater basins identified as stressed. Figure IV.6-7 maps the distribution of estimated water use by DFA and overdraft groundwater basins, and Figure IV.6-8 maps the water use by DFA and overdraft and stressed groundwater basins. Development is in 17 overdraft and stressed groundwater basins, and increased groundwater use in these sensitive basins can adversely affect water supplies and exacerbate impacts associated with overdraft conditions and declining groundwater levels.

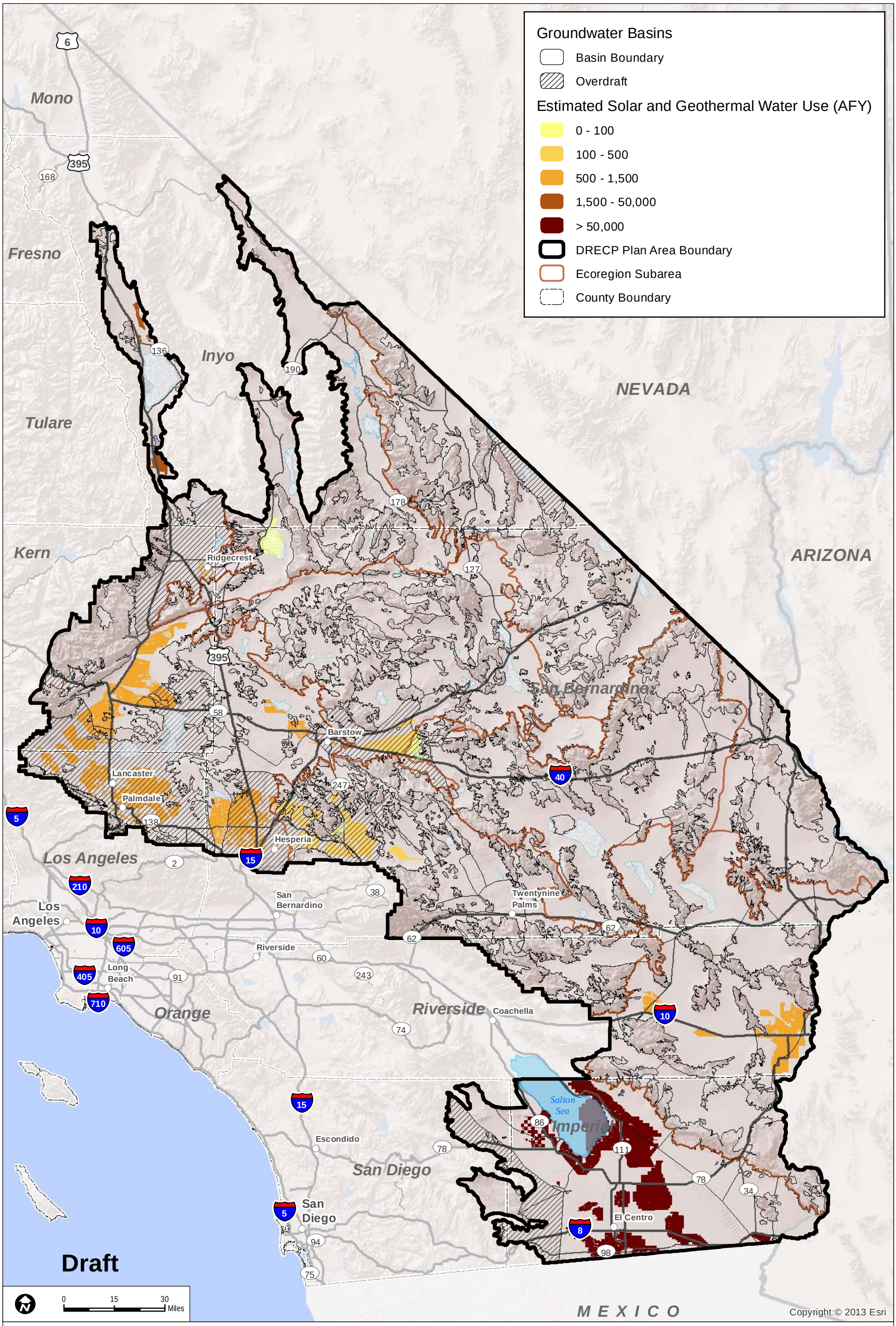
Table IV.6-5
Renewable Energy Development Area and Estimated Water Use – Alternative 3

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	*Geothermal*	*Total*[3]		
Cadiz Valley and Chocolate Mountains	20,000	0	36,000	3,000	900
Imperial Borrego Valley	42,000	15,000	72,000	8,000	81,000
Kingston and Funeral Mountains	0	0	0	0	0
Mojave and Silurian Valley	4,000	0	5,000	600	400
Owens River Valley	2,000	1,000	4,000	500	7,000
Panamint Death Valley	2,000	0	2,000	300	100
Pinto Lucerne Valley and Eastern Slopes	12,000	0	39,000	2,000	500
Piute Valley and Sacramento Mountains	0	0	0	0	0
Providence and Bullion Mountains	2,000	0	3,000	300	100
West Mojave and Eastern Slopes	38,000	0	78,000	5,000	1,000
Total	**122,00**	**16,000**	**240,000**	**20,000**	**92,000**

1 Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).

2 Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.[3] Total development area is the sum of solar, geothermal, wind, and transmission project areas.

Note: Data has been rounded; tables may not sum due to rounding.

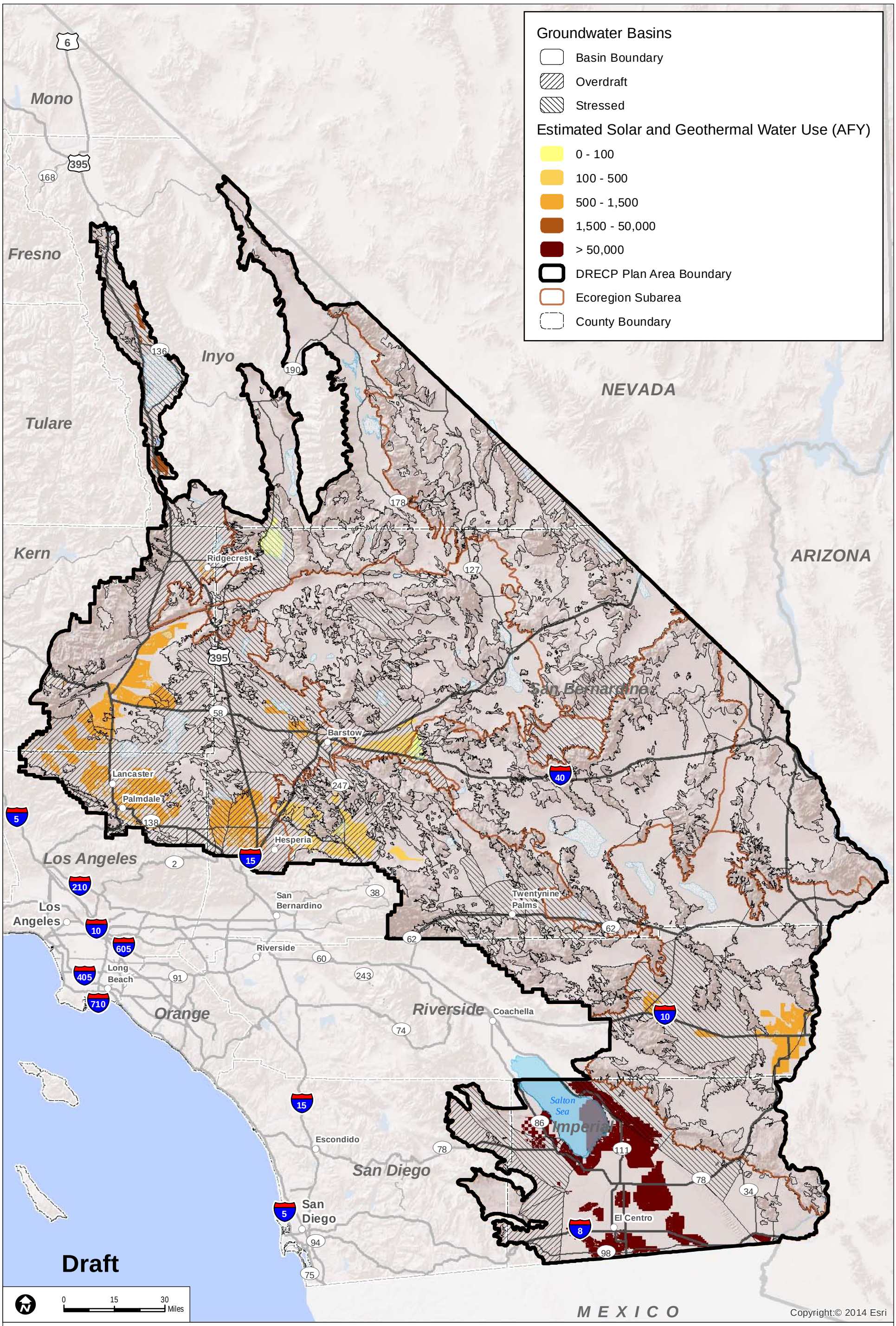


Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-7

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft Groundwater Basins - Alternative 3

INTENTIONALLY LEFT BLANK



Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-8

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft and Stressed Groundwater Basins - Alternative 3

INTENTIONALLY LEFT BLANK

Some developed basins under Alternative 3 can be hydraulically connected to areas located outside the Plan Area; a discussion of these potential impacts outside the Plan Area appears in Section IV.6.3.5.5, Impacts Outside the Plan Area for Alternative 3.

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Impacts on groundwater recharge resulting from land disturbance under Alternative 3 would be similar to those shown in Section IV.6.3.1.1.1. Alternative 3 potentially affects recharge on 240,000 acres.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

Impacts on groundwater levels would be similar to those shown in Section IV.6.3.1.1.1. The greatest potential water use is in the Imperial Borrego Valley (81,000 AFY) ecoregion subarea, but most of the water use is for geothermal technology (15,000 acres) and solar technology (42,000 acres). An additional 7,000 AFY of water use is also planned in the Owens River Valley ecoregion subarea, and that water use is also primarily for geothermal and solar technologies (1,000 and 2,000 acres, respectively). The remaining water use in the Plan Area is for solar technology located in the Cadiz Valley and Chocolate Mountains, Mojave and Silurian Valley, Panamint Death Valley, Pinto Lucerne Valley and Eastern Slopes, Providence and Bullion Mountains, and West Mojave and Western Slopes ecoregion subareas. A substantial number of basins within these ecoregion subareas are in overdraft or characterized as stressed (Figure IV.6-8), and groundwater use for renewable energy projects will likely exacerbate depletion of the water supply and increase the magnitude and scope of adverse impacts.

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

Land subsidence would cause impacts similar to those shown in Section IV.6.3.1.1.1. As shown in Table IV.6-5, renewable energy water use under Alternative 3 is 14,000 AFY, with most of the water use attributed to geothermal and solar development in the Imperial Borrego Valley ecoregion subarea.

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

Impacts from the potential migration of poor-quality groundwater would be similar to those shown in Section IV.6.3.1.1.1. The large amount of renewable energy development could affect groundwater quality.

Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies.

The potential for impacts from injection of saline water for geothermal steam water would be as shown in Section IV.6.3.1.1.1. Geothermal development increases the potential for contamination, with potential impacts in the Imperial Borrego Valley and Owens River Valley ecoregion subareas.

Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Groundwater contamination from chemical spills or brine disposal would be as shown in Section VI.6.3.1.1.1.

Study Area Lands

Future Assessment Areas. Lands within FAAs are neither reserve lands nor DFAs; they are simply areas that are deferred for future assessment. The future assessment will determine their suitability for renewable energy development or for ecological conservation. If renewable energy development occurs on FAA lands, a Land Use Plan Amendment would not be required. FAAs for each alternative are included and located as shown in Table IV.1-2 and Figure II.6-1 in Volume II. The FAAs represent areas where renewable energy development or inclusion to the reserve design could be implemented through an amendment to the DRECP but additional assessment would be needed. The FAA in Alternative 3 is in overdraft basins; however development of this FAA would not likely affect groundwater resources given that additional assessment would be required and measures to reduce impacts would be implemented.

Special Analysis Areas. Designating the SAAs as conservation would have no impact to groundwater. Impacts would be the same as those explained for the Plan-wide reserve design in the section "Impacts of the Reserve Design."

DRECP Variance Lands. There are no DRECP Variance Lands in Alternative 3. The 13,000 acres of DRECP Variance Lands identified in the Preferred Alternative would become undesignated areas in Alternative 3, thus limiting development and reducing any impacts on groundwater.

Impact Reduction Strategies and Mitigation

The implementation of the Plan would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Plan would be lessened in several ways. First, the Plan incorporates CMAs for each alternative, including

specific biological reserve design components and LUPA components. Also, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development. If significant impacts would still result after implementation of CMAs and compliance with applicable laws and regulations, then specific mitigation measures are recommended in this section.

Conservation and Management Actions

The conservation strategy for Alternative 3 (presented in Volume II, Section II.3.1.1) defines specific actions to reduce the impacts of this alternative. The conservation strategy includes definition of the reserve design and specific CMAs for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would also apply to nonfederal lands. The CMAs described in Section IV.6.3.2 apply to Alternative 3.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.6.3.1.1.1.

Mitigation Measures

After implementation of the CMAs and existing laws and regulations, application of mitigation measures (GW-1a, GW-2a, GW-2b, GW-3a, GW-3b, and GW-4a) would further reduce some of the DRECP's adverse impacts.

IV.6.3.5.1.2 Impacts from Reserve Design

The estimated acreage of groundwater basins in Reserve Design Lands for Alternative 3 is summarized in Table R2.6-25 (Appendix R2). Reserve Design Lands include existing protected areas (LLPAs and MEMLs), plus Alternative 3 existing and proposed BLM conservation lands (NLCS lands, ACECs, and wildlife allocations), and Alternative 3 Conservation Planning Areas. No renewable energy development is allowed in existing protected areas, and the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. Accordingly, no adverse impacts are expected to groundwater resources from the reserve design. Under Alternative 3, renewable energy development is restricted from almost 3 million acres located within 34 overdraft or stressed groundwater basins, thereby protecting and preserving groundwater and water-supply conditions in these areas.

IV.6.3.5.2 Impacts of DRECP Land Use Plan Amendment on BLM Land: Alternative 3

This section addresses two components of effects of the BLM LUPA: the streamlined development of renewable energy and transmission on BLM land under the LUPA and the impacts of the amended land use plans themselves.

IV.6.3.5.2.1 Impacts from Renewable Energy and Transmission Development on BLM Land

Under the DRECP LUPA, renewable energy development on BLM lands in DFAs would be streamlined. The types of impacts would be similar to those shown in Section IV.6.3.2.1 for the Plan-wide impacts. The potential acres of groundwater basin impacts on BLM lands under Alternative 3, by technology type, are shown in Table R2.6-26 (Appendix R2); 58,000 acres within 28 basins assume development of solar, wind, geothermal, and transmission projects. Land disturbances caused by renewable energy projects can affect groundwater recharge. Almost 50% of the developed area is for solar technology, and a smaller portion of the developed area (12%) is for geothermal.

Renewable energy technologies can use large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 3, solar and geothermal development on BLM lands would be in four overdraft basins and seven basins identified as already stressed.

IV.6.3.5.2.2 Impacts of Changes to BLM Land Designations

The DRECP LUPA alternative designates new NLCS lands, new ACECs and wildlife allocations, expands and reduces existing ACECs, designates new SRMAs, and expands and reduces existing SRMAs, creates buffer corridors along National Scenic and Historic Trails, and manages lands with wilderness characteristics. The BLM LUPA also replaces MUCs and establishes VRM Classes in the CDCA. More than 6.7 million acres are assumed to be allocated in the BLM LUPA land designation under Alternative 3 (Table R2.6-26). Because the BLM LUPA land designations under Alternative 3 protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited. Groundwater-related CMAs are the same for all alternatives.

IV.6.3.5.3 Impacts of Natural Community Conservation Plan: Alternative 3

The impacts of the NCCP for Alternative 3 would be the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis.

IV.6.3.5.4 Impacts of General Conservation Plan: Alternative 3

The impacts of the GCP for Alternative 3 would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, but they would be on nonfederal lands only. The potential acreage of groundwater basin impacts on GCP lands under Alternative 3, by technology type, is summarized in Table R2.6-27 (Appendix R2); 183,000 acres are assumed to be developed for solar, wind, geothermal, and transmission projects. Land disturbance by renewable energy projects can affect groundwater recharge, and construction and operation of the projects can affect groundwater quality from chemical spills or leakage of brines from storage ponds.

More than 50% of the developed area in GCP lands is for solar energy projects located in 30 groundwater basins (93,000 acres), and about 6% of the developed area is for geothermal projects distributed between four basins (East Salton Sea, Harper Valley, Middle Mojave River Valley, and West Salton Sea). Solar and geothermal technology can use large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 3, 86,000 acres of the planned solar and geothermal development in GCP lands would be in 6 overdraft basins and 10 basins considered to be stressed.

The estimated acreage of groundwater basins in GCP Reserve Design Lands under Alternative 3 is summarized in Table R2.6-28 (Appendix R2); 575,000 acres are allocated to GCP Reserve Design Lands. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet renewable energy water requirements would likely be limited.

IV.6.3.5.5 Impacts Outside the Plan Area for Alternative 3

Under Alternative 3, planned renewable energy development would be in basins hydraulically connected to adjacent areas located outside the Plan Area (See Figure IV.6-7 for the locations and distribution of development areas). Renewable energy projects are planned in groundwater basins connected to areas within Mexico (the Imperial Valley Basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (Palo Verde Valley, located in the Cadiz Valley and Chocolate Mountain ecoregion subarea). Groundwater level and water supply changes can extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.5.5.1 Impacts of Transmission Outside the Plan Area for Alternative 3

The impacts of transmission outside the Plan Area on groundwater, water supply, and water quality would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.6.3.1.5, Impacts of Transmission Outside the Plan Area in No Action Alternative.

IV.6.3.5.5.2 Impacts of BLM LUPA Decisions Outside the Plan Area

Under the proposed BLM LUPA, the only changes outside the Plan Area would be the designation of NLCS lands, ACECs, and National Scenic and Historic Trails management corridors, VRM Classes, and new land allocations to replace MUCs on CDCA lands. The estimated acres of groundwater basins in BLM LUPA lands outside the Plan Area under Alternative 3 are summarized in Table R2.6-29 (Appendix R2). Because the BLM LUPA land designations outside the Plan Area protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.5.6 CEQA Significance Determination for Alternative 3

The CEQA significance determinations for impacts from Alternative 3 described in Section IV.6.3.6.1.1 are the same as those described for the Preferred Alternative in Section IV.6.3.2.6.

IV.6.3.5.7 Comparison of Alternative 3 With Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 3 with the Preferred Alternative.

IV.6.3.5.7.1 Alternative 3 Compared With Preferred Alternative for Plan-wide DRECP

Alternative 3 develops 23% less area for renewable energy projects than the Preferred Alternative (240,000 acres versus 310,000 acres, respectively). This decreases the potential for chemical spills and groundwater contamination, but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge; with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Because the developed area is smaller, Alternative 3 therefore has less potential to increase groundwater recharge relative to the Preferred Alternative.

Renewable energy projects in Alternative 3 are estimated to use slightly more water than in the Preferred Alternative (92,000 AFY versus 91,000 AFY, respectively), with most of the use for both alternatives for geothermal projects in the Imperial Borrego Valley and Owens River Valley ecoregion subareas. The CMAs and associated mitigation apply to either alternative, and ensure that no project is approved unless it is shown that the water supply is adequate to support development without causing an adverse impact.

Geographic Distinctions

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. Alternative 3 assumes 61,000 acres of solar and geothermal development in 17 of the 37 overdraft or stressed groundwater basins in the Plan Area (Figure IV.6-8), where the Preferred Alternative assumes only about 43,000 acres in 14 of the basins (Figure IV.6-2). Alternative 3 therefore develops more area and associated water use within stressed groundwater basins than the Preferred Alternative. The CMAs and associated mitigation apply to either alternative, and ensure that no project is approved unless it is shown that the water supply is adequate to support development without causing an adverse impact.

Under Alternative 3, there is no development in the Kingston and Funeral Mountains ecoregion subarea (specifically the Pahrump Valley), while 3,000 acres would be developed in the Pahrump Valley under the Preferred Alternative. Groundwater in deep limestone formations beneath the Pahrump Valley may flow to springs along the east side of the Death Valley Basin, so Alternative 3 minimizes water use and its associated impacts on these sensitive features. Similarly, relative to the Preferred Alternative, the development area under Alternative 3 is smaller in areas adjacent to Mexico and Arizona (the Imperial Valley and Palo Verde Valley basins, respectively), reducing the potential for groundwater level and water supply changes that could extend across their boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.5.7.2 Alternative 3 Compared With Preferred Alternative for the BLM Land Use Plan Amendment

Alternative 3 proposes to develop 50% less BLM land than under the Preferred Alternative (58,000 acres versus 115,000 acres, respectively). Alternative 3 therefore has less potential for water quality impacts from chemical spills; but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Because less land is disturbed under Alternative 3, it has a lower potential to alter groundwater recharge, and, with mitigation, the Preferred Alternative may therefore increase groundwater recharge relative to Alternative 3 (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins).

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of the projects and associated water use are important to consider. Alternative 3 develops 13,000 acres of solar and geothermal projects in 11 overdraft or stressed basins, where the Preferred Alternative develops 17,000 acres of solar and geothermal projects in 12 overdraft or stressed basins. The BLM LUPA for Alternative 3 therefore minimizes development of sensitive groundwater basins relative to the Preferred Alternative.

IV.6.3.5.7.3 Alternative 3 Compared With Preferred Alternative for NCCP

The impacts of the NCCP for Alternative 3 are the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis. As a result, the comparison of Alternative 3 with the Preferred Alternative for the NCCP is the same as described for Plan-wide DRECP.

IV.6.3.5.7.4 Alternative 3 Compared With Preferred Alternative for the GCP

The impacts of the GCP for Alternative 3 and the Preferred Alternative would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, and they would occur only on nonfederal lands. Alternative 3 allocates 6% less total area to renewable energy projects (183,000 acres versus 195,000 acres, respectively), which lowers the potential for chemical spills and groundwater contamination; but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge, and, with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Because the developed area is smaller, Alternative 3 has less potential to increase groundwater recharge relative to the Preferred Alternative.

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of the projects are important to consider. Under Alternative 3, development occurs in 16 overdraft or stressed basins (86,000 acres), whereas development under the Preferred Alternative occurs in 14 overdraft or stressed basins (35,000 acres). The GCP for Alternative 3 therefore develops more area located in sensitive groundwater basins relative to the Preferred Alternative. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would mitigate impacts from development under both alternatives.

Table R2.6-28 (Appendix R2) shows the acres of groundwater basins in GCP Reserve Design Lands under Alternative 3, and shows that more land is allocated to the reserve design relative to the Preferred Alternative, shown in Table R2.6-10 (575,000 and 561,000 acres, respectively). These lands include all or portions of 27 overdraft or stressed basins

under Alternative 3, relative to 28 overdraft or stressed basins under the Preferred Alternative. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet water requirements would be limited. The GCP reserve design in Alternative 3 therefore protects and preserves a greater area and number of sensitive groundwater basins from development relative to the Preferred Alternative.

IV.6.3.6 Alternative 4

IV.6.3.6.1 Plan-wide Impacts of Implementing the DRECP: Alternative 4

Alternative 4 integrates the renewable energy, BLM LUPA, and conservation components of the DRECP Preferred Alternative with other existing uses in the Plan Area. It includes geographically dispersed DFAs on public and private lands with an expected mix of solar, wind, and geothermal technologies. The estimated renewable energy development pattern follows:

- Emphasis on solar in the Cadiz Valley and Chocolate Mountains ecoregion subarea.
- Dispersed wind with most in the West Mojave and Eastern Slopes ecoregion subarea.
- Geothermal in the Imperial Borrego Valley and Owens River Valley ecoregion subareas.

IV.6.3.6.1.1 Plan-wide Impacts and Mitigation Measures from Renewable Energy and Transmission Development

Impact Assessment

Potential renewable energy development within Plan Area groundwater basins under Alternative 4 is shown in Table R2.6-30 (Appendix R2). Development would be in 31 groundwater basins; the total developed area is summarized by ecoregion subarea in Table IV.6-6 (solar only, geothermal only, and total renewable energy development for all technologies combined). Most (69%) of the developed area is within two ecoregion subareas (Cadiz Valley and Chocolate Mountains and West Mojave and Eastern Slopes), with another 28% in the Imperial Borrego Valley and Pinto Lucerne Valley and Eastern Slopes ecoregion subareas. There are geothermal projects in the Imperial Borrego Valley (14,000 acres) and Owens River Valley (1,000 acres) ecoregion subareas. One ecoregion subarea (Piute Valley and Sacramento Mountains) has no planned development under Alternative 4.

Table IV.6-6 shows estimated projection of total water use by solar and geothermal projects within each ecoregion subarea. Total estimated water use was calculated using the projected megawatt distribution and water use factors as described above in Section

IV.6.1.1 "General Methods," and results in Table IV.6-6 indicate an estimated total use of 91,000 AFY, and ranges in available development areas from a minimum of 30 AFY (Kingston and Funeral Mountains ecoregion subarea) to 80,000 AFY (Imperial Borrego Valley ecoregion subarea). Wet cooled geothermal projects account for almost 87,000 AFY of the total water use under Alternative 4. Ninety-seven percent of the total water use under Alternative 4 occurs in the Imperial Borrego Valley and Owens River Valley ecoregion subareas since it contains 15,000 acres of geothermal projects and 30,000 acres of solar projects.

Under Alternative 4, renewable energy projects can be developed in a number of overdraft basins and groundwater basins identified as stressed. Figure IV.6-9 maps the distribution of estimated water use by DFA and overdraft groundwater basins, and Figure IV.6-10 maps water use by DFA, overdraft, and stressed groundwater basins. Development is planned in 18 overdraft and stressed groundwater basins, and the increased groundwater use in these sensitive basins can adversely affect water supplies and exacerbate impacts associated with overdraft conditions and declining groundwater levels. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would mitigate impacts from development.

Some of the developed basins under Alternative 4 can be hydraulically connected to areas located outside the Plan Area; a discussion of these potential impacts outside the Plan Area is provided in Section IV.6.3.6.5, Impacts Outside the Plan Area for Alternative 4.

Table IV.6-6
Renewable Energy Development Area and Estimated Water Use – Alternative 4

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	*Geothermal*	*Total*[3]		
Cadiz Valley and Chocolate Mountains	39,000	0	102,000	7,000	2,000
Imperial Borrego Valley	28,000	14,000	49,000	6,000	80,000
Kingston and Funeral Mountains	600	0	600	100	30
Mojave and Silurian Valley	3,000	0	4,000	400	300
Owens River Valley	2,000	1,000	4,000	500	8,000
Panamint Death Valley	800	0	800	100	40
Pinto Lucerne Valley and Eastern Slopes	6,000	0	27,000	1,000	300
Piute Valley and Sacramento Mountains	0	0	0	0	0
Providence and Bullion Mountains	1,000	0	1,000	200	40

Table IV.6-6
Renewable Energy Development Area and Estimated Water Use – Alternative 4

Ecoregion Subarea	Renewable Energy Development Focus Area (acres)			MW[1]	Water Use (AFY)[2]
	Solar	*Geothermal*	*Total*[3]		
West Mojave and Eastern Slopes	38,000	0	88,000	5,000	1,000
Total	**118,000**	**15,000**	**276,000**	**20,000**	**91,000**

[1] Total megawatts for all technologies combined using the energy generation described in Appendix O (Methods for Megawatt Distribution).
[2] Estimated solar thermal water use included industrial processes (0.5 AFY/MW) and cooling (minimum estimate of 1 AFY/MW represented by dry cooled technology, and maximum estimate of 14.5 AFY/MW represented by wet cooled technology); photovoltaic water use for cleaning (0.05 AFY/MW), and geothermal water use for cooling (assumed wet cooled technology at 31 AFY/MW); water use for wind assumed negligible.
[3] Total development area is the sum of solar, geothermal, wind, and transmission project areas.
Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Impact GW-1: Construction of Plan components could alter groundwater recharge.

Impacts on groundwater recharge from land disturbance under Alternative 4 would be similar to those shown in Section IV.6.3.1.1.1. Alternative 4 potentially affects recharge on 276,000 acres.

Impact GW-2: Groundwater consumption lowers groundwater levels, depletes water supplies, and affects groundwater discharge.

Impacts on groundwater levels would be similar to those shown in Section IV.6.3.1.1.1. The greatest potential water use is in the Imperial Borrego Valley and Owens River Valley ecoregion subareas (88,000 AFY) ecoregion subarea, with most of the water use for geothermal technology (15,000 acres) and solar technology (30,000 acres). The remaining water use is mostly for solar technology located in the Cadiz Valley and Chocolate Mountains, Mojave and Silurian Valley, Pinto Lucerne Valley and Eastern Slopes, Providence and Bullion Mountains, and West Mojave and Western Slopes ecoregion subareas. A substantial number of basins within these ecoregion subareas is in overdraft or is characterized as stressed (Figure IV.6-10). Groundwater use for renewable energy projects will likely exacerbate depletion of the water supply and the magnitude and scope of adverse impacts.

Impact GW-3: Groundwater consumption could cause land subsidence and permanently decrease storage capacity.

Land subsidence would cause impacts similar to those shown in Section IV.6.3.1.1.1. As shown in Table IV.6-6, renewable energy water use under Alternative 4 is 91,000 AFY, with most of the water use attributed to geothermal and solar development in the Imperial Borrego Valley ecoregion subarea.

Impact GW-4: Groundwater consumption could cause existing poor-quality groundwater to migrate.

Impacts from the potential migration of poor-quality groundwater would be similar to those shown in Section IV.6.3.1.1.1. The large amount of renewable energy development could affect groundwater quality.

Impact GW-5: Injection of water for geothermal steam generation could contaminate potable water supplies.

The potential for impacts from injection of saline water for geothermal steam water would be as shown in Section IV.6.3.1.1.1. Geothermal development increases the potential for contamination, particularly in the Imperial Borrego Valley and Owens River Valley ecoregion subareas where geothermal development would be located.

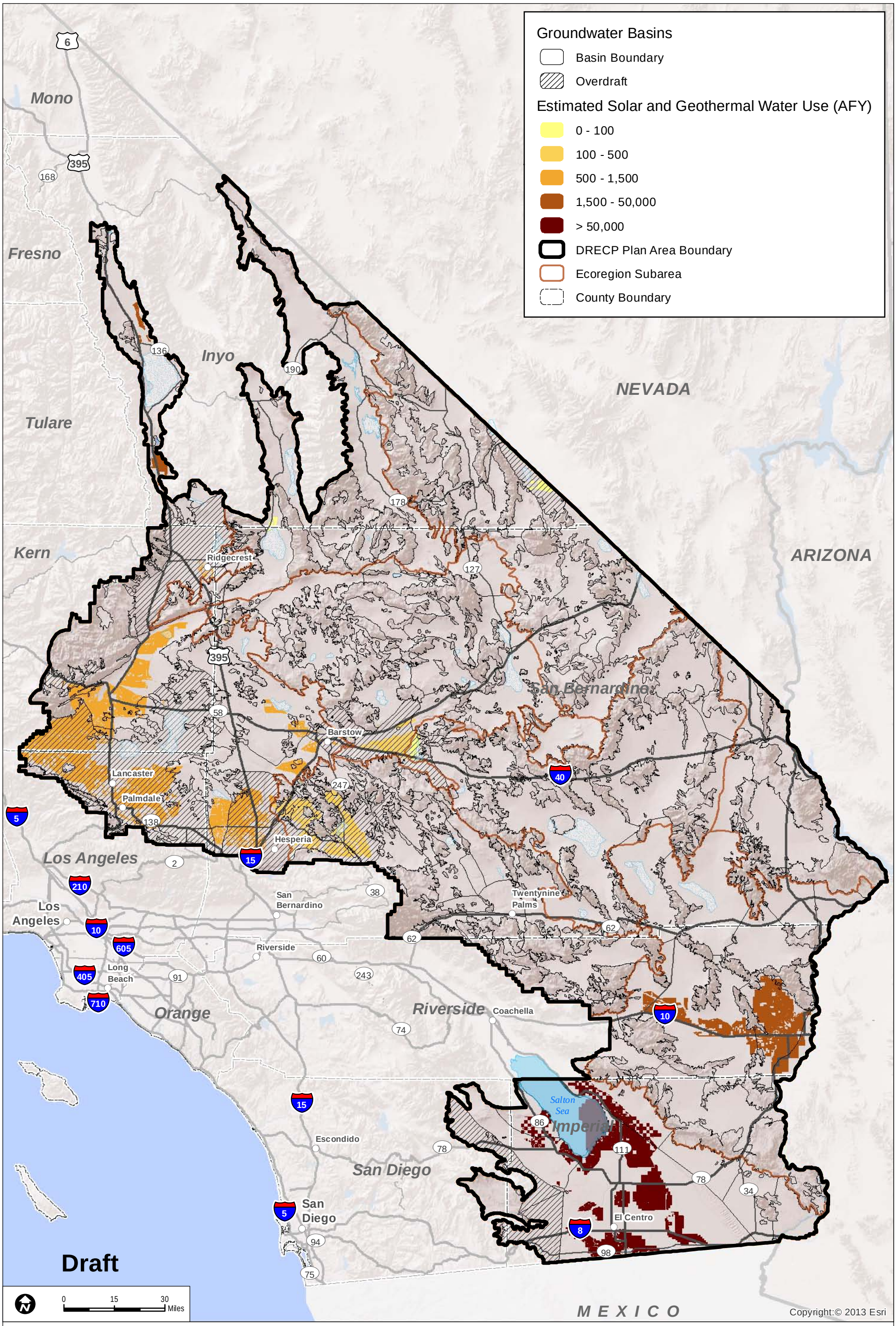
Impact GW-6: Chemical spills or brine disposal could contaminate groundwater.

Groundwater contamination from chemical spills or brine disposal would be as shown in Section VI.6.3.1.1.1.

Study Area Lands

Future Assessment Areas. There are no FAAs in Alternative 4.

Special Analysis Areas. Designating the SAAs as largely conservation and undesignated, with some as DRECP Variance Lands, would have no impact on groundwater. Impacts would be the same as those explained for the Plan-wide reserve design in the section "Impacts of the Reserve Design."

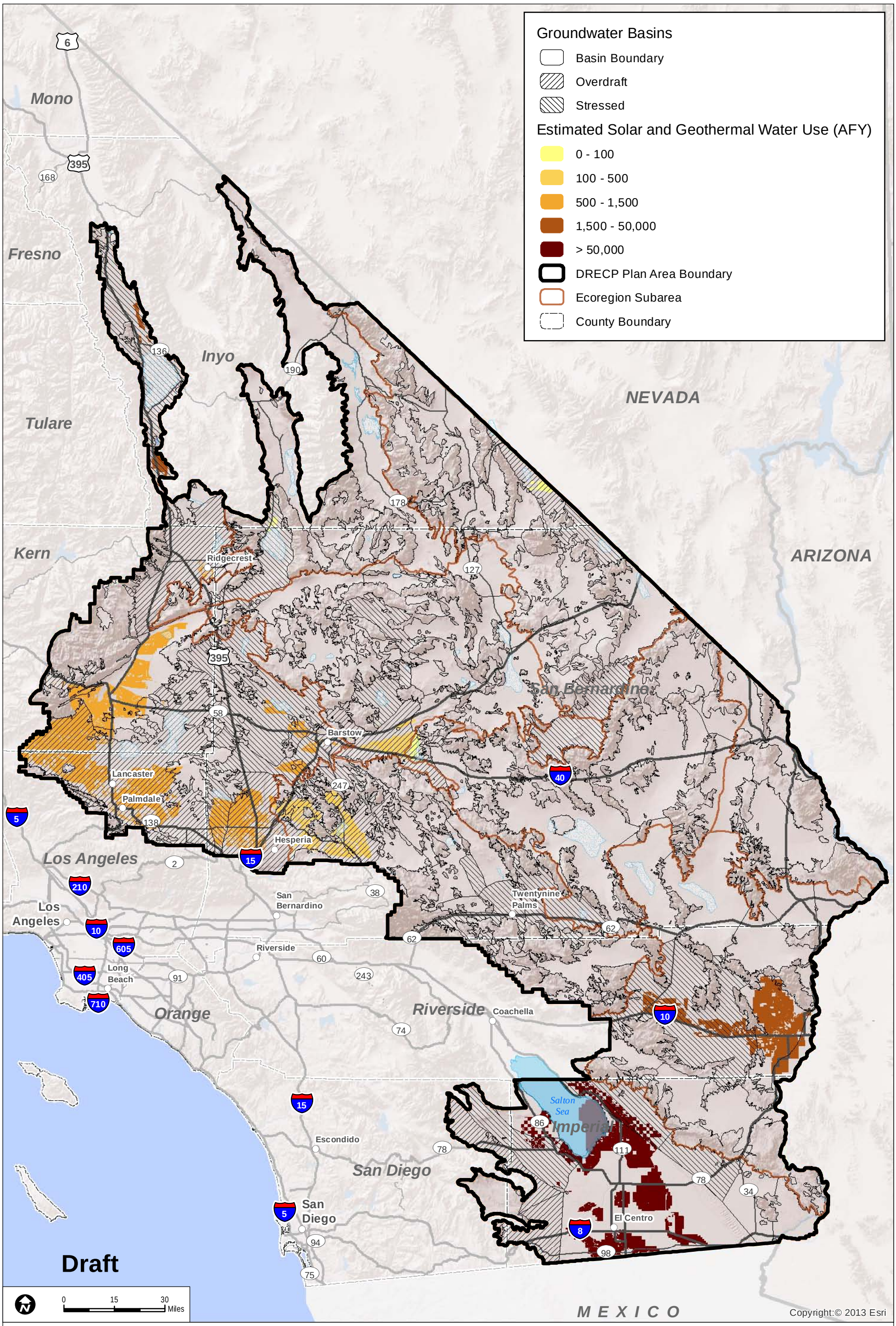


Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-9

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft Groundwater Basins - Alternative 4

INTENTIONALLY LEFT BLANK



Sources: ESRI (2014); California Department of Water Resources (2003)

FIGURE IV.6-10

Planned Development Areas, Estimated Solar and Geothermal Water Use, and Overdraft and Stressed Groundwater Basins - Alternative 4

INTENTIONALLY LEFT BLANK

DRECP Variance Lands. DRECP Variance Lands represent the BLM Solar PEIS Variance Lands as screened for the DRECP and EIR/EIS based on BLM screening criteria. Covered Activities could be permitted for NCCP purposes only through an NCCP plan amendment. However, development of renewable energy on variance lands would not require a BLM Land Use Plan Amendment so the environmental review process would be somewhat simpler than if the location were left undesignated. The 588,000 acres of DRECP Variance Lands in Alternative 4 could result in development in overdraft and stressed basins. However, measures to reduce impacts would be implemented.

Impact Reduction Strategies and Mitigation

The implementation of the Plan would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The renewable energy development impacts covered by the Plan would be lessened in several ways. First, the Plan incorporates CMAs for each alternative, including specific biological reserve design components and LUPA components. In addition, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development. If significant impacts would still result after implementation of CMAs and compliance with applicable laws and regulations, then specific mitigation measures are recommended in this section.

Conservation and Management Actions

The conservation strategy for Alternative 4 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the reserve design and specific CMAs for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would also apply to nonfederal lands. The CMAs summarized in Section IV.6.3.2 apply to Alternative 4.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.6.3.1.1.1.

Mitigation Measures

After implementation of the CMAs and existing laws and regulations, application of Mitigation Measures GW-1a, GW-2a, GW-2b, GW-3a, GW-3b, and GW-4a would further reduce some of the DRECP's adverse impacts.

IV.6.3.6.1.2 Impacts from Reserve Design

The estimated acres of groundwater basins in Reserve Design Lands are summarized in Table R2.6-31 (Appendix R2). Reserve Design Lands include the existing protected areas (LLPAs and MEMLs), plus Alternative 4 existing and proposed BLM conservation lands (NLCS lands, ACECs, and wildlife allocations), and Alternative 4 Conservation Planning Areas. No renewable energy development is allowed on existing protected areas, and the use of or access to groundwater resources to meet renewable energy project water requirements would be limited. No adverse impacts are therefore expected to groundwater resources because of the reserve design. Under Alternative 4, renewable energy development is restricted on over 3 million acres located within 31 overdraft or stressed groundwater basins, thereby protecting and preserving groundwater and water supply conditions in these areas.

IV.6.3.6.2 Impacts of DRECP Land Use Plan Amendment on BLM Land: Alternative 4

This section addresses two components of effects of the BLM LUPA: the streamlined development of renewable energy and transmission on BLM land under LUPA and the impacts of the amended land use plans themselves.

IV.6.3.6.2.1 Impacts from Renewable Energy and Transmission Development on BLM Land

Under the DRECP LUPA, renewable energy development on BLM lands in DFAs would be streamlined. The types of impacts would be similar to those shown in Section IV.6.3.2.1 for the Plan-wide impacts. The potential acres of groundwater basin impacts on BLM lands under Alternative 4, by technology type, are shown in Table R2.6-32 (Appendix R2); 94,000 acres within 26 basins are assumed to be developed for solar, wind, geothermal, and transmission projects. Land disturbances caused by renewable energy development can impact groundwater recharge. A small proportion (5%) of the developed area is for geothermal, and the geothermal development area is distributed between five basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, Rose Valley, and West Salton Sea).

Renewable energy technologies can utilize large amounts of water and impact groundwater resources; Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 4, solar and geothermal development on BLM lands would occur in three overdraft basins and seven basins identified as already stressed.

IV.6.3.6.2.2 Impacts of Changes to BLM Land Designations

The DRECP LUPA alternative designates new NLCS lands, new ACECs and wildlife allocations, expands and reduces existing ACECs, designates new SRMAs, and expands and reduces existing SRMAs, and buffer corridors along National Scenic and Historic Trails. The BLM LUPA also replaces MUCs, and establishes VRM Classes in the CDCA. More than 4.5 million acres are assumed allocated in the BLM LUPA land designation under Alternative 4. Because the BLM LUPA land designations protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.6.3 Impacts of Natural Community Conservation Plan: Alternative 4

The impacts of the NCCP for Alternative 4 would be the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis.

IV.6.3.6.4 Impacts of General Conservation Plan

The impacts of the GCP for Alternative 4 would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, but they would occur on nonfederal lands only. The potential acres of groundwater basin impacts on GCP lands under Alternative 4, by technology type, are summarized in Table R2.6-33 (Appendix R2); 181,000 acres are assumed to be developed for solar, wind, geothermal, and transmission projects. Land disturbance by renewable energy projects can affect groundwater recharge, and construction and operation of the projects can affect groundwater quality from chemical spills or leakage of brines from storage ponds.

Almost 50% of the developed area in GCP lands is for solar energy projects located in 26 groundwater basins (84,000 acres), and about 6% of the developed area is for geothermal energy projects distributed between four basins (East Salton Sea, Imperial Valley, Ocotillo-Clark Valley, Owens Valley, and Rose Valley). Solar and geothermal technology can use large amounts of water and impact groundwater resources. Groundwater use can lower groundwater levels, deplete basin water supplies, decrease groundwater discharge, and degrade groundwater quality. Under Alternative 4, 46,000 acres of solar and geothermal development in GCP lands would occur in eight overdraft basins and in 10 basins considered stressed.

The estimated acres of groundwater basins in GCP Reserve Design Lands under Alternative 4 are summarized in Table R2.6-34 (Appendix R2); more than 572,000 acres are allocated to GCP Reserve Design Lands. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or

access to groundwater resources to meet renewable energy project water requirements would be limited in these basin areas.

IV.6.3.6.5 Impacts Outside the Plan Area for Alternative 4

Under Alternative 4, planned renewable energy development would be in basins hydraulically connected to adjacent areas located outside the Plan Area (See Figure IV.6-9 for the locations and distribution of development areas). Renewable energy projects are planned in groundwater basins connected to areas within Nevada (the Pahrump Valley basin, located in the Kingston and Funeral Mountains ecoregion subarea), Mexico (the Imperial Valley basin, located in the Imperial Borrego Valley ecoregion subarea), and Arizona (Palo Verde Valley, located in the Cadiz Valley and Chocolate Mountain ecoregion subarea). Groundwater level and water supply changes can therefore extend across these boundaries and impact areas outside the Plan Area and the Colorado River.

IV.6.3.6.5.1 Impacts of Transmission Outside the Plan Area

The impacts of transmission outside the Plan Area on groundwater, water supply, and water quality would be the same under all alternatives. These impacts are as described in the No Action Alternative in Section IV.6.3.1.5, Impacts of Transmission Outside the Plan Area in No Action Alternative.

IV.6.3.6.5.2 Impacts of BLM LUPA Decisions Outside the Plan Area

Under the proposed BLM LUPA, the only changes outside the Plan Area would be the designation of NLCS lands, ACECs, National Scenic and Historic Trails management corridors, VRM Classes, and new land allocations to replace MUCs on CDCA lands. The estimated acreage of groundwater basins in BLM LUPA lands located outside the Plan Area under Alternative 4 is summarized in Table R2.6-35 (Appendix R2). Because the BLM LUPA land designations outside the Plan Area protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, the use of or access to groundwater resources to meet renewable energy project water requirements would likely be limited.

IV.6.3.6.6 CEQA Significance Determination for Alternative 4

The CEQA significance determinations for the impacts from Alternative 4 described in Section IV.6.3.6.1.1 are the same as those described for the Preferred Alternative in Section IV.6.3.2.6.

IV.6.3.6.7 Comparison of Alternative 4 With Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 4 with the Preferred Alternative.

IV.6.3.6.7.1 Alternative 4 Compared With Preferred Alternative for Plan-wide DRECP

Alternative 4 develops 11% less area for renewable energy projects than the Preferred Alternative (276,000 acres versus 310,000 acres, respectively). This lowers the potential for chemical spills and groundwater contamination; but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge; with mitigation these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Because the developed area is smaller, Alternative 4 therefore has less potential to increase groundwater recharge relative to the Preferred Alternative.

Renewable energy projects in Alternative 4 use the same amount of water as in the Preferred Alternative.

Geographic Distinctions

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of the projects and their associated groundwater use are important to consider. Alternative 4 develops 63,000 acres of solar and geothermal projects in 18 of the 37 overdraft or stressed groundwater basins in the Plan Area (Figure IV.6-10), where the Preferred Alternative develops about 43,000 acres in 14 of the basins (Figure IV.6-2). Alternative 4 therefore develops more area within more sensitive groundwater basins than the Preferred Alternative. Existing regulations, implementation of CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

IV.6.3.6.7.2 Alternative 4 Compared With Preferred Alternative for the BLM LUPA

Alternative 4 proposes to develop 18% less BLM land than the Preferred Alternative (94,000 acres versus 115,000 acres, respectively). Alternative 4 therefore has less potential for water quality impacts from chemical spills; but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Because less land is disturbed under Alternative 4, it has a lower potential to alter groundwater recharge, and with mitigation, the Preferred Alternative may therefore increase groundwater recharge relative to Alternative 4.

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. Alternative 4 develops 16,000 acres of solar and geothermal projects in 18 overdraft or stressed basins, where the Preferred Alternative develops 17,000 acres of solar and geothermal projects in 12 overdraft and stressed basins. The BLM LUPA for Alternative 4 develops less acreage, but the developed area is distributed between more sensitive basins relative to the Preferred Alternative.

IV.6.3.6.7.3 Alternative 4 Compared With Preferred Alternative for NCCP

The impacts of the NCCP for Alternative 4 are the same as those defined in Section IV.6.3.2.1 for the Plan-wide analysis. As a result, the comparison of Alternative 4 with the Preferred Alternative for the NCCP is the same as described for Plan-wide DRECP.

IV.6.3.6.7.4 Alternative 4 Compared With Preferred Alternative for the GCP

The impacts of the GCP for Alternative 4 and the Preferred Alternative would be similar to those defined in Section IV.6.3.2.1 for the Plan-wide analysis, and they would occur only on nonfederal lands. Alternative 4 allocates 7% more total area to renewable energy projects relative to the Preferred Alternative (181,000 acres versus 195,000 acres, respectively), which lowers the potential for chemical spills and groundwater contamination; but existing regulations and BMPs reduce potential groundwater contamination impacts in both alternatives. Renewable energy development has the potential to alter groundwater recharge, and, with mitigation, these changes may increase groundwater recharge (e.g., installing pervious groundcover and directing runoff flows from a greater area to percolation basins). Because the developed area is smaller, Alternative 4 therefore has less potential to increase groundwater recharge relative to the Preferred Alternative.

Solar and geothermal technologies account for most renewable energy-related water use, so the locations of these projects are important to consider. Under Alternative 4, development occurs in 18 overdraft or stressed basins (46,000 acres), where development under the Preferred Alternative occurs in 14 overdraft or stressed basins (35,000 acres). The GCP for Alternative 4 therefore develops more area located in sensitive groundwater basins relative to the Preferred Alternative. Existing regulations, implementation of the CMAs, and additional measures required for renewable energy projects would reduce impacts from development under both alternatives.

Table R2.6-34 (Appendix R2) reports the acres of groundwater basins in GCP Reserve Design Lands under Alternative 4, and shows that more land is allocated to the reserve design relative to the Preferred Alternative shown in Table R2.6-10 (572,000 acres versus 561,000 acres, respectively). These lands include all or portions of 28 overdraft or stressed

basins under Alternative 4, which is similar to the 28 overdraft or stressed basins under the Preferred Alternative. Because the GCP Reserve Design Lands protect ecological, historical, cultural, scenic, scientific, and recreational resources and values, the use of or access to groundwater resources to meet project water requirements would be limited in both alternatives. The GCP reserve design in Alternative 4 therefore protects and preserves a greater area of the sensitive groundwater basins where development occurs, relative to the Preferred Alternative.

INTENTIONALLY LEFT BLANK