# Appendix 5C

## Potential Well Impact Summary

# 1 SUMMARY PURPOSE

This summary describes all water supply well completion data available for the San Joaquin Valley - Kaweah Subbasin (Subbasin) since January 1, 2002. The purpose of this summary is estimate for the number of wells that may be impacted by groundwater levels declining to elevations protective of 90% of wells in the Subbasin (described in Appendix 5A). These estimates can be used by the Groundwater Sustainability Agencies (GSAs) to develop well mitigation plans for their respective Groundwater Sustainability Plans (GSPs).

The majority of minimum thresholds described in Appendix 5A are at higher elevations than elevations protective of 90% of wells. The estimates of potentially impacted wells therefore overestimate the number of wells. However, since these estimates are to be used for determining the magnitude of wells to be addressed by mitigation plans, they can be considered worst-case estimates.

# 2 WELL RECORDS IN THE KAWEAH SUBBASIN

A majority of water supply wells installed in the Subbasin since 2002 have well construction information available from Department of Water Resources (DWR) Well Completion Reports submitted by well drillers. These well records are used to develop chronic lowering of groundwater level sustainable management criteria (SMC), as described in Appendix 5A. This summary supplements potential well impacts described in Appendix 5A by including wells without completed well depth information.

## 2.1 Data Sources and Quality Control

Well completion information compiled in this appendix is from the DWR Well Completion Report (WCR) dataset, downloaded on March 1, 2022. The WCR dataset does not contain a complete accurate dataset, however, it is the best public source of data available. For example, some wells in the dataset are likely dry or have been destroyed. To filter out wells that may have been abandoned or no longer represent typical modern well depths and current groundwater elevations, only well records drilled since 2002 are used for analysis. Furthermore, well completion reports are not always accurately located. Where coordinates of wells are unavailable, DWR locates the well in the middle of the Public Land Survey System section. The location given by DWR in the WCR dataset is used in this analysis.

## 2.2 Total Well Records

The majority of water supply well records used in the analysis have known well depths, and the well use type for wells without well depth data are generally proportional to those with depth information. The number of wells installed in the Subbasin both with and without known well depths are included in Table 1. Approximately 3,768 supply wells have been installed in the Subbasin since 2002. Of these, 3,353, or about 89%, have well completion data in the WCR dataset and are used in the SMC analysis described in Appendix A. The proportion of wells used for various purposes is nearly identical for the full WCR dataset compared to the subset of wells with known depths; almost all supply wells are either used for agricultural use (55%) or domestic use (41%). Comparatively small numbers of wells are used for public supply (3%), and industrial (1%) purposes. Since the subset of wells with known depths includes a majority of well records in the dataset and closely approximates well types installed in the Subbasin, it is an appropriate dataset to use to develop mitigation plans.

Table 1. Water Supply Well Records by Use Type

| Well Use | All Water Supply Well Records from Jan 1, 2002 | | Well Records with Depth Information | |
|---|---|---|---|---|
| | Number of Wells | Percentage | Number of Wells | Percentage |
| Agricultural | 2,061 | 55% | 1,859 | 55% |
| Domestic | 1,545 | 41% | 1,364 | 41% |
| Public Supply | 129 | 3% | 117 | 3% |
| Industrial | 22 | 1% | 13 | <1% |
| **TOTAL** | **3,757** | - | **3,353** | - |

## 2.3 Well Records by GSA

Table 2 summarizes the number of well records by well use type for each GSA. There are approximately 1,281 well records in East Kaweah, 1,810 in Greater Kaweah, and 668 in Mid-Kaweah.

Table 2. Summary of Wells by GSA

| Well Use Type | East Kaweah | | Greater Kaweah | | Mid-Kaweah | | Total |
|---|---|---|---|---|---|---|---|
| | Number of Wells | Percentage | Number of Wells | Percentage | Number of Wells | Percentage | |
| Domestic | 463 | 36% | 813 | 45% | 269 | 40% | 1,545 |
| Agricultural | 793 | 62% | 914 | 50% | 354 | 53% | 2,061 |
| Public Supply | 22 | 1% | 66 | 4% | 41 | 6% | 129 |
| Industrial | 3 | <1% | 15 | 1% | 4 | 1% | 22 |
| **Total** | **1,281** | - | **1,808** | - | **668** | - | **3,757** |

## 2.4 Well Records by Aquifer Analysis Zone

The wells installed in each aquifer analysis zone may be used by GSAs for well mitigation plans. The total number of well records in each aquifer zone is summarized in Table 3. Figure 1 shows the location of the analysis zones.

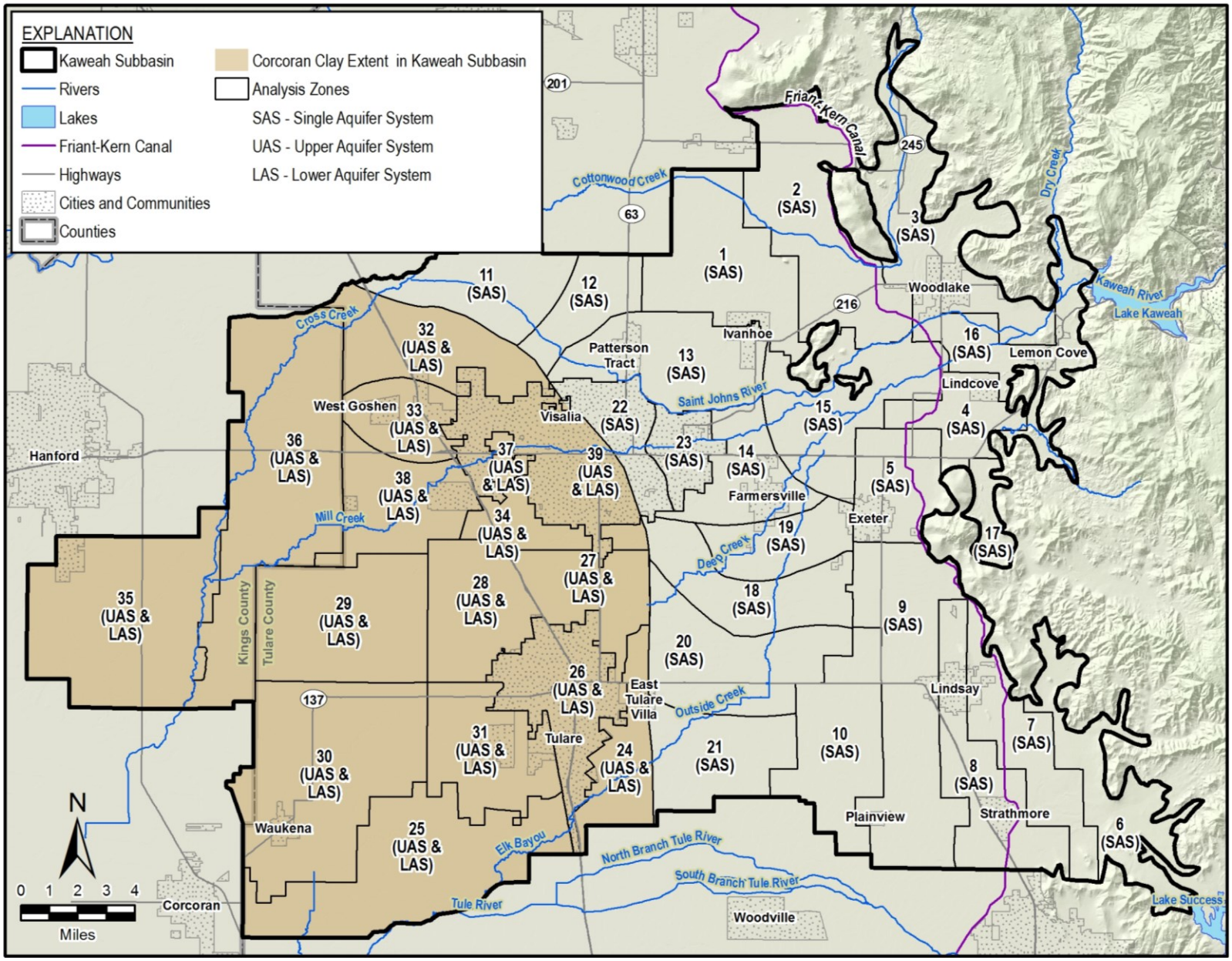


Figure 1. Kaweah Subbasin Analysis Zones

Table 3. Total Well Records by Analysis Zone

| Analysis Zone | Agricultural Well Records | Domestic Well Records | Public Well Records | Industrial Well Records | Total Well Records |
|---|---|---|---|---|---|
| 1 | 212 | 119 | 5 | 1 | 337 |
| 2 | 149 | 23 | 0 | 1 | 173 |
| 3 | 52 | 39 | 1 | 0 | 92 |
| 4 | 46 | 42 | 6 | 0 | 94 |
| 5 | 43 | 29 | 1 | 1 | 74 |
| 6 | 25 | 9 | 0 | 0 | 34 |
| 7 | 46 | 18 | 0 | 0 | 64 |
| 8 | 51 | 56 | 2 | 0 | 109 |
| 9 | 137 | 99 | 7 | 0 | 243 |
| 10 | 69 | 52 | 1 | 0 | 122 |
| 11 | 24 | 2 | 2 | 0 | 28 |
| 12 | 33 | 30 | 3 | 0 | 66 |
| 13 | 85 | 146 | 7 | 0 | 238 |
| 14 | 42 | 52 | 7 | 1 | 102 |
| 15 | 65 | 73 | 2 | 0 | 140 |
| 16 | 19 | 46 | 1 | 1 | 67 |
| 17 | 11 | 3 | 0 | 0 | 14 |
| 18 | 56 | 62 | 3 | 0 | 121 |
| 19 | 25 | 87 | 3 | 0 | 115 |
| 20 | 55 | 88 | 5 | 0 | 148 |
| 21 | 38 | 12 | 5 | 1 | 56 |
| 22 | 16 | 6 | 7 | 0 | 29 |
| 23 | 3 | 7 | 1 | 0 | 11 |
| 24 | 33 | 33 | 2 | 1 | 69 |
| 25 | 70 | 3 | 4 | 0 | 77 |
| 26 | 14 | 18 | 7 | 0 | 39 |
| 27 | 49 | 75 | 4 | 0 | 128 |
| 28 | 50 | 69 | 2 | 0 | 121 |
| 29 | 61 | 19 | 2 | 0 | 82 |
| 30 | 108 | 52 | 10 | 1 | 171 |
| 31 | 33 | 8 | 4 | 0 | 45 |
| 32 | 18 | 1 | 1 | 3 | 23 |
| 33 | 44 | 32 | 1 | 3 | 80 |
| 34 | 25 | 52 | 2 | 1 | 80 |
| 35 | 89 | 29 | 9 | 4 | 131 |
| 36 | 87 | 8 | 6 | 0 | 101 |
| 37 | 9 | 15 | 0 | 0 | 24 |
| 38 | 43 | 16 | 2 | 0 | 61 |
| 39 | 27 | 17 | 4 | 3 | 51 |
| **Total** | **2,062** | **1,547** | **129** | **22** | **3,760** |

# 3 POTENTIALLY IMPACTED WELLS

## 3.1 Well Records Shallower than Protective Well Depth by GSA

Wells shallower than protective well depths described in Appendix 5A may be impacted should groundwater elevations approach or exceed minimum thresholds during GSP implementation. The total number of well records shallower than protective well depths in each GSA is estimated using the percentage of wells shallower than the 90$^{th}$ percentile well depth by well use type. Selection of the 90$^{th}$ percentile well depth accounts for uncertainty in the data, especially regarding the likelihood the shallowest wells have been destroyed and replaced during ongoing dry conditions and declining groundwater levels. The analysis is completed using only wells with known well depths. The majority of minimum thresholds described in Appendix 5A are at higher elevations than elevations protective of 90% of wells. The tables that follow therefore overestimate the number of potentially impacted wells. However, since these estimates are to be used for determining the magnitude of wells to be addressed by mitigation plans, they can be considered worst-case estimates.

Table 4 through Table 6 show the approximate number of impacted wells in each GSA, including wells with unknown well depths.

- East Kaweah GSA – approximately 121 wells may be impacted, including 64 domestic wells, 55 agricultural wells, and 3 public supply wells (Table 4).
- Greater Kaweah GSA – approximately 134 wells may be impacted, including 70 domestic wells, 60 agricultural wells, and 4 public supply wells (Table 5).
- Mid-Kaweah GSA – approximately 41 wells may be impacted, including 21 domestic wells and 20 agricultural wells (Table 6).

Table 4. East Kaweah GSA Potentially Impacted Wells

| Well Use Type | Well Records with Known Depth | | | All Well Records | | |
|---|---|---|---|---|---|---|
| | Number of Wells | Number of Potentially Impacted Wells | Percentage Potentially Impacted Wells | Number of Wells | Number of Potentially Impacted Wells | Density of Wells (wells per square mile) |
| Domestic | 440 | 61 | 14% | 463 | 64 | 0.35 |
| Agricultural | 755 | 52 | 7% | 793 | 55 | 0.30 |
| Public Supply | 22 | 3 | 14% | 22 | 3 | 0.02 |
| Industrial | 2 | 0 | 0% | 3 | 0 | 0 |
| **Total** | **1,219** | **116** | | **1,281** | **122** | **0.66** |

Table 5. Greater Kaweah GSA Potentially Impacted Wells

| Well Use Type | Well Records with Known Depth | | | All Well Records | | |
|---|---|---|---|---|---|---|
| | Number of Wells | Number of Potentially Impacted Wells | Percentage Potentially Impacted Wells | Number of Wells | Number of Potentially Impacted Wells | Density of Wells (wells / square mile) |
| Domestic | 708 | 93 | 13% | 813 | 106 | 0.30 |
| Agricultural | 788 | 47 | 6% | 914 | 55 | 0.16 |
| Public Supply | 59 | 6 | 10% | 66 | 7 | 0.02 |
| Industrial | 8 | 0 | 0% | 15 | 0 | 0 |
| **Total** | **1,563** | **146** | | **1,808** | **168** | **0.48** |

Table 6. Mid-Kaweah GSA Potentially Impacted Wells

| Well Use Type | Well Records with Known Depth | | | All Well Records | | |
|---|---|---|---|---|---|---|
| | Number of Wells | Number of Potentially Impacted Wells | Percentage Potentially Impacted Wells | Number of Wells | Number of Potentially Impacted Wells | Density of Wells (wells / square mile) |
| Domestic | 216 | 17 | 8% | 269 | 21 | 0.13 |
| Agricultural | 316 | 18 | 6% | 354 | 20 | 0.12 |
| Public Supply | 36 | 0 | 0% | 41 | 0 | 0.00 |
| Industrial | 3 | 0 | 0% | 4 | 0 | 0 |
| **Total** | **571** | **35** | | **668** | **41** | **0.25** |

## 3.2 Well Records Shallower than Protective Well Depth by Aquifer Zone

The wells installed in each aquifer zone may be used by GSAs for well mitigation plans. The approximate number of well records that are shallower than the protective well depth in each aquifer zone is summarized in Table 7. Figure 1 shows the location of the analysis zones.

Table 7. Potentially Impacted Wells Summarized by Analysis Zone

| Analysis Zone | Agricultural Well Records | Domestic Well Records | Public Well Records | Industrial Well Records | Total Well Records |
|---|---|---|---|---|---|
| 1 | 15 | 19 | 0 | 0 | 34 |
| 2 | 16 | 3 | 0 | 0 | 19 |
| 3 | 2 | 2 | 0 | 0 | 4 |
| 4 | 2 | 7 | 0 | 0 | 9 |
| 5 | 3 | 4 | 0 | 0 | 7 |
| 6 | 3 | 1 | 0 | 0 | 4 |
| 7 | 5 | 1 | 0 | 0 | 6 |
| 8 | 1 | 9 | 1 | 0 | 11 |
| 9 | 7 | 13 | 2 | 0 | 21 |
| 10 | 4 | 8 | 0 | 0 | 12 |
| 11 | 3 | 1 | 0 | 0 | 4 |
| 12 | 3 | 3 | 0 | 0 | 6 |
| 13 | 1 | 16 | 2 | 0 | 19 |
| 14 | 0 | 10 | 0 | 0 | 10 |
| 15 | 4 | 11 | 0 | 0 | 15 |
| 16 | 2 | 5 | 0 | 0 | 7 |
| 17 | 1 | 1 | 0 | 0 | 2 |
| 18 | 2 | 10 | 0 | 0 | 12 |
| 19 | 2 | 6 | 0 | 0 | 8 |
| 20 | 0 | 14 | 0 | 0 | 14 |
| 21 | 3 | 3 | 0 | 0 | 6 |
| 22 | 3 | 1 | 0 | 0 | 4 |
| 23 | 0 | 2 | 0 | 0 | 2 |
| 24 | 2 | 4 | 0 | 0 | 6 |
| 25 | 7 | 1 | 0 | 0 | 8 |
| 26 | 2 | 0 | 0 | 0 | 2 |
| 27 | 2 | 3 | 0 | 0 | 6 |
| 28 | 1 | 2 | 0 | 0 | 3 |
| 29 | 2 | 2 | 0 | 0 | 4 |
| 30 | 8 | 7 | 0 | 0 | 15 |
| 31 | 2 | 1 | 0 | 0 | 3 |
| 32 | 3 | 0 | 0 | 0 | 3 |
| 33 | 2 | 4 | 0 | 0 | 6 |
| 34 | 0 | 6 | 1 | 0 | 7 |
| 35 | 6 | 1 | 2 | 0 | 9 |
| 36 | 8 | 1 | 1 | 0 | 10 |
| 37 | 0 | 1 | 0 | 0 | 1 |
| 38 | 0 | 7 | 1 | 0 | 8 |
| 39 | 1 | 1 | 0 | 0 | 2 |
| **Total** | **129** | **192** | **10** | **0** | **331** |