Local Agency Management Program

For

Onsite Wastewater Treatment Systems

Kern County, California

Environmental Health Services Division
Kern County Public Health Department

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Section 1:
Introduction and Background

Introduction

This document presents the proposed Local Agency Management Program (LAMP) pertaining to the oversight of onsite wastewater treatment systems (OWTS) within the County of Kern, California. This LAMP has been prepared in accordance with the requirements of the State Water Resources Control Board's (SWRCB) *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems*, dated June 19, 2012, also referred to as the "OWTS Policy".

The State OWTS Policy provides a multi-tiered strategy for management of OWTS in California. This LAMP has been prepared by Kern County to obtain approval for OWTS management under Tier 2 of the OWTS Policy. As such, it is intended to allow the County to continue providing local oversight of OWTS by implementing practices that: (a) are suited to the conditions in Kern County; (b) meet or exceed the environmental protections of the "default" siting and design requirements for OWTS identified in Tier 1 of the SWRCB Policy; and (c) ensure the best opportunity for coordinated and comprehensive management of OWTS, public health, and water quality in Kern County.

This LAMP is intended to apply to all OWTS within Kern County having wastewater design flows of up to 10,000 gpd, with the exception of those located on State and Federally-owned lands. Any OWTS with a design flow exceeding 10,000 gpd would be regulated by the respective California Regional Water Quality Control Board. The position of Director of the Environmental Health Division (EHD), of and within the administrative control of the director of public health services is responsible for administration of this policy. Cities within the county that have designated the County Health Officer as their jurisdiction's health officer by resolution or ordinance, with approval of the board of supervisors, for the purpose of enforcing state and local environmental health laws, shall adhere to this policy. All environmental health division personnel who engage in enforcement of orders, and other regulatory enforcement actions as prescribed by the state shall be qualified as required by state law.

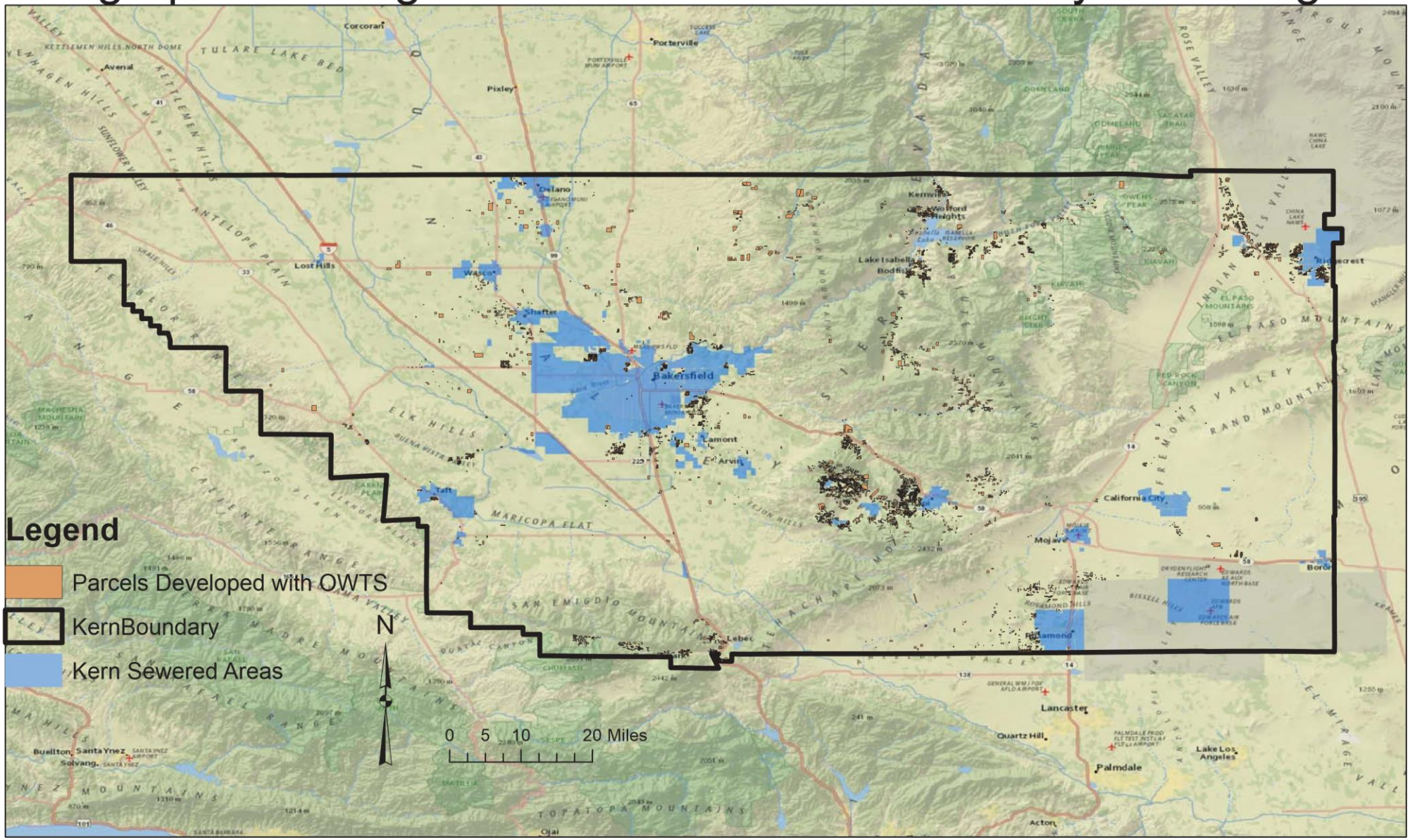
Geographical Area

Kern County is located at the southern end of the Central Valley of California and shares boundaries with Kings and Tulare Counties to the north, Inyo County to the northeast, San Luis Obispo County to the west, Ventura and Los Angeles Counties to the south, and San Bernardino County to the east (see **Figure 1-1**). The county encompasses over 8,171 square miles of territory, or approximately 5,229,440 acres. The county seat and largest city is Bakersfield.

A major physical feature of the county is the San Joaquin Valley, encompassing 2,374 square miles at the southern terminus of California's Central Valley. The flat basin of the San Joaquin Valley is bordered on the west by the Temblor Range (part of the Coast Range Mountains), on the south by the Transverse and Tehachapi Ranges, and on the east by the southern slope

Geographic Setting

Kern County LAMP Fig.1-1



of the Sierra Nevada Mountains. Almost one-third of the county's land area, the San Joaquin Valley includes the cities of Bakersfield, Wasco, Shafter, McFarland, and Delano agricultural lands and also is the location of some of the largest oil reserves in the United States.

The western border of Kern County is situated within the Temblor Range, trending northwest to southeast, west of the San Joaquin Valley foothills, and parallel to the San Andreas Fault, located immediately west in neighboring San Luis Obispo County. Most of the land of the Temblor Range is composed of grasslands and brush, with a significant portion of the western foothills of the San Joaquin Valley occupied with oil drilling and production.

At the southwestern corner of Kern County is the convergence of the Temblor and Transverse Mountain Ranges, the Transverse Ranges running roughly east-west, combining with the Tehachapi Range, to form the southern border of San Joaquin Valley. The Tehachapi Range continues northeastward to converge with the southern terminus of the north–south trending Sierra Nevada Mountains. These densely-wooded mountain regions contain some concentrated populations in the mountain valleys. Large portions of the mountain areas are park and open space.

Southeast of the Tehachapi Range and east of the southern Sierra Nevada Mountains, is another major physical feature, the Mojave Desert. At 1,032 square miles, the Mojave Desert completes the southeast and eastern portion of Kern County and extends eastward into neighboring San Bernardino County. Except for the communities of Mojave, Ridgecrest, and Rosamond, the Mojave Desert portion of the County is sparsely populated and is occupied with mining operations, such as borax mining, and is also the site of Edwards Air Force Base.

Development in the County is mostly in the San Joaquin Valley along Interstate Highway 5 and the 99 Freeway. Radiating out from Bakersfield are also Freeways 14, 46, 58, and 178 that influence development density in the sparsely populated areas outside of the basin.

Regulation of Onsite Wastewater Treatment Systems

The Kern County Public Health Services Department, Environmental Health Division, is responsible for regulating OWTS throughout the unincorporated areas of the county. The EHD also administers OWTS regulations in the various cities in the county. OWTS are used almost exclusively for properties located outside of municipal sewer service boundaries, which includes a large number of unincorporated parcels in the Bakersfield Metropolitan area, as well as small communities and subdivisions in the mountain regions around Lake Isabella, Tehachapi Valley, and the Grapevine area. Countywide there are currently estimated to be approximately 16,500 OWTS.

The County has historically operated its onsite wastewater systems program under the authority granted to it by two California Regional Water Quality Control Boards: (1) the Central

Valley Region, for those areas that drain to the west side of the County, in Tulare Lake Basin; and (2) the Lahontan Region, for those areas that drain to the east side of the County toward the Mojave Desert. **Figure 1-1** is a map of Kern County, showing major geographical features, city and sanitary district boundaries, and the location and distribution of OWTS in the unincorporated areas.

Historically, the County has relied on the California Plumbing Code (CPC) for most technical and procedural matters pertaining to OWTS. In response to the State OWTS Policy, beginning in 2013 the County started taking measures to modify and update the County's onsite system management program to meet provisions of the Policy. This effort included some initial changes in administrative policies and procedures, followed by a more comprehensive review, update, and revisions to establish a local OWTS Ordinance with an accompanying set of technical standards to replace the CPC. The new OWTS Ordinance combined with an "Onsite Systems Manual" containing various standards, policies, procedures, and technical information for implementation of the Ordinance, now contain all pertinent OWTS requirements for Kern County and form the basis of this LAMP.

Kern County OWTS Requirements

Onsite Wastewater Ordinance

The County Onsite Wastewater Ordinance establishes standards for the approval, installation, and operation of OWTS within Kern County consistent with the County's overall responsibility to prevent the creation of health hazards and nuisance conditions and the protection of surface and groundwater quality. A copy of the Ordinance accompanies and is an integral part of this LAMP. Any change to the Ordinance requires approval by the Kern County Board of Supervisors. **Table 1-1** presents a brief synopsis of various sections of the Ordinance.

Table 1-1. Kern County Onsite Wastewater Ordinance Summary

CHAPTER 8.62__. ONSITE WASTEWATER TREATMENT SYSTEMS	
Section 8.62.010	**Purpose** - States purpose to establish standards for compliance with applicable laws and protection of public health and water quality.
Section 8.62.020	**Definitions**
Section 8.62.030	**Applicability** – applies to all OWTS up to max 10,000 gpd flow limitation, no community systems
Section 8.62.040	**Administration and enforcement** – by director of Environmental Health Services on behalf of Health Officer.
Section 8.62.050	**County not responsible for damage -**
Section 8.62.060	**Standards, guidelines and onsite systems manual** – establishes Onsite Systems Manual for implementation policies, procedures, and technical details
Section 8.62.070	**Connection to sanitary sewer** - requires connection to sanitary sewer if within 200 feet of parcel
Section 8.62.080	**Prohibited acts** – describes unlawful acts to include construction without permit and habitation without approved sanitation system.
Section 8.62.090	**Building permit approval** - requires OWTS clearance prior to bldg. construction and repair/remodel
Section 8.62.100	**OWTS installation permit required** – OWTS permits for new construction and repairs/remodels
Section 8.62.110	**Permit duration and extension** – two-year permit duration with provision for extension
Section 8.62.120	**Permits nontransferable –** permits not transferable to another person or site
Section 8.62.130	**Application and fees** - application and payment of fees; to be set by Board of Supervisors
Section 8.62.140	**Denial, suspension or revocation of OWTS permit** – allowances for director to deny, suspend, or revoke permit
Section 8.62.150	**Appeals -** process for appealing any decision of the director pursuant to this code chapter
Section 8.62.160	**Siting criteria** - specifies criteria for OWTS States building requirements for inclusion of flush toilet and use of an OWTS
Section 8.62.170	**Site evaluation** – required for all OWTS installations to verify conformance with siting criteria
Section 8.62.180	**Plans** - Requires submission of plot plan with OWTS permit application
Section 8.62.190	**Operation and maintenance** - Requires operation and maintenance guidelines for OWTS, provided by designer or installer
Section 8.62.200	**Cumulative impacts** – additional reqts for cumulative impact assessment for certain OWTS
Section 8.62.210	**Director review and approval** – requires director review and approval of OWTS plans
Section 8.62.220	**Installation** – specifies contractor license for installation; with owner-builder exception
Section 8.62.230	**Installation inspection and approval** - specifies OWTS construction inspection requirements
Section 8.62.240	**Conventional OWTS** – septic tank, subsurface dispersal system, and 100% reserve area min reqts
Section 8.62.250	**Cesspools prohibited** - prohibition of cesspool and requires abatement upon discovery
Section 8.62.260	**Holding tanks** - restrictions on use of holding tanks and portable toilets
Section 8.62.270	**Alternative systems** – uses, types, design, operating, and monitoring requirements

Section 8.62.280	**Operating permits** - required for all alternative OWTS and some other cases
Section 8.62.290	**Abandoned OWTS** - specifies requirements for destruction of abandoned OWTS
Section 8.62.300	**Variances** - conditions under which variances may be granted
Section 8.62.310	**Abatement -** abatement of OWTS failures, including property lien or order to vacate, if necessary
Section 8.62.320	**Violations -** notice, enforcement process, and cost recovery for OWTS failures/code violations
Section 8.62.330	**Penalty** – violations or unlawful acts constitute infraction, separate offense each day

Onsite Systems Manual

The Onsite Systems Manual provides the procedural and technical details for implementation of the Ordinance. It contains siting, evaluation, design, construction, and operating requirements for OWTS for residential and non-residential occupancies, covering conventional and alternative OWTS. The Onsite Systems Manual will be reviewed and updated from time-to-time, typically every few years, to keep pace with new issues, policies, procedures, and technologies affecting the use and management of onsite wastewater systems in Kern County. The Onsite Manual will be maintained by the EHD. The initial document submitted with this LAMP, as well as any substantive changes in the future, will require approval by the director and by the Regional Water Quality Control Board.

The Onsite Systems Manual is divided into seven main sections as follows:

Part 1: Siting, Design, and Construction Requirements for OWTS. This part of the Manual provides technical standards and guidelines for the design and construction of various onsite wastewater treatment and disposal technologies and components

Part 2: Design Guidelines, Policies, and Procedures. This part contains a compilation of EHD information sheets, guidelines, diagrams, charts, forms, and other information for use by designers and contractors working with OWTS projects.

Part 3: Requirements for Alternative OWTS. This part provides technical guidance and requirements for the application, design, construction, and management of various alternative onsite wastewater treatment and dispersal technologies, including design standards.

Part 4: Operation, Monitoring, and Performance Guidelines. This provides guidelines and criteria for operation, monitoring, and maintenance of conventional and alternative OWTS, including: (a) performance requirements for different components and types of OWTS; (b) monitoring requirements; and (c) guidelines for evaluating the functioning status and performance of OWTS.

Part 5: Standards, Rules, and Regulations for Land Development. This part contains County standards for sewage disposal, water supply, and preservation of environmental health protection applicable to land development projects.

Part 6: OWTS User Information. This contains various guides and information pamphlets about the use and care of OWTS for the benefit of owners and the public.

Part 7: Requirements for Sewage Pumping, Grease Traps, & Toilet Rental Business. This part sets forth the terms and conditions related to liquid waste hauling and portable toilet operations in the County.

Organization of this LAMP

This LAMP is organized to present a comprehensive explanation of the various requirements, policies, procedures, and measures used to regulate and oversee the use of OWTS in Kern County. It is also structured as much as possible to address the items listed in the State OWTS Policy pertaining to Local Agency Requirements and Responsibilities (Section 3.0 of the OWTS Policy) and Local Agency Management Program for Minimum OWTS Standards (Section 9.0 of the OWTS Policy). Reference is made throughout this LAMP to the County's OWTS Ordinance and Onsite Systems Manual, which are attached as part of this LAMP. A matrix-checklist developed by the Central Valley RWQCB is included in **Appendix C**, indicating the specific sections of this LAMP, County code, and Onsite Systems Manual references corresponding to each item required by the State OWTS Policy. The following briefly summarize the contents of this document.

- ***Section 1 - Introduction and Background:*** This introductory section describes the overall purpose, scope, geographical coverage, and overview of the key elements of the LAMP.

- ***Section 2 - Environmental Conditions, OWTS Usage and Water Quality Management in Kern County: T***his section provides background information on environmental conditions pertinent to the use and suitability for OWTS, extent of OWTS usage in the County, and summary of OWTS management approaches and requirements adopted for protection of water quality in Kern County, addressing items in State OWTS Policy Section 9.1.

- ***Section 3 - OWTS Siting, Design, and Construction Requirements:*** This section summarizes key requirements of the County Ordinance and Onsite Systems Manual pertaining to siting, design and construction of OWTS, per the requirements of section 9.2 and covering applicable items listed under Tier 1 (Sections 7.0 and 8.0) of the State OWTS Policy.

- **Section 4 – Special Management Issues:** This section describes the provisions contained in the Kern County LAMP corresponding with special OWTS management issues listed in Sections 9.2.1 through 9.2.12 of the State OWTS Policy.

- ***Section 5 – Prohibitions*:** This section describes the provisions contained in the Kern County LAMP corresponding with the required prohibitions set forth in Section 9.4 of the State OWTS Policy.

- ***Section 6 – Program Administration:*** This section presents the County's plan for addressing the administrative aspects of the LAMP, including record keeping, on-going assessment of water quality issues related to OWTS, and reporting to the RWQCB, as required under Sections 3.3 and 9.3, of the State OWTS Policy.

- ***Appendix A – Supporting Rationale:*** This presents discussion of the supporting rationale (including literature sources) for the various siting and design requirements, focusing on vertical separation requirements for conventional and alternative OWTS, comparison with Tier 1 standards of the OWTS Policy, and highlighting the requirements and management practices that are more protective than the provisions of the OWTS Policy.

- ***Appendix B – Nitrate Loading:*** This presents estimates that have been made of wastewater discharge volumes, and nitrate loading contributions to groundwater from the approximately 16,500 existing OWTS in different geographical areas of Kern County. This will be part of the County's ongoing assessment of water quality impacts from

  OWTS.

Section 2:
Environmental Conditions, OWTS Usage, and Water Quality Management in Kern County

This section provides background information on environmental conditions, OWTS usage, and management approaches adopted for protection of water quality in Kern County.

Surface Water Hydrology

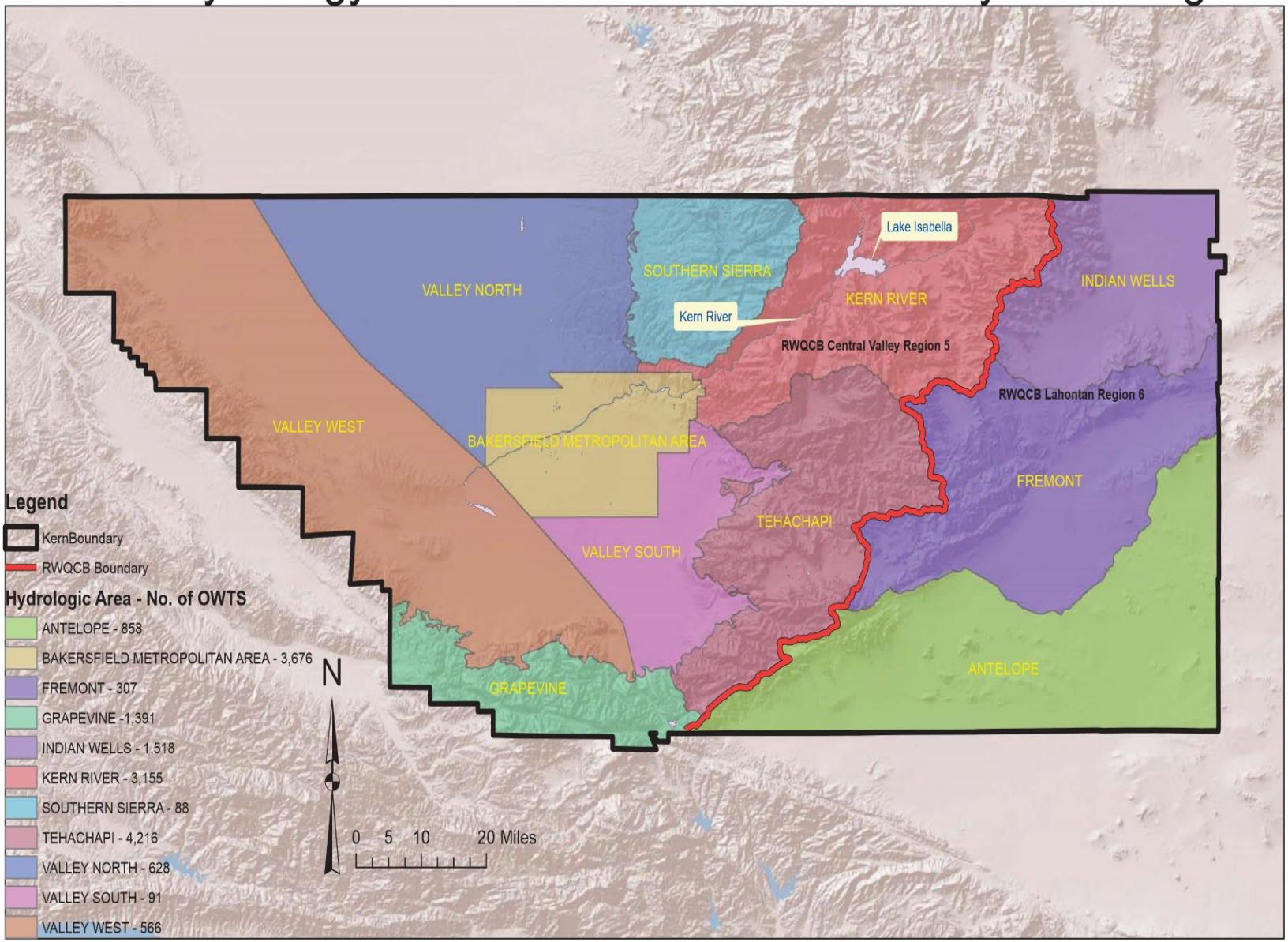
Kern County includes two primary hydrologic regions, the Tulare Lake Hydrologic Region and the South Lahontan Hydrologic Region. These hydrologic regions are managed under two Water Quality Control Board Regions: Central Valley Region 5 (Tulare Lake Hydrologic Region on the west side of the county) and Lahontan Region 6 (the South Lahontan Hydrologic Region on the east side of the county). Very small areas in the remote west edges of the county fall within the Central Coast Region. Utilizing watershed boundaries established by the California Department of Water Resources (DWR), eleven (11) hydrologic areas were delineated and labeled as shown in **Figure 2-1**. Eight of the hydrologic areas are in the Central Valley Region and three within the Lahontan Region. The boundaries match DWR delineations, except that the expansive San Joaquin Valley area was further divided geographically into four sub-areas: labeled Valley North, Valley West, Valley South, and Bakersfield Metropolitan Area. Respective watershed areas and estimated number of OWTS in each Hydrologic Area are listed in Table 2-1.

Table 2-1
Kern County Hydrologic Areas

Hydrologic Area	Total Watershed Area (acres)	Estimated Number of Developed Parcels w/OWTS
Central Valley Region		
Bakersfield Metro Area	2,043,106	3,676
Valley North	2,626,729	628
Valley West	2,444,693	566
Valley South	1,276,966	91
Grapevine	373,658	1,391
Tehachapi	454,041	4,216
Kern River	747,589	3,155
Southern Sierra	264,235	88
TOTAL	**10,231,017**	**13,811**
Hydrologic Area	**Total Watershed Area (acres)**	**Estimated Number of Developed**
Lahontan Region		
Antelope	2,146,292	858
Fremont	908,922	307
Indian Wells	535,095	1,518
TOTAL	**3,590,309**	**2,683**

Surface Hydrology

Kern County LAMP Fig.2-1



Major Kern County Rivers, Creeks, and Dry Lakes

Kern River

The Kern River originates in groups of glacial lakes in the vicinity Mount Whitney and drains an approximate area of 2,420 square miles in the southern Sierra Nevada Range. Water runoff from the Sierra Nevada flows from northeast to southwest and enters the San Joaquin Valley through the Kern River Canyon. Kern River has two primary tributaries that meet at Lake Isabella, which was dammed by the Isabella Dam and Reservoir in 1954, for the purposes of flood control. There is generally no flow in the Kern River past the City of Bakersfield due to water diversion into seven canals that flow through the City. In very wet years, water flows in the river southwest to the Buena Vista Lake bed and north to Tulare Lake or into the California Aqueduct near Tupman (KCGP RPEIR, Volume 1, 2004).

Poso Creek

Poso Creek is the primary drainage course for surface water from the Greenhorn Range of Kern County, located in the east side of the County to the north of the Kern River. The creek flows to the southwest out of Kern County, then turns to the northwest before it outlets onto the plains north of Bakersfield and ultimately into the Tulare Lake Bed.

Caliente Creek

The Caliente Creek is located to the south of the Kern River on the east side of the County. The Caliente Stream Group includes various creeks including Caliente Creek, Sycamore Creek, Walker Basin Creek, Tehachapi Creek, Little Sycamore Creek, Comanche Creek, and Tejon Creek. Most of the surface water flow from Caliente Creek seeps into the ground, with only infrequent high intensity flows that reach the Great Valley. Water from high flow ultimately reaches the Kern Lake area.

Sandy Creek

Sandy Creek drains an area within Kern and San Luis Obispo Counties in the southwestern portion of the San Joaquin Valley. The creek originates on the eastern slopes of the Temblor Range. The channel is poorly defined east of Taft-Ford City area and becomes more defined near the Buena Vista Lake Bed. Runoff in Sandy Creek is sporadic, but can become a flood hazard in urban areas during heavy rainfall years.

Cuddy Creek

Cuddy Creek originates in the San Emigdio Mountains and flows eastward through the communities of Lake of the Woods and Frazier Park and ultimately under Interstate 5 to the Tejon (Castaic) Lake bed. The creek is intermittent, with peak flows occurring in winter and spring following periods of peak precipitation.

Major Dry Lakes

Four major dry lake beds occur in eastern Kern County. These include the Rosamond Lake, Rogers Lake, Koehn Lake, and China Lake. Rosamond and Rogers Dry Lakes are located in the southeastern portion of the county on Edwards Air Force Base. The lakebeds receive drainage from Kern and Los Angeles Counties. Koehn Lake is a playa located about 20 miles northeast of Mojave in the Cantil Valley. The lakebed receives runoff from the El Paso Mountains to the northwest and the Rand Mountains to the southeast. China Lake, located northeast of Ridgecrest is located within the China Lake Naval Weapons Center. Drainage from the El Paso Mountains located south of the lake, flows northeast through and around Ridgecrest to China Lake.

Groundwater

Utilizing boundaries established by the California Department of Water Resources (DWR), sixteen (16) alluvial groundwater basins were delineated and labeled as shown in **Figure 2-2**. Eleven (11) basins are located in the Tulare Lake Hydrologic Region, and five (5) basins are located in the South Lahontan Hydrologic Region. There are also small fractional portions of groundwater basins that lie predominantly in neighboring counties (San Bernardino and Los Angeles) which area shown in **Figure 2-2.** These were omitted from further analysis due to the small percentage of each basin falling within Kern County, as well as the absence of any overlying parcel development in these remote areas of the County.

For the 16 groundwater basins, **Table 2-2** summarizes the basin characteristics, including surface area, storage and annual recharge as reported by DWR in Bulletin 118 (DWR, 2003). Also included in **Table 2-2** is groundwater monitoring data, including depth to groundwater and water quality monitoring data available through DWR. The depths to groundwater presented reflect the range of measurements from the most recent well monitoring data available in the DWR Groundwater Library. Where available, data are included from the edges as well as the center of each basin.

Soils and OWTS Suitability Mapping

General Soils Map. Figure 2-3 presents a General Soils Map of Kern County compiled from information contained in several soil surveys and mapping published by the U.S. Department of Agriculture, which include: (1) Soil Survey of Kern County, California, Northwestern Area, 1988; (2) Soil Survey Kern County, California, Southeastern Part, 1981; (3) Soil Survey of Kern County, California, Southwestern Part, 2008; and (4) Online soils data base maintained by the Natural Resources Conservation Service (NRCS). The General Soils Map contained in the 1988 Soil Survey of Northwestern Kern County, provided the baseline groupings of general soil associations, which were extended to cover other portions of the County, as shown in **Figure 2-3**.

Groundwater Basins

Kern County LAMP Fig.2-2

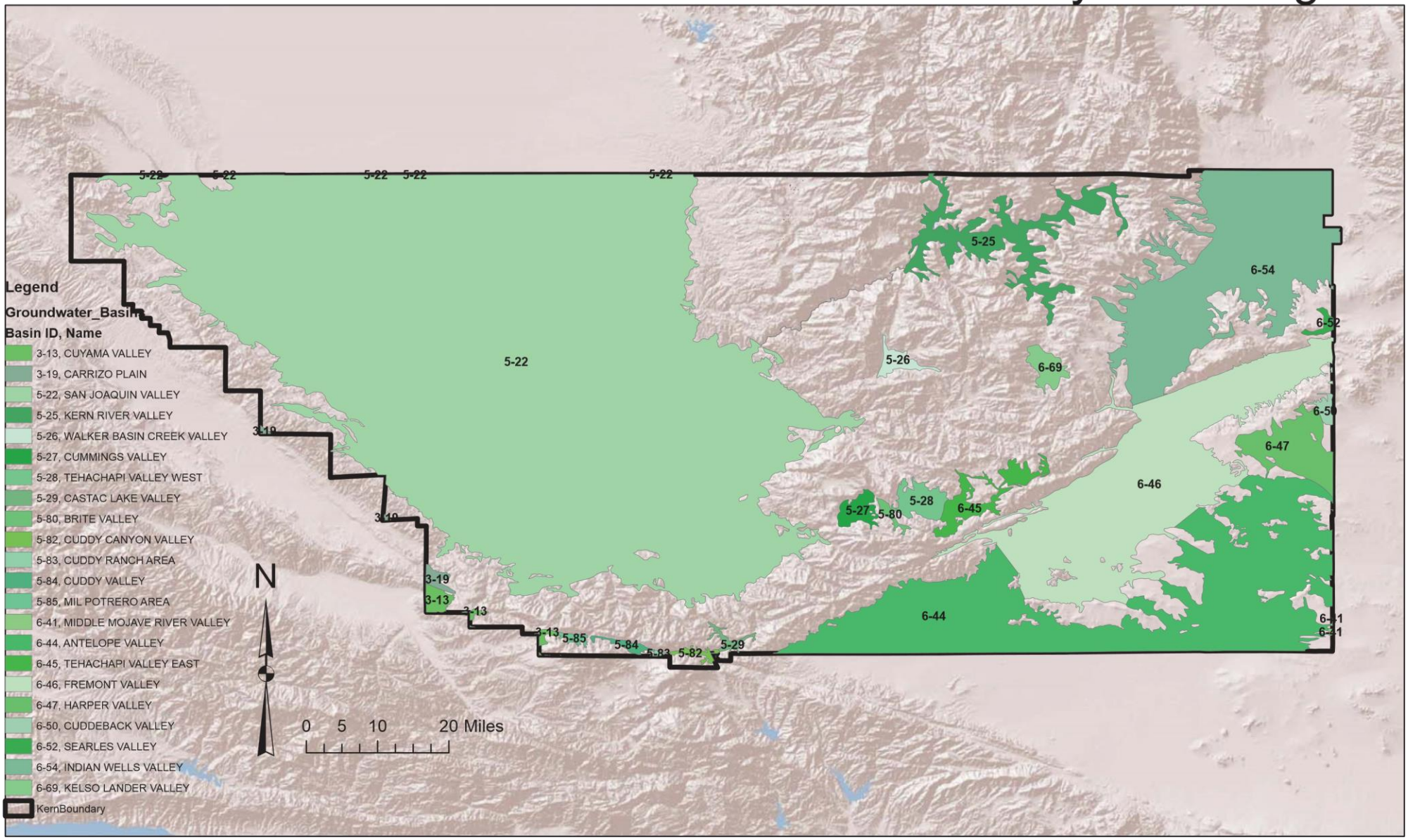


Table 2-2. Kern County Groundwater Basin Characteristics

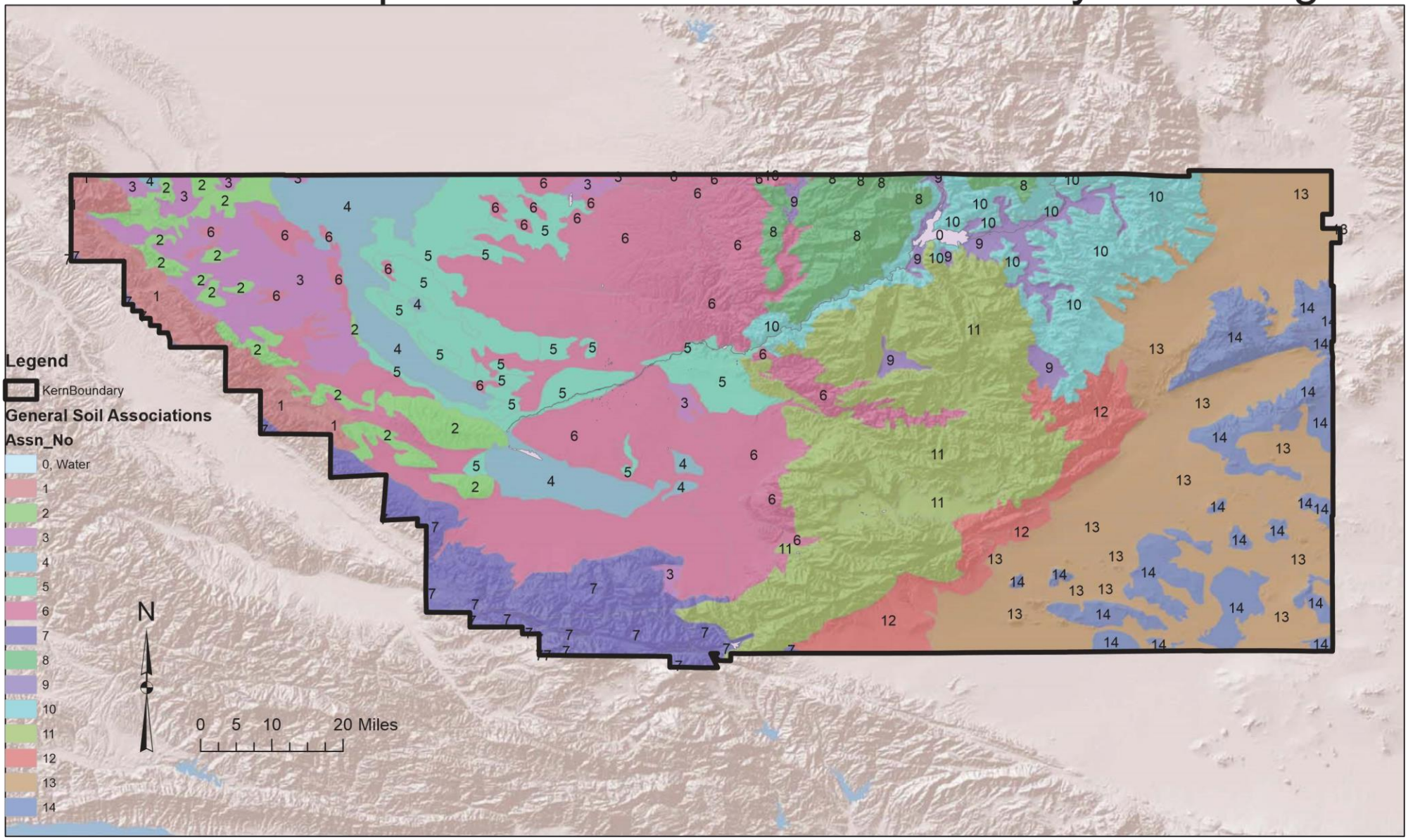
GW Basin Name	Basin No.	Hydrologic Area	Surface Area (AC)	Storage Volume (AC-FT)	Annual Recharge Volume (AC-FT/YR)	Depth to Groundwater (ft., bgs)	Water Quality			
							TDS (mg/L)		Nitrate	
							Range	Ave.	# Wells Monitored	# Wells Exceeding MCL
San Joaquin Valley	5-22.14	Tulare Lake Valley [1]	1,945,000	40,000,000	1,534,000	5 to 20 (perched); 50 to 300+ (regional)	150 - 5,000	400 - 450	475	38
Kern River Valley	5-25	Kern River	74,000	N/A		9 to 63	253 - 480	378	76	5
Walker Basin Creek Valley	5-26	Tehachapi	7,670	-	-	22 to 102	-	-	-	-
Cummings Valley	5-27	Tehachapi	10,000	98,000	4,500	0 to 110	-	344	15	0
Tehachapi Valley West	5-28	Tehachapi	14,800	225,000	4,000	1 to 57	280 - 365	315	30	2
Castaic Lake Valley	5-29	Grapevine	3,600	-	-	37 to 52	570 - 605	583	8	0
Brite Valley	5-80	Tehachapi	3,170	26,000	3,000	51	-	-	-	-
Cuddy Canyon	5-82	Grapevine	3,300	-	-	67 to 130	690 - 695	690	5	0
Cuddy Ranch Area	5-83	Grapevine	4,203	-	-	33 to 42	480 - 645	550	6	0
Cuddy Valley	5-84	Grapevine	3,500	77,000	510	no data	325-645	407	10	0
Mil Potrero	5-85	Grapevine	2,300	-	3,100 [2]	artesian to 50	372 - 657	460	7	0
Antelope Valley	6-44	Antelope	1,010,000 [3]	68,000,000	48,000	20 to 280	200 - 800	300	243	8
Tehachapi Valley East	6-45	Fremont	24,000	150,000	3,000	284	298 - 405	361	10	0
Fremont Valley	6-46	Fremont	335,000	4,800,000	-	110 to 212	398 - 1,400	596	15	0
Indian Wells Valley	6-54	Indian Wells	382,000 [4]	2,050,000	15,100	13 to 212	192 - 950	390	58	1
Kelso Lander	6-69	Fremont	11,200	-	-	no data	360 - 1300	-	-	-

* Primary data source: DWR Bulletin 118, California's Groundwater

1. *Extends over sub-areas designated Valley North Valley West, Valley South and Bakersfield Metropolitan*
2. *Includes estimate of 400 AC-FT/YR from 1,900 OWTS in 8,800 watershed area (CM Engineering, 1970)*
3. *Groundwater basin extends over portions of Kern, Los Angeles, and San Bernardino Counties*
4. *Groundwater basin extends over portions of Kern, Inyo, and San Bernardino Counties*

General Soils Map

Kern County LAMP Fig.2-3



Soils in the County can be grouped into general landform classifications as follows:

1. **Alluvial Plains, Fans, and Stream Benches (3, 5, 6, 11):** Soils found in the flat portions of the San Joaquin Valley and Mojave Desert are deep, well drained soils derived from sedimentary parent material and formed in alluvial plains, fans, stream benches, flood plains, and basin rims. The deep, well drained fine sandy loam and clay loam soils in these areas are well suited for conventional OWTS.

2. **Basins (4):** Soils found in the basin areas of San Joaquin Valley are deep, well drained to somewhat poorly drained clays and silt loams. Restricted permeability and locally shallow perched groundwater conditions can pose a moderate constraint for OWTS.

3. **Foothills (2, 12):** The foothill soils of San Joaquin Valley and the Eastern footslopes of the Southern Sierra Nevada and Tehachapi Mountains are generally shallower, located on old fans and terraces that lie between the more recent alluvial soils on the valley floor and the soils of the uplands. Soils range from sandy loams to stratified coarse gravelly sand. Limited soil depth over bedrock, steep slopes, and somewhat excessive permeability pose moderate to locally severe constraints for OWTS in the foothill regions.

4. **Uplands (1, 7, 8, 9, 10, 11, 14):** The mountain soils of the Temblor and Diablo Ranges to the west of San Joaquin Valley are shallow to deep and well drained loams situated on gently rolling to steep slopes. The Coast and Transverse Ranges to the south have moderately deep to very deep, well drained to excessively well drained, and fine sandy to gravelly loams.

   East of the San Joaquin Valley, mountainous areas include the Tehachapi and Greenhorn Ranges, continuing into the southern terminus of the Sierra Nevada Mountains. Soil are generally suitable for OWTS in the upland areas, limited by locally steep slopes and shallow soil depth and in some areas by shallow seasonal groundwater conditions.

Soil-OWTS Suitability: The general mapping of soil conditions takes into account location and landform conditions, depth to bedrock, slope, subsurface texture, and drainage conditions of the soils, which are all key factors that can affect the suitability of the soils for onsite wastewater treatment. **Table 2-3** was developed from the published soil survey information, summarizing the soil characteristics of the general soil associations mapped in **Figure 2-3.**

The second to last right-hand column in **Table 2-3** highlights the key constraints and overall suitability designation for OWTS for each general soil association. The designations were developed and assigned based on the USDA soils information and Questa's best professional judgment (preliminary). This is provided as a general assessment tool and is not a substitute for site-specific investigation of and planning for onsite wastewater treatment systems. It provides a general indication of the management and design issues likely to be encountered in each area. It does not take into account local constraints such as steep slopes, setback, or other anomalous conditions that may be found on particular sites. The last column gives the estimated number of residential OWTS within each general soil area, determined by merging the GIS parcel data with the soil mapping boundaries.

Table 2-3: Kern County General Soil Associations

General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
1	**Soils on the Hills and Mountains of the Temblor and Diablo Ranges**	shallow to deep	mainly gently rolling to very steep 9-75%, some undulating	well drained	clay to sandy loam, some very shelly loam	Generally suitable conditions for conventional OWTS with locally steep slope limitations; potentially requiring shallow dispersal designs	5
2	**Soils on the Foothills of the Temblor and Diablo Ranges**	shallow to deep	Rolling to steep; some very steep	well drained to somewhat excessively drained	mainly sandy loam, some fine sandy loam to stratified coarse gravelly sand	Generally suitable conditions for conventional OWTS with locally steep slope limitations, potentially requiring shallow dispersal designs	30
3	**Soils Mainly on Alluvial Fans, Alluvial Plains, and Terraces in the Western Part of the San Joaquin Valley**	deep	nearly level to moderately sloping	well drained	clay loam to sandy loam	Suitable conditions for conventional OWTS	936
4	**Soils Mainly in Basins of the San Joaquin Valley**	deep	nearly level to gently sloping, 0-5%	well drained to somewhat poorly drained	loam, fine sandy loam, and clay	Suitable conditions for conventional OWTS; some inclusions of low permeability and perched groundwater favoring shallow dispersal designs	132
5	**Soils Mainly on Alluvial Fans, Alluvial Plains, Basin Rims, and Flood Plains in the Eastern Part of the San Joaquin Valley**	deep	nearly level to gently sloping, 0-5%	well drained to somewhat excessively drained	silt and clay loam to sandy loam	Suitable conditions for conventional OWTS; may be limited locally by cumulative groundwater loading effects from high density of OWTS	9,612
6	**Soils on Flood Plains, Alluvial Fans, Stream Terrace, and Fan Remnants of Southern and Southeastern Joaquin Valley**	moderately deep to very deep	nearly level to moderately sloping	well drained to somewhat excessively well drained	mainly clay loam to sandy loam, some gravely loam, and loamy sand	Suitable conditions for conventional OWTS; may be limited locally by cumulative groundwater loading effects from high density of OWTS	12,169

General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
7	**Soils on the Coast and Transverse Range**	moderately deep to very deep	mainly gently sloping to steep, some nearly level	well drained	silty clay loam to very gravelly sandy loam	Generally suitable conditions for conventional OWTS; some local inclusions of steep slope; potentially requiring alternative treatment and/or shallow dispersal designs	1,380
8	**Soils and Rock outcrop on Hillslopes, Mountain Slopes, Flood Plains, Stream Terraces, Alluvial Fans, and Fan Remnants on the Western and Central Slopes of the Southern Sierra Nevada and Greenhorn Ranges**	mainly shallow to moderately deep, some very deep	mainly moder-ately steep to very steep; some nearly level	well drained to somewhat excessively drained	gravelly sandy loam to stony, boulder coarse sandy loam	Moderately constrained by steep slopes and shallow soils; potentially requiring alternative treatment and/or shallow dispersal designs	149
9	**Soils in Mountain Valleys, on Flood Plains, in Depressions, and on Stream Terraces, Inset Fans, Fan Aprons, Alluvial Fans, Fan Piedmonts, and Fan remnants of the Southern Sierra Nevada Range; Primarily Near Lake Isabella in South Fork Valley**	very deep	nearly level to moderately steep	well drained or somewhat poorly drained	fine sandy loam	Generally suitable conditions for conventional OWTS, with areas of shallow groundwater and low permeability constraints; potentially requiring alternative treatment and/or shallow dispersal designs	2,230
				well drained or excessively drained	gravelly loamy coarse sand		
10	**Soils on the Hillslopes and Mountain Slopes on the Eastern Slopes of the Southern Sierra Nevada Range**	very shallow to moderately deep	moderately sloping to very steep	well drained to somewhat excessively drained	mainly gravelly loamy coarse sand, some boulder loamy coarse sand or fine sandy loam	Moderately to severely con-strained by steep slopes and shallow soils; potentially requiring alternative treatment and/or shallow dispersal designs	866

General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
11	**Soils on Uplands and in Valleys of the Sierra Nevada and Tehachapi Mountains**	moderately deep to very deep	Nearly level to hilly, 0-30%	well drained	sandy loam to clay loam	Generally suitable conditions for conventional OWTS, with areas of shallow groundwater, steep slopes, and high OWTS densities; potentially requiring alternative treatment and/or	4,875
12	**Soils on the Eastern Foot Slopes of the Sierra Nevada and Tehachapi Mountains**	rock outcrop and shallow	nearly level to steep	well drained to somewhat excessively drained	gravelly sandy loam and loamy coarse sand	Moderately to severely constrained by steep slopes and shallow coarse-textured soils, potentially suitable for supplemental treatment and/or shallow dispersal designs	36
13	**Soils of the Mojave Desert**	mainly deep to very deep, some shallow	nearly level to strongly sloping	well drained to excessively drained	sandy clay loam to very gravelly loamy sand	Generally suitable conditions for conventional OWTS; some local inclusions of steep slope limitations favoring shallow dispersal designs	5,215
14	**Soils of the Mojave Uplands**	shallow to deep	gently sloping to strongly sloping	well drained	sandy loam and silica lime cemented hardpan	Moderately to severely con-strained for conventional OWTS by steep slopes and shallow soils; potentially requiring shallow dispersal designs	73
		shallow and very shallow	very steep		coarse sandy loam to clay loam		

OWTS Usage Estimates

Parcel Development Status

Since a comprehensive inventory of existing OWTS usage in Kern County does not exist, estimates were made by Questa Engineering in connection with studies supporting the development of this LAMP. This included a systematic GIS-based inventory to determine the development status (i.e., developed or vacant) of all parcels in non-sewered areas of the County, which was taken as the best estimate of the current number of OWTS in the county. Description of the methodology, assumptions, and results is provided in **Appendix B**.

The geographic area covered in the analysis included the unincorporated area of Kern County, plus those portions of California City which do not have municipal sewer service and instead rely on the use of OWTS. All incorporated property within the remaining cities and sanitary districts was excluded, under the assumption that municipal sewer systems either serve or are available to these parcels. Some "islands" of unincorporated parcels were found to exist in the urban areas; and in most cases found these areas to be connected to a sewage treatment facility. There may be some additional isolated cases within sanitary district boundaries were individual lots or small pockets of development are not connected to the municipal sewer system; and these findings should be added to the inventory in the future as the information becomes available.

OWTS Distribution by Watershed Areas

To assist with present and future management of OWTS and water quality assessments, the GIS parcel status data were merged with watershed boundaries, providing useful information on the distribution of OWTS according to geographical and watershed areas in the county. The results are presented in **Tables 2-4** and **2-5** for the Central Valley and Lahontan regions of the county, respectively. Shown in the tables for each watershed is the total land acreage comprising each basin, the lot area developed with OWTS, the estimated number of OWTS, and the average lot size for the developed parcels. As indicated, about 84% of the OWTS are located in the Central Valley Region and 16% in the Lahontan Region.

Table 2-4.
OWTS Usage and Distribution Hydrologic Area, Kern County - Central Valley Region 5

Hydrologic Area	Total Water-shed Area (acres)	Developed Lot Area (acres)	Number of Developed Parcels	Average Developed Lot Size (acres)
Bakersfield Metro Area	2,043,106	4,662	3,676	1.27
Valley North	2,626,729	6,080	628	9.68
Valley West	2,444,693	1,704	566	3.01
Valley South	1,276,966	761	91	8.37
Grapevine	373,658	1,625	1,391	1.17
Tehachapi	454,041	15,692	4,216	3.72
Kern River	747,589	5,271	3,155	1.67
Southern Sierra	264,235	3,337	88	37.92
TOTAL	**10,231,017**	**39,132**	**13,811**	**2.83**

Table 2-5.
OWTS Usage and Distribution by Hydrologic Area, Kern County - Lahontan Region 6

Hydrologic Area	Total Water-shed Area (acres)	Developed Lot Area (acres)	Number of Developed Parcels	Average Developed Lot Size (acres)
Antelope	2,146,292	2,855	858	3.32
Fremont	908,922	1,647	307	5.36
Indian Wells	535,095	4,893	1,518	3.22
TOTAL	**3,590,309**	**9,395**	**2,683**	**3.50**

Water Quality Management Measures

The following summarizes how key site suitability, land use, and development factors have been addressed in the OWTS requirements of Kern County's LAMP for protection of water quality. This summary is organized to correspond with the elements listed under Section 9.1 of the SWRCB OWTS Policy.

Groundwater Quality Protection

1. **Soil Conditions:** Soil suitability is the single most critical aspect of onsite wastewater treatment and dispersal. The soil provides the medium for the absorption and treatment of wastewater discharged through sub-surface dispersal systems. This is accomplished mainly through a combination of physical filtering, biological and chemical processes, and dilution. Protection of underlying groundwater relies on provision of an adequate depth of permeable soil below the dispersal field (zone of aeration) for absorption and treatment to occur. The Kern County Onsite Wastewater Ordinance and Onsite Systems Manual requires detailed site evaluation to document suitable soil characteristics and depth for each OWTS installation consistent with industry practices and appropriate for the conditions and requirements in Kern County (see **Section 3**). The observed depth and percolation characteristics of the soil are used to select the appropriate location, sizing, and design of the OWTS, to achieve proper effluent dispersal and groundwater protection.

2. **Geologic Factors:** Geology is important to the suitability and performance of OWTS due to its influence on topography and landforms, the type and characteristics of soils that develop at the surface, the occurrence and movement of sub-surface water, and slope stability. A large percentage of OWTS usage in Kern County occurs in flat valley desert regions, characterized by deep alluvial soils where the geology does not pose any unusual of difficult constraints. However, there are also large numbers of OWTS in the mountainous regions, where the rock formations may influence the suitability for and effects of OWTS. Geologic factors are addressed for new OWTS based on: (a) information from basic site evaluations for all installations; and (b) for systems located on slopes, steep slopes, or near areas of unstable land masses, the completion of a geotechnical study, including assessment of hydrogeologic conditions, water movement, and slope stability.

3. **Groundwater Conditions:** Groundwater conditions are of importance for OWTS usage in Kern County due to the great dependence on groundwater resources for public and private water supplies. While most of the county is served by public water systems, there are mountainous and rural desert areas of the county that rely on local aquifers for both public and private water supplies, in areas where OWTS discharges may be within the contributing watershed/recharge area. Site evaluation practices include requirements for documenting groundwater conditions, which include procedures for wet weather observations (Onsite Systems Manual Parts 1 and 2). Documentation of groundwater levels, in combination with soil permeability (percolation rate), provide the basis for selection of the appropriate OWTS design and maintenance of an appropriate vertical separation distance between the point of effluent dispersal and the water table for protection against pathogen impacts. Siting and design criteria addressing groundwater separation requirements have been developed to provide the following:

    - Vertical separation distance of 7 feet for conventional OWTS and 12 feet for seepage pits;

- Reduced vertical separation distance of 2 to 3 feet, based on inclusion of supplemental treatment and/or alternative dispersal designs (e.g., pressure distribution, drip dispersal) found to provide more effective use of the shallow unsaturated soil zones for improved absorption and biodegradation of wastewater constituents, including pathogens.

- Reduced vertical separation distance of 10 feet for seepage pits where supplemental treatment is provided.

- No provision for vertical separation distance of less than 2 feet for trenches and 10 feet for seepage pits.

Appendix A provides further discussion of the supporting rationale, including literature sources, for the OWTS groundwater separation requirements adopted by Kern County.

4. **Areas with High Usage of Domestic Wells:** Most development in Kern County is served by public water systems. Domestic wells are used to a moderate extent in the more rural areas of the county. Measures to assure protection of existing and new domestic water supply wells from the effects of OWTS include the following:

    - Minimum horizontal setback distances between OWTS and water wells consistent with requirements of the State OWTS Policy;

    - Water well testing, review, and approval by EHD for any new development;

    - Provision in County Ordinance (Article 3) for EHD to require completion of cumulative impact studies for new OWTS proposals in areas of water quality concern (see additional discussion below). This may include areas of high domestic well usage.

    - Availability of alternative treatment and dispersal technologies to mitigate documented or potential impacts to groundwater in areas of high domestic well usage.

    - The EHD will be giving special attention to ongoing review of OWTS and water quality data in areas of high domestic well usage as part the Water Quality Assessment Program under this LAMP (see **Section 6**).

5. **Domestic Water Well Data:** For nearly 30 years, the EHD has been collecting groundwater quality data for new domestic water well installations in the County. In connection with the development of this LAMP the data for nitrate concentrations were compiled and merged with GIS parcel information and then sorted by hydrologic area. **Table 2-6** summarizes the results, organized by 11 different general hydrologic areas defined for the County. The nitrate results were grouped to into four different ranges of values (<15, 15-30, 30-45, and >45 mg/L) as indicated and include the results for 2,571 wells. Additional data exist for a large number of other wells, but could not be linked to an APN, and therefore are not included in this initial analysis. These and

additional data like them will be reviewed in further detail through the implementation of the County's LAMP and will be an important point of reference for the required Water Quality Assessment addressed in Section 6 of this LAMP document.

For graphical illustration, **Figure 2-4** shows the location of all 2,571 wells represented by the data below; **Figure 2-5** shows the location of only those wells with reported NO_3 concentration in the ranges of 30 to 45 mg/L and >45 mg/L.

Table 2-6.
Summary of Domestic Well Nitrate Data by Hydrologic Area, 1990-present (number of wells in NO_3 concentration range)

Hydrologic Area	<15 mg/L	15-30 mg/L	30-45 mg/L	>45 mg/L	Total Records
Antelope	268	14	1	4	287
Bakersfield Metro Area	260	26	5	17	308
Fremont	87	17	4	3	111
Grapevine	46	9	4	3	62
Indian Wells	153	17	0	4	174
Kern River	215	44	20	10	289
Southern Sierra	39	12	6	13	70
Tehachapi	478	102	19	13	612
Valley North	234	47	25	47	353
Valley South	82	12	9	11	114
Valley West	173	6	6	6	191
Total	**2,035**	**306**	**99**	**131**	**2,571**
Percent of Total	**79%**	**12%**	**4%**	**5%**	

Surface Water Quality Protection

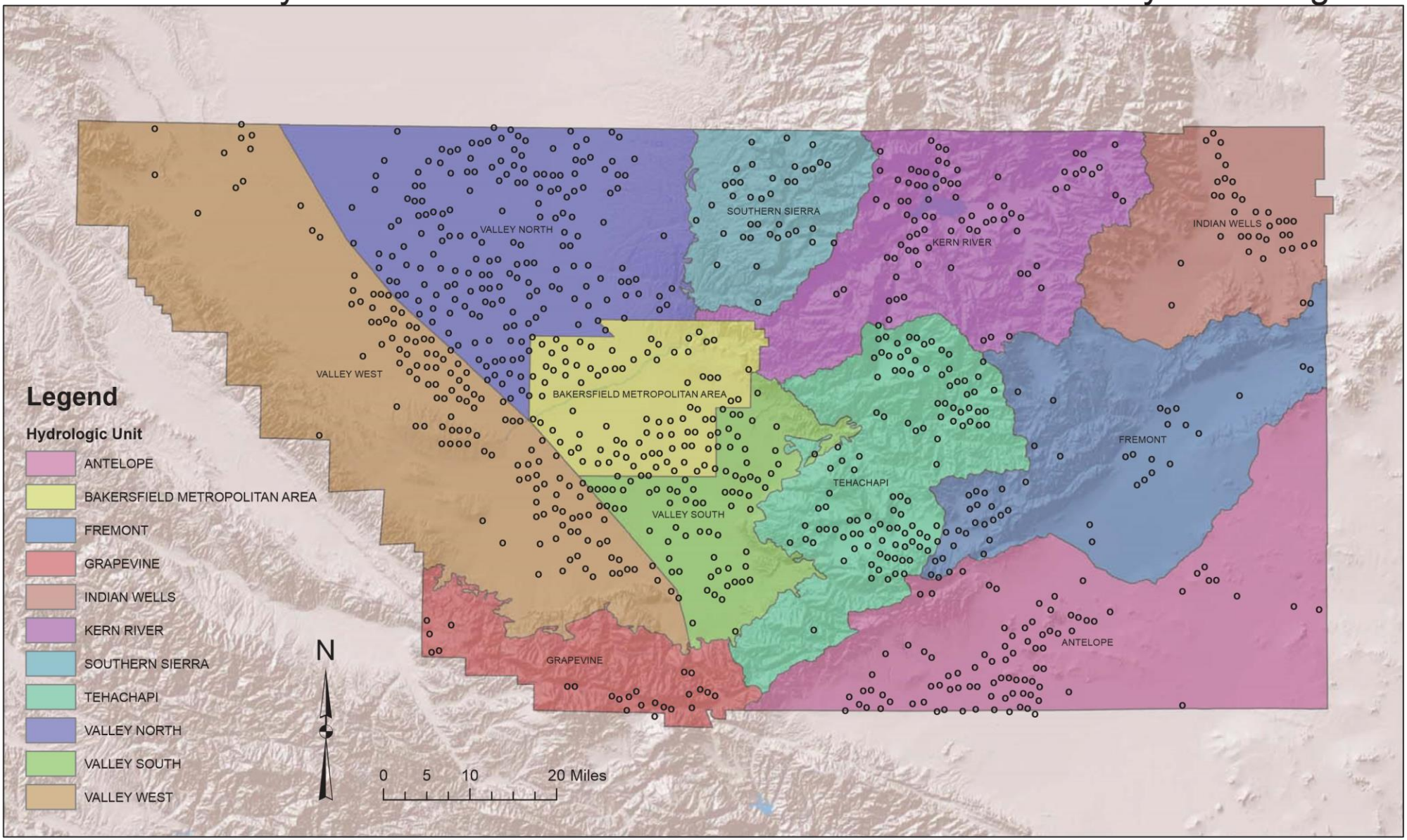
1. **Minimum watercourse/water body setback requirements:** The primary measure for protection of surface water quality is the establishment of safe horizontal setback buffers between OWTS components (treatment tanks and dispersal fields) and various water and landscape features. The requirements contained in the Kern County Onsite Systems Manual are consistent with current and historical policies and guidelines of the Central Valley and Lahontan Regional Water Quality Control Boards. They address setbacks to springs, drainage ditches/swales, watercourses, and reservoirs.

2. **Alternative treatment and dispersal technologies:** The County's updated Ordinance and Manual includes alternative treatment and dispersal technologies that provide greater flexibility and options for system repairs than have historically been available in Kern County. This will have two positive effects for surface water quality protection: (1) the use of alternative treatment technologies, producing higher quality effluent, can compensate for reduced amount of soil absorption area where the repair system on an older non-conforming development site encroaches within the normal setback buffer; and (2) alternative dispersal methods and sizing criteria can reduce

the amount of encroachment into the setback area, by making more portions of the property (e.g., shallow soil areas) potentially feasible for wastewater dispersal.

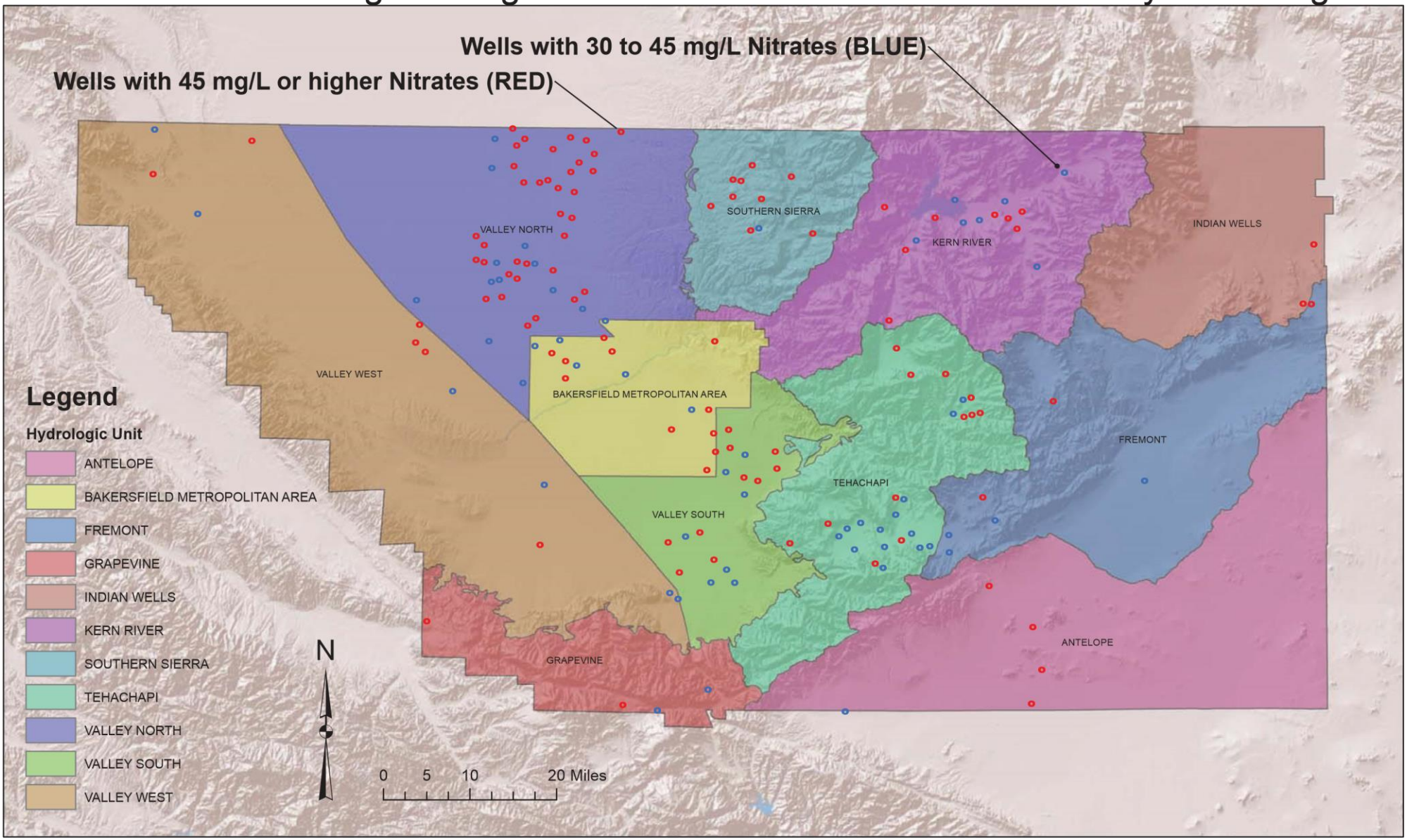
Water Wells Analyzed for Nitrates

Kern County LAMP Fig. 2-4



Water Wells with 30 mg/L or Higher Nitrates

Kern County LAMP Fig. 2-5



3. **Erosion control measures:** Depending upon site conditions and system design, construction of an OWTS may pose a threat of soil erosion and impacts on downstream receiving waters from excavations for tanks, trenching for pipelines and dispersal trenches, and associated clearing and grading activities. The County's Onsite Systems Manual requires that erosion control measures be implemented in connection with the installation of OWTS in mountain areas and that final approval of the OWTS installation is contingent upon confirmation that the specified erosion control measures have been implemented.

4. **Flood protection measures:** In addition to prohibiting the installation of OWTS in low-lying areas that experience annual flooding, the County's Onsite System Manual includes provisions for evaluation and incorporation of special design measures for systems located within areas subject to inundation by extreme flood events, such as the 100-year flood. Specifically, the measures require: (a) protection for OWTS supplemental treatment, pressure distribution and/or drip dispersal components from flood damage, such as structural tie-downs and/or elevating critical components above the 100-year flood level; (b) prevention of discharge of wastewater into flooded dispersal areas from pump systems (e.g., using flood-activated float switches to override/disable pump operation during high water conditions); and (c) additional emergency storage capacity for flood periods.

5. **Enhanced Protection for Water Supply Watersheds:** Kern County does not have a great many surface water resources that serve as water supply sources. However, those that do exist warrant special concern and enhanced water quality protection. In accordance with the requirements of State OWTS Policy, Kern County has adopted increased setback standards for any OWTS located in an area tributary to and within 1,200 feet and within 2,500 feet of a public water supply surface water intake. The provisions for identifying and notifying public water system owners of pending OWTS applications are discussed in **Sections 4** and **5** of this LAMP, along with the applicable requirements for OWTS design when the dispersal system must be located within the prescribed setback buffer (e.g., for a replacement system or pre-existing lot of record).

Impaired surface waters (nitrogen or pathogens)

There are no water bodies in Kern County currently listed as impaired for nitrogen or pathogens.

High Density of OWTS, Parcel Size and Cumulative Impacts

Consideration of OWTS density, parcel size and potential cumulative OWTS impact issues (e.g., groundwater mounding, nitrate loading) are addressed in Kern County primarily through Ordinance requirements under Article 3, that call for the completion of cumulative impact assessments for certain types of projects or locations, including consideration of such factors as the constituent levels (e.g., nitrogen content) in the wastewater, the volume of wastewater flow, the density of OWTS discharges in a given area, and/or the sensitivity and beneficial uses of water resources in the discharge area. Guidelines for such studies are contained in

the Onsite Systems Manual (Part 1). The guidelines identify circumstances requiring cumulative impact studies, minimum qualifications of those conducting the work, typical data needs and assumptions, analytical methods, and evaluation criteria. The Ordinance also allows for the County to designate areas of special environmental concern for OWTS that may be identified from the results of cumulative impact studies. Any new subdivision utilizing OWTS with lot sizes smaller than 2.5 acres where domestic wells are used, normally require cumulative impact assessment to evaluate nitrogen loading.

Additionally, the new Ordinance provisions allowing the use of alternative treatment and dispersal technologies provide opportunities to mitigate nitrate loading (e.g., with supplemental treatment systems) and hydraulic mounding (e.g., with pressure distribution or drip dispersal designs).

Geographic areas with many older non-conforming OWTS installations and setbacks

Older, non-conforming OWTS are common in the rural mountain and agricultural areas of the County. OWTS issues commonly arise in areas where properties were originally developed for seasonal/recreational cabins and have converted over the years to year-round residences. Often the properties are very small, with OWTS constructed prior to the introduction of modern codes. Some systems consist of cesspools, and repairs/replacement systems tend to be very challenging. Non-conformance with adopted setback requirements (e.g., from structures, water features, etc.) are also common. Non-conforming OWTS located in areas of high groundwater conditions, such as some parts of the Lake Isabella area, are especially problematic.

Measures contained in the County's updated Ordinance that will aid significantly in addressing problems of older non-conforming OWTS, are the availability of alternative treatment and dispersal system designs to provide more effective upgrades and repairs for lots having limited area, soil limitations, or other constraints for conventional OWTS. Additionally, as discussed in Section 4, the County anticipates the eventual need to pursue community approaches to OWTS management in some of the mountain development areas that may include the implementation of Onsite Waste Disposal Zones (e.g., maintenance districts) and/or development of community facilities to replace individual OWTS.

Section 3:
OWTS Siting, Design, and Construction Requirements

Siting Criteria for OWTS

Approval of any conventional OWTS shall require compliance with the following minimum siting criteria.

1. **Soil Depth:** For conventional OWTS, minimum depth of soil beneath the bottom of the dispersal field, shall be 7 feet for leaching trenches or beds and 12 feet for seepage pits. For alternative OWTS, minimum soil depth may be reduced to 3 feet for trench systems and 10 feet for seepage pits.

2. **Vertical separation to ground water:** Minimum vertical separation distance between the bottom of the dispersal field and groundwater, including perched groundwater, shall be 7 feet for leaching trenches or beds, and 12 feet for seepage pits. For alternative OWTS utilizing supplemental treatment, minimum depth to groundwater may be reduced to 2 feet for trench systems and 10 feet for seepage pits. For alternative OWTS utilizing supplemental treatment and/or alternative dispersal methods, minimum separation distance to groundwater may be reduced to 3 feet or 2 feet, depending on the type of alternative OWTS design as provided in Table 3-1. Depth to groundwater may be reduced to 10 feet for seepage pits where used in combination with supplemental treatment.

Table 3-1.
Depth to Groundwater Requirements for Conventional and Alternative OWTS (feet, below trench bottom)

Type of OWTS	Percolation Rate (MPI)	Min. Depth to Groundwater (feet)[1]		
		2	3	7
Conventional Septic Tank & Dispersal Trench	1-60			X
Conventional Trench w/Supplemental Treatment Pressure Distribution (PD) Trench At-grade	1-120		X	
Pressure Distribution w/Supplemental Treatment Mound At-grade w/Supplemental Treatment Raised Sand Filter Bed Drip Dispersal w/Supplemental Treatment	1-120	X		

[1] Measured from the bottom of the dispersal system

3. **Soil Percolation Rate:** For conventional leaching, trenches, or beds, the average soil percolation rate in the proposed disposal field area shall not be faster than one minute per inch (1 mpi) nor slower than 60 mpi, determined in accordance with procedures prescribed in the Onsite Systems Manual. For seepage pits, percolation rates shall not be slower than 25 mpi. Soils having percolation rates between 60 and 120 mpi will require the use of an alternative OWTS, as provided per Article 3 of the Kern County Onsite Wastewater Ordinance Code and in accordance with methods and requirements detailed in Part 2 of the Onsite Systems Manual.

4. **Ground Slope:** Maximum ground slope in the disposal field area shall not exceed thirty (30) percent.

5. **Horizontal Setbacks:** Minimum horizontal setback distances from various site features to OWTS components, shall be as listed in Part 1, Table 1-1 of the Onsite Systems Manual.

6. **Areas of Flooding:** OWTS shall not be located in the primary floodplain or "floodway" as determined or estimated from published floodplain maps or on the basis of historical evidence acceptable to the Director. OWTS are not permitted in secondary floodplain areas unless: (1) they are protected by flood control devices approved by the Kern County Water Agency or Kern County Department of Public Works; (2) they are constructed with appropriate measures to minimize infiltration of floodwaters into the system and discharges from the system into the floodwater.

7. **OWTS Located on Property Served:** OWTS shall be located on the same property as the building(s) being served. An exception may be granted by the Director for existing lots of record, where the OWTS may be located on an adjoining property within a non-revocable easement.

Site Evaluations for OWTS

1. For all locations where an OWTS is proposed to be installed, a site evaluation shall be conducted prior to permit approval to verify conformance with applicable horizontal setbacks, ground slope, soils, and groundwater requirements as prescribed in this Manual.

2. Site evaluation methods shall include soil profiles, percolation tests, and other exploratory tests, as necessary, to verify adequate depth and permeability of soil and vertical separation between disposal field and groundwater, for both primary and reserve disposal areas.

3. Testing shall be conducted in accordance with standards and guidelines provided in the Onsite Systems Manual.

4. Where the director has been provided adequate evidence to demonstrate suitable soil conditions and groundwater separation exists, testing requirements may be waived.

5. For new divisions of land, soil profiles, percolation tests, and groundwater determinations will be required on every parcel, unless the director determines, on a case-by-

case basis, that such testing is not necessary due to the availability of sufficient information to demonstrate conformance with applicable siting criteria for all proposed OWTS locations.

Wastewater Flows for OWTS Design

Wastewater flow requirements for OWTS design are covered in Part 1, Section 1.3 of the Onsite Systems Manual and include the following provisions:

1. **Peak daily flow:** All OWTS sized for peak daily flow;

2. **Residential OWTS:** Based on number of bedrooms in accordance with criteria in Table 1-2 in the Manual (consistent with CPC criteria). Design flows for a primary residence and secondary dwelling unit, shall be determined independently, regardless of whether the flows are treated separately or in a combined OWTS;

3. **Multiple Dwelling Units or Apartments:** Based on the number of dwelling units in accordance with criteria in Table 1-3 in the Manual (consistent with CPC criteria)**;**

4. **Non-residential OWTS:** Based on consideration of projected activities, occupancy, facilities, and estimating factors (unit flows) given in Table 1-4 of the Manual (consistent with CPC). Alternative flows may be based on other appropriate literature references (e.g., EPA Manuals) or documented wastewater flow for a comparable facility, as deemed acceptable by EHD;

5. **Flow Equalization:** Flow equalization may be used for non-residential and mixed use facilities that experience significant, regular and predictable fluctuations in wastewater flows, such as churches, schools, and special event venues. Flow equalization is the process of controlling the rate of wastewater flow through an OWTS by providing surge capacity storage and timed-dosing of the incoming flow. It allows peak surges (e.g., weekend usage) to be spread out over several subsequent days to aid in overall OWTS performance.

Conventional OWTS Requirements

Where an OWTS is required, it shall, at a minimum, consist of a septic tank and subsurface dispersal system for absorption and leaching of the effluent into the soil (Conventional OWTS). The septic tank and effluent dispersal system must be designed, permitted, and so constructed as to meet the requirements prescribed by the Onsite Systems Manual in Part 1, Sections 1.4 and 1.5; which have been developed to be substantially consistent with requirements contained in the California Plumbing Code, the guidelines that have historically been followed in the County. Key design and construction requirements detailed in the Manual include the following:

Septic Tank Requirements

Requirements for septic tanks in Section 1-4 of the Manual cover the following:

- Capacity
- Plans
- Structural design
- Prefabricated tanks
- Construction materials
- Compartments, partitions, and baffles
- Access manholes and sidewalls
- Pipe opening sizes, extension, and venting
- Effluent Filter
- Water-tightness Testing

Conventional Disposal Trenches and Beds

Requirements for septic tanks in Section 1-5 of the Manual cover the following:

- General – requires design to be based on soils analysis and/or percolation testing;
- Sizing – effective absorption area and absorption capacity for trenches, leaching beds, and chamber designs;
- Construction – addresses depth, length, width, spacing, cover, grade, pipe and filter material, distribution boxes and laterals, connections and joints, surface covering, and dosing siphons.

Construction Inspection and Testing

Minimum requirements for inspection and testing of OWTS installations are addressed in Section 1.7 of the Manual, covering: (a) pre-construction meeting; (b) open trench inspection; (c) drain rock, pipe materials, and placement; (d) diversion valves; (e) septic tank location, size, and water-tightness testing; and (f) final inspection, backfill, and as-built; as applicable.

Seepage Pit Requirements

Requirements for seepage pits are prescribed in the Onsite Systems Manual in Part 1, Section 1.6. These requirements have been developed to be substantially consistent with requirements contained in the most recent adopted version of the Kern County Plumbing Code; the guidelines that have historically been followed in the County. Design and construction requirements detailed in the Manual include the following:

- Sizing – effective absorption area and capacity
- Multiple Installations – level and sloping sites
- Construction
- Spacing
- Lining
- Sidewall
- Cover
- Inlet Fitting

Alternative OWTS

General

An alternative OWTS is a type of OWTS that utilizes either a method of wastewater treatment other than a conventional septic tank, for the purpose of producing a higher quality wastewater effluent and/or a method of wastewater dispersal, other than a gravity fed drain field trench for effluent dispersal. Kern County Ordinance and Onsite Systems Manual allow for, and in some cases require, the use of an alternative OWTS. Alternative OWTS may be permitted by EHD for the repair or upgrading of any existing OWTS and for new construction on any legally created parcel where: (a) it is determined that sewage cannot be disposed of in a sanitary manner by a conventional OWTS; (b) it is determined that an alternative OWTS would provide equal or greater protection to public health and the environment than a conventional OWTS; or (c) necessary to comply with requirements adopted for Mountain and Groundwater Impact Areas. Alternative OWTS normally include pressure distribution for effluent dispersal and often include supplemental treatment.

General requirements guiding the use of alternative OWTS include the following:

- Types of alternative OWTS permitted are limited to those identified in the Manual for which siting and design standards have been adopted and approved by the EHD and the Regional Water Board as part of the County's LAMP.

- All alternative OWTS must be designed by a Registered Professional (RCE, REHS, PG) as allowed by their registration and installed by a contractor duly licensed by the Contractors State License Board of the State of California to install OWTS (A, C-42 or C-36).

- All alternative OWTS require the issuance of a renewable annual operating permit which is in addition to the construction permit issued for system installation. Operating permits are intended to serve as the basis for ensuring on-going maintenance and require that such work be performed by a registered professional or qualified onsite wastewater maintenance provider.

- Monitoring and reporting requirements to verify adequate performance of alternative OWTS, are implemented as conditions of the operating permit and vary according to the type of system.

Types of Alternative OWTS

The types of alternative OWTS approved for use in Kern County include the following:

1. **Supplemental Treatment Systems:**

    a. Intermittent sand filters;

    b. Proprietary Systems;

    c. Others as may be approved.

2. **Alternative Dispersal Systems:**

    a. Pressure distribution systems;
    b. Mound systems;
    c. Subsurface drip dispersal systems;
    d. Others as may be approved.

Siting, Design, and Construction Requirements

Siting, design, and construction requirements are provided in Part 3 of the Manual for each respective type of Alternative OWTS.

Operating permits

A County-issued operating permit is required for all alternative systems. Operating permits are intended to serve as the basis for verifying the adequacy of alternative system performance and ensuring on-going maintenance, including requirements for system inspection, monitoring and reporting of results to Environmental Health, along with the requirement for permit renewal; typically on an annual or biennial (every two years) basis. An OWTS operating permit gives Environmental Health right of inspection. In addition, failure to comply with requirements of an OWTS operating permit may subject the system owner or user to administrative enforcement and fines.

Performance monitoring and reporting requirements

Performance monitoring requirements and frequencies for Alternative OWTS are provided in Part 3 and Part 4 of the Manual and are dependent on the type and complexity of the system, treatment components, and dispersal system. A monitoring program will be established for each alternative OWTS as a condition of the operating permit at the time of permit issuance and may be amended at the time of permit renewal. Monitoring shall be performed to ensure that the alternative OWTS is functioning satisfactorily to protect water quality and public health and safety. The monitoring program will be in accordance with guidelines prescribed in the Onsite Systems Manual.

EHD will compile and review monitoring and inspection results for alternative OWTS and periodically provide a summary of results to the Central Valley and Lahontan Regional Water Boards. Based on this review, EHD may require corrective action for specific properties or certain types of alternative OWTS, or general changes in monitoring and inspection requirements.

Section 4:
Special OWTS Management Issues

The following describes the provisions contained in the Kern County LAMP corresponding with special OWTS management issues listed in sections 9.2.1 through 9.2.12 of the State OWTS Policy.

OWTS Inspection, Monitoring, Maintenance, and Repair

Kern County Ordinance requirements pertaining to operational inspections, monitoring, maintenance, and repair of OWTS are summarized in **Table 4-1** below.

Table 4-1.
Summary of Kern County Provisions for OWTS Inspection, Monitoring, Maintenance, and Repairs

Activity	Code, Manual Section	Inspections	Monitoring	Maintenance & Repairs*
Building Additions & Remodels		OWTS performance inspection required at time of application for building addition or remodel; procedures specified in Onsite Manual, Part 4.	May involve water sampling, dye testing, or other monitoring.	Maintenance and/or repair work may be required as a result of inspection findings.
Operating Permits		Regular inspections of OWTS according to terms of operating permit for (a) alternative systems; (b) large flow OWTS, >2,500 gpd; (c) holding tanks; and (d) other OWTS at Director's discretion.	Monitoring of OWTS under terms of operating permit, including flows, water levels, pump-out volumes, and water quality sampling as applicable.	Maintenance and/or repair work may be required from time-to-time based on observations during routine inspections or as part of normal system servicing.
Complaint Investigations (Abatement)		Inspections of OWTS by EHD staff in response to complaints or observed violation(s).	May involve water sampling, dye testing, or other monitoring.	Maintenance and/or repair work may be required as a result of inspection findings.

*Code Article 2 stipulates that it is unlawful to "Construct, alter, repair, or replace an OWTS or a component element thereof, which system is subject to the provisions of this chapter, without first obtaining a permit from the director in accordance with the provisions of this chapter and standards established hereunder".

OWTS Near Impaired Water Bodies

No water bodies in Kern County are listed as impaired pursuant to Section 303(d) of the Clean Water Act. Therefore, no special provisions related to impaired water bodies have been adopted for OWTS in Kern County.

Variances and Exceptions

Ordinance Code

As provided in Kern County OWTS Ordinance, Article 4, variances from the terms of the Ordinance and requirements as prescribed in the Onsite Systems Manual may be granted by the Director of the Environmental Health Division under the following conditions:

1. The variance will not harm the public health, safety, and welfare of the people of Kern County;

2. Due to special conditions or exceptional characteristics of the property, its location or surroundings, a literal enforcement of the Ordinance, and the Onsite Systems Manual would result in unnecessary hardship;

3. The hardship was not caused with the intent to avoid the requirements of this Chapter or the Onsite Systems Manual;

4. The variance will not have any adverse environmental effect on the use of the adjoining property.

Exceptions

1. Dispersal systems may be located on slopes over 30% with a variance, if supported by a geotechnical assessment and report;

2. Dispersal systems may be located closer than 100 feet from an unstable land mass with a variance, if supported by a geotechnical assessment and report;

3. Holding tanks are prohibited by code, but they may be permitted as an exception for a publicly-owned/non–residential facility, under certain conditions as specified in Article 3.

OWTS Repairs and Corrective Actions

OWTS that require corrective action to address a current or threatened failure condition, shall be repaired in a manner approved by the EHD that brings the OWTS into substantial conformance with County Ordinance and Manual to the greatest extent practicable. For systems that can be repaired, the work shall be implemented as soon as is reasonably possible and in accordance with any time limits issued by the EHD.

The overall goal with all OWTS repairs is to obtain a practical, timely, and effective long-term correction to the failure condition. In determining the level of corrective work required, the EHD will take into consideration a variety of factors, generally according to the following priorities:

1. Soil characteristics and groundwater separation;
2. Setbacks from wells and streams;
3. Ground slope and setback from unstable landforms;
4. OWTS sizing standards;
5. Other setback criteria (e.g., foundations, pipelines, and trees).

Interim measures, such as installation of a holding tank and pumping/hauling of septage, may be required for failed systems that require replacement and submittal of system design plans. Submittal requirements for OWTS repairs may vary case-by-case, and will depend on the nature of the failure condition, the property location, type of occupancy, and the type of corrective work needed.

Prohibitions

No variances or exceptions are permitted to prohibitions 1 through 9 listed in **Section 5** of this LAMP.

Prohibition 10 in **Section 5,** relating to OWTS in proximity to public water wells and/or water supply intakes, contains specific exception clauses applicable to OWTS repairs and new or replacement OWTS on existing legal lots of record.

Appeals

The Onsite Wastewater Ordinance allows an applicant to appeal the decision of the Director to the Board of Supervisors, in accordance with procedures set forth in Article 2. This may include issues related to variances or exceptions to Ordinance requirements.

Professional, Contractor, and Maintenance Provider Qualifications

Kern County Ordinance requirements pertaining to qualifications for OWTS professionals, contractors, and maintenance providers are summarized in **Table 4-2**.

The qualification notations and terminology in **Table 4-2** have the following meanings:

- RCE: Registered Civil Engineer
- REHS: Registered Environmental Health Specialist
- PG: Professional Geologist
- CEG: Certified Engineering Geologist
- SS: Soil Scientist as certified by the Soil Science Society of America
- Registered Septic Tank Pumper: Registered with Kern County in accordance with California Health and Safety Code 117400 et. seq.
- Maintenance Provider: An individual registered having experience in the construction and/or operation of OWTS as evidenced by the either of the following:

- Possession of a valid contractor's license (A, C-36 or C-42).
- Completion of an onsite wastewater certification training coarse by a third-party entity, such as the California Onsite Wastewater Association (COWA), National Association of Waste Transporters (NAWT), National Sanitation Foundation (NSF), or other acceptable training program as determined by the Director.

Table 4-2.
Qualifications for OWTS Practitioners

OWTS Activity	Required Work	Code or Manual Section	Minimum Qualifications
Site Evaluation	Conduct field studies and evaluation of geology, soils, percolation, groundwater, slopes, and other factors for design and use of OWTS		RCE, REHS, PG, SS
System Design	Prepare plans and supporting design analysis required for permitting and installation of OWTS.		RCE, REHS, PG
System Installation	Install OWTS in accordance with approved plans and permit conditions issued by EHD.		General Engineering Contractor License: • Class A • Class C-42 • Class -36 Exception: Homeowner may install conventional OWTS on their own property.
Cumulative Impact Assessment	Assess nitrate loading, groundwater mounding, or other cumulative impacts of OWTS for flows >2,500 gpd or as otherwise required by EHD.		RCE/ REHS/PG/SS
Geotechnical Assessment	Assess slope stability, drainage, and other geotechnical issues for OWTS located on slopes over 30%.		RCE or PG with CEG certificate or equivalent experience
Performance Evaluation	Conduct performance evaluation of OWTS for building addition/remodel project, failure investigation, or as otherwise required by EHD.		RCE/ REHS/PG OWTS Maintenance Provider
Septic Tank Pumping & Report	Pump and haul septage.		Registered Septic Tank Pumper
Alternative System Inspection and Monitoring	Perform inspection, monitoring, and reporting of alternative OWTS in accordance with conditions of operating permit issued by EHD.		RCE/ REHS/PG or Maintenance Provider

Education and Outreach

Kern County's LAMP includes the following provisions for education and outreach regarding OWTS:

1. **Website - Informational Material:** EHD maintains a website including up-to-date information on various OWTS matters, such as: (a) regulatory issues; (b) permitting requirements, procedures, fees, forms, etc.; (c) meetings and other announcements; and (d) OWTS user information, guidelines, and references, including a list of local service/maintenance providers and after hours contact information. This includes access to the Onsite Systems Manual which contains a section (Part 6) devoted to compilation of practical information and guides for OWTS users;

2. **OWTS Operation and Maintenance Guidelines:** Kern County Onsite Wastewater Ordinance (Article 3) requires operation and maintenance guidelines to be provided to the OWTS owner (and EHD) for each new or replacement OWTS by either the system designer or installer. This applies to both conventional and alternative OWTS. Final approval of system installation is contingent upon confirmation that the required operation and maintenance guidelines have been provided;

3. **Alternative Systems Operating Permits:** Owners of alternative OWTS will be issued an ongoing operating permit that specifies ongoing inspection, monitoring, and reporting requirements for the system. Although, the work will be conducted substantially by qualified maintenance providers, the system owner is ultimately responsible for compliance under the operating permit, which will indirectly promote an improved level of education and understanding of the OWTS operational requirements.

Septage Management

Septage Receiving Facilities

Septage disposal for OWTS in Kern County occurs almost entirely at the following publicly owned treatment plants (POTWs):

1. **Central Valley Region (West County):** City of Bakersfield Plants #2 and #3

2. **Lahontan Region (East County):** Rosamond Community Services District Plant

Estimated Septage Pumping Volumes

Based on an average pumping frequency of once every five (5) years and a pump-out volume of 1,000 gallons per tank, estimates of annual volumes of septage generated by OWTS in Kern County were developed for the West and East County regions and summarized in **Table 4-3.**

Table 4-3.
Estimated Annual Septage Generation in Kern County

	West County	East County	Total
Estimated Number of OWTS	13,811	2,683	16,494
Estimated Annual Septage Volume (M gal.)	2.76*	0.54	3.30

* City of Bakersfield reported 3.8 million gallons of septage received and treated at their #2 and #3 wastewater treatment plants in 2015.

The available capacities at septage receiving facilities in Kern County are considered adequate for the estimated annual septage generation rates for both the West and East County areas.

Septic Tank Pumper Registration

There are a large number of septic tank pumping businesses operating in Kern County. EHD has the enforcement authority to register, issue the environmental health permit, and regulate the activities of all sewage pumping, grease trap pumping, and portable toilet rental businesses in the County. Part 7 of the Onsite Systems Manual contains the requirements ("Terms and Conditions") applicable to these operations in the County.

Onsite Maintenance Districts

Presently there are no onsite wastewater maintenance districts in Kern County. Some of the key functions of an onsite wastewater management district are already covered on a county-wide basis, by requirements and activities under the newly (proposed/adopted) Onsite Wastewater Ordinance and within the provisions of this LAMP, including: (a) operating permits for alternative OWTS and certain other OWTS based on system size or other factors; and (b) requirements for water quality assessment and reporting to the RWQCB.

However, over the years there has been discussion and interest in the concept of an OWTS maintenance district approach for some of the mountain area communities. In particular, Golden Hills Community Services District (CSD) has historically been active and involved in review and oversight of OWTS serving properties within their jurisdiction. The CSD was originally identified in the 1980's as a potential candidate for establishment of an Onsite Wastewater Disposal Zone (OSWDZ) per (State Health and Safety Code), to provide additional on-going monitoring and assessment of OWTS. Although it was not pursued further at the time, the need for locally-based OWTS maintenance/monitoring programs continues to exist in certain challenging areas of the County supporting high OWTS densities. Through this LAMP the EHD intends to support the implementation of an OSWDZ for Golden Hills and other areas to supplement EHD oversight and assessment of OWTS where warranted.

Regional Salt and Nutrient Management Plans

Estimates have been made of wastewater discharge volumes, and nitrate loading contributions to groundwater from the approximately 16,500 existing OWTS in Kern County and are provided in **Appendix B**. OWTS inventories and waste loading estimates have been organized and tabulated according to major hydrologic areas and for areas directly overlying groundwater basins. OWTS represent a very small fraction of the nitrate and salt loading to groundwater in comparison to other agricultural sources. However, these estimates of wastewater volumes and nitrate loading will be available and in a useful form as input to any Regional Salt and Nutrient Management Planning efforts. In addition, Environmental Health will evaluate all Regional Salt and Nutrient Management Plans as they become available for additional constituents of concern and incorporate into future planning, any other water quality standards as referenced by approved Regional Salt and Nutrient Management Plans.

Watershed Management Coordination

Other than the Kern River, there are relatively few watersheds of significance in Kern County and limited watershed management activities or interest groups. However, with the development and implementation of this LAMP, the EHD will be maintaining GIS-based information on OWTS densities, wastewater loading, functioning status, and water quality factors that will be a useful reference for any watershed management activities in the future.

Evaluating Proximity to Public Sewers

Evaluating the proximity to public sewers for new and replacement OWTS is accomplished by the following:

1. OWTS permit instructions and informational pamphlets will advise applicants of the code requirement for connection to public sanitary sewer where the property is within 200 feet of an available sewer;

2. Permit application form to be completed and filed by the system designer and/or contractor, includes an entry related to sewer line proximity;

3. EHD permit review includes sewer proximity as a checklist item for certain geographical areas of the County;

4. The GIS-based inventory of OWTS prepared as part of this LAMP, includes a consolidated mapping of city and sewer district boundaries for the entire County. This will facilitate future identification and review of OWTS-public sewer proximity issues. As sewer district boundaries change in the future, GIS mapping will need to be updated. This is proposed to be done, at a minimum, every five years in coordination with the Water Quality Assessment and reporting to the RWQCBs per Section 6 of this LAMP.

OWTS Notification to Public Water System Owner(s)

Under Kern County Onsite Systems Manual (Part 1, Section 1.2), special horizontal setback requirements apply to OWTS located in the proximity of public water supply wells and public water system surface water intakes. Providing adequate notification to the owner(s) of public water systems about OWTS installations near their facilities will be accomplished by the following procedures:

1. EHD will rely primarily on information provided by the SWRCB Division of Drinking Water (DDW) to determine the locations and respective owner(s) of water wells and public water system surface water intake locations in Kern County;

2. At the time of permit application for any new or replacement OWTS, EHD staff will review the location of the proposed OWTS in relation to known public water wells and surface water intakes;

3. Where EHD staff determines the proposed OWTS dispersal system is closer than 150 feet to a public water well, or closer than 1,200 feet to a public water system surface water intake in a location tributary to the intake, notification of the proposed OWTS application will be sent to the water system owner(s). The notification will be accompanied by a copy of the permit application and supporting OWTS design information, including documented soils, topography, groundwater and percolation data.

4. Where EHD becomes aware of a failing OWTS located closer than 150 feet to a public water well, or closer than 2,500 feet to a public water system surface water intake in a location tributary to the intake, EHD shall notify the respective owner(s) and the SWRCB Division of Drinking Water as soon as practicable, but no later than 72 hours from the time of discovery of the failing OWTS. The notification will be accompanied by a copy of the permit application and supporting OWTS design information, including documented soils, topography, groundwater and percolation data.

5. The owner(s) receiving notification of proposed OWTS installations per (3) or (4) above will be afforded a 15-day period in which to submit comments on the proposed OWTS application.

6. Prior to issuing an OWTS installation permit for any system per (3) or (4) above, the Director will review and consider any comments and recommendations submitted by affected water system owner(s) per (5) above.

7. Upon issuance and/or denial of an OWTS installation permit per (3) or (4) above, the Director will provide notification to the affected water system owner(s) of the action taken.

Procedures for Dispersal Field Located Within Public Well/Intake Setback

New OWTS

In cases where a new OWTS is proposed on a lot created prior to the effective date of the State OWTS Policy (May 13, 2013) and the dispersal field does not meet the specified OWTS horizontal setbacks) from public water wells and public water supply intakes (per Manual Part 1, Section 1.2), the OWTS may be permitted subject to complying with the following requirements to address possible water source impacts:

1. The dispersal field shall be sited to comply with the setback requirements to the maximum extent practicable;
2. The OWTS shall incorporate supplemental treatment, including pathogen removal;
3. Pathogen removal is defined as achieving an effluent fecal coliform bacteria concentration less than or equal to 200 Most Probable Number (MPN) per 100 milliliters;
4. Minimum vertical separation to groundwater shall be three (3) feet below the bottom of the dispersal field;
5. The minimum dispersal field soil cover shall be 12 inches;
6. Completion of a cumulative impact analysis regarding nitrate loading effects (per Ordinance Article 3) if the setback issue involves a public water well; and
7. Other measures as specified by the Director.

On a case-by-case basis, the Director may establish alternative OWTS siting and operational requirements to those listed above, where it is determined by the Director that the alternate requirements will provide a similar level of protection against adverse impact to the public water source.

Repair/Replacement OWTS

For repair or replacement of an existing OWTS where the dispersal field does not meet the specified OWTS horizontal setbacks from public water wells and public water supply intakes (per Manual Part 1, Section 1.2), the OWTS may be permitted subject to complying with the following requirements to address possible water source impacts:

1. The dispersal field shall be sited to comply with the setback requirements to the maximum extent practicable;
2. The OWTS shall incorporate supplemental treatment or other mitigation measures specified by the Director, unless he/she finds no evidence of an existing or potential threat of impact to the public water source by the OWTS based on topography, soil depth, and groundwater conditions.

Phase-Out of Cesspool Usage

The use of cesspools for sewage disposal is not authorized under Kern County Onsite Wastewater Ordinance (Article 3). However, due to the age of many homes in the County (50 to 80+ years old), especially in remote mountain areas and agricultural areas, a number of cesspools still exist and continue to be discovered from time-to-time. Historically, discovery and abandonment of existing cesspools has come about: (a) voluntarily by the property owner; (b) in response to complaints; or (c) through OWTS inspections associated with property transfers or building addition/remodeling projects. Any cesspools identified will be required to come into compliance with current standards, to the fullest extent practical, as soon as possible.

Septic tank servicing also provides an opportunity for septic pumping contractors to discover the existence of cesspools, and advise homeowners on abandonment requirements and options. Under the new ordinance, the expanded range of alternatives for system repairs/ replacement is expected to provide some incentives and options to accelerate the gradual phase-out of the remaining cesspools in the County.

Section 5:
Prohibitions

The following describe the provisions contained in the Kern County LAMP corresponding with the required prohibitions set forth in Section 9.4 of the State OWTS Policy.

1. ***Cesspools:*** The use of cesspools for sewage disposal is not authorized under Kern County Onsite Wastewater Ordinance (Article 3).

2. ***OWTS over 10,000 gpd capacity:*** Kern County Onsite Wastewater Ordinance applies to any OWTS where the maximum daily flow volume of waste produced is 10,000 gpd or less (Article 1). If the amount of waste produced is more than 10,000 gpd or where a community system serving multiple discharges under separate ownership is proposed, the method of treatment and dispersal must be approved by RWQCB, as applicable.

3. ***OWTS with surface discharge:*** Surface discharge of wastewater from an OWTS is not authorized under Kern County Onsite Wastewater Ordinance. Article 1 requires that OWTS "…shall, at a minimum, consist of a septic tank and subsurface dispersal system for absorption and leaching of the effluent into the soil." **(emphasis added)**

4. ***OWTS on steep slopes (>30%) without slope stability report:*** Kern County Onsite Systems Manual (Part 1, Section 1.2) limits the placement of OWTS dispersal fields to areas with ground slope no greater 30%. Any OWTS dispersal field proposed on slopes >30% would only be considered in connection with OWTS repairs/corrective action or under a variance application, where an assessment and report addressing slope stability, drainage, and other pertinent geotechnical factors affecting the operation and and/or impacts from the construction and use of the proposed OWTS would be required.

5. ***Sizing reductions for IAPMO certified dispersal systems:*** Kern County Onsite Systems Manual (Part 1, Section 1.5) permits the use of leaching chambers (IAPMO certified) as a conventional dispersal method with the sizing based on bottom area only. Additionally, where chambers are used no sizing reduction greater than 30% (i.e., sizing multiplier of no less than 0.70) is permitted.

6. ***Supplemental treatment systems without monitoring:*** Under the Kern County Onsite Wastewater Ordinance, supplemental treatment is defined as an alternative system, and as such, is required to be inspected and monitored in accordance with an operating permit issued by the EHD per Code Article 3.

7. ***OWTS for RV Dump Stations:*** Kern County Onsite Wastewater Ordinance pertains to the treatment and dispersal of domestic wastewater which, by definition in the governing State OWTS Policy (referenced in Article 1), does not include wastewater from industrial processes or recreational vehicle (RV) dump stations. Domestic wastewater may include incidental RV holding tank discharges (e.g., at the owner's residence/storage location). Any proposals for RV Dump Stations will be referred to the appropriate RWQCB for permitting. This limitation does not apply to full hook-up sewer connections similar to those used at a recreational vehicle park.

8. ***Groundwater separation less than two (2) feet or less than 10 feet for seepage pits:*** Kern County Onsite Systems Manual (Part 1, Section 1.2) sets forth minimum siting requirements for OWTS dispersal fields for conventional and alternative OWTS. Neither section authorizes the installation of any OWTS dispersal system where the vertical separation to groundwater below the dispersal field is less than two (2) feet for trenches or less than 10 feet for seepage pits.

9. ***Where public sewer connection is available:*** For any property where the installation of a new, expanded, or replacement OWTS is proposed, Kern County Onsite Wastewater Ordinance (Article 3) requires connection to an available public sewer where the property line of the building served is within 200 feet of the sewer line, subject to approval by the sewer authority and the Kern County Local Agency Formation Commission, if necessary.

10. ***Proximity to public water system wells and surface water intakes:*** Kern County Onsite Systems Manual (Part 1, Section 1.2) sets forth minimum horizontal setback requirements for OWTS that include the following restrictions for OWTS dispersal systems located in the proximity of public water supply wells and public water system surface water intakes:

    a. **Public water well:**
        i. 150 feet setback for any dispersal system no greater than 10-feet deep;
        ii. 200 feet for any dispersal system greater that 10-feet deep;
        iii. Completion of 2-yr microbial transport study for any OWTS >20-ft deep and within 600 feet.

    b. **Public water system surface water intake:**
        i. 400 feet setback from edge of watercourse/water body where OWTS dispersal field is <1,200 feet to water supply intake;
        ii. 200 feet setback from edge of watercourse/water body where OWTS dispersal field is >1,200 feet to water supply intake.

    c. **Exceptions for replacement OWTS:** For replacement OWTS unable to meet the horizontal setback requirements of (a) or (b) above, the replacement dispersal field shall meet the setback requirements to the greatest extent practicable. Additionally, EHD will require the replacement OWTS to incorporate supplemental treatment and other measures, as appropriate, unless it is determined no evidence of an existing or potential threat of impact to the public water source by the OWTS based on topography, soil depth, and groundwater conditions.

    d. **Exceptions for new OWTS:** For new OWTS on parcels created prior to May 13, 2013, that are unable to meet the horizontal setback requirements of (a) or (b) above, the new dispersal field shall meet the setback requirements to the greatest extent practicable. Additionally, EHD will require the new OWTS to incorporate supplemental treatment, including pathogen removal, plus other requirements noted below. In accordance with State OWTS Policy, pathogen removal in this case is defined as achieving an effluent fecal coliform bacteria concentration less

than or equal to 200 Most Probable Number (MPN) per 100 milliliters. Other requirements include:

i. Providing a minimum vertical separation to groundwater of three(3) feet below the bottom of the dispersal field;
ii. Providing a minimum dispersal field soil cover of 12 inches;
iii. Completion of a cumulative impact analysis regarding nitrate loading effects (per Ordinance Article 3) if the setback issue involves a public water well; and
iv. Other measures as specified by EHD.

On a case-by-case basis, the Director may establish alternative OWTS siting and operational requirements to those listed above, where it is determined by the Director that the alternate requirements will provide a similar level of protection against adverse impact to the public water source.

Section 6:
Program Administration

OWTS Permitting Records

The EHD will retain permanent records of OWTS permitting actions and will make those records available within 10 working days upon written request for review by the appropriate RWQCB, as applicable. This includes:

- Installation permits issued for new, repair, and replacement OWTS, including type of OWTS system (e.g., conventional trench or seepage pit, alternative OWTS) and tier;
- OWTS variances and/or exemptions issued, including tier, number, location, and description;
- Operating permits issued for alternative systems, OWTS with flows >2,500 gpd or other OWTS where the Director has determined the need for an operating permit;
- Septic tank pumper reporting data, including the number and location of septic tank pump-outs, organized according to geographic/hydrologic management areas of the County;
- List of applications and registrations issued for liquid waste haulers.

Water Quality Assessment Program

Objectives

The EHD will maintain an OWTS water quality assessment program having three primary objectives: (1) to determine the general operational status of OWTS in the County; (2) assess possible impacts of OWTS on groundwater and surface water quality, and their associated beneficial uses; and (3) identify areas for changes to existing OWTS management practices.

Hydrologic Area and Groundwater Basin Approach

The OWTS-water quality assessment will be organized according to the various hydrologic areas and groundwater basins delineated and presented in Section 2 of this LAMP and utilized in supporting GIS studies. This will allow the existing GIS-based mapping, OWTS inventories, and nitrate loading analyses to be utilized and updated. Additionally, localized focus areas within each hydrologic area may be delineated where warranted and may include joint cooperative efforts with other jurisdictions (e.g., water districts, community services districts) involved with water resources and wastewater management activities. For example, Golden Hills Community Services District (CSD) has historically been active and involved in review and oversight of OWTS serving properties within their jurisdiction. The CSD has been identified as a potential candidate for establishment of an Onsite Wastewater Disposal Zone (OSWDZ) per (State Health and Safety Code), to provide additional on-going monitoring and assessment of OWTS. The County will support the implementation of an OSWDZ for Golden Hills and other areas to supplement EHD oversight and assessment of OWTS where warranted. Progress in the development of OSWDZs will be included in annual reporting to

the RWQCB (per below) and addressed in greater detail in the 5-yr Water Quality Assessment report, including any additional OWTS monitoring/maintenance information from such programs, where available.

Operational Status of OWTS

The general operational status of OWTS will be assessed through compilation and review of the following types of information:

1. **Septic tank pumping logs:** The monthly septic tank reporting data submitted to the EHD will be compiled and filed electronically. This will allow the pump-out data to be organized by geographical/hydrological areas of the County and to be reviewed periodically for trends (e.g., frequency of pump-outs in general or for specific areas or properties) or other information relevant to OWTS operational conditions;

2. **Complaints and abatement of failing OWTS:** Complaints and abatement activities related to failing OWTS will be compiled and mapped (electronically) to facilitate ongoing review of the type and level of operational problems and identification of any trends;

3. **Variances issued for new and/or repair OWTS:** Information regarding variances for new and repair OWTS will be entered into the EHD OWTS database files to facilitate review and reporting;

4. **Performance Inspections:** Results of performance inspections of existing OWTS conducted in connection with building additions/remodel projects, or property transactions will be documented and compiled with property/OWTS data files;

5. **Alternative OWTS Inspection Reports:** Monitoring reports submitted periodically to EHD for alternative systems or other OWTS having an operating permit, will be reviewed individually at the time of report submission and will be compiled for annual review by EHD of all alternative OWTS;

6. **Special management areas:** Where special management programs for OWTS are implemented (e.g., under consideration for Golden Hills CSD), the EHD will utilize and incorporate monitoring and assessment information for OWTS in these designated areas, including any findings or recommendations that may be relevant to other areas or the County OWTS management program in general.

The data review and assessment will focus on both positive and negative findings, apparent trends, and areas for changes in practices. The assessment will maintain and update the existing inventory of OWTS in the county. To the greatest extent practical, the various types of OWTS data above will be entered into GIS-compatible files to facilitate review, mapping, and reporting.

Water Quality Assessment

The water quality assessment will include the following:

1. **Water Quality Parameters of Concern:** The initial focus of the water quality assessment program will be on two key water quality parameters – pathogens and nitrate-nitrogen. Other parameters of concern may be added if warranted.

2. **Wastewater Discharge Volumes:** Estimates of annual wastewater discharge from OWTS will be updated based upon the running inventory of OWTS per above.

3. **Nitrate Loading:** Nitrate loading estimates (by groundwater basin/geographic area) will be maintained and updated based on the running inventory of OWTS in the County.

4. **Water Quality Data Sources:** Relevant water quality monitoring data for pathogens and nitrate-nitrogen will be compiled from available sources. As follow-up to identified issues (e.g., increasing temporal trends), other constituents may in the future be compiled to discern between wastewater and other potential nitrate sources. Data sources are anticipated to include the following:

    - Receiving water quality monitoring data reported under alternative systems operating permits;
    - Water quality data from cumulative impact studies;
    - Groundwater Reports from Kern County Water Agency and similar local groundwater management agencies;
    - Groundwater Reports from other public sources, for example, United States Geological Survey, California Department of Water Resources, and Lawrence Livermore National Laboratory
    - Domestic water wells sampling, both from new wells and others as feasible based on access;
    - Public water system raw water quality data monitoring reports;
    - Reservoir or stream water quality sampling data for Kern River or other studies;
    - Receiving water sampling performed as part of any NPDES permits;
    - Groundwater sampling performed as part of Waste Discharge Requirements, such as some of the small wastewater treatment systems in the mountain regions of the County;
    - Data from the California Water Quality Assessment Database; and
    - Groundwater data collected as part of the Groundwater Ambient Monitoring and Assessment Program available in the Geotracker Secure Database.

Environmental Health will make every effort to collect or receive data from any and all water systems outside of our permitting jurisdiction. This may include obtaining data

directly from the water systems or establishing a partnership with them for monitoring. This issue will continue to be refined over the course of time.

5. **Assessment:** In addition to periodically updating the OWTS nitrate loading estimates for the county, it is anticipated that assessment of the data will include a review to: (a) determine relevance of the various data to OWTS; (b) identification of any obvious water quality degradation attributable to OWTS warranting follow-up investigation or action; (c) identification of any water quality degradation where OWTS may be implicated as a possible source; and (d) identification of water quality data/areas indicating no apparent issues of concern related to OWTS.

The County will consider utilizing a computer model to evaluate nitrate loading and ground-water recharge rates for higher density and/or clustered development within the Lahontan Regional Water Quality Control Board as dictated by the pace of development.

Reporting to Regional Water Boards

Annual Report

By February 1st of each year, an annual report pertaining to OWTS activities in Kern County will be submitted to the applicable RWQCB. The annual report will, at a minimum, include the following information, organized in a tabular spreadsheet format:

1. Number and location of complaints pertaining to OWTS operation and maintenance, including identification of those which were investigated and how they were resolved;

2. Number, location, and description of permits issued for new and replacement OWTS, including tier, any variances and/or exemptions issued;

3. Number and location of septic tank pump-outs per septic pumper reports;

4. List of applications and registrations issued, as part of the local septic tank pumper registration program pursuant to Section 117400 et seq. of the California Health and Safety Code.

The report will include: (a) a summary of whether any further actions related to OWTS are warranted to protect water quality or public health; (b) status of water quality data collection and review; and (c) any other information deemed appropriate by the Director of Environmental Health Services.

5-Yr Water Quality Assessment Report to RWQCB

Every five (5) years the annual report to the RWQCB will be accompanied by a Water Quality Assessment Report that summarizes the information and findings from the EHD Water Quality Assessment Program described above. The report will present an overall assessment

regarding any evidence of water quality impact from OWTS along with any recommended changes in the LAMP to address the identified impacts. Additionally, any groundwater water quality data generated by the EHD from monitoring activities will be submitted in electronic data format (EDF), for inclusion in Geotracker and any surface water quality data will be submitted to CEDEN in aSWAMP comparable format[2].

[2] CEDN stands for California Electronic Data Exchange Network; SWAMP stands for Surface Water Ambient Monitoring Program

Appendix A

Supporting Rationale for
Kern County OWTS Siting and Design Criteria Appendix A

Supporting Rationale for
Kern County OWTS Siting and Design Criteria

Following is a discussion of the supporting rationale (including literature references) for the various siting and design requirements for OWTS contained in Kern County's LAMP for those items that differ from the Tier 1 requirements of the State OWTS Policy. The topic areas addressed include: (1) groundwater separation requirements; (2) OWTS design and sizing; (3) use of seepage pits; (4) horizontal setback distances; and (5) allowable OWTS densities (lot size) for new subdivisions. Additionally, highlighted at the end are the various requirements and management practices contained in Kern County's LAMP that constitute a higher level of water quality and environmental protection relative to OWTS than provided in the Tier 1 requirements.

Pathogen Removal and Groundwater Separation Requirements:

Bacteria, viruses, and other pathogens are present in great numbers in sewage and represent an ongoing threat to public health. Preventing the transmission of disease is the foremost concern associated with the treatment and dispersal of sewage and is the basis for many of the established standards that dictate how, where, and when wastewater treatment and dispersal can occur. Ground waters and surface waters are afforded protection from OWTS contamination through the establishment of specific criteria pertaining to the soil properties, vertical separation (i.e., the distance from the bottom of the dispersal trench to the seasonal high groundwater below), and horizontal (surface water) setback requirements. The level of wastewater treatment (prior to dispersal) and the design of the dispersal system can also play a role in pathogen removal. The soil is critical, but the factors are complex, and there is no simple rule for proper design and operation. Attenuation and removal of pathogens in the soil is accomplished through such mechanisms as microbial predation, filtration, adsorption, and die-off.[3] Related factors include the depth, texture, and structure of the soil, hydraulic loading rate, and other physicochemical properties such as moisture, temperature, oxygen, and pH.

It is well known that soils have a tremendous capacity to remove bacteria from percolating wastewater. The retention and die-off of most, if not all, pathogenic bacteria occur within 2 to 3 feet of the soil infiltrative surface in a properly functioning OWTS (Anderson et al, 1994; Washington Dept. of Health, 1990). Viruses can also be retained and eliminated within a few feet, depending on the soil conditions; but it is generally accepted that they can persist longer and travel farther in the soil than bacteria (Anderson, et al, 1991; Ayres and Associates, 1993). Unlike bacteria, viruses are not always present in individual residential OWTS discharges, since it depends on the health status of the residents. Viruses are more likely to be consistently present at some level in commercial and community wastewater systems, which accept wastes from a broader segment of the population. Once reaching the water table, bacteria and viruses have been found to survive and travel significant distances with

[3] "Microbial predation" refers to consumption by other soil microbes; "filtration" refers to physical trapping between soil particles; "adsorption" refers to attachment to the surfaces of soil particles; "die-off" refers to degradation or inactivation due to the inability of the pathogen to sustain itself in the soil environment.

the groundwater (potentially hundreds of feet), depending on the rate of groundwater movement. Survival time in soil and groundwater is typically on the order of days to weeks for bacteria and weeks to months for viruses.

Consistent with current knowledge and practices for preventing pathogen impacts from OWTS, the Kern County LAMP includes a combination of siting and design requirements including: soil depth and percolation characteristics, minimum vertical separation to groundwater, minimum horizontal setbacks to various water/landscape features, dispersal field design/sizing criteria based on percolation rates, and, for some situations, options for use of supplemental treatment and alternative dispersal designs. Horizontal setbacks are the same for all OWTS (conventional and alternative) and are consistent with long-standing criteria contained in the guidelines of the Central Valley Regional Water Board and most local jurisdictions in California. The setback requirements also include more restrictive requirements for public water wells and public water system surface water intakes per the 2012 State OWTS Policy.

The key issue related to potential pathogen impacts from OWTS is the vertical separation below the dispersal trench to the seasonally high groundwater level (i.e.: water table). **Table A-1** lists the depth to groundwater requirements for conventional OWTS in Kern County, along with the corresponding groundwater separation requirements contained in the historical guidelines of the Central Valley Regional Water Board and the Tier 1 requirements in the State OWTS Policy. As indicated, the adopted approach in Kern County utilizes a standard depth to groundwater distance of 7 feet for soils with percolation rates in the range of 1 to 60 mpi; above 60 mpi conventional OWTS are not permitted. The County requirements for conventional OWTS are less restrictive for percolation rates under 5 mpi, but otherwise more restrictive than the historical Central Valley Regional Water Board Guidelines. For 6 to 30 mpi, the Kern County standards are more conservative than the historical RWQCB guidelines and essentially equivalent to the Tier 1 criteria (7 ft. vs 8 ft.). Above 60 mpi, Kern County standards are more conservative (safe) than both the historical RWQCB guidelines and the State Tier 1 requirements, since the County requirements do not allow conventional trench design for these conditions, and instead require an alternative design approach.

Table A-1.
Comparison of Depth to Groundwater Requirements for Conventional OWTS (feet, below trench bottom)

Percolation Rate (min per inch)	Kern County	Central Valley RWQCB Historical Guidelines	SWRCB OWTS Policy Tier 1 Requirements
1-5	7	*	20
6-30	7	5	8
31-60	7	5	5
61-120	Not permitted	5	5

*Requires demonstration of “adequate filtration”

Under this LAMP, the County proposes to allow reduced groundwater separation distances for different types of alternative treatment and dispersal systems as shown in **Table A-2**, also including the requirements for conventional OWTS for comparison.

Table A-2.
Proposed Depth to Groundwater Requirements for Conventional and Alternative OWTS
(Feet - below trench bottom)

Type of OWTS	Percolation Rate (MPI)	Min. Depth to Groundwater (feet)[i]		
		2	3	7
Conventional Septic Tank & Dispersal Trench	1-60			X
Conventional Trench w/Supplemental Treatment Pressure Distribution (PD) Trench	1-120		X	
Pressure Distribution w/Supplemental Treatment Mound Drip Dispersal w/Advanced Treatment	1-120	X		

[3]Measured from the bottom of the dispersal system

The supporting rationale for the reduced vertical separation requirement for the various alternative OWTS designs, is derived from research studies done over the past 30 to 40 years, largely funded by the US EPA and referenced in the *On-site Wastewater Treatment Systems Manual* (US EPA, 2002). These studies have documented how various advanced treatment and dispersal methods can improve the operation and treatment effectiveness of OWTS as compared with conventional septic tank-gravity dispersal trench designs. A major focus of the research efforts has been on finding methods to augment or improve the natural pollutant removal processes in the soil (especially related to pathogens) to help overcome limited soil depth and high groundwater conditions, which are a common constraint virtually everywhere OWTS are used. The following is a review of some of the key findings and principles that have emerged from the research and have supported changes in OWTS siting and design criteria.

1. **Pressure Distribution.** There is strong evidence and agreement in the professional literature that pressure distribution improves the performance of any soil absorption system as compared with standard gravity distribution, and should be the distribution method of choice (US EPA, 2002). This is due to two main factors: (1) pressure distribution disperses the wastewater flow uniformly over the entire available soil infiltrative surface, which allows the maximum absorption potential to be realized for any given soil condition; and (2) creation of wetting and draining cycles (via effluent dosing) promotes the maintenance of aerobic soil conditions at the infiltrative surface, which improves biodegradation and reduces the potential for soil clogging caused by the buildup of organic matter. The professional literature also notes that uniform spreading of the effluent discharge to the soil with the use of pressure distribution (or drip dispersal), ideally with timed-dosing, is critical to assure effective pathogen reduction in situations where the vertical separation is reduced.

2. **Supplemental Treatment:** Pathogen removal efficiencies can vary greatly amongst the different types of supplemental treatment systems that would be permitted and used under this LAMP. The greatest removal efficiencies are generally attributed to intermittent sand filters. Crites and Tchobanoglous (1998) present data showing fecal coliform removal efficiencies of 97.9 percent to 99.9 percent for intermittent sand filters. Leverenz, et. al. (2002), estimate intermittent sand filters as having the ability to produce effluent with fecal coliform concentrations <800 MPN/100 ml. For comparison, the fecal coliform concentration in effluent from a standard septic tank is similar to that in raw sewage and typically ranges from about 10,000 to 100,000 MPN/100 ml (Crites and Tchobanoglous, 1998). Additionally, however, an important purpose of the supplemental treatment unit in combination with the dispersal system design, is to establish and maintain aerobic/unsaturated conditions in the soil absorption field. Maintenance of aerobic soil conditions is conducive to pathogen removal and an improvement over the operational conditions of conventional gravity dispersal fields, which are designed to allow a saturated (anaerobic) soil-infiltrative surface. Research has demonstrated that aerobic effluent: (a) promotes the growth of aerobic soil microflora that can have antagonistic effects on viruses; and (b) reduces the amount of organic compounds that compete for adsorption sites with viruses and bacteria (Potts, 2003).

3. **Pathogen Removal in Soils:** The retention and die-off of most, if not all, pathogenic bacteria occur within 2 to 3 feet of the soil infiltrative surface in a properly functioning OWTS (Anderson et. al., 1994; Washington State DOH, 1990). Viruses can also be retained and eliminated within a few feet, depending on the soil conditions; but it is generally accepted that they can persist longer and travel farther in the soil than bacteria (Anderson et al, 1991; Ayres Associates, 1993). Studies have shown that vertical separation distances to groundwater of 12 to 18 inches, are sufficient to achieve good fecal coliform removal where the wastewater receives supplemental treatment prior to soil application, along with pressure distribution or drip dispersal methods (Converse and Tyler, 1998; Duncan et. al., 1994). Additionally, most of the research studies of OWTS pathogen removal have focused on sandy soil types; and the results of these studies have formed the basis for the soil depth criteria, such as those contained in the EPA Design Manual (2 to 4 feet unsaturated soil depth). Consequently, the soil depth criteria is already oriented toward the “worst case” conditions (sandy, permeable soils) and there is a built-in safety factor, with respect to pathogen removal for finer textured soils with higher silt and clay fractions.

As previously noted, while there is no simple rule or absolute formula for OWTS-groundwater separation, the Kern County depth to groundwater criteria related to type of OWTS and percolation rates are similar to standards adopted and followed in many other counties in California over the past 10 to 20+ years (i.e.: Butte, Nevada, Placer, Solano, Marin, Sonoma, Napa, Contra Costa, Mendocino, among others).

Additionally, an important aspect of siting and design of OWTS under these criteria is the process for determining seasonally high groundwater levels in the dispersal field area. The requirements in Kern County specify field observation methods for groundwater determination consistent with best industry practices. These requirements have been in effect for a number of years and will continue under the County LAMP.

Finally, the LAMP includes an operating permit program for all alternative OWTS that will ensure ongoing inspection and monitoring of OWTS for verification of proper performance.

Based on the above considerations, the criteria relative to the depth to groundwater requirements and use of alternative treatment and dispersal methods are consistent with the current state of knowledge and best management practices and would provide suitable protection against pathogen impacts from onsite wastewater treatment systems.

Dispersal Trench Sizing:

Dispersal trench sizing (i.e., length) is commonly based on three factors: (a) design wastewater flow; (b) trench infiltrative surface dimensions (width and depth); and (c) wastewater application rates (gpd/ft^2) related to percolation rate or soil type. Kern County requirements differ in some respects from the SWRCB Tier 1 criteria, but overall provide a more conservative (safe) design approach, as follows:

1. Kern County specifies the use of peak daily wastewater flow for dispersal system sizing; Tier 1 specifies the use of average daily wastewater flow (8.1.3). As a rule of thumb, average daily flow is typically about 50% of peak wastewater flow, resulting in 100% greater sizing/safety factor in the Kern County design approach.

2. The standard allowance for infiltrative surface in Kern County requirements is trench bottom areas, up to 3 ft^2 per lineal foot of trench, which is more conservative than the 4 ft^2 per lineal foot specified in the Tier 1 requirements (8.1.6). Kern County also has allowance for up to 7 ft^2 per lineal foot of trench under the category of "special design", where the system design is supported by both soils and percolation testing. This is higher than the Tier 1 requirement; however, Kern County also limits the use of conventional trenches (standard and special design) to sites having percolation of 60 mpi or less, compared with allowance for percolation rates up to 120 mpi in Tier 1.

3. **Table A-3** below shows a comparison of the wastewater application rate criteria based on percolation rate for a range of values, including Kern County requirements, Tier 1 criteria, US EPA, and other Northern California Counties. As can be seen, there are similarities and differences among all of the criteria. Kern County requirements are patterned after CPC, which have been followed in Kern County and several other California counties for many years. Kern County requirements are higher in the faster percolation range (, 10 mpi), similar in the middle range (10-60 mpi), and more conservative in the slower range (>60 mpi) where conventional OWTS dispersal fields are not permitted in Kern.

Table A-3
Wastewater Application Rates for Conventional OWTS Dispersal Field Sizing (gpd/ft^2)

Percolation Rate (mpi)	Kern County LAMP		SWRCB OWTS Policy Tier 1	USEPA Design Manual
	Soil Type	Application Rate*		
1-5	2	1.98	1.20	1.20
10	3	1.2	0.80	0.80
24	4	0.56	0.60	0.60
30	5	0.42	0.533	0.56
45	5	0.42	0.367	0.45
60	5	0.42	0.2	0.35
90	-	Not permitted	0.1	0.20
91-120	-	Not permitted	0.1	0.20

*Based on 3 ft^2/lf, 3-bedroom system

Seepage Pits:

Tier 1 of the State OWTS Policy permits seepage pits only for repairs. Tier 2 of the Policy provides only that where seepage pits are used, they shall maintain a minimum separation to groundwater of at least 10-feet, and various other setback requirements from public water wells related to the depth of the seepage pit. Kern County has historically allowed for the use of seepage pits in accordance with the most recent adopted version of the Kern County Code, including the additional requirements that (a) they only be used where disposal fields are not feasible; (b) they be limited to areas with percolation rates of 25 mpi or better; and (c) they maintain a minimum twelve (12') -ft vertical separation to groundwater. The Kern County LAMP retains these same existing provisions and requirements for the use of seepage pits.

Groundwater depths in the majority of areas using seepage pits in the County is often on the order of 100 to 300 feet below ground surface (e.g.: in the San Joaquin Valley and Mojave Desert areas). A study of the long-term effect of wastewater discharge impacts from seepage pits on groundwater quality in the Mojave River Basin was conducted jointly by the U.S. Geological Survey and the Lahontan Regional Water Board; findings were reported in Water Resources Investigations Report 93-4137 (U.S.G.S., 1995). The study confirmed a high rate of bacteria removal within a few feet of travel in the unsaturated zone below 30-ft deep seepage pits. The study was also unable to document any significant change in groundwater quality at an average depth of 150 feet below land surface from the seepage pits after many years of operation. The seepage pits in the area of study are estimated to account for 18% of the annual basin recharge. Rates of wastewater travel in the unsaturated zone ranged from 0.07 to 1.0 feet per day, affording several months to several years of travel time for wastewater constituents to undergo treatment in the unsaturated zone. The findings of this study support the continued limited use of seepage pits, in areas of the county having deep unsaturated zones for wastewater absorption.

Horizontal Setbacks:

Kern County's OWTS Ordinance includes horizontal setback distances that are equal to or exceed the SWRCB Tier 1 requirements in all respects, except for Tier 1 item 7.5.5, which specifies a 200-ft setback from "… vernal pools, wetlands, lakes, ponds, or other surface waters…". Kern County requirements treat these water bodies the same as "watercourses", with a 100-ft horizontal setback requirement, which is consistent with historical RWQCB guidelines and requirements found in all other jurisdictions reviewed. The SWRCB's rationale for the 200-ft setback distance is not known.

The County's 100-ft setback distance is meant to protect beneficial uses of both watercourses and water bodies, which primarily include contact and non-contact recreation and aquatic resources. Consistent with the State OWTS Policy, Kern County includes a 200-ft to 400-ft setback for surface waters in proximity to public water supply intakes – a beneficial use of water warranting a higher level of protection from waste sources.

The Tier 1 200-ft setback in Item 7.5.5 appears to be without substantial merit and is at odds with other setback requirements (e.g.: 100-ft setback from a domestic water supply well). The justification for a 200-ft setback from such water features as stock watering ponds, golf course lakes, and wetlands (that may or may not have any surface water features) is not known; and therefore, it is not included in Kern County OWTS requirements.

Allowable Densities for New Subdivisions:

Tier 1 (section 7.8) specifies that average development density (i.e., acres per dwelling unit/OWTS) be based on a sliding scale (0.5 to 2.5 acres) related to average rainfall. Kern County "Standards, Rules, and Regulations for Land Development" (Land Development), require a minimum lot size of 2.5 acres for land divisions relying on the use of domestic water wells, which complies with the most conservative criterion in Tier 1. Additionally, a cumulative impact assessment (e.g., nitrate loading) may also be required, the results of which could be the basis for increasing or decreasing the minimum lot size, or imposing other mitigation measures (e.g., supplemental treatment providing nitrogen removal), where warranted on a case-by-case basis. This would meet the same objective of Section 7.8, but would be done on the basis of site specific conditions and analysis.

For areas using OWTS where water supply is from a public system (not onsite wells), County Land Development requirements have historically specified a minimum lot size of 10,000 square feet and potentially as little as 7,200 square feet, substantially less than the Tier 1 requirements. However, as noted above, the new Ordinance includes provisions for the Director to require cumulative impact analysis where wastewater loading/density is of potential concern. This requirement would apply commonly to small-lot subdivision proposals and would provide site-specific analysis and mitigation measures to evaluate and address groundwater quality impact concerns related to lot size/density factors. In addition, any new development within the Lahontan Regional Water Quality Control Board's jurisdiction would be subject to conducting a cumulative impact assessment.

More Protective Aspects of Kern County LAMP:

The following highlight the more protective aspects of the Kern County LAMP, as compared with the Tier 1 requirements of the State OWTS Policy.

1. **Alternative OWTS:** Establishes requirements for alternative OWTS, providing better options, design guidance, and a managed system for dealing with repairs/replacement (where needed) for the approximately 16,500 existing OWTS in the county.

2. **Operating Permits:** Establishes an operating permit program for alternative OWTS to provide a higher level of performance monitoring and regular reporting to the County.

3. **Cumulative Impact Assessments:** Includes requirements and guidelines for conducting cumulative impact assessments related to nitrate loading, groundwater mounding, or other issues or locations of concern for certain situations based on size (flow) of the OWTS or density of systems. Tier 1 allows OWTS designs up to 3,500 gpd with no comparable requirements.

4. **Pump Systems:** Onsite Systems Manual includes design guidance and requirements for pump systems; none are provided in Tier 1.

5. **Pressure Distribution Systems:** Treats pressure distribution systems as an alternative OWTS, including requirements for operating permit and performance monitoring/reporting. Tier 1 (8.1.4) recognizes pressure distribution as a conventional trench design option without providing or referencing any design criteria.

6. **Cut Banks and Steep Slopes:** Includes horizontal setback requirement for cut banks and steep slopes, which represent potential avenues for effluent seepage.

7. **Peak vs Average Flow:** Dispersal system design is based on peak, rather than average wastewater flow as provided in Tier 1.

8. **Floodplains:** Includes setback and design requirements related to floodplains.

9. **Performance Evaluation Guidelines:** Provides procedures and criteria to guide performance evaluations of OWTS in connection with building remodel projects, property transfers, abatement investigations, etc.

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Appendix B

OWTS Usage and Loading Estimates For Kern County

OWTS Usage and Loading Estimates for Kern County
Prepared by Questa Engineering Corp

General Approach and Scope

The following describes the process used to develop an inventory of the total number and distribution of residential OWTS in Kern County, organized and integrated with soils mapping and hydrologic information. The analysis was completed by Questa Engineering using GIS parcel data supplied by County of Kern, along with soils and hydrological data primarily from the USDA National Resource Conservation Service (NRCS), California Department of Water Resources (DWR), and the US Geological Survey (USGS).

There were four basic elements of this analysis as follows:

1. **Parcel Development Status:** Conduct a systematic GIS-based inventory to determine the development status (i.e., developed or vacant) of all residential parcels in non-sewered areas of the County. (Note: the analysis did not address OWTS serving commercial occupancies, or other non-residential uses, which may be significant locally, but overall represent a relatively small percentage of total OWTS discharges in the County. This can be addressed for selected areas in the future as an addendum to this analysis).

2. **General Soil/OWTS Suitability Mapping:** Define and construct GIS map of general soil associations for the County, focused on factors pertinent to the use of OWTS.

3. **Hydrologic Areas:** Delineate general hydrologic areas of the County, consistent with State databases, in a GIS format compatible with parcel and soils information.

4. **Groundwater Basins:** Identify and compile information on recognized groundwater basins in Kern County, including GIS map files compatible with parcel, soils, and hydrological data.

The geographic area covered in the analysis includes all of Kern County, with the parcel data analysis focused only on the unincorporated lands within the county. All incorporated property within the various cities was excluded, under the assumption that municipal sewer systems either serve or are available to all of these parcels. Some “islands” of unincorporated parcels were found to exist in the Bakersfield urban area; and for our initial analysis we assumed these parcels to be served by OWTS. If additional information reveals any of these parcels to be connected to municipal sewers corrections will be made to remove these parcels from OWTS status.

Additionally, any other unincorporated parcels determined to be connected to community sewer systems in other parts of the County, will have their OWTS status corrected.

Parcel Development Status

The first step in the analysis was to identify and create an inventory of the non-sewered parcels in the County, along with their development status (i.e., developed or vacant). It was found that this information is not readily available from any County department. Therefore, this was done according to the following process using the County GIS database.

1. **Identify Non-sewered Parcels:**

    a. First, parcels in the Kern County GIS parcel database, under field TRA_NO, which have a code number starting with 054 or greater, are considered unincorporated parcels.

    b. Next, city and sanitary district boundaries were applied to the County-wide data base to exclude parcels located within areas known to be served by public sewers. This included mainly incorporated lands, but it also included some unincorporated areas of (e.g. sanitary districts, county service areas, and community service districts) which are served by their own community wastewater facilities.

    c. In an effort to more accurately map sewered areas, individual treatment plants were contacted to obtain the current boundaries of their sewer service area. Sewer service boundaries for all 33 wastewater treatment facilities (WWTFs) listed in the SWRCB Kern County database, were either derived from paper maps, GIS shapefiles, or verbally described over the telephone. In many cases, such as with County Service Areas (CSAs), sewered areas had to be identified separately from other services (i.e. water service or sanitary service) and then added to the list of sewer service boundaries. A composite of all sewered areas was created in GIS, in order to exclude parcels located within sewered areas and focus solely on parcels that could potentially be developed with OWTS.

    d. From the above analysis, the total number of non-sewered parcels in the County (excluding non-development areas such as Federal lands) was determined to be 164,912.

2. **Determine Development Status:**

    a. County Assessor's information and other GIS parcel data were reviewed and found not to have any designation indicating whether or not a particular property is developed or vacant.

    b. Per discussions with knowledgeable County staff, "tax exemption value" and "tax exemption type" for each property were judged to be the most reasonable indicators.

    c. An iterative process was then followed to determine the "exemption type" most indicative of a developed vs. vacant property. Parcels in the Kern County GIS parcel database, under field EX_TYPE, which have a code letter of "H", are considered developed with a home. Other EX_TYPE codes to be considered

were “DA” and “DV”, which preclude “H” tax exemptions with exemptions for disabilities, but parcels could potentially still be developed with a residence.

d. Parcels with codes “DA” or “DV were then spot-checked against air photos to determine the presence/absence of buildings and other property features indicative of existing development for habitation. Parcels were also checked against another data field, “improvement value”; based on this review, we concluded that parcels assessments showing improvements value greater than $10,000, indicated a probable developed parcel.

e. The indicators as derived above were then assigned to the County-wide GIS inventory of unincorporated non-sewered parcels, with the following findings:

i. Developed Parcels: 16,494
ii. Vacant Parcels: 148,418
Total Parcels: 164,912

Soils/ OWTS Suitability Mapping

General Soils Map: Figure B-1 presents a General Soils Map of Kern County compiled from information contained in several soil surveys and mapping published by the U.S. Department of Agriculture, which include: (1) Soil Survey of Kern County, California, Northwestern Area, 1988; (2) Soil Survey Kern County, California, Southeastern Part, 1981; (3) Soil Survey of Kern County, California, Southwestern Part, 2008; and (4) Online soils data base maintained by the Natural Resources Conservation Service (NRCS). The General Soils Map contained in the 1988 Soil Survey of Northwestern Kern County provided the baseline groupings of general soil associations, which were extended to cover other portions of the County.

Soils in the County can be grouped into general landform classifications as follows:

1. **Alluvial Plains, Fans, and Stream Benches (3, 5, 6, 11):** Soils found in the flat portions of the San Joaquin Valley and Mojave Desert are deep, well drained soils, derived from sedimentary parent material and formed in alluvial plains, fans, stream benches, flood plains, and basin rims. The deep, well drained fine sandy loam and clay loam soils in these areas are well suited for conventional OWTS.

2. **Basins (4):** Soils found in the basin areas of San Joaquin Valley are deep, well drained to somewhat poorly drained clays and silt loams. Restricted permeability and locally shallow perched groundwater conditions can pose a moderate constraint for OWTS.

3. **Foothills (2, 12):** The foothill soils of San Joaquin Valley and the Eastern footslopes of the Southern Sierra Nevada and Tehachapi Mountains are generally shallower, located on old fans and terraces that lie between the more recent alluvial soils on the valley floor and the soils of the uplands. Soils range from sandy loams to stratified coarse gravelly sand. Limited soil depth over bedrock, steep slopes, and somewhat excessive permeability pose moderate to locally severe constraints for OWTS in the foothill regions.

4. **Uplands (1, 7, 8, 9, 10, 11, 14):** The mountain soils of the Temblor and Diablo Ranges to the west of San Joaquin Valley are shallow to deep and well drained loams situated on gently rolling to steep slopes. The Coast and Transverse Ranges to the south have moderately deep to very deep, well drained to excessively well drained fine sandy to gravelly loams. East of the San Joaquin Valley, mountainous areas include the Tehachapi and Greenhorn Ranges, continuing into the southern terminus of the Sierra Nevada Mountains. Soil is generally suitable for OWTS in the upland areas, limited by locally steep slopes and shallow soil depth, and in some areas by shallow seasonal groundwater conditions.

Soil-OWTS Suitability: The general mapping of soil conditions takes into account location and landform conditions, depth to bedrock, slope, subsurface texture, and drainage conditions of the soils, which are all key factors that can affect the suitability of the soils for onsite wastewater treatment. **Table B-1** was developed from the published soil survey information, summarizing the soil characteristics of the general soil associations mapped in **Figure B-1.**

The second to last right-hand column in **Table B-1,** highlights the key constraints and overall suitability designation for OWTS for each general soil association. The designations were developed and assigned based on the USDA soils information and Questa's best professional judgment. This is provided as a general assessment tool and is not a substitute for site-specific investigation of and planning for onsite wastewater treatment systems. It provides a general indication of the management and design issues likely to be encountered in each area. It does not take into account local constraints such as steep slopes, setback or other anomalous conditions that may be found on particular sites. The last column gives the estimated number of residential OWTS within each general soil area, determined by merging the GIS parcel data with the soil mapping boundaries.

Hydrologic Areas

Hydrologic Area Mapping: Kern County lies almost entirely within two hydrological and Water Quality Control Board Regions: Central Valley Region 5 and Lahontan Region 6 (east side of the county). Very small areas in the remote west edges of the county fall within the Central Coast Region. Utilizing watershed boundaries established by the California Department of Water Resources (DWR), eleven (11) hydrologic areas were delineated and labeled as shown in **Figure B-2**. Eight of the hydrologic areas are in the Central Valley Region and three within the Lahontan Region. The boundaries match DWR delineations, except that the expansive San Joaquin Valley area, was further divided geographically into four subareas: labeled Valley North, Valley West, Valley South, and Bakersfield Metropolitan Area.

OWTS Distribution by Soils

Kern County LAMP Fig.B-1

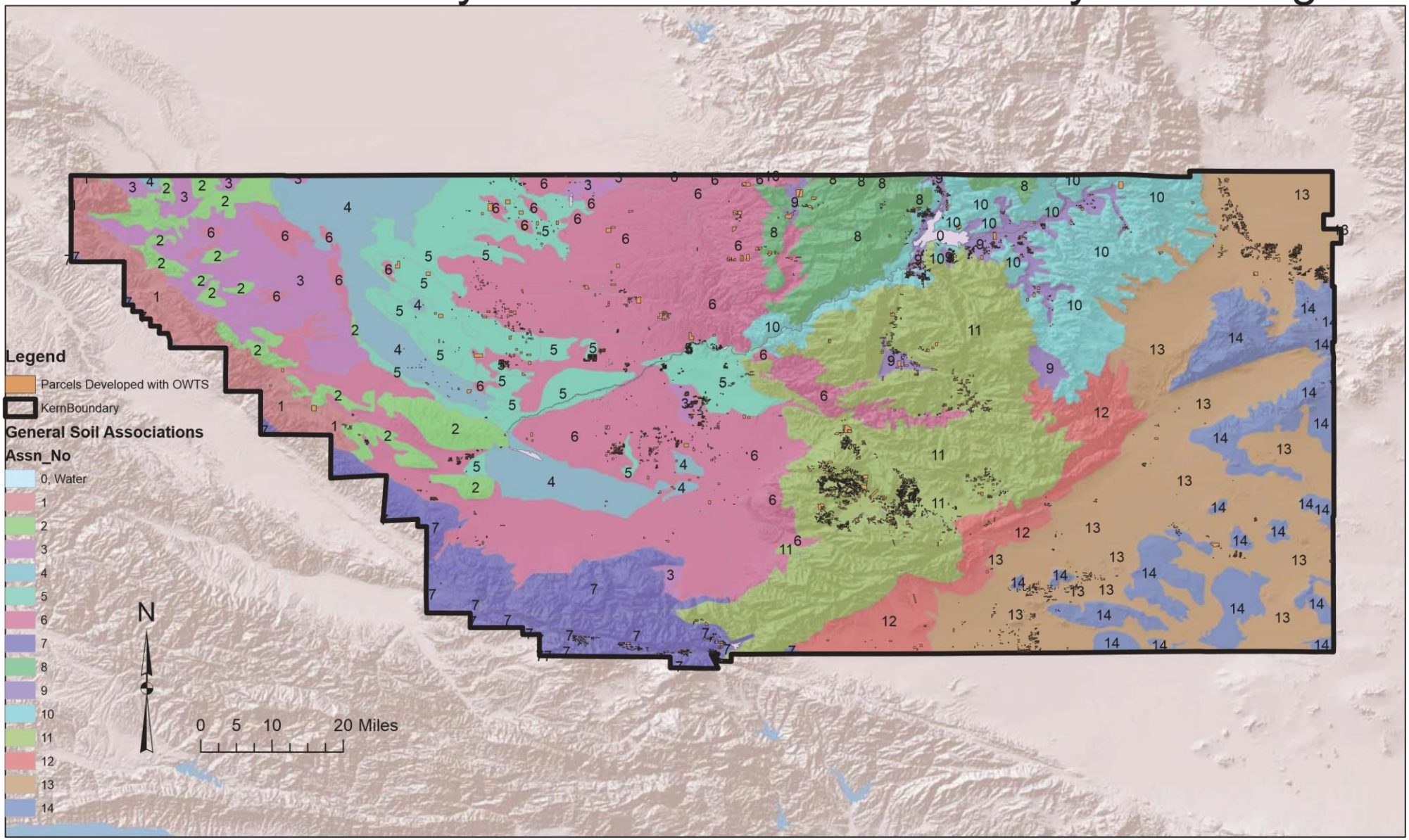


Table B-1: Kern County General Soil Associations

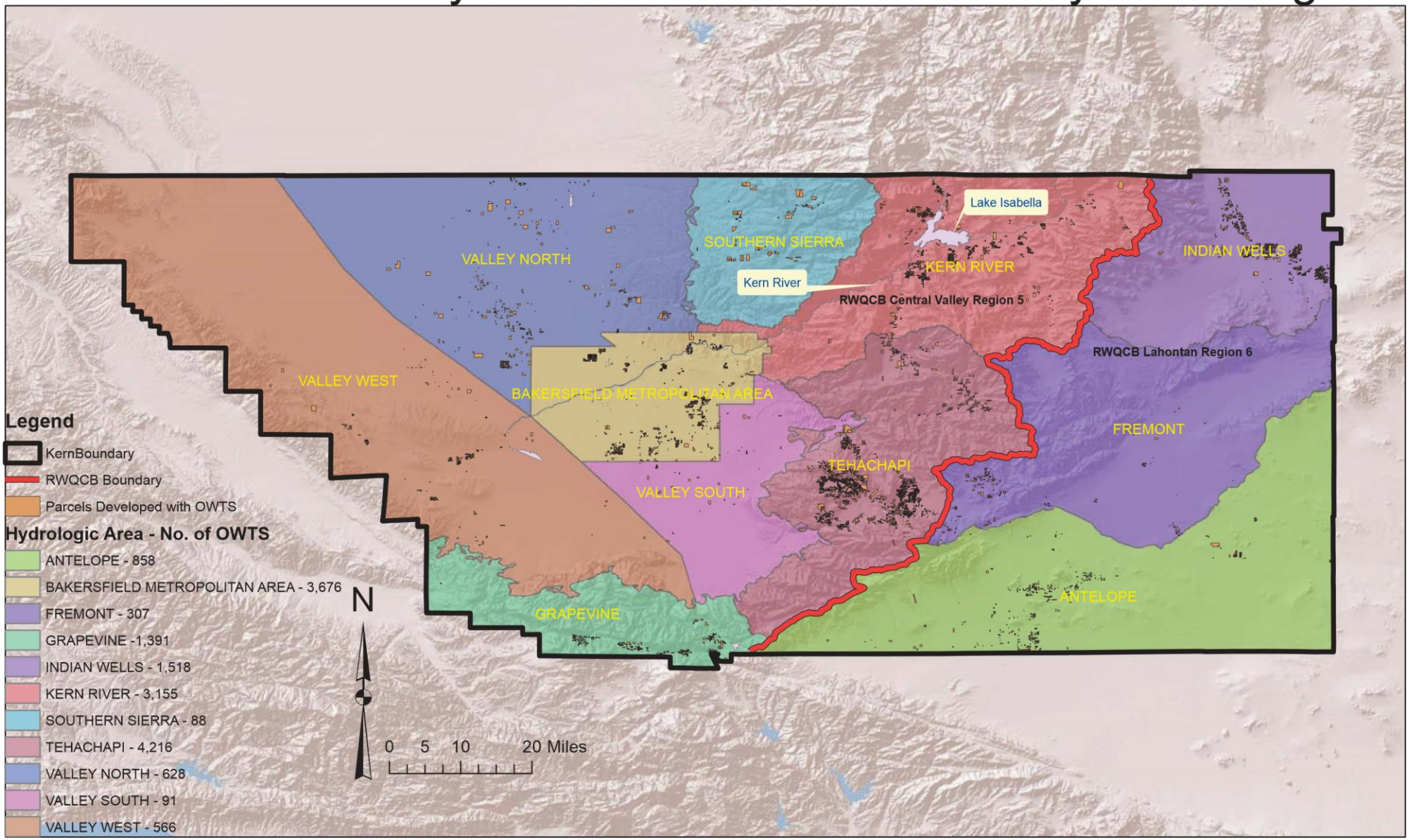
General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
1	**Soils on the Hills and Mountains of the Temblor and Diablo Ranges**	shallow to deep	mainly gently rolling to very steep 9-75%, some undulating	well drained	clay to sandy loam, some very sandy loam	Generally suitable conditions for conventional OWTS with locally steep slope limitations; potentially requiring shallow dispersal designs	5
2	**Soils on the Foothills of the Temblor and Diablo Ranges**	shallow to deep	rolling to steep, some very steep	well drained to somewhat excessively drained	mainly sandy loam, some fine sandy loam to stratified coarse gravelly sand	Generally suitable conditions for conventional OWTS with locally steep slope limitations; potentially requiring shallow dispersal designs	30
3	**Soils Mainly on Alluvial Fans, Alluvial Plains, and Terraces in the Western Part of the San Joaquin Valley**	deep	nearly level to moderately sloping	well drained	clay loam to sandy loam	Suitable conditions for conventional OWTS	936
4	**Soils Mainly in Basins of the San Joaquin Valley**	deep	nearly level to gently sloping, 0-5%	well drained to somewhat poorly drained	loam, fine sandy loam and clay	Suitable conditions for conventional OWTS; some inclusions of low permeability and perched groundwater favoring shallow dispersal designs	132
5	**Soils Mainly on Alluvial Fans, Alluvial Plains, Basin Rims, and Flood Plains in the Eastern Part of the San Joaquin Valley**	deep	nearly level to gently sloping, 0-5%	well drained to somewhat excessively drained	silt and clay loam to sandy loam	Suitable conditions for conventional OWTS; may be limited locally by cumulative groundwater loading effects from high density of OWTS	9,612
6	**Soils on Flood Plains, Alluvial Fans, Stream Terraces, and Fan Remnants of Southern and Southeastern Joaquin Valley**	moderately deep to very deep	nearly level to moderately sloping	well drained to somewhat excessively well drained	mainly clay loam to sandy loam, some gravelly loam and loamy sand	Suitable conditions for conventional OWTS; may be limited locally by cumulative groundwater loading effects from high density of OWTS	12,169

General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
7	**Soils on the Coast and Transverse Range**	moderately deep to very deep	mainly gently sloping to steep, some nearly level	well drained	silty clay loam to very gravelly sandy loam	Generally suitable conditions for conventional OWTS; some local inclusions of steep slope; potentially requiring alternative treatment and/or shallow dispersal designs	1,380
8	**Soils and Rock outcrop on Hillslopes, Mountain Slopes, Flood Plains, Stream Terraces, Alluvial Fans, and Fan Remnants on the Western and Central Slopes of the Southern Sierra Nevada and Greenhorn Ranges**	mainly shallow to moderately deep, some very deep	mainly moderately steep to very steep, some nearly level	well drained to somewhat excessively drained	gravelly sandy loam to stony, boulder coarse sandy loam	Moderately constrained by steep slopes and shallow soils; potentially requiring alternative treatment and/or shallow dispersal designs	149
9	**Soils in Mountain Valleys, on Flood Plains, in Depressions, and on Stream Terraces, Inset Fans, Fan Aprons, Alluvial Fans, Fan Piedmonts, and Fan remnants of the Southern Sierra Nevada Range, Primarily Near Lake Isabella in South Fork Valley**	very deep	nearly level to moderately steep	well drained or somewhat poorly drained	fine sandy loam	Generally suitable conditions for conventional OWTS, with areas of shallow groundwater and low permeability con-straints; potentially requiring alternative treatment and/or shallow dispersal designs	2,230
				well drained or excessively drained	gravelly loamy coarse sand		
10	**Soils on the Hillslopes and Mountain Slopes on the East-ern Slopes of the Southern Sierra Nevada Range**	very shallow to moderately deep	moderately sloping to very steep	well drained to somewhat excessively drained	mainly gravelly loamy coarse sand, some boulder loamy coarse sand or fine sandy loam	Moderately to severely constrained by steep slopes and shallow soils; potentially requiring alternative treatment and/or shallow dispersal designs	866

General Soil Association Number	Description	Soil Depth	Slope	Drainage	Soil Texture	Suitability and Constraints for OWTS	Estimated Number of OWTS
11	**Soils on Uplands and in Valleys of the Sierra Nevada and Tehachapi Mountains**	moderately deep to very deep	nearly level to hilly, 0-30%	well drained	sandy loam to clay loam	Generally suitable conditions for conventional OWTS, with areas of shallow ground-water, steep slopes and high OWTS densities; potentially requiring alternative treatment and/or	4,875
12	**Soils on the Eastern Foot Slopes of the Sierra Nevada and Tehachapi Mountains**	rock outcrop and shallow	nearly level to steep	well drained to somewhat excessively drained	gravelly sandy loam and loamy coarse sand	Moderately to severely constrained by steep slopes and shallow coarse-textured soils; potentially suitable for supplemental treatment and/or shallow dispersal designs	36
13	**Soils of the Mojave Desert**	mainly deep to very deep, some shallow	nearly level to strongly sloping	well drained to excessively drained	sandy clay loam to very gravelly loamy sand	Generally suitable conditions for conventional OWTS; some local inclusions of steep slope limitations favoring shallow dispersal designs	5,215
14	**Soils of the Mojave Uplands**	shallow to deep	gently sloping to strongly sloping	well drained	sandy loam and silica lime cemented hard-pan	Moderately to severely constrained for conventional OWTS by steep slopes and shallow soils; potentially requiring shallow dispersal designs	73
		shallow and very shallow	very steep		coarse sandy loam to clay loam		

OWTS Distribution by Watershed

Kern County LAMP Fig.B-2



OWTS Distribution by Hydrologic Area:

The hydrologic area information was merged with the GIS parcel status data to segregate the developed unincorporated parcels (i.e., OWTS) according to their location in different hydrologic areas in the county. The results are presented in **Tables B-2** and **B-3** for the Central Valley and Lahontan regions of the county, respectively. Shown in the tables for each hydrologic area are the total land acreage comprising each hydrologic area, the lot area developed with OWTS, the number of OWTS, and the average lot size for the developed parcels. As indicated, about 84% of the OWTS are located in the Central Valley Region and 16% in the Lahontan Region. The greatest concentrations of OWTS are Bakersfield Metropolitan Area (22%, with lot size supporting OWTS average approximately 1.27 acres) and Tehachapi (26% of the total, average lot size of 3.72 acres). Other large concentrations of OWTS are in the Grapevine, Kern River, and Antelope hydrologic areas. Outside of the Bakersfield area average OWTS lot sizes range from about 1 to 38 acres in the different areas of the county, with the overall county-wide average being about 3 acres.

Table B-2.
OWTS Usage and Distribution Hydrologic Area, Kern County - Central Valley Region 5

Hydrologic Area	Total Watershed Area (acres)	Developed Lot Area (acres)	Number of Developed Parcels	Average Developed Lot Size (acres)
Bakersfield Metro Area	2,043,106	4,662	3,676	1.27
Valley North	2,626,729	6,080	628	9.68
Valley West	2,444,693		566	3.01
Valley South	1,276,966	761	91	8.37
Grapevine	373,658	1,625	1,391	1.17
Tehachapi		15,692	4,216	3.72
Kern River	747,589	5,271	3,155	1.67
Southern Sierra	264,235	3,337	88	37.92
TOTAL	**10,231,017**	**39,132**	**13,811**	**2.83**

Table B-3.
OWTS Usage and Distribution by Hydrologic Area, Kern County - Lahontan Region 6

Hydrologic Area	Total Watershed Area (acres)	Developed Lot Area (acres)	Number of Developed Parcels	Average Developed Lot Size (acres)
Antelope	2,146,292	2,855	858	3.32
Fremont	908,922	1,647	307	5.36
Indian Wells	535,095	4,893	1,518	3.22
TOTAL	**3,590,309**	**9,395**	**2,683**	**3.50**

Cumulative Wastewater Loading by Hydrologic Area:

Based on the estimated number and distribution of developed properties using OWTS determined above, estimates of the associated cumulative wastewater loading volumes were made for different geographical and hydrological regions of the County. This was done using an average daily wastewater flow of 150 gpd per OWTS, which is typical for rural residences, equal to about one-third to one-half the peak daily design flow used for system sizing. **Tables B-4** and **B-5** present the estimated volume of wastewater generated for each of the 11 general hydrological areas in the County for existing development conditions. Estimated wastewater volumes are shown in gallons per day (gpd) and million gallons per year (Mgal/yr.). Additionally, the average annual wastewater loadings, in gallons per acre, are calculated and presented based on the total acreage of non-sewered area within each hydrologic area. These results were used further to estimate the total annual nitrogen loading on a per acre basis, which are shown in the last column. This provides a basis for comparing and assessing the nitrogen loading in different hydrologic areas, tracking ongoing OWTS impacts from additional development in the future, and input to local or regional groundwater models.

Table B-4. Estimated OWTS Wastewater & Nitrogen Loading - Central Valley Region

Hydrologic Area	Developed Lot Area (acres)	Number of Developed Parcels	Discharge Volume (gpd)	Discharge Volume (Mgal/yr.)	Average Wastewater Loading gal/ac-yr.	Estimated Annual Nitrogen Loading* (lbs. /ac-yr.)
Bakersfield Area	4,662	3,676	551,400	201	43,171	25.2
Valley North	6,080	628	94,200	34	5,655	3.3
Valley West	1,704	566	84,900	31	18,186	10.6
Valley South	761		13,650	5	6,547	3.8
Grapevine	1,625	1,391	208,650	76	46,866	27.4
Tehachapi	15,692	4,216	632,400	231	14,710	8.6
Kern River	5,271	3,155	473,250	173	32,771	19.1
Southern Sierra		88	13,200	5	1,444	0.8
TOTAL	**39,132**	**13,811**	**4,835,850**	**756**	**19,323**	

*****Based on 150 gpd per OWTS, at a concentration of 70 mg-N/L

Table B-5. Estimated OWTS Wastewater & Nitrogen Loading - Lahontan Region

Hydrologic Area	Developed Lot Area (acres)	Number of Developed Parcels	Discharge Volume (gpd)	Discharge Volume (Mgal/yr.)	Average Wastewater Loading (gal/ac-yr.)	Estimated Annual Nitrogen Loading* (lbs. /yr.)
Antelope	2,855	858	128,700	50	16,454	9.6
Fremont	1,647	307	46,050	17	10,206	6.0
Indian Wells	4,893	1,518	227,700	83	16,986	9.9
TOTAL	**9,395**	**2,683**	**402,450**	**147**	**15,635**	

*****Based on 150 gpd per OWTS, at a concentration of 70 mg-N/L

Groundwater Basins

Groundwater Basin Mapping:

Utilizing boundaries established by the California Department of Water Resources (DWR), sixteen (16) alluvial groundwater basins were delineated and labeled as shown in **Figure B-3**. Eleven (11) basins are located in the Tulare Lake Hydrologic Region and five (5) basins are located in the South Lahontan Hydrologic Region. There are also small fractional portions of groundwater basins that lie predominantly in neighboring counties (San Bernardino, Los Angeles) which area shown in **Figure B-3.** These were omitted from further analysis due to the small percentage of each basin falling within Kern County, as well as the absence of any overlying parcel development in these remote areas of the County.

For the 16 groundwater basins, **Table B-6** summarizes the basin characteristics, including surface area, storage, and annual recharge as reported by DWR in Bulletin 118 (DWR, 2003). Also included in **Table B-6** is groundwater monitoring data, including depth to groundwater, and water quality monitoring data available through DWR. The depths to groundwater presented reflect the range of measurements from the most recent well monitoring data available in the DWR Groundwater Library. Where available, data are included from the edges as well as the center of each basin. For reference, Attachment A includes recent mapping of depth to groundwater for the regional aquifer and perched groundwater zones in the Tulare Lake Groundwater Basin, the largest basin in Kern County.

OWTS Distribution by Groundwater Basin:

In an analysis similar to the one performed by hydrologic region, the groundwater basin boundaries were merged with the GIS parcel status data to obtain estimates of the number of developed unincorporated parcels/ OWTS overlying each of the recognized alluvial groundwater basins in the county. The results are presented in **Table B-7**, along with projected wastewater loading volumes, based on an average discharge of 150 gpd per residential OWTS.

OWTS Distribution by Watershed

Kern County LAMP Fig.B-2

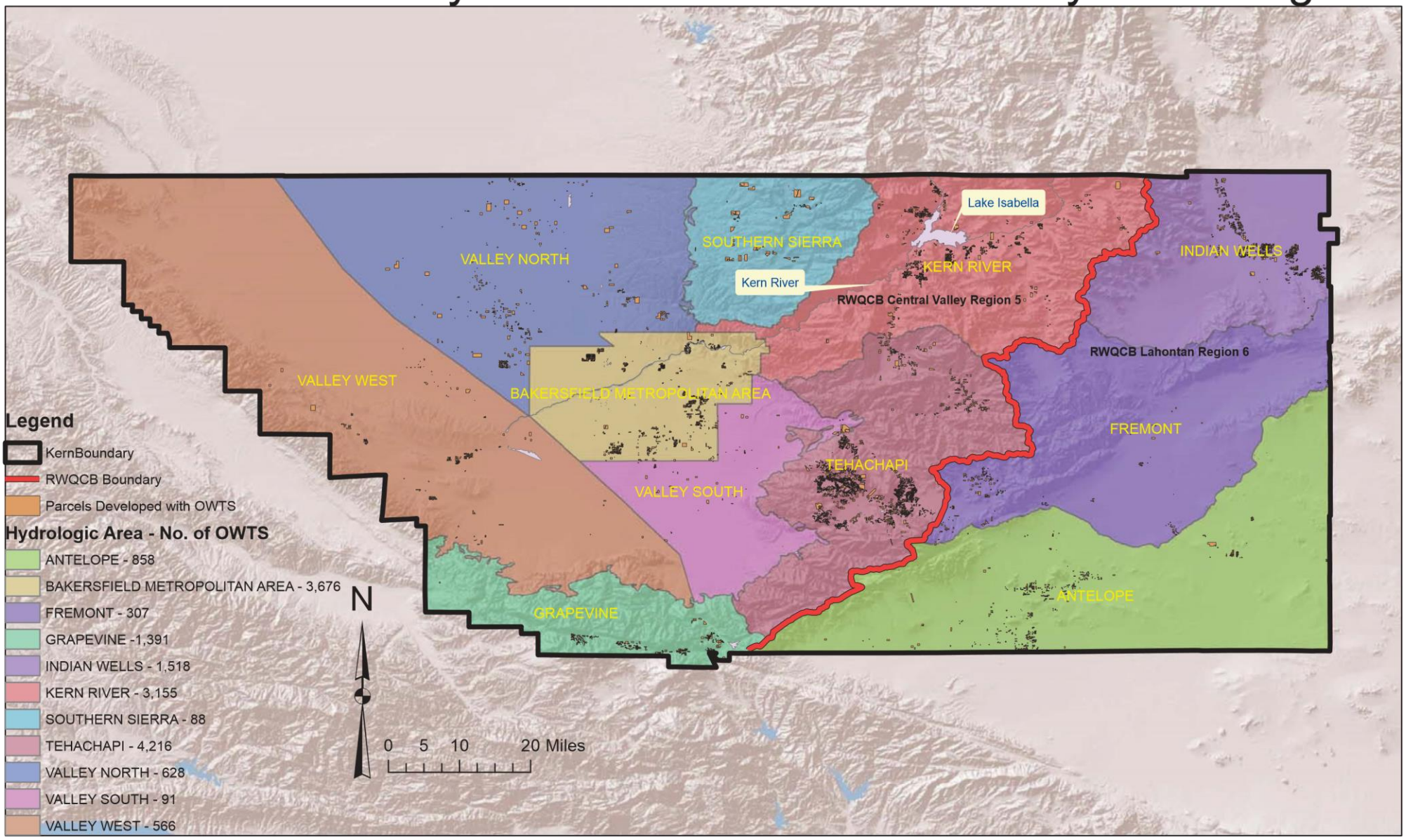


Table B-6. Kern County Groundwater Basin Characteristics

GW Basin Name	Basin No.	Hydrologic Area	Surface Area (AC)	Storage Volume (AC-FT)	Annual Recharge Volume (AC-T/YR)	Depth to Groundwater (ft., bgs)	Water Quality			
							TDS (mg/L)		Nitrate	
							Range	Ave.	# Wells Monitored	# Wells Exceeding MCL
San Joaquin Valley	5-22.14	Tulare Lake Valley [1]	1,945,000	40,000,000	1,534,000	5 to 20 (perched); 50 to 300+ (regional)	150 - 5,000	400 - 450	475	38
Kern River Valley	5-25	Kern River	74,000	N/A		9 to 63	253 - 480	378	76	5
Walker Basin Creek Valley	5-26	Tehachapi	7,670	-	-	22 to 102	-	-	-	-
Cummings Valley	5-27	Tehachapi	10,000	98,000	4,500	0 to 110	-	344	15	0
Tehachapi Valley West	5-28	Tehachapi	14,800	225,000	4,000	1 to 57	280 - 365	315	30	2
Castaic Lake Valley	5-29	Grapevine	3,600	-	-	37 to 52	570 - 605	583	8	0
Brite Valley	5-80	Tehachapi	3,170	26,000	3,000	51	-	-	-	-
Cuddy Canyon	5-82	Grapevine	3,300	-	-	67 to 130	690 - 695	690	5	0
Cuddy Ranch Area	5-83	Grapevine	4,203	-	-	33 to 42	480 - 645	550	6	0
Cuddy Valley	5-84	Grapevine	3,500	77,000	510	no data	325-645	407	10	0
Mil Potrero	5-85	Grapevine	2,300	-	3,100 [2]	artesian to 50	372 - 657	460	7	0
Antelope Valley	6-44	Antelope	1,010,000 [3]	68,000,000	48,000	20 to 280	200 - 800	300	243	8
Tehachapi Valley East	6-45	Fremont	24,000	150,000	3,000	284	298 - 405	361	10	0
Fremont Valley	6-46	Fremont	335,000	4,800,000	-	110 to 212	398 - 1,400	596	15	0
Indian Wells Valley	6-54	Indian Wells	382,000 [4]	2,050,000	15,100	13 to 212	192 - 950	390	58	1
Kelso Lander	6-69	Fremont	11,200	-	-	no data	360 -1300	-	-	-

* Primary data source: DWR Bulletin 118, California's Groundwater

1. *Extends over sub-areas designated Valley North Valley West, Valley South, and Bakersfield Metropolitan*
2. *Includes estimate of 400 AC-FT/YR from 1,900 OWTS in 8,800 watershed area (CM Engineering, 1970)*
3. *Groundwater basin extends over portions of Kern, Los Angeles, and San Bernardino Counties*
4. *Groundwater basin extends over portions of Kern, Inyo, and San Bernardino Counties*

Table B-7. OWTS Loading Volumes, Kern County Groundwater Basins (Updated April 2016)

GW Basin Name	Surface Area of Basin (ac)	Annual Recharge Volume (AC-FT/YR)	Number of Developed Parcels with OWTS	Basin-wide OWTS Density (acres per OWTS)	Estimated Daily OWTS Discharge (gpd)	Estimated Annual OWTS Discharge		OWTS Loading as Percentage of Annual Basin Recharge Volume (%)
						Mgal/yr.	AC-Ft/yr.	
San Joaquin Valley	1,945,000	1,534,000	4,939	394	740,850	270	830	0.05
Kern River Valley	74,000		2,322	32	348,300	127	390	
Walker Creek Basin Valley	7,670	-	71	108	10,650	4	12	
Cummings Valley	10,000	4,500	276	36	41,400	15	46	1.03
Tehachapi Valley West	14,800	4,000	1,606	9	240,900	88	270	6.75
Castaic Lake Valley	3,600	-	93	39	13,950	5	16	
Brite Valley	3,170	3,000	141	22	21,150	8	24	0.79
Cuddy Canyon	3,300	-	361	9	54,150	20	61	
Cuddy Ranch Area	4,203	-	138	30	20,700	8	23	
Cuddy Valley	3,500	510	241	15	36,150	13	40	7.94
Mil Potrero*	2,300	3,100	1,900	1	285,000	104	319	10.30
Antelope Valley	1,010,000	48,000	597	1,692	89,550	33	100	0.21
Tehachapi Valley East	24,000	3,000	69	348	10,350	4	12	0.39
Fremont Valley	335,000	-	353	949	52,950	19	59	
Indian Wells Valley	382,000	15,100	1,501	254	225,150	82	252	1.67
Kelso Lander	11,200	-	0		0	0	0	0.00
Total			14,608	0	2,191,200	800	2,454	

** Includes estimated 400 ac-ft./yr. recharge from 1,900 OWTS located in 8,800 acre surrounding watershed (CM Engineering, 1970); 343 OWTS directly over gw basin.*

Using estimates of annual groundwater recharge volumes for each basin (where available), we also calculated the percentage of basin recharge contributed by OWTS. The calculated percentages represent the average over the full extent of the groundwater basin; localized contributions in different parts of the basin would vary above and below the average based on the density of OWTS discharges in a given area. It should also be noted that, in the case of the Mil Potrero basin in the Grapevine hydrologic area, based on a 1970 study referenced by DWR, OWTS contribution to groundwater recharge presented in **Table B-7** includes the indirect effects from an estimated 1,900 OWTS located in the 8,800 acre watershed area encompassing and surrounding the 2,300-acre groundwater basin. The current GIS parcel analysis indicates only 343 of the 1,900 OWTS lie directly over the Mil Potrero basin.

The OWTS contribution to groundwater recharge is potentially an issue with regard to cumulative effects on groundwater quality, nitrate-nitrogen in particular. As indicated by the calculations in **Table B-7**, the recharge percentage contributions from OWTS is typically on the order of 1 to 2 percent for most of the County, which would typically produce only very small effects on groundwater-nitrate concentrations. In those basins indicating recharge percentages on the order of 5 to 10% or more (e.g., Tehachapi Valley West, Cuddy Valley, Mil Potrero), the nitrate loading effects could be potentially significant locally in areas of high OWTS density, possibly contributing to elevated groundwater-nitrate concentrations affecting drinking water supplies. Water sample results for local groundwater supplies in the area would be helpful in assessing the actual nitrate loading effect in these areas. The relative contribution from OWTS was not calculated for several groundwater basins where DWR reported unavailability of information on basin recharge. As a follow-up step, an effort should be made in the future to develop preliminary estimates of recharge in Kern Valley and the other small groundwater basins in the Tehachapi and Grapevine hydrologic areas due to the significant use of OWTS in these areas.

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