STANISLAUS COUNTY GROUNDWATER WELL SITING AND CONSTRUCTION GUIDELINES

August 29, 2023

I. Purpose

Improperly constructed, altered, maintained, or destroyed wells are a potential pathway for introducing poor quality water, pollutants, and contaminants to good-quality groundwater. The potential for groundwater quality degradation increases as the number of wells that are improperly constructed, altered, maintained, or destroyed increases. Wells can facilitate groundwater quality degradation by allowing:

- Pollutants, contaminants, and water to enter a well bore or casing;
- Poor quality surface and subsurface water, pollutants, and contaminants to move between the casing and borehole wall;
- Poor quality groundwater, pollutants, and contaminants to move from one stratum or aquifer to another; and/or,
- The well bore to be used for illegal waste disposal.

The purpose of these Guidelines is to provide safe, viable, and environmentally protective controls to the natural environment, during the construction, destruction, or modification of groundwater wells in Stanislaus County.

II. Authority

It is the responsibility of Stanislaus County Department of Environmental Resources (DER) to promote health, and quality of life by identifying, preventing, and controlling harmful environmental factors within Stanislaus County. DER is responsible for

reviewing plans and approving permits for water production, cathodic protection and monitoring wells in Stanislaus County. The California Department of Water Resources (DWR) developed well standards to protect groundwater quality, including protection against adverse effects caused by improper well construction or abandonment of wells, as published in the "California Well Standards – Bulletin 74-81/90" (Bulletin). Local jurisdictions have the authority to adopt standards which meet or exceed the Bulletin, and to administer and enforce them at the local level as detailed in Water Code Sections 13800 - 13806. The County's authorities and requirements are contained in the Stanislaus County Code in Chapter 9.36 – Water Wells, which incorporates the standards set forth in the Bulletin, and allows for the adoption of additional guidelines for their implementation and standards that are more stringent that the Bulletin. These Guidelines are developed consistent with the above authorities.

III. Implementation

DER will utilize the following information in implementing these Guidelines, which will be used in conjunction with the Bulletin and these Guidelines:

- References, reports and studies regarding the known hydrology and groundwater water quality conditions associated with Stanislaus County;
- DER's "Programmatic Environmental Impact Report, Discretionary Well Permitting and Management Program(PEIR)," dated June 2018;
- California State Water Resources Control Board (SWRCB) "Aquifer Risk Map – Domestic Wells and Small Systems (Houlihan and Bellan, 2021), created in support of SB 200 to help prioritize SAFER funding for domestic wells and state small water systems at risk for water quality issues; (https://gispublic.waterboards.ca.gov/portal/sharing/rest/content/items/62b116bb7e824df098b871cbce73ce3b/data);
- USGS and SWRCB "Groundwater Ambient Monitoring and Assessment (GAMA) Program Online Tools" (https://www.waterboards.ca.gov/water_issues/programs/gama/online_tools.html);
- Regional Water Quality Control Board (RWQCB) Region 5: "Updated Groundwater Quality Analysis and High Resolution Mapping for Central Valley Salt and Nitrate Management Plan," dated June 2016; and,
- Federal Emergency Management Agency (FEMA) "Flood Mapping Tool" (https://msc.fema.gov/portal/home).

The resulting Guidelines meet or exceed those in the current Bulletin. These Guidelines will be revised as appropriate when the State of California releases any

amended version of the Bulletin. In order to assess whether a permit application complies with the standards included in the guidelines, a checklist and flow chart with simple yes or no decision points have been developed and are included as Attachment 1 and 2, respectively.

IV. Definitions:

A. Abandoned: A well is considered abandoned, or permanently inactive, if it has not been used for one year and there is no intention for future use. Abandoned wells must be destroyed (decommissioned) immediately unless the owner demonstrates "intent for future use" and maintains the well in accordance with California Health & Safety Code Section 115700.

B. Accessory pipe: Any tubular device installed as part of the well structure that is not the well casing or conductor casing (e.g., gravel fill pipe, sounding tube, video access tube, chemical injection tube).

C. Admixture: A material other than water, aggregate, and cement that is used as an ingredient in a cementitious material to modify its freshly mixed, setting, or hardened properties and that is added to the batch before or during its mixing. (ASTM C125-03, modified)

D. Agricultural Wells: Water wells used to supply water only for irrigation or other agricultural purposes, including so-called "stock wells".

E. Annular space: The space between any well casing and the borehole wall, and the space between any two well casings. The annular space is also referred to as the annulus.

F. Anode (cathodic protection): An object, usually metallic, designed to corrode in place of the object it is designed to protect.

G. Aquifer: A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant quantities of groundwater to wells and springs. (DWR Bulletin 118: California's Groundwater, 2003)

H. Bacteria: Microscopic single-celled organisms lacking a distinct nucleus

I. Bentonite: A highly expansive colloidal clay used as primary component of drilling fluids, sealant, and as an admixture for cementitious sealing materials.

J. Borehole: A hole drilled or bored into the earth.

K. Casing: A tubular retaining structure which is installed in the well bore to maintain the well opening. Casing includes well casing, conductor casing, and accessory pipe, including vent pipe used for cathodic protection wells.

L. **Cathodic protection well:** Any artificial excavation in excess of 50 feet constructed by any method for the purpose of installing equipment or facilities for the protection electrically of metallic equipment in contact with the ground, commonly referred to as cathodic protection. (California Water Code Section 13711**).**

M. **Cement:** An inorganic material as defined in ASTM C150, synonymous to Portland Cement and hydraulic cement.

N. **Cementitious material:** An inorganic material or mixture of inorganic materials that sets and develops strength by chemical reaction with water by formation of hydrates and is capable of doing so under water. (ASTM C125-03)

O. **Competent Clay Layer:** A sediment layer with relatively low permeability that is at least 10 feet thick and contains more than 50% fines with a predominance of clay-sized particles.

P. **Concrete:** A composite material that consists of cement, aggregate, and water. (ASTM C125-03, modified)

Q. **Conductor casing:** Conductor casing typically are large-diameter casings placed between the borehole wall and well casing to stabilize the upper formation while drilling and/or support the suspended weight of well casing and screen. (Handbook of Groundwater Development, Roscoe Moss Company, 1990, modified)

R. **Confined groundwater:** Confined groundwater is isolated from the atmosphere by geologic materials of low permeability and generally is present under pressures that are higher than atmospheric pressure. (Groundwater and Wells, 2007, modified)

S. **Confined aquifer:** An aquifer overlain by a confining layer. (Applied Hydrogeology, Fetter, 1994)

T. **Confining layer:** A bed or stratum of rock or sediment stratigraphically above or below and significantly less permeable than one or more aquifers.

U. **Contaminant:** Any physical, chemical, biological or radiological substance or matter in water listed in the Primary or Secondary Contaminant List in the Safe Drinking Water Act (SDWA)**.**

V. **Contamination:** An impairment of the quality of the waters of the state by waste to a degree which creates a hazard to the public health through poisoning or through the spread of disease. Contamination includes any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected.

W. **Corcoran Clay:** A low-permeability, regionally extensive, lacustrine deposit as much as 200-ft thick that divides the groundwater-flow system of the western

San Joaquin Valley into an upper semi-confined zone and a lower confined zone.

X. Corrosion: Deterioration of metallic objects by electrochemical reaction with the environment.

Y. Crushed stone: The product resulting from the artificial crushing of rocks, boulders, or large cobblestones, substantially all faces of which have resulted from the crushing operation. (ASTM C125-03)

Z. De minimis well: A domestic well used for production of less than 2 acre-feet of groundwater annually as defined in California Water Code Section 10721 (e).

AA. Destruction : Destruction is the permanent, physical removal of a well from service through proper sealing according to these standards. The objective of destruction is to restore, as nearly as possible, the subsurface conditions that existed before the well was installed. Other terms commonly used in place of "destruction" are decommissioning, closure, and plugging.

BB. Fly ash: The finely divided residue that results from the combustion of ground or powdered coal and that is transported by flue gases from the combustion zone to the particle removal system. (ASTM C125-03)

CC. Formation: A body of rock or sediment sufficiently homogeneous or distinctive to be mappable as a unit.

DD. Freshly mixed: A composite material is regarded freshly mixed if it possesses enough of its original workability so that it can be placed and consolidated by the intended methods. (ASTM C125-03, modified)

EE. Gravel: A natural, granular, mineral material of certain particle size greater than sand. (ASTM C125-03, modified)

FF. Gravel pack: typically sand and/or gravel, or other material (e.g., siliceous beads) placed in the annular space to stabilize the borehole wall and to prevent formation material from entering the well during pumping.

GG. Groundwater: That part of subsurface water which is in the zone of saturation, where water pressure is equal to or greater than atmospheric pressure.

HH. Local enforcing agency (LEA): The LEA is designated by duly authorized local, regional, or State government to administer and enforce laws and ordinances pertaining to the construction, maintenance, abandonment, and destruction of wells for the protection of water quality. In most California counties, the LEA is the county department of environmental health, but it can be another entity. The LEA is sometimes referred to as the "well permitting agency."

II. Measured depth: The length of the borehole measured along the borehole path from the ground surface.

JJ. Monitoring well: Any artificial excavation by any method for the purpose of monitoring fluctuations in groundwater levels, quality of underground waters, or the concentration of contaminants in underground waters. (California Water Code Section 13712).

KK. Pollution: Pollution" means an alteration of the quality of the waters of the state by waste to a degree which unreasonable affects: (1) Such water for beneficial use; or (2) Facilities which service such beneficial uses. Pollution may include contamination.

LL. Qualified Professional: A Professional Civil Engineer or Professional Geologist with experience in the design and construction of wells and the assessment of the migration of groundwater contamination of pollution.

MM. Sand: A natural, granular, mineral material of certain particle size, smaller than gravel and larger than silt. (ASTM C125-03, modified).

NN. Seal, annular: A watertight seal placed between the well casing and the side wall of a drilled hole.

OO. Seal, sanitary: A grout, mastic or mechanical device to make a watertight joint between the pump and casing or the concrete base.

PP. Seal, surface: A monolithically poured concrete platform constructed around the top of the well casing on thoroughly compacted earth.

QQ. Slurry: A semiliquid mixture of insoluble matter suspended in water.

RR. Special Management Area: Areas in Stanislaus County where, due to local soil, geologic or hydrogeologic conditions, special well seal depth or other measures have been adopted to prevent potential water quality degradation or public health risks. Several Special Management Area have been designated. They are demarked as SMA1; SMA2, SMA3, SMA4, & SMA5 in Section IX and Figure 1 of these Guidelines;

SS. Separation Distance. The distance, in feet or fractions of a mile, by which a well is required to be laterally separated from a potential contamination source to prevent potential water quality degradation as a result of well completion or operation. Horizontal separation distances in these Guidelines are more restrictive than state standards.

TT. Solid rock material: Consolidated rock that is slightly weathered or fresh, with moderately to widely-spaced jointing or fracturing, and no evidence of shearing or brecciation. Corresponds with "solid material" as used in the Bulletin when referring to drilling in fractured rock aquifers.

UU. Target aquifer: That aquifer or water bearing zone that is screened to access groundwater.

VV. Tremie pipe: A tubular device or pipe used to place materials in the annular space.

WW. Total Vertical Depth: Vertical measurement of a straight perpendicular line from a horizontal plane at the ground surface to the point of interest, independent of the path of the borehole. For vertical boreholes, the true vertical depth is equal to the measured depth.

XX. Unconfined Aquifer: An aquifer without a confining layer at the top. The top of an unconfined aquifer is the water table, which is the plane where groundwater pressure is equal to atmospheric pressure. (Groundwater Hydrology, 1978, modified).

YY. Upper Zone: In SMA1, the Upper Zone shall be defined as the groundwater-bearing zone that overlies the Corcoran Clay. In SMA2, the Upper Zone shall be as defined for the Nitrate Control Program adopted by the Central Valley Regional Water Quality Control Board and published in the report prepared titled "Region 5: Updated Groundwater Quality Analysis and High Resolution Mapping for Central Valley Salt and Nitrate Management Plan," prepared for the Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS) program dated June 2016. Different aquifer zones are not defined in SMA3.

ZZ. Water Well: Any artificial excavation constructed by any method for the purpose of extracting water from, or injecting water into, the underground. This definition shall not include: (a) oil and gas wells, or geothermal wells constructed under the jurisdiction of the Department of Conservation, except those wells converted to use as water wells; or (b) wells used for the purpose of (1) dewatering excavation during construction, or (2) stabilizing hillsides or earth embankments. (California Water Code Section 13710)

AAA. Well Casing: A tubular retaining structure installed in the well bore to maintain the well opening and protect any pumps or other equipment installed within. Well casing may be used with or without conductor casing.

V. Potential contamination sources found in the Stanislaus County and their control

A. Protect Your Well Area: Be careful about storage and disposal of household and yard care chemicals and wastes. Responsible farmers and gardeners minimize the use of fertilizers and pesticides. Legal use of these chemicals requires following of all United States Environmental Protection Agency (EPA) labeling instructions regarding appropriate use and disposal to protect water resources and the environment. Reduce erosion and prevent surface water runoff near the well wherever possible. Make sure your well water is protected from exposure to surface water, soil, animals and insects. Wellheads should be maintained and

protected from surface water or soil inflow, and from potential vandalism. Enhance your awareness about what may pollute the drinking water source in your area.

When possible, a well should be located up the groundwater gradient from potential sources of pollution or contamination. The separation distances in Table VI-1 provide have been adopted to provide adequate protection for water quality regardless of the wells position relative to a potential pollution or contamination source with respect to gradient; however, locating wells up-gradient from pollutant and contaminant sources can provide an extra measure of protection for a well.

Ongoing Maintenance is an important part of well safety. Damaged wellheads should be repaired or sealed as soon as possible. Many homeowners procrastinate on maintenance until problems arise, which can be costly. It's better to maintain your well, identify problems early, and correct them quickly to protect your well's performance. Wellhead protection from incursion by leaks, spills, surface water and activities that involve the handling of potentially polluting substances is essential for both domestic and public water supply wells, as well as for irrigation wells.

B. Naturally Occurring Pollutants: Naturally occurring pollutants can be present in the aquifer system or overlying soils and can contaminate well-water supplies. The following sections provide a general summary of naturally-occurring pollutants that may occur in Stanislaus County.

- **Microorganisms**: Bacteria, viruses, parasites, and other microorganisms are sometimes found in water. Shallow wells—those with water closest to the ground level—are at greatest risk. Runoff, or water flowing over the land surface, may pick up these pollutants from wildlife and soils. Some of these microorganisms can cause a variety of illnesses. Symptoms include nausea and diarrhea. These can occur shortly after drinking contaminated water. The effects could be short-term yet severe (similar to food poisoning), or might recur frequently or develop slowly over a long time.

- **Nitrates and Nitrites:** Although high nitrate levels are usually due to human activities (see below), they may be found naturally in ground water. They come from the breakdown of nitrogen compounds in the soil. Flowing ground water picks them up from the soil. Drinking large amounts of nitrates and nitrites is particularly threatening to infants (for example, when mixed in formula).

- **Heavy Metals:** Underground rocks and soils may contain arsenic, hexavalent chromium, and uranium that can be mobilized into aquifers. Cadmium, lead, selenium and other heavy metals may also be naturally occurring in aquifer systems, but are not common in Stanislaus County.

C. **Anthropogenic Contaminants:** Common human activities also can pollute ground water. The following sections provide a general summary of contaminants that may occur in Stanislaus County.

- **Bacteria and Nitrates:** Septic tanks, other sewage systems and waste or runoff from concentrated animal feeding operations can cause bacterial and nitrate contamination. Both sewage systems and animal manures should be monitored to prevent pollution. Sanitary landfills and garbage dumps are also sources. Contamination from these sources may occur in shallow aquifer systems or improperly sealed wells. Children, the elderly, and people whose immune systems are weak due to AIDS or cancer treatments are at extra risk when exposed to water-borne bacteria. Fertilizers can also add to nitrate problems as discussed below. Nitrates cause a health threat in very young infants called “blue baby” syndrome. This condition disrupts oxygen flow in the blood.

- **Heavy Metals:** Activities such as mining, construction, plating and other manufacturing can release heavy metals into nearby ground water sources. Some older fruit orchards may contain high levels of arsenic, once used as a pesticide. Landfills may also release heavy metals.

- **Fertilizers:** Farmers use fertilizers to promote plant growth and crop yield. These products are also used on golf courses and suburban lawns and gardens. Many fertilizers contain forms of nitrogen that can break down into nitrates and may end up in ground water, most commonly in the shallow aquifer system. This could add to other sources of nitrates mentioned above. The types of soil and the amount of water moving through the soil play a role in the breakdown of nitrates through a process known as denitrification that can limit its migration and persistence of nitrate in the aquifer system.

- **Pesticides and Herbicides:** Farmers use pesticides to reduce insect, nematode and fungal damage and herbicides to control weed growth. These products are also used on golf courses and suburban lawns and gardens. The chemicals in these products may end up in ground water. The soil fumigant 1,2-dibromo-3-chloropropane (DBCP) was widely used in the San Joaquin Valley before it was banned in 1977 and residual concentrations have been found in many areas, especially in the shallow aquifer system. Another constituent of soil fumigants, 1,2,3-trichloropropane (1,2,3-TCP), has also been found in many areas. The types of soil and the amount of water moving through the soil also play a role in the migration and persistence of these organic contaminants.

- **Leaking Underground & Aboveground Storage Tanks and Piping:** Petroleum products, chemicals, and wastes stored in underground/ aboveground storage tanks and pipes may end up in ground water. Tanks and

piping leak if they are constructed, installed or maintained improperly. Steel tanks and piping corrode with age. Common contaminants associated with leaks and spills from tanks and pipeline systems include gasoline, fuel oxygenates such as methyl tertiary-butyl ether (MTBE) and diesel fuel from commercial fuel operations, and perchloroethylene (PCE) associated with dry cleaners. Fuel tanks are also often found on farms, and the possibility of leaking tanks is great on old, abandoned farm sites.

- **Household Wastes:** Improper disposal of many common products can contaminate ground water. These include cleaning solvents, used motor oil, paints, and paint thinners. Even soaps and detergents can harm drinking water. These are often a problem from faulty septic tanks and septic leach fields.
- **Water Treatment Chemicals:** Improper handling or storage of water-well treatment chemicals (disinfectants, corrosion inhibitors, etc.) close to your well can cause problems.

VI. Water Well Location

A. Separation Distances. All water wells shall be located an adequate horizontal distance from known or potential sources of pollution and contamination. Common sources of pollution and appropriate setbacks, based on local conditions, to prevent the potential for pollution of or through wells are summarized in Table VI-1, below:

Table VI-1 Minimum Separation Distances (Note 1)

Pollution Source	Minimum Separation Distance from Borehole to Pollution Source
Pit privy; Any sewer (sanitary, industrial, or storm; main or lateral); Onsite wastewater treatment system (i.e., septic tank, subsurface sewage leaching field)	100 feet for a domestic or stock well and 150/200/600 feet for all other wells (Note 2)
Stormwater infiltration well	150 feet
Earthen-surfaced animal housing (e.g., corral, confined pasture)	100 feet for a rural residential and 150 feet for commercial animal housing
Cesspool or seepage pit	150 feet for a domestic well and 600 feet for a public supply well
Petroleum/chemical storage tank or product non-transmission line (subsurface)	300 feet
Petroleum/chemical storage tank leaking (subsurface)	0.5 mile (2,640 feet)
Petroleum/chemical product transmission pipeline (subsurface)	1,000 feet
RCRA sites subject to corrective action	1 mile (5,280 feet)
Superfund sites	1 mile (5,280 feet)
Records of federally-registered, or state-permitted or registered, hazardous waste sites identified for investigation or remediation, such as sites enrolled in state and tribal voluntary cleanup programs and tribal- and state-listed brownfields sites	0.5 mile (2,640 feet)
Properties identified for environmental concerns ▪ Records of delisted NPL sites ▪ Registries or publicly available lists of engineering controls ▪ Records of former CERCLIS sites with no further remedial action notices	0.5 mile (2,640 feet)
Sewage, manure, or waste percolation & evaporation pond	600 feet
Sewage, manure, or waste irrigation and spreading area	600 feet
Established storage & preparation areas for pesticides/fertilizers/chemicals (Note 3)	300 feet
Solid waste disposal site (CLASS 3)	0.5 mile (2,640 feet)
Solid waste disposal site (CLASS 2)	0.5 mile (2,640 feet)

1. As permitted in the Bulletin, the minimum separation distances listed in this table have been selected to be more stringent than State minimum standards to address potentially variable local conditions within the County. Further, the separation distances are based on conservative assumptions that apply regardless of the groundwater gradient direction relative to the potential pollution source(s).

2. A 150 feet setback from a public water well where the depth of the effluent dispersal system does not exceed 10 feet; 200 feet from a public water well where the depth of the effluent dispersal system is between 10 and 20 feet; and 600 ft from a public water well when the dispersal system is greater than 20 feet in depth.

3. Anything less than fully enclosed with hard top flooring, walls, and roof.

B. Flooding. The location of the proposed well with respect to the floodplain of the 100-year flood, as defined by FEMA, shall be determined using available mapping information from FEMA. This determination affects applicability of the surface construction features inside the 100 year flood zone. Inside the 100-year flood zone above-ground well components shall be constructed to withstand flood-related loads, including the effects of buoyancy, hydrodynamic forces, and debris impact. There are two construction options, one of which shall be selected by the applicant. The applicant may request a variance from these construction options if it deems them to be impractical.

- **Option A:** The top of the well casing and any openings into the top of the well shall be no less than 12 inches above the 100-year flood elevation.
- **Option B:** The top of the well casing and any openings into the top of the well shall be no less than 12 inches above grade. Openings designed to permit the entrance and/or egress of air or gas, shall be constructed to prevent surface water from entering the well structure.

Public water supply wells shall be protected against flooding in accordance with the California Waterworks Standards (California Code of Regulations, Title 22, Division 4, Chapter 16), which requires that "Each new air-release, air vacuum, or combination valve, and any such valve installed to replace an existing valve shall be: (a) Installed such that its vent opening is above grade, above the calculated 100-year flood water level, and, if recorded data are available, above the highest recorded water level;…" In addition, the California Waterworks Standards require that a public water supply well's wellhead terminates a minimum of 18 inches above the finished grade.

VII. Hydrogeology of the Central Valley and Stanislaus County

A. Setting. Stanislaus County is located in the San Joaquin Valley, a deep, north-northwest trending alluvial basin drained by the San Joaquin River. The valley is bordered by the Coast Range to the southwest and the foothills of the Sierra Nevada Mountains to the northeast. Erosion of these mountain ranges created the alluvial aquifer system, which consists of deposits derived from the surrounding mountain ranges. Stanislaus County can be divided into five geomorphic regions that reflect its geologic setting. They are, from northeast to southwest:

- **Sierra Nevada Foothills:** The Foothills region is a narrow belt on the northeastern edge of the county characterized by relatively steep topography and the presence of metamorphic rocks that are exposed or covered by a thin soil profile.
- **Eastern Alluvial Fans:** Lapping onto the foothills bedrock complex and sloping gently to the west is a broad complex of alluvial fans composed of sediments

derived from the Sierra Nevada. These sediments include complexly interbedded gravels, sands, silts and clays of alluvial, fluvial, floodplain and volcano-fluvial origin.

- **Basinal Deposits:** The lowest portion of the valley is underlain by interbedded distal alluvial fan, floodplain and lacustrine deposits and fluvial deposits associated with the San Joaquin River. These sediments are more strongly stratified than the surrounding alluvial fans, and extend roughly between Highway 99 on the east and between Highway 33 and Highway 5 on the west.
- **Western Alluvial Fans:** The western alluvial fans occupy a relatively narrow band along the west side of the San Joaquin Valley that extends relatively steeply onto the valley floor. The underlying deposits consist of complexly interbedded gravels, sands, silts and clays derived from sedimentary rocks, ophiolites and mélange complexes exposed in the Coast Ranges.
- **Coast Ranges:** The Coast Ranges are a moderately to steeply sloping region underlain by marine sedimentary rocks, ophiolite complexes and subduction zone mélange.

B. Hydrogeology. The Eastern Alluvial Fans, Western Alluvial Fans and Basin Deposits are part of complex set of interbedded aquifers and aquitards that comprises the regional aquifer system within the San Joaquin Valley Groundwater Basin (SJVGB). In Stanislaus County, the SJVGB is bounded by the relatively impermeable basement rocks of the Sierra Nevada foothills to the northeast and the Coast Range to the southwest and subdivided along the major rivers into the Delta-Mendota, Eastern San Joaquin, Modesto, and Turlock groundwater subbasins. The aquifers tend to be unconfined to semi-confined in the upper alluvial fan areas, grading to semi-confined and confined near the valley axis due to the presence of better-defined stratification and aerially-extensive lacustrine clays in this area. The cumulative thickness of the water-bearing formations in the basin ranges from a few hundred feet near the SJVGB margins to over 1,000 feet in the center of the basin.

Separating the shallow and deep aquifers in the area of the Basinal Deposits is the Corcoran Clay, a laterally extensive lacustrine unit of the Upper Tulare and Upper Turlock Lake Formations. The Corcoran Clay occurs at a depth of approximately 250 to 300 feet below ground surface (bgs), is approximately 150 to 250 feet thick, and acts as a regional aquitard, impeding groundwater exchange between upper and lower aquifers. As a result, groundwater quality is often variable in the shallow and deep aquifers. It extends through the width of the county in a swath on either side of the San Joaquin River.

Depth to groundwater generally increases with distance away from the San Joaquin River, although this pattern can be locally modified by well extraction or recharge from irrigation. In the Basinal Deposit area, the depth to groundwater

varies between approximately 2 and 20 feet bgs, and in the Eastern and Western Alluvial Fans, depths vary between 20 and 200 feet bgs. In the Foothills geomorphic region, groundwater flows through fractures in the bedrock, and is typically found at depths greater than 100 feet. Groundwater in the Coast Range is also usually found depths greater than 100 feet, where it exists in either the pores of sedimentary rocks or in fractures in metamorphic rock, and occasionally reaches the surface in natural springs.

C. Water Quality: Groundwater in Stanislaus County is generally of good quality, although some elevated concentrations of pollutants and contaminants do occur. Extensive agricultural activities in the county have led to areas where nitrate levels are above drinking water standards, especially in the shallow aquifer system. Animal waste associated with dairy farming in addition to fertilizers used in agriculture and lawns were identified as the most likely sources of nitrate contamination, with onsite wastewater treatment systems (OWTS) noted as another potential source. Basinal sediments in the valley can be locally anoxic, a condition that favors bacterial denitrification and the reduction of nitrate to nitrogen gas. Nitrate impacts may locally extend into the deeper aquifers when drawn down by municipal pumping.

Elevated concentrations of uranium have been identified primarily in shallow groundwater in the middle and lower Eastern Alluvial Fan area in the vicinity of Modesto and Ceres. Uranium is naturally contained in sediments derived from the granitic rocks of the Sierra Nevada, and is believed to have been mobilized as modern, alkaline recharge water penetrated into the shallow aquifer system. In Modesto, it has been found to be strongly correlated with nitrate. Also, coincident with elevated nitrate levels in portions of agricultural regions in the middle and lower Eastern Alluvial Fan area are elevated concentrations of soil fumigant residuals such as 1,2,3-trichloropropane (1,2,3-TCP) and dibromo-chloro-propane (DBCP). Municipal supply wells have also been impacted in some areas by these agricultural chemicals, which tend to persist in the environment and can be drawn deeper into the aquifer system by pumping municipal wells.

Elevated concentrations of arsenic have been detected at various depths in some areas of Eastern Alluvial Fan and Basinal Deposit areas, for example near Modesto, Salida and Hughson. Arsenic behaves in a complex way geochemically and can be mobilized under a variety of conditions. It is often associated with older, anoxic water or with the dissolution of ferric complexes as groundwater is drawn from anoxic into oxic zones by pumping. It can occur in the shallow and the deep aquifer system.

Similarly, wells serving the communities of Newman, Patterson, Grayson and Crows Landing have been locally impacted by hexavalent chromium in sediments derived from the Diablo Range. Concentrations of hexavalent chromium are

generally greater in oxic groundwater compared to anoxic groundwater, but it is found at various depths.

Urban sources of groundwater contamination in the County include dry-cleaning operations, landfills, industrial sites, and leaking underground storage tanks. Historical dry-cleaning facilities remain a source of the organic contaminant, perchloroethylene (PCE) near contamination sites in Modesto and Turlock. Methyl tert-butyl ether (MTBE) originates from leaking underground gasoline storage tank sites.

Elevated concentrations of salts (total dissolved solids or TDS) are found at depth beneath the freshwater aquifers in the County, generally below a depth of about 1,000 feet bgs. However, elevated TDS is also found in some areas both above and below the Corcoran Clay in the Basinal Deposit area. Operation of deep-water wells has locally caused upwelling of deep saline groundwater that underlies the base of freshwater in some parts of the San Joaquin Valley.

VIII. Construction Standards

A. Sealing Material: The following standards shall be followed for the selection, preparation and placement of sealing materials. Except for water and aggregate, each sealing material component must comply with NSF/ANSI Standards 60 and/or 61. Alternatively, the "Concrete Site Mix Evaluation Method" Performance Standard, Compatibility, and Mixing, may be used to verify that a cementitious sealing material is NSF/ANSI 61 compliant even if one or more of the individual components is not certified.

- **Water:** The quality of water added to sealing material must be free of pollutants and must not adversely affect the sealing material's properties. Water used in cementitious sealing materials, should not exceed 2,000 milligrams per liter chloride and 1,500 mg/l sulfate. Adhere to sealing material manufacturer's specifications and applicable ASTM standards for water quality requirements.

- **Performance Standard, Compatibility and Mixing:** Approved sealing materials for annular seals and well destruction must be mixed in accordance with the manufacturer's specifications to achieve a hydraulic conductivity of less than or equal to $1x10^{-7}$ cm/s as determined by ASTM D5084 "Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter". Sealing Material Components and be thoroughly mixed to achieve uniform hydration and an effective, homogeneous seal. Approved sealing materials must be compatible with the buried components of the well system and the subsurface environment.

  For cementitious materials, NSF/ANSI 60 and/or 61 compliance can be met through certification of individual components or alternatively, using the

"Concrete Site Mix Evaluation Method" in accordance with the AWWA Waterworks Standards - Concrete Used for Drinking Water Systems, May 2015. The Concrete Site Mix Evaluation may be used to verify a cementitious sealing is NSF/ANSI 61 compliant even if one or more of the individual components is not certified, such as cement or fly ash. This method requires samples analysis of the hardened cementitious material to be analyzed by an ANSI-accredited laboratory to determine NSF/ANSI 61 compliance as follows: "Samples of the hardened concrete, with proper chains-of-custody are analyzed by an ANSI-accredited laboratory to determine if the mixture meets the requirements of the analytes provided under NSF/ANSI 61

- **Cement**: Cement must meet the requirements of ASTM C150 "Standard Specification for Portland Cement."
- **Bentonite**: Bentonite must be commercially prepared, powdered, granulated, pelletized, or chipped/crushed sodium bentonite.
- **Aggregate:** Aggregate must meet the specifications of ASTM C33 "Standard Specification for Concrete Aggregates" and of the sealing material manufacturer. The quality of aggregate must be compatible with other ingredients and must not adversely affect the sealing material's properties.
- **Sand:** Sand properties can impact pumpability. Sand that is too fine can increase pumping pressures and viscosity. This may result in excess water being added to the pumped mix, increasing the hydraulic conductivity of emplaced sealing material. Sand that is too coarse can settle out of the mix and cause pumpability problems. Sand grain shape can also impact viscosity and pumpability. Well-rounded sand is easier to pump than angular sand.
- **Neat Cement**: For Types I or II Portland cement, one 94-pound sack of Portland cement must be mixed with 5 to 6 gallons of water. Additional water may be required when admixtures are used
- **Sand Cement:** Sand cement must be mixed at a ratio of not more than 188 pounds of fine aggregate to one 94-pound sack of Portland cement (i.e., 2 parts fine aggregate to 1 part cement, by weight) and up to 6 gallons of water, where Type I or Type II Portland cement is used.

More water may be required when admixtures are used, but the resulting sand cement must not exceed hydraulic conductivity limits. Performance Standard, Compatibility, and Mixing.

Fine aggregate grading must conform to specifications set forth in ASTM C33 "Standard Specification for Concrete Aggregates" or Caltrans Standard Specifications Division XI Materials, Section 90 Concrete, for Fine Aggregate Gradation. In addition, for well sealing applications:

1. The greatest allowed particle size must pass the 3/8-inch sieve with not more than 5% of aggregate retained by the No. 4 sieve (3/16-inch).
2. The greatest allowed particle size must not exceed 1/5th the thickness of the seal.

B. Casing Material: Well casing must be assembled and installed with sufficient care to prevent damage to casing sections and joints. Casing and joints above intervals of perforations or screen must be watertight.

Manufacturer's guidelines and industry best practices must be followed during the storage, transport, handling, and installation of casing and fittings to prevent damage. Pipe and fitting manufacturers can provide special handling procedures for cold weather conditions.

Excessive bending of pipe and fittings must be avoided. Bending must be within the limits specified by the manufacturer for the type, grade, wall thickness, and diameter of casing and fittings.

- **Metal Casing:** Metal casing may be joined by welds, welded collars, threads, splines, or threaded couplings. Welding must be accomplished in accordance with the standards of the American Welding Society or the most recent revision of the American Society of Mechanical Engineers Boiler Construction Code. Metal casing must be equipped with a "drive shoe" at the lower end if it is driven into place.
- **Plastic Casing:** Plastic casing may be joined by solvent welding, or mechanically joined by threads or other means, depending on the type of material and its fabrication. Solvent cement used for solvent welding must meet specifications for the type of plastic casing used. Solvent cement must be applied in accordance with solvent and casing manufacturer instructions. Particular attention must be given to instructions pertaining to required setting time for joints to develop strength. The following specifications for solvent cements and joints for PVC casing must be met:
  - ASTM D2564, "Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings"
  - ASTM D2855, "Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings"

  Plastic casing or screen must not be subjected to excessive stress during installation and must not be driven into place. Care must be taken to ensure that plastic casing and joints are not subjected to excessive heat from cementitious sealing material. A specifically designed adapter must be used to join plastic casing to metallic casing or screen.

Heat of hydration developed by cementitious sealing materials must be accounted for and necessary precautions must be taken to prevent casing damage or collapse during construction.

C. **Permanent Conductor Casing:** Permanent conductor casing that is installed to aid in the drilling process or to seal off shallow soil or aquifer layers must be installed with sufficient annular space and provisions, such as centralizers, to allow for the placement of a conductor casing sanitary seal according to these standards. The sealing material shall extend below the shoe of the conductor casing and allowed to cure for at least 24 hours prior to drilling through the casing. If a permanent conductor casing is being installed to seal off a local contaminated or low quality groundwater stratum associated with an identified contamination incident, a proposal for the landing depth of the conductor casing relative to the identified layer to be sealed and underlying lower permeability strata shall be provided to the DER for review and approval.

D. **Temporary Conductor Casing:** Temporary conductor casing that is installed solely to aid in the drilling process without sufficient annular space and provisions, such as centralizers, to allow for the placement of a conductor casing seal according to these standards, must be removed as the surface seal is placed between the well casing and borehole wall. The sealing material must be kept at a sufficient height above the bottom of the temporary conductor casing as it is withdrawn to prevent caving of the borehole wall. If this temporary conductor casing is not removed during well installation, the well must be destroyed in its entirety in accordance with these standards. If a temporary conductor casing is being installed to seal off a local contaminated or low quality groundwater stratum associated with an identified contamination incident, a proposal for the landing depth of the conductor casing relative to the identified layer to be sealed and underlying lower permeability strata shall be provided to the DER for review and approval.

E. **Protection of Aquifer During Construction:** If polluted soil or groundwater will be penetrated during drilling and drilling activities could mobilize those pollutants before sealing material can be installed, then precautions must be taken to seal off or isolate those polluted zones during drilling and well construction operations. Special precautions shall include the use of conductor casing, borehole liners, maintaining drilling fluid in the borehole for positive pressure such that formation water cannot enter the borehole, or specialized drilling equipment.

IX. Well Seals

A. **Materials:** The seal material shall consist of neat cement grout, sand-cement grout, bentonite-cement grout, bentonite, or concrete, and shall conform to the specifications given in Section IIX and in the Bulletin. Sealing materials and their

uses shall be in accordance with manufacturer's recommendations. A transition seal consisting of hydrated bentonite or fine sand shall be placed between the gravel pack and the annular seal.

B. Surface Seal: A concrete surface seal shall be poured monolithically in the upper 3 feet of the well annular space and shall be free from cracks or other defects likely to detract from its water tightness. For all water supply wells, a slab shall be monolithically poured with the surface seal on thoroughly compacted native earth and shall be a minimum thickness of 6 inches, extending 4 inches above and 2 inches below surrounding ground level, and shall be extended at least 2 feet in all directions from the well casing. The surface of the concrete slab shall be smooth troweled and shall be graded away from the well casing in all directions for a distance of at least 1 foot from the casing, with sufficient fall to drain water away from the casing. The top of the well casing shall extend a minimum of one inch above the concrete surface slab, and the top of the well casing shall terminate above grade and above known levels of flooding. Any access opening in the well cap, well casing, or pump base for the purpose of disinfecting the well or measuring the water level shall be protected with a threaded, watertight plug or cap. Air vents on wells requiring such shall be installed in an approved manner.

C. Annular Seals: All production wells (including domestic, public supply, irrigation and stock wells) shall have an annular seal in the uppermost 80 feet vertical depth of the borehole unless the well is located in a Special Management Area, as defined below. The required annular seal depths adopted herein are intended to provide adequate protection of water quality and public health under the anticipated conditions in Stanislaus County when the wells are located outside the separation distances specified in Table VI-1. The top of the annular seal interval is at ground surface unless freezing conditions exist or if a vault is used, in which case it is at the bottom of vault. The annular seal shall be between the well and conductor casing and outside of the conductor casing. The bottom of the annular seal shall be no more than 50 feet above the screen interval of the well. Deviation from this requirement will require the approval of a variance by the DER.

For monitoring wells and remediation extraction wells, the annular seal may be reduced as needed and as approved by the regulatory agency overseeing the case. A monitoring well with a reduced annular seal length less than 20 ft. total vertical depth, must be constructed only in first encountered groundwater and not completely penetrate a confining layer that separates shallow groundwater from deeper water. Sealing Requirements to Prevent Cross-Flow and Contamination between Aquifers would still apply. Caution should be exercised when locating a monitoring well with an annular seal shorter than 50 feet total vertical depth with respect to sources of pollution and flooding.

The following Special Management Areas (SMAs) are established to protect groundwater quality based on specific geologic and hydrogeologic conditions in various parts of the County as shown in Figure 1.

- **SMA1 Corcoran Clay Area.** In this area, the Corcoran Clay represents a regional aquitard that separates an upper unconfined to semi-confined aquifer system from a lower confined aquifer system. These systems may have different water quality conditions and groundwater levels, and cross connecting the aquifers above and below the Corcoran Clay can lead to vertical migration of pollution. The boundaries of this area shall be based on the extent of the Corcoran Clay as mapped by the United States Geological Survey in Professional Paper 1766, or as updated in the future.
    - All wells drilled into the aquifer beneath the Corcoran Clay shall have a design based on a lithologic log or geophysical log collected during drilling that verifies the presence, depth and thickness of the Corcoran and any contiguous overlying or underlying clay units. If logging determines that the Corcoran Clay is not present at the well location, the well shall be completed per the requirements applicable to SMA2.
    - All wells located within the area underlain by the Corcoran Clay and penetrating the Corcoran Clay shall be constructed in a manner that prevents the intermixing of water above and below the Corcoran clay layer. There shall be no perforations above and below the Corcoran clay layer in the same casing of any well. There shall be no gravel pack installed above and below the Corcoran clay layer in the same borehole. The annular well seal of all wells with screen intervals and gravel packs below the Corcoran Clay shall extend to the bottom of the Corcoran Clay, as verified by lithologic or geophysical logging during drilling of the well.
    - The annular seals of wells in SMA1 shall meet the following specifications:
        - Wells with completion depths in the Upper Zone shall be completed as follows:
            - In no case shall the annular seal extend to a depth that is more than 50 feet above the well screen interval;
            - The annular seal of domestic or agricultural wells shall extend at least 50 feet below ground surface;[1] and

[1] For agricultural wells, this represents a 150% increase in the seal depth required under Bulletin 74-81/90, which provides an additional level of protection in the event of locally varying conditions. For domestic wells, it is consistent with the most conservative standard currently in use and represents a minimal risk due to the low pumping rate of the wells, consistent with the way domestic wells are treated in the LAMP and State guidance.

- The annular seal of all other wells shall extend at least 80 feet below ground surface.[2]

▪ Wells with completion depths below the Corcoran Clay shall be completed as follows:

- The annular seal shall extend at least 10 feet into the Corcoran Clay or an overlying contiguous Competent Clay that is immediately above the Corcoran Clay and vertically continuous with it, as verified by lithologic or geophysical logging information gathered during drilling of the well.

- **SMA2 Alluvial Fans.** The boundaries of this area extend from the outer groundwater basin boundaries as determined in the latest edition of DWR Bulletin 118 to the boundary of the Corcoran Clay. In these alluvial fan areas, vertical groundwater movement is less impeded and oxygenated groundwater extends deeper into the aquifer system.

  - All wells located within SMA2 shall be constructed in a manner that prevents the intermixing of water between the Upper Zone and underlying aquifers. There shall be no perforations within the Upper Zone and the aquifer system underlying the Upper Zone in the same casing of any well. There shall be no gravel pack installed within and below the Upper Zone in the same borehole.

  - The annular seals of wells in SMA2 shall meet the following specifications:

    ▪ Wells with completion depths in the Upper Zone shall be completed with an annular seal as specified for SMA1.

    ▪ Wells with completion depths below the bottom of the Upper Zone shall be completed as follows:

      - The annular seal shall extend to a depth of at least 50 feet for domestic and agricultural wells and 80 feet for all other wells or

      - The annular seal shall extend at least 10 feet into the first Competent Clay beneath the Upper Zone, as verified by lithologic or geophysical logging during drilling of the well; or

      - The annular seal shall extend at least 10 feet into the first Competent Clay beneath the Upper Zone, as determined by the driller based on site-specific lithologic and water quality information from a nearby

[2] For industrial and public supply wells, this represents a 60% increase in the seal depth required under Bulletin 74-81/90, which provides an additional level of protection in the event of locally varying conditions.

boring or well, or from a test well or test boring drilled and logged prior to installing the well.

- In areas of the county where there has been no documented water quality issues in the aquifer (contaminant concentrations that exceed the MCL) and there is no identified threat of degrading an upper or lower aquifer; the annular seal shall extend a minimum of 50 feet or 10 feet into the next competent clay lens, whichever is greater.

- **SMA3 Fractured Bedrock.** The boundaries of this area extend from the County line to the outer groundwater basin boundaries as determined in the latest edition of DWR Bulletin 118. These areas are underlain by fractured bedrock aquifers of the Coast Range, or of the crystalline bedrock area east of the San Joaquin Valley alluvial basin.
  - The annular seals of wells in SMA3 shall meet the following specifications:
    - Wells shall be completed with a minimum 50-foot annular seal; or
    - Wells shall be completed into the first Solid Rock stratum beneath the water table as determined based on logging of the well boring or a test boring or well; or
    - Annular seals that prevent the vertical migration of pollution shall be determined by the driller based on site-specific information from a nearby boring or well, or from a test well or test boring drilled and logged prior to installing the well.

The following additional SMAs are established to protect groundwater quality based on specific pollutant concentration data for various parts of the County as described below.

- **SMA4 Areas with Recognized Contamination in the Shallow Aquifer.** Wells located in an area identified as high risk for contamination by uranium or 1,2,3-TCP in the SWRCB's "Aquifer Risk Map – Domestic Wells and Small Systems" (Houlihan and Bellan, 2021), or with contamination by nitrate exceeding the State Maximum Contaminant Level (MCL) in the RWQCB's "Updated Groundwater Quality Analysis and High Resolution Mapping for Central Valley Salt and Nitrate Management Plan," dated June 2016 (the Updated Groundwater Quality Analysis Dataset), are in an area where the Upper Zone has been degraded by human activities at the ground surface. The annular seals of these wells shall be subject to the following requirements.
  - All wells located within SMA4 shall be constructed in a manner that prevents the intermixing of water between the Upper Zone and underlying aquifers. There shall be no perforations within the Upper Zone and the aquifer system underlying the Upper Zone in the same casing of any well. There shall be

no gravel pack installed within and below the Upper Zone in the same borehole.

- The annular seals of wells in SMA4 shall meet the following specifications:
  - Wells with completion depths in the Upper Zone shall be completed as follows:
    - Wells with completion depths in the Upper Zone shall be completed as specified for SMA1.
    - For domestic wells with completion depths in the Upper Zone, the applicant shall be advised of the existence of the potential drinking water quality issues in the area. The well shall be tested prior to being placed into service as required under Section X.E. of these guidelines.
  - Wells with completion depths below the bottom of the Upper Zone shall be completed as follows:
    - The annular seal shall extend at least 10 feet into the first Competent Clay beneath the Upper Zone; or
    - If a Competent Clay is not present in the upper 50 feet beneath the Upper Zone, the annular seal shall extend or at least 50 feet below the bottom of the Upper Zone.

- **SMA5 Wells Completed in Setback Zones or Areas with Potential Contamination in Target Aquifer Depths.** Wells located in (1) an area identified as having a high risk for pollution by arsenic or hexavalent chromium (presumably naturally-occurring) in the SWRCB's Aquifer Risk Map are in an area where the depth of natural pollution may vary. The annular seals of wells in SMA5 shall meet the following specifications:
  - For wells completed in the Upper Zone, the requirements of SMA4 for Upper Zone wells shall apply.
  - For wells completed in the Lower Zone, recommendations for annular seals that prevent the vertical migration of pollution shall be provided by a Qualified Professional (Professional Engineer or Professional Geologist) based on available lithologic and water quality information near the site, or from a test well or test boring drilled, logged and sampled prior to installing the well.
  - For wells located within the setback zone from regulated contamination sites, recommendations for annular seals that prevent the vertical migration or capture of contamination shall be provided by a Qualified Professional (Professional Engineer or Professional Geologist) based on review of

information regarding the nature, extent and likelihood of contamination associated with the case, and in consideration of the local hydrostratigraphy and groundwater conditions.

- Wells in which the annular seals were specified by a Qualified Professional to prevent the vertical migrations and/or capture of contamination can have the borehole and/or casing diameters changed in the field due to actual field conditions, if:
  - The installed borehole and/or casing is equal to or small than that specified by the Qualified Professional.
  - The minimum annular space is maintained.
  - The grout material remains the same as specified by the Qualified Professional.

  It is requested that Environmental Health be notified of any changes to a permit no later than the request to schedule the sanitary seal inspection.

D. Perforations: The perforating of casing shall not deform the casing. If a well is deepened, the perforations above the minimum annular seal depths specified in Section C shall be sealed off to prevent cross-flow contamination.

E. Freefall Seals: Freefall placement of sealing materials is only allowed to 30 feet of total depth and is not allowed through standing water. Any seal which is deeper than 30 feet total depth or extends below the water table requires the use of a pressurized tremie pipe.

F. Sealing the Pump Head: Where the pump is installed directly over the casing, a watertight sanitary seal (e.g., gasket, grout or mastic) must be placed between the pump head and the pump base (concrete slab), or a watertight seal must be placed between the pump base and the rim of the casing, or a well cap must be installed to close the annular opening between the casing and the pump column pipe. Where the pump is offset from the well or where a submersible pump is used, the opening between the well casing and any pipes or cables which enter the well must be closed by a watertight seal or well cap. A watertight seal must be placed between the pump discharge head and the discharge line; or, in the event of a below-ground discharge, between the discharge pipe and discharge line.

X. Permit Issuance, Requirements and Fees

A permit application shall be submitted for each well on a standard form available from the DER. All well permit applications shall be accompanied by a version of the Water Quality Checklist attached to these Guidelines.

A well permit shall be issued by DER on a standard form supplied for that purpose. A fee shall be charged for such permit. It shall be the responsibility of the permit holder to maintain a copy of the permit on the work site during all stages of work on a well. A permit for work on a well shall not be issued if the proposed well will be in violation of this chapter or will prohibit the use of surrounding property for any of the purposes for which it is zoned.

A. Information Required for Well Annular Seal Designs: Well permit applications shall include information verifying that the well annular seals comply with the minimum requirements of these guidelines.

- For wells located in SMA2 or SMA3, the applicant may provide lithologic or geophysical log data on which the well annular seal design is based at the time the application is submitted or during the time of well inspection.
- The depth to the bottom of the Corcoran Clay in SMA1, a Competent Clay layer in SMA2, and Solid Rock in SMA3 shall be verified based on lithologic and/or geophysical logs reviewed during well inspection in the field.
- For Lower Zone wells located in SMA5, the applicant shall provide a letter from a Qualified Professional (Professional Engineer or Professional Geologist) that describes the site-specific conditions (lithologic log, geophysical log and water quality data) on which the well annular seal design is based. This data may include logs or sampling data from existing nearby wells or borings, or test wells or borings drilled and sampled for the purpose of designing the well.
- If a test well or boring is proposed for designing a well seal, the purpose of the test well or boring shall be stated on the Application Water Quality Checklist for the test well or boring. A permit for drilling and sampling of the test well or boring must be obtained and the results submitted with a separate application to construct the production well.

B. Licenses Required: No person shall undertake to dig, bore or drill a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, to deepen or reperforate such a well, or to abandon or destroy such a well, unless the person responsible for that construction, alteration, destruction, or abandonment possesses a C-57 Water Well Contractor's license in accordance with the California Water Code (Section 13750.5). All other work on wells shall be performed by contractors licensed in accordance with the provisions of the Contractor's License Law of the State of California (Chapter 9, Division 3, of the Business and Professions Code).

C. Inspections: DER may conduct inspections at any time to assure compliance with the requirements of these Guidelines. The stage at which each prescribed inspection is required shall be set forth in the permit. Prior to sealing the annular space, DER shall be notified and shall conduct a verification of any adjustments in

the seal design made on the basis of well lithologic or geophysical logs, and an inspection of the sealing process unless inspection has been waived. If the proposed seal depth in the application is proposed to be adjusted by the driller based on a lithologic or geophysical log collected during well drilling, the log shall be provided to the DER inspector prior to placement of annular seals. After the work on a production well has been completed and upon installation of a well pump, DER shall be so notified by the persons performing the work and DER will conduct a final inspection thereof unless inspection has been waived. The steps needed to final a well permit are described in Subsection E, below.

D. Variance: An applicant may apply to DER for a variance from these standards. All requests for a variance shall be accompanied by a completed well permit application, a description of the deviation from these standards for which approval is being sought, and substantial evidence that granting of the variance will not lead to degradation of groundwater quality or a risk to public health. The County may request that the application be accompanied by payment of a retainer to cover the County's expenses to review the variance and conduct the appropriate environmental review required under the California Environmental Quality Act (CEQA).

E. Permit Completion/Final: Upon completion of a well, the driller shall be responsible for the attachment of a sanitary well seal or a well cover. The driller shall also submit a copy of the report required by Section 13751 (Division 7, Chapter 10, Article 3) of the California Water Code to DER within sixty days of construction or destruction of any water well. The following additional requirements shall be met, as applicable, before a permit will be considered final and a well can be placed into service.

- **Verification of Well Pad/Base:** A concrete base or pad shall be constructed at ground surface around the top of the well casing and contact the annular seal, unless freezing conditions exist or the well terminates in a vault below ground surface. Additional requirements are summarized in Section IX.B.

- **Backflow Prevention:** For domestic and public supply production wells, all pump discharge pipes not discharging or open to the atmosphere must be equipped with an automatic device to prevent backflow and/or back siphonage into a well.

  Irrigation well systems, including those used for landscape irrigation, and other well systems that employ, or which have been modified to employ, chemical feeders or injectors must be equipped with a backflow prevention device(s).

- **Well Water Quality Testing:** Water from all new potable supply wells shall be tested both bacteriologically and chemically (for nitrates, total coliform bacteria and fecal coliform bacteria) by a state certified laboratory prior to placing the well into service. Wells in areas of known pollutants (i.e., wells in SMA4, SMA5

or within the setback distances of regulated contamination sites) shall also be required to test for the known contaminants for which the SMA has been established, and any contaminants found at concentrations exceeding their respective Maximum Contaminant Levels in Title 22 of the California Code of Regulations (MCLs) within ½ mile of the well as determined from the SWRCB's GeoTracker GAMA online database (e.g., including, but not limited to Arsenic, Uranium, DBCP, 123-TCP, PCE, MTBE, and Chromium 6). The performance and cost of the analysis shall be the responsibility of the applicant. If the testing results exceed MCLs, applicants for construction of domestic wells will be advised by the County of the need for water treatment to achieve MCLs for potable use, and of any current programs that provide funding to support the installation of treatment systems.

XI. Well Destruction

Approved Methods of Destruction. Approved methods of well destruction shall follow the requirements of the State Well Standards in the Bulletin, including any updates thereto.

ATTACHMENT 1

Groundwater Well Siting and Construction Guidelines

Pre-Application Water Quality Checklist

Groundwater Well Siting and Construction Guidelines

Pre-Application Water Quality Checklist

Address:_____City:_____APN:_____

Well Location: Lat:_____Long:_____

Submitted by:_____Company:_____

Phone:_____Email: _____

Type of Work
☐ New ☐ Destruction ☐ Replacement ☐ Deepening ☐ Other: _____

Water Well Type
☐ Domestic ☐ Test Hole/Well ☐ Industrial ☐ Cathodic Protection ☐ Agricultural ☐ Irrigation ☐ Other: _____

Separation Distances (Groundwater Well Siting and Construction Guidelines, Section VI.A.)

Potential Contamination Source	Minimum Separation Distance	Verification	Standard Met?
Pit privy; Any sewer (sanitary, industrial, or storm; main or lateral); Wastewater treatment system (*i.e.*, septic tank, subsurface sewage leaching field)	Domestic or Stock Well: 100 ft All Other Wells – 150/200/600 ft (Note 1)	Sketch	☐ Yes ☐ No
Stormwater infiltration well	150 ft	Sketch	☐ Yes ☐ No
Animal enclosures	100 ft for Domestic/Ag Wells and 150 ft for Industrial/Public Wells	Sketch	☐ Yes ☐ No
Cesspool or seepage pit	Domestic or Ag Wells: 150 ft Public/Industrial – 600 ft	Sketch	☐ Yes ☐ No
Petroleum/chemical storage tank or product non-transmission line (subsurface)	300 ft	Sketch; GeoTracker	☐ Yes ☐ No
Petroleum/chemical product transmission pipeline (subsurface)	1,000 ft	Sketch; State Fire Marshall	☐ Yes ☐ No
RCRA Sites subject to corrective action; Superfund sites	1 mile (5,280 feet)	GeoTracker	☐ Yes ☐ No
Petroleum storage tanks (leaking underground); Records of federally-registered, or state-permitted or registered, hazardous waste sites identified for investigation or remediation; Properties identified for environmental concerns	0.5 mile (2,640 feet)	GeoTracker	☐ Yes ☐ No
Sewage, manure or waste evaporation/percolation pond; Sewage, manure or waste irrigation and spreading area	600 ft	Sketch	☐ Yes ☐ No
Solid Waste Disposal Site	0.5 mile (2,640 feet)	GeoTracker	☐ Yes ☐ No

1. A 150 feet setback from a public water well where the depth of the effluent dispersal system does not exceed 10 feet; 200 feet from a public water well where the depth of the effluent dispersal system is between 10 and 20 feet; and 600 ft from a public water well when the dispersal system is greater than 20 feet in depth.

Flood Plains (Groundwater Well Siting and Construction Guidelines Section VI.B.)

Is the well located in a 100-Year Floodplain as designated by FEMA? □ Yes □ No

If yes, check the option below that will be implemented to prevent surface water from entering the well. Attach plans, specifications or other information documenting the approach.

□ Option A: The top of the well casing and any openings into the top of the well will be no less than 12 inches above the 100-year flood elevation.

□ Option B: The top of the well casing and any openings into the top of the well will be no less than 12 inches above grade. Openings designed to permit the entrance and/or egress of air or gas will be constructed to prevent surface water from entering the well structure.

□ Option C: Alternate method proposed by the applicant

Annular Seal (Groundwater Well Siting and Construction Guidelines Section IX.)

Applicable Special Management Area(s)	Applicable Option	Minimum Required Annular Seal Depth	Verification	Standard Met?
□ SMA1: Corcoran Clay Area	□ Penetrates Corcoran Clay	At least 10 feet into Corcoran Clay or contiguous overlying clay	□ Proposed seal depth □ Depth to top of Corcoran Clay from Updated GW Quality Dataset □ Data from nearby borings or wells □ Test well/boring logs □ Field verification based on logs	□ Yes □ No
	□ Completed above Corcoran Clay	At least 50 ft for domestic and agricultural wells, 80 ft for all other wells, and in no case more than 50 ft above the screen interval		
□ SMA2: Alluvial Fan Area	□ Upper Zone Well	At least 50 ft for domestic and agricultural wells, 80 ft for all other wells, and in no case more than 50 ft above the screen interval	□ Proposed seal depth	□ Yes □ No
	□ Below Upper Zone	At least 200 feet, 50 feet below the Upper Zone or 10 feet into a Competent Clay below the Upper Zone	□ Proposed seal depth □ Data from nearby borings or wells □ Test well/boring logs □ Field verification based on logs	
□ SMA3: Fractured Rock	□ Default Minimum Seal	50 feet	□ Proposed seal depth	□ Yes □ No
	□ Seal to Solid Rock	Completed into Solid Rock beneath water table	□ Proposed seal depth □ Field verification based on logs □ Data from nearby borings or wells □ Test well/boring logs	
	□ Alternate well completion based on site-specific data	Prohibits vertical migration based on driller determination		

Applicable Special Management Area(s)	Applicable Option	Minimum Required Annular Seal Depth	Verification	Standard Met?
□ SMA4: Upper Zone Contamination Risk Area for (check all that apply): □ NO3 Upper Zone □ 1,2,3-TCP □ Uranium □ NO3 Deep Zone (beneath upper zone).	□ Completed in Upper Zone	At least 50 ft for domestic and agricultural wells, 80 ft for all other wells, and The distance between the bottom of the annular seal and the top of the well screen interval shall not exceed 50 feet	□ Proposed seal depth □ Data from Aquifer Risk Map and Updated GW Quality Analysis Dataset □ Depth to bottom of Upper Zone □ Data from nearby borings or wells □ Test well/boring logs □ Field verification based on logs	□ Yes □ No
	□ Completed below the Upper Zone, Default Minimum Seal Depth	Not less than 50 feet below the bottom of the Upper Zone		
	□ Completed below the Upper Zone; Seal to Competent Clay	At least 10 feet into Competent Clay below the Upper Zone		
□ SMA5: Other Con-tamination Risk Area (check all that apply): □ Arsenic (As) □ Chrome 6 (Cr6+) □ within setback from Regulated Site	□ Upper Zone well	At least 50 ft for domestic and agricultural wells, 80 ft for all other wells, and The distance between the bottom of the annular seal and the top of the well screen interval shall not exceed 50 feet	□ Proposed seal depth □ Aquifer Risk Map for As and Cr6+ □ Data from Updated GW Quality Analysis Dataset for NO3 □ Depth to bottom of Upper Zone □ Field verification based on logs	□ Yes □ No
	□ Well completion designed by Qualified Professional	In accordance with recommendations by Qualified Professional	□ Letter from Qualified Professional with recommended seal depth □ Aquifer Risk Map for As and Cr6+ □ Data from Updated GW Quality Analysis Dataset for NO3 □ Depth to bottom of Upper Zone □ Field verification based on logs	□ Yes □ No
	□ Evaluation of reported closed contamination or school site case by qualified professional	In accordance with recommendations by qualified professional	□ Letter from Qualified Professional with recommended seal depth	□ Yes □ No

Notes:

1. GeoTracker: https://geotracker.waterboards.ca.gov/
2. FEMA: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd
3. Updated Groundwater Quality Analysis Dataset: "Updated Groundwater Quality Analysis and High Resolution Mapping for Central Valley Salt and Nitrate Management Plan," by Central Valley Regional Water Quality Control Board, dated June 2016
4. Aquifer Risk Map: https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=17825b2b791d4004b547d316af7ac5cb
5. GeoTracker GAMA: https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/

Instructions

Gather the information below to complete the checklist. Complete the checklist sequentially and attach all appropriate documentation.

Separation Distances

1. Attach a sketch, map or marked Google Earth image showing the well location and distance to the nearest:
    a. Well location and Assessor's Parcel;
    b. Pit privy, sewer line, septic tank, leach field, cesspool, or seepage pit;
    c. Storm water infiltration well;
    d. Earthen-surfaced animal housing (corral, confined pasture, barn, etc.);
    e. Petroleum or chemical storage tank and/or supply lines;
    f. Sewage, manure or waste evaporation/percolation pond; and/or
    g. Sewage, manure or waste irrigation and spreading area.
2. Attach a screen shot from the GeoTracker site showing the location of the following:
    a. The well location;
    b. Permitted Facilities including: Permitted Waste Discharge Requirements Sites, Permitted USTs, DTSC Hazardous Waste Sites, Land Disposal Sites, Oil/Gas Sites, and Confined Animal Sites within 0.5 mile (2,640 feet); and
    c. Cleanup Sites including: LUST Cleanup Sites, Cleanup Program Sites, Military Cleanup Sites, and DTSC Cleanup Sites within 1 mile (5,280 feet).

Flood Plains

1. Attach a screen show from the FEMA website showing the location of the well and outlines of any identified 100-year flood plains within 1 mile (5,280 feet) of the well.

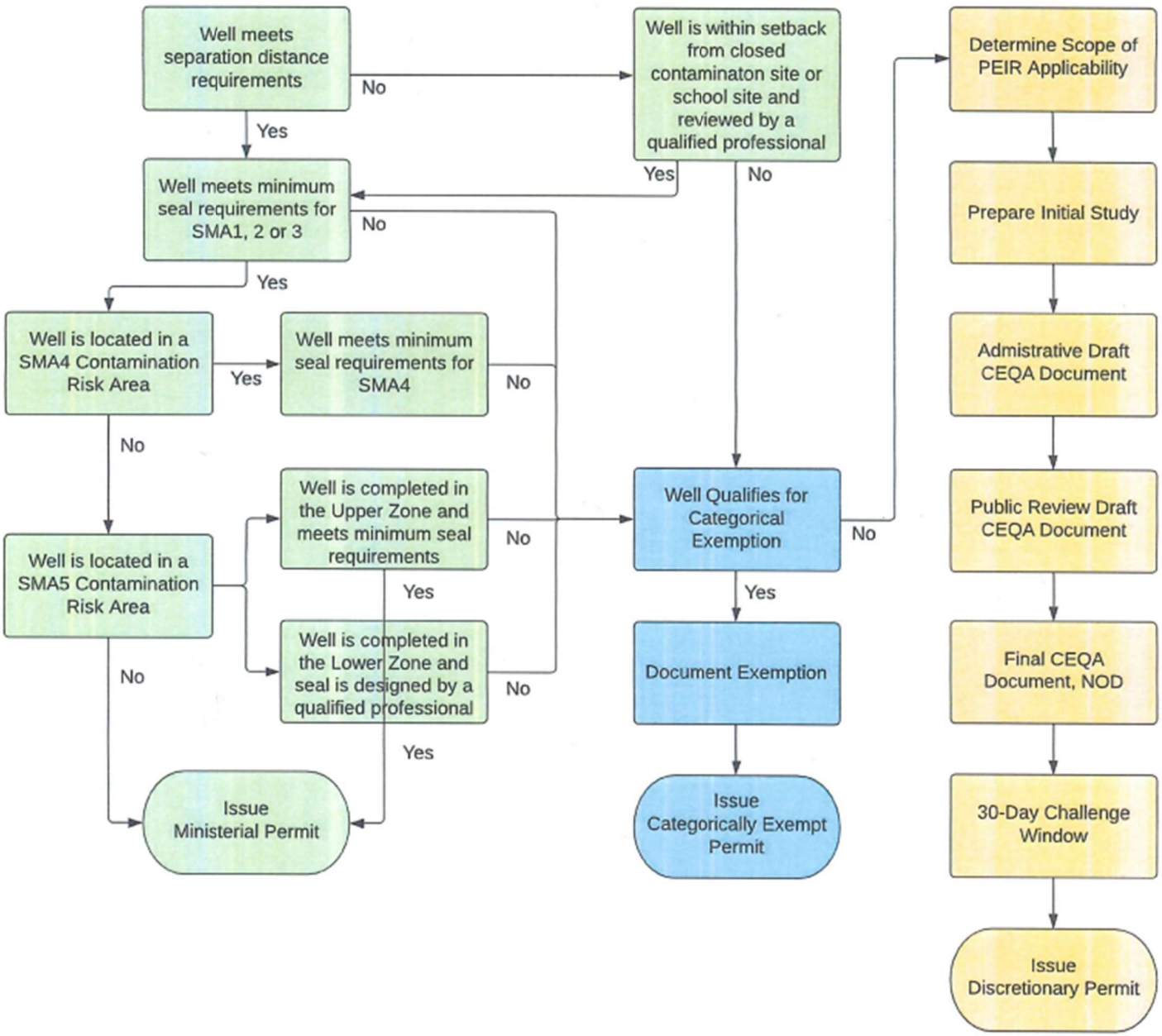
Annular Seal

1. Attach a screen shot from Google Earth using the kmz plug-in or GIS files available from the County showing the location of the well and nearby Special Management Areas established in the vicinity;
2. Attach screen shots from Google Earth using the KMZ plug-in or GIS files available from the County showing the location of the well and the following:
    a. If the well is located in SMA1, the depth and thickness of the Corcoran Clay;
    b. If the well is in SMA1 or SMA2, the depth to the base of the Upper Zone; and
    c. If the well is in SMA1 or SMA2, the concentration of Upper Zone NO3-N, Lower Zone NO3-N, 1,2,3-TCP, Uranium Arsenic and Hexavalent Chromium.
3. Indicate if the driller intends to verify and adjust seal depths based on field log or elog data.
4. Attach site-specific data, if applicable, including the following:
    a. Lithologic log, elog and/or sampling data from an existing nearby well(s) or boring(s).
    b. Data from GeoTracker or GeoTracker GAMA.
    c. Lithologic log, elog and/or sampling data from a new test well or boring for which a prior permit has been obtained.
5. If applicable, attach a letter from a Qualified Professional (Professional Civil Engineer or Professional Geologist) with a recommended well seal and completion design, and supporting data and information.
    a. Letter must be signed and stamped
    b. Attach lithologic logs, elogs and water quality data, as appropriate, for nearby wells or borings. .
    c. Provide the scope and results of any site specific investigation, if conducted, including any test wells or borings.
    d. If the well is located within the specified minimum setback distance from a reported contamination incident that has been closed by the regulatory agency or within the specified minimum setback distance from a school investigation site, attach an evaluation of the case(s) that indicates the well will not pose a risk of vertical contamination migration or lateral contamination migration and capture of contamination associated with the case(s).

ATTACHMENT 2

Groundwater Well Siting and Construction Guidelines

Application Processing Flowchart


Well meets separation distance requirements
No
Well is within setback from closed contaminaton site or school site and reviewed by a qualified professional
Yes
No
Yes
Well meets minimum seal requirements for SMA1, 2 or 3
No
Yes
Well is located in a SMA4 Contamination Risk Area
Yes
Well meets minimum seal requirements for SMA4
No
No
Well is located in a SMA5 Contamination Risk Area
Well is completed in the Upper Zone and meets minimum seal requirements
No
Yes
Well is completed in the Lower Zone and seal is designed by a qualified professional
No
Yes
No
Issue Ministerial Permit
Well Qualifies for Categorical Exemption
No
Yes
Document Exemption
Issue Categorically Exempt Permit
Determine Scope of PEIR Applicability
Prepare Initial Study
Admistrative Draft CEQA Document
Public Review Draft CEQA Document
Final CEQA Document, NOD
30-Day Challenge Window
Issue Discretionary Permit