Cuyama Valley Groundwater Basin Groundwater Sustainability Plan Minimum Thresholds, Measurable Objectives, and Interim Milestones Draft

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CUYAMA BASIN GROUNDWATER SUSTAINABILITY AGENCY

WOODARD & CURRAN

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Chapter 5 Minimum Thresholds, Measurable Objectives, and Interim Milestones

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Acronyms

AFY	Acre feet per year
Basin	Cuyama Groundwater Basin
GSP	Groundwater Sustainability Plan
IM	Interim Milestone
MCL	Maximum Contaminant Levels
MO	Measurable Objective
MT	Minimum Threshold
SGMA	Sustainable Groundwater Management Act
TDS	Total Dissolved Solids

This section of the Cuyama GSP defines the sustainability criteria used to avoid undesirable results during GSP implementation. SGMA requires the application of Minimum Thresholds (MT), Measurable Objectives (MO), and Interim Milestones (IM) on all Representative Monitoring Sites identified in the GSP. These values, or thresholds, guide the GSA and groundwater users within the Basin to identify sustainable values for the Sustainability Indicators as well as progress indicators throughout the 20-year plan implementation period.

5.1 Useful Terms

There are several terms that describe Basin conditions and the values calculated for the Representative Sites:

- **Sustainability Goals** – The culmination of conditions in the absence of undesirable results within 20 years of the applicable statutory deadline.
- **Undesirable Results** – The significant and unreasonable occurrence of conditions that adversely affect groundwater use in the basin, as defined in Section X – Undesirable Results
- **Measurable Objectives** – A specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.
- **Minimum Thresholds** – A numeric value for each sustainability indicator used to define when undesirable results occur, if minimum thresholds are exceeded in a percentage of sites in the monitoring network.
- **Interim Milestones** – A target value representing measurable conditions, in increments of five years, set by an Agency as part of a Plan that helps the basin reach sustainability by 2040.
- **Sustainability Indicators** – refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). These include:
    - Groundwater levels,
    - Groundwater storage,
    - Seawater intrusion,
    - Water quality,
    - Land subsidence, and
    - Interconnected surface water

Thresholds, both MOs and MTs, are applied to all sustainability indicator representative sites. Sites included in monitoring networks but that are not classified as representative sites are not required to have MOs or MTs. All representative sites will also have interim milestones calculated for years 2025, 2030, and 2035 to help guide the GSA to 2040 sustainability goals.

The following subsections describe the process and results for establishing MOs, MTs, and MIs for each of the sustainability indicators described above.

5.2 Chronic Lowering of Groundwater Levels

The Undesirable Result for the chronic lowering of groundwater levels is a result that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Groundwater conditions, as discussed in Section 2.2, vary across the Basin. These conditions are influenced by geographic, geologic, and land uses overlying the Basin. Because of the variety of conditions, threshold regions were used to establish the appropriate sustainability criteria for each region.

5.2.1 Threshold Regions

Six Threshold Regions were defined to allow areas with similar conditions to be grouped together for the MO, MT, and IM values to be calculated. Threshold Regions are shown in Figure 5-1.

The following subsections discuss the strategies used to calculate the MOs, MTs, and Milestones for each Threshold Region.

Southeastern Threshold Region

The Southeaster Threshold Region lies in the southeastern edge of the Basin and is characterized as having moderate agricultural land use with steep geographic features surrounding the valley. Groundwater is generally high in this area, with levels around 50 feet or less below the ground surface, which indicates that this region is likely in a 'full' condition. The northern boundary of this region is the narrows at the Cuyama river, and the eastern boundary is the extent of alluvium.

Eastern Threshold Region

The Eastern Threshold Region lies just east of the central part of the Basin and encompasses Ventucopa and much of the surrounding agricultural property. This part of the Basin has agricultural pumping. Hydrographs in this region indicate that groundwater levels have been, in general, declining for the past 20 years. The northern boundary of this region is the Santa Barbara Canyon Fault, and the southern boundary is where the Cuyama Valley significantly narrows due to geographic changes.

Central Threshold Region

The Central Threshold Region incorporates the majority of agricultural land use within the Basin, as well as the towns of Cuyama and New Cuyama. The greatest depths to groundwater are also found in the Central Threshold Region, and groundwater levels have generally been declining in this region since the 1950's. The south-eastern boundary is defined by the Santa Barbara Canyon fault, and the western boundary by the Russell Fault.

Western Threshold Region

The Western Threshold Region is characterized by shallow depth to water, and hydrographs in this region indicate that it is likely that this portion of the basin is in a 'full' condition. It lies primarily on the north facing slope of the lower Cuyama Valley. The eastern boundary is defined by the Russell Fault, and the northern boundary was drawn to differentiate distinct land uses.

Northwestern Threshold Region

The Northwestern Threshold Region is the bottom of the Cuyama Basin and has new agricultural land use. Hydrographs in this portion of the Basin indicate that this portion is likely in a 'full' condition. The southeastern border was drawn to differentiate between the land uses of the Western and Northwestern Threshold Region.

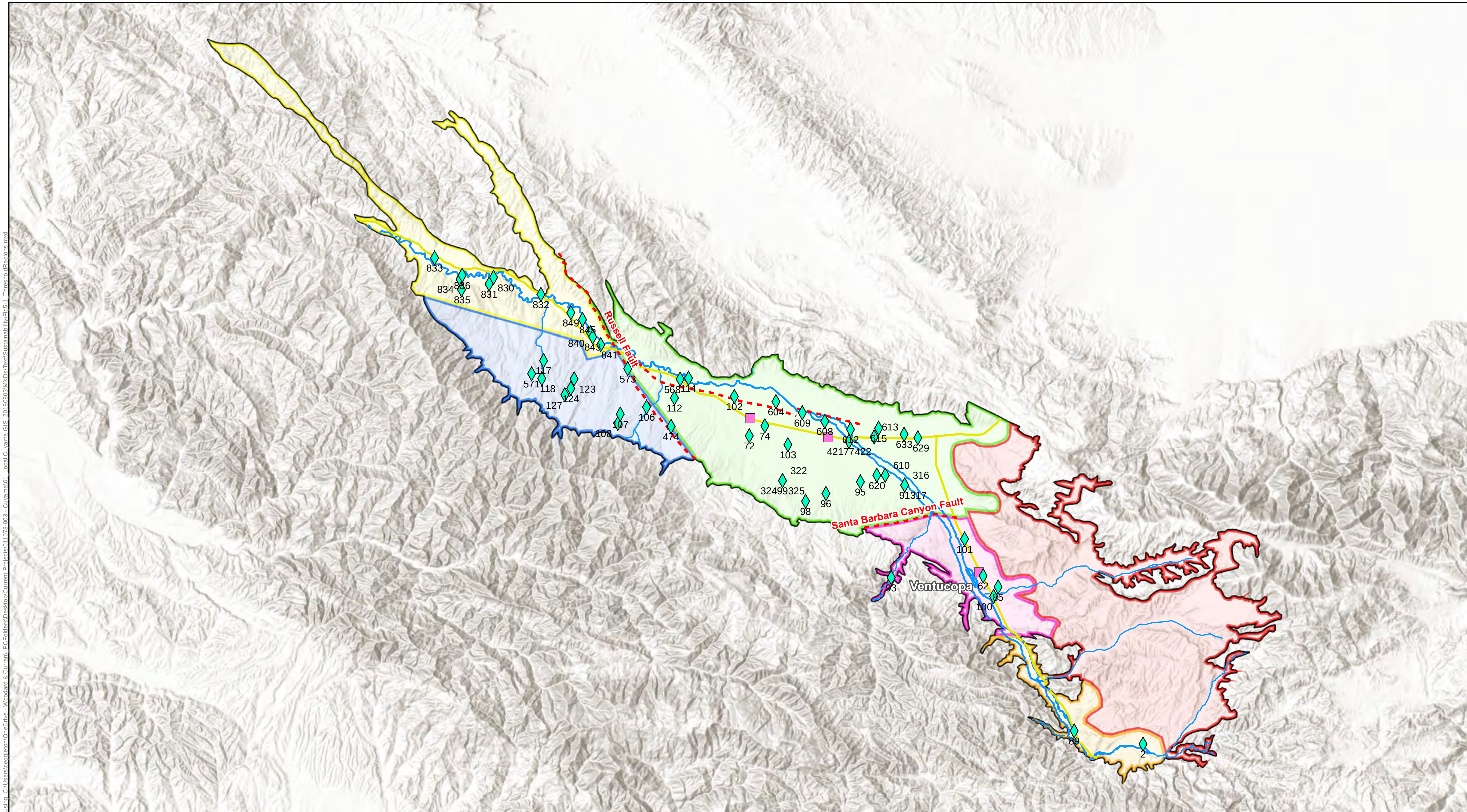

Figure 5-1: Cuyama GW Basin Groundwater Level Representative Wells & Threshold Regions

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

January 2019

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Legend

- Cuyama Basin
- Towns
- Representative Wells
- Faults
- Highways
- Cuyama River
- Streams

Threshold Regions

- Badlands Region
- Central Region
- Eastern Region
- Northwestern Region
- Southeastern Region
- Western Region

N

0 2.75 5.5 11 Miles

Badlands Threshold Region

The Badlands Threshold Region includes the areas east of the Central, East, and Southeast Threshold Regions on the west facing slope of the Cuyama Valley. There are few active wells and little groundwater use in this area. There is no monitoring in this region, and this region does not have sustainability criteria.

5.2.2 Minimum Thresholds, Measurable Objectives, and Interim Milestones

This section describes the establishment of MTs, MOs, and IMs by threshold region, and explains the rationale behind each selected methodology.

Southeastern Threshold Region

Monitoring in this threshold region indicates levels are static except for the drought conditions period identified as from 2013 to 2018. Static groundwater levels indicate this area of the Basin is generally at capacity and therefore the MT is protective of domestic, private, public, and environmental uses.

The MT for the Southeastern Threshold Region was calculated by finding the measurement taken closest to (but not before) 1/1/2015 and not after 4/30/2015. If no measurement was taken during this 4-month period, then a linear trendline was applied to the data and the value for 1/1/2015 was extrapolated.

To provide an operational flexibility range, the MO was calculated by adding 5-years of groundwater storage to the MT. Five-years of storage was calculated by finding the decline in groundwater levels form 2013-2018, which was considered to be a period of drought conditions. If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value decline value.

Placeholder for IM calculation

Levels will be measured using the frequency of measurement and monitoring protocols documented in Section 4 and Appendix XX.

Eastern Threshold Region

Monitoring in this region indicates a downward trend in groundwater levels. The MT for this region intends to protect domestic, private, public and environmental uses of the groundwater by allowing for managed extraction in areas that have beneficial uses and protecting those with at risk infrastructure.

Stakeholders reported concern about the dewatering of domestic wells in this region, and groundwater levels have been declining in monitoring wells in this region. The MT and MO consider the sustainability of water levels in regards to both domestic and agricultural users. The MT was calculated by comparing two separate mathematical methods and choosing the more restrictive (smaller depth to water value) between the two.

The first method found the total range of recorded groundwater levels and used 20% of the range. This 20% of the range was then added below the value closest to January 1, 2015 (as described in the previous subsection).

The second method was calculated by finding the shallowest nearby well depth and 10 feet were added to this value. A Geographic Information System (GIS) analysis was conducted to find the shallowest wells near each of the representative wells. This incorporated both the OPTI dataset, as well as the Department of Water Resources (DWR)'s Township and Range mapping application that utilizes well drilling reports. OPTI well analysis used a 1.5-mile radius circle to find nearby well depths, and the DWR data uses a 9 square mile grid to find the shallowest well.

The MT values calculated by the two methods were then compared, and the more restrictive value was applied to each representative well.

The MOs were calculated by subtracting 5-yrs of groundwater storage from the MT. 5-yrs of storage was found by calculating the decline in groundwater levels form 2013-2018 (a drought period). If measurements are insufficient for this time period, a linear trendline was used to extrapolate the value.

Placeholder for IM calculation

Levels will be measured using the frequency of measurement and monitoring protocols documented in Section 4 and Appendix XX.

Central Threshold Region

Monitoring in this region indicates a decline in groundwater levels, indicating an extraction rate that exceeds recharge rates. The MT for this region is set to allow current beneficial uses of groundwater while reducing extraction rates over the planning horizon to meet sustainable yield. The MO is intended to allow sufficient operational flexibility for future drought conditions.

The MT for the Central Threshold Region was calculated by taking finding the maximum and minimum groundwater levels for each representative well and calculating 20% of the historical range. This 20% of the historical range was then added to the depth to water measurement closest to, but not before, 1/1/2015 and no later than 4/30/2015. If no measurement was taken during this 4-month period, then a linear trendline was applied to the data and the value for 1/1/2015 was extrapolated.

The MO was calculated by subtracting 5-yrs of groundwater storage from the MT. Five-years of storage was found by calculating the decline in groundwater levels form 2013-2018 (a drought period). If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value.

OPTI Wells 74, 103, 114, 568, 609, and 615 used a modified MO calculation where the MO utilized the linear trendline of the full range of measurements to extrapolate a 1/1/2015 value.

Placeholder for IM calculation

Levels will be measured using the frequency of measurement and monitoring protocols documented in Section 4 and Appendix XX.

Western Threshold Region

Monitoring in this threshold region indicates levels are stable, and varied significantly depending on which portion of the region the monitoring well was located in. The most common use of groundwater in this region is for domestic uses. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses of the groundwater and protecting current well infrastructure. The MT was calculated by taking the difference between the total well depth and the value closest to mid-February, 2018, and calculating 15% of that depth. That value is then subtracted from the mid-February, 2018measurement to calculate the MT. This would allow users in this Threshold Region to utilize their groundwater supply without increasing the risk of running a dry well beyond acceptable limits, and this methodology is responsive to the variety of conditions and well depths in this region.

The MO was then calculated by finding the measurement closest to mid-February, 2018, which monitoring indicates is likely a "full" condition.

OPTI Well 474 utilizes a modified MO calculation where the historical high elevation measurement was used as the MO.

Placeholder for IM calculation

Levels will be measured using the frequency of measurement and monitoring protocols documented in Section 4 and Appendix XX.

Northwestern Threshold Region

Monitoring in this threshold region indicates levels are stable, with some declines in the area of new agriculture. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses and utilizing the storage capacity of this region of the Basin. The MT for the Northwestern Threshold Region was found by determining the total average saturated thickness for the primary storage area of the Threshold Region and calculating 15% of that depth. This value was then set as the MT.

The MO was calculated using 5-years of storage. Because historical data reflecting new operations in this Threshold Region is extremely limited, 50 feet was used as 5 years of storage based on local landowner input.

There are several wells in this Threshold Region that were reclassified as "Far-west Northwestern Wells", and include OPTI Wells 830, 831, 832, 833, 834, 835, and 836. These wells have total depths that are shallower and utilize the same strategies as the Western Threshold Region for their MOs and MTs.

Placeholder for IM calculation

Levels will be measured using the frequency of measurement and monitoring protocols documented in Section 4 and Appendix XX.

Badlands Threshold Region

The Badlands Threshold Region has no groundwater use or active wells within this area, thus, no MO, MT, or Interim Milestones were calculated.

5.2.3 Selected minimum thresholds, measurable objectives, and interim milestone graphs, figures, and tables

Figure 5-2 shows an example hydrograph with indicators for the MT, MO, IM (to be calculated) over the hydrograph. The left axis shows elevation above mean sea level, the right axis shows depth to water below ground surface. The brown line shows the ground surface elevation, and time in years is shown on the bottom axis. Each measurement taken at the monitoring well is shown as a blue dot, with blue lines connecting between the blue dots indicating the interpolated groundwater level between measurements. The MT is shown as a red line, and the MO is shown as a green line. IM symbology to be added Appendix XXX includes hydrographs with MT, MO and IM (to be added) for each representative monitoring well.

Table 5-1 shows the representative monitoring network and the numerical values for the MT, MO, and IM (to be added).

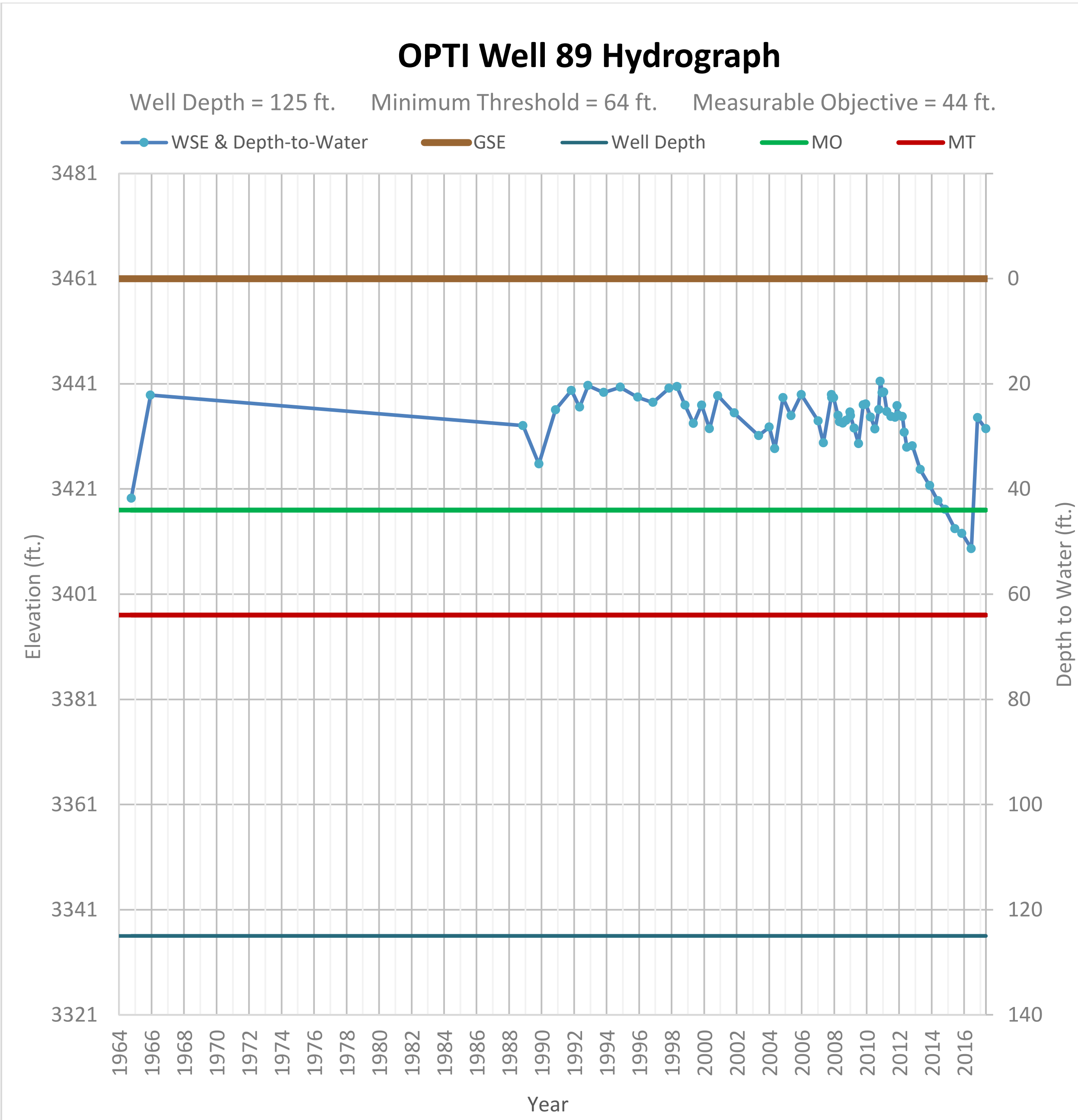

Figure 5-2 Example Hydrograph

Table 5-1 – Representative Monitoring Network and Sustainability Criteria

OPTI Well	Region	Final MT	Final MO	2025 IM	2030 IM	2035 IM	Well Depth	Screen Top	Screen Bottom	GSE
72	Central	169	124				790	340	770	2171
74	Central	256	243							2193
77	Central	450	400				980	960	980	2286
91	Central	625	576				980	960	980	2474
95	Central	573	538				805			2449
96	Central	333	325				500			2606
98	Central	450	439				750			2688
99	Central	311	300				750	730	750	2513
102	Central	235	197							2046
103	Central	290	235				1030			2289
112	Central	87	85				441			2139
114	Central	47	45				58			1925
316	Central	623	574				830			2474
317	Central	623	573				700			2474
322	Central	307	298				850			2513
324	Central	311	299				560			2513
325	Central	300	292				380			2513
420	Central	450	400				780			2286
421	Central	446	398				620			2286
422	Central	444	397				460			2286
474	Central	188	169				213			2369
568	Central	37	36				188			1905
604	Central	526	487				924	454	924	2125
608	Central	436	407				745	440	745	2224
609	Central	458	421				970	476	970	2167
610	Central	621	591				780	428	780	2442
612	Central	463	440				1070	657	1070	2266
613	Central	503	475				830	330	830	2330
615	Central	500	468				865	480	865	2327
620	Central	606	566				1035	550	1035	2432

629	Central	559	527	1000	500	1000	2379
633	Central	547	493	1000	500	1000	2364
62	Eastern	151	126	212			2921
85	Eastern	171	147	233			3047
93	Eastern	105	91	151			2928
100	Eastern	134	105	284			3004
101	Eastern	104	81	200			2741
840	Northwestern	203	153	900	200	880	1713
841	Northwestern	203	153	600	170	580	1761
843	Northwestern	203	153	620	60	600	1761
845	Northwestern	203	153	380	100	360	1712
849	Northwestern	203	153	570	150	550	1713
2	Southeastern	72	55	73			3720
89	Southeastern	64	44	125			3461
106	Western	154	141.4	227.5			2327
107	Western	91	72.23	200			2482
108	Western	165	135.62	328.75			2629
117	Western	160	150.82	212			2098
118	Western	124	57.22	500			2270
123	Western	31	12.59	138			2165
124	Western	73	57.12	160.55			2287
127	Western	42	31.74	100.25			2364
571	Western	144	120.5	280			2307
573	Western	118	67.5	404			2084
830	Far-West Northwestern	59	56	77.2			1571
831	Far-West Northwestern	77	52	213.75			1557
832	Far-West Northwestern	45	30	131.8			1630
833	Far-West Northwestern	96	24	503.55			1457
834	Far-West Northwestern	84	42	320			1508
835	Far-West Northwestern	55	36	162.2			1555
836	Far-West Northwestern	79	36	325			1486

5.3 Reduction of Groundwater Storage

The Undesirable Result for the reduction in groundwater storage is a result that causes significant and unreasonable reduction in the viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Reduction of groundwater storage is not a concern for the Basin for two reasons. First, monitoring in several areas of the Basin (western, eastern, and portions of the north facing slope of the Cuyama Valley near the center of the Basin) indicate that those regions are likely near, or at full conditions.

Second, because the primary aquifer in the Basin is not confined, storage closely matches groundwater levels

SGMA regulations define the MT for reduction of groundwater storage as the, "… total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results."

Undesirable results for groundwater storage volumes in this GSP will use groundwater levels as a proxy, as the groundwater level sustainability criteria are protective of groundwater in storage.

5.3.1 Threshold Regions

Groundwater storage is measured by proxy using groundwater level thresholds, and thus uses the same methodology and threshold regions as groundwater levels.

5.3.2 Proxy Monitoring

Reduction of groundwater storage within the Basin uses groundwater levels as a proxy for determining sustainability, as permitted by §354.26 (d) of CA Regulation Title 23, Chapter 1.5.2.5. Additionally, there are currently no state, federal, or local standards that regulate groundwater storage. As described above, any benefits to groundwater storage are expected to coincide with groundwater level management.

5.4 Seawater Intrusion

Due to the geographic location of the Cuyama Basin, seawater intrusion is not a concern, and thus is not required to establish criteria for undesirable results for seawater intrusion, as supported by §354.26 (e) of CA Regulation Title 23, Chapter 1.5.2.5.

5.5 Degraded Water Quality

The Undesirable Result for degraded water quality is a result stemming from a causal nexus between SGMA-related groundwater quantity management activities and groundwater quality that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

The SGMA regulations specify that, "minimum thresholds for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results."

Because the undesirable result for degraded water quality stems from the causal nexus between SGMA related quantity management and groundwater quality, TDS will be monitored by the GSA as part of this GSP, and other constituents will not. As discussed in Section 2.2 Groundwater Conditions, there are few contamination sites in the Basin. Additionally, these sites are under jurisdiction of the RWQCB. Nitrates are under the jurisdiction of the Irrigated Lands Regulatory Program (ILRP), and the GSA does not possess land use authority to influence fertilizer use. Arsenic occurs at specific depths in the basin, but the location of sources of arsenic is not well understood and is not manageable by the GSA at a regional scale.

5.5.1 Threshold Regions

Groundwater quality monitoring does not utilize Threshold Regions. Figure 5-3 shows the location of the groundwater quality representative wells in the Basin.

5.5.2 Proxy Monitoring

Proxy monitoring is not used for groundwater quality monitoring within the Cuyama Basin.

5.5.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

The GSA has decided to address total dissolved solids (TDS) within the Basin by setting MTs, MOs, and IMs. TDS does not have a primary maximum contaminant level (MCL), but does have both a California Division of Drinking Water and U.S. Environmental Protection Agency (USEPA) Secondary standard of 500 mg/L, and a short-term standard of 1,500 mg/L. Current levels in the Basin range from 84 mg/L to 4,400 mg/L. This is due to saline conditions in the portions of the watershed where rainfall percolates through marine sediments which contain large amounts of salt.

Due to this natural condition, additional data will be collected during GSP implementation to increase the GSAs understanding of salt/TDS sources within the Basin,. It should be noted however, that TDS levels in the groundwater do not detrimentally impact the agricultural economy of the Basin. Much of the crops grown in the Basin, including carrots, are not significantly affected by the kinds of salts in the Basin.

Due to these factors the MT for representative well sites are set to be the 20% of the total range of each representative monitoring site above the 90^{th} percentile of measurements for each site.

To provide for an acceptable margin of operational flexibility, the MO for the TDS levels within the Basin have been set to the temporary MCL of 1,500 mg/L for each representative well where the latest measurements as of 2018 are greater than 1,500 mg/L. For wells with recent measurements less than 1,500 mg/L, the MO is set to the most recent measurement as of 2018.

This GSP has calculated two different interim milestones to achieve sustainability by 2040. GSP regulations require GSAs to avoid undesirable results by 2040, which is to say meet or exceed the MT. The GSA also recognizes that reaching the MO is a priority, and thus a range of interim milestones has been set. Interim milestones for TDS have been set as a linear trendline from the latest measurement value in 2018 to the 2040 MO and MT as shown in Table 5-2.

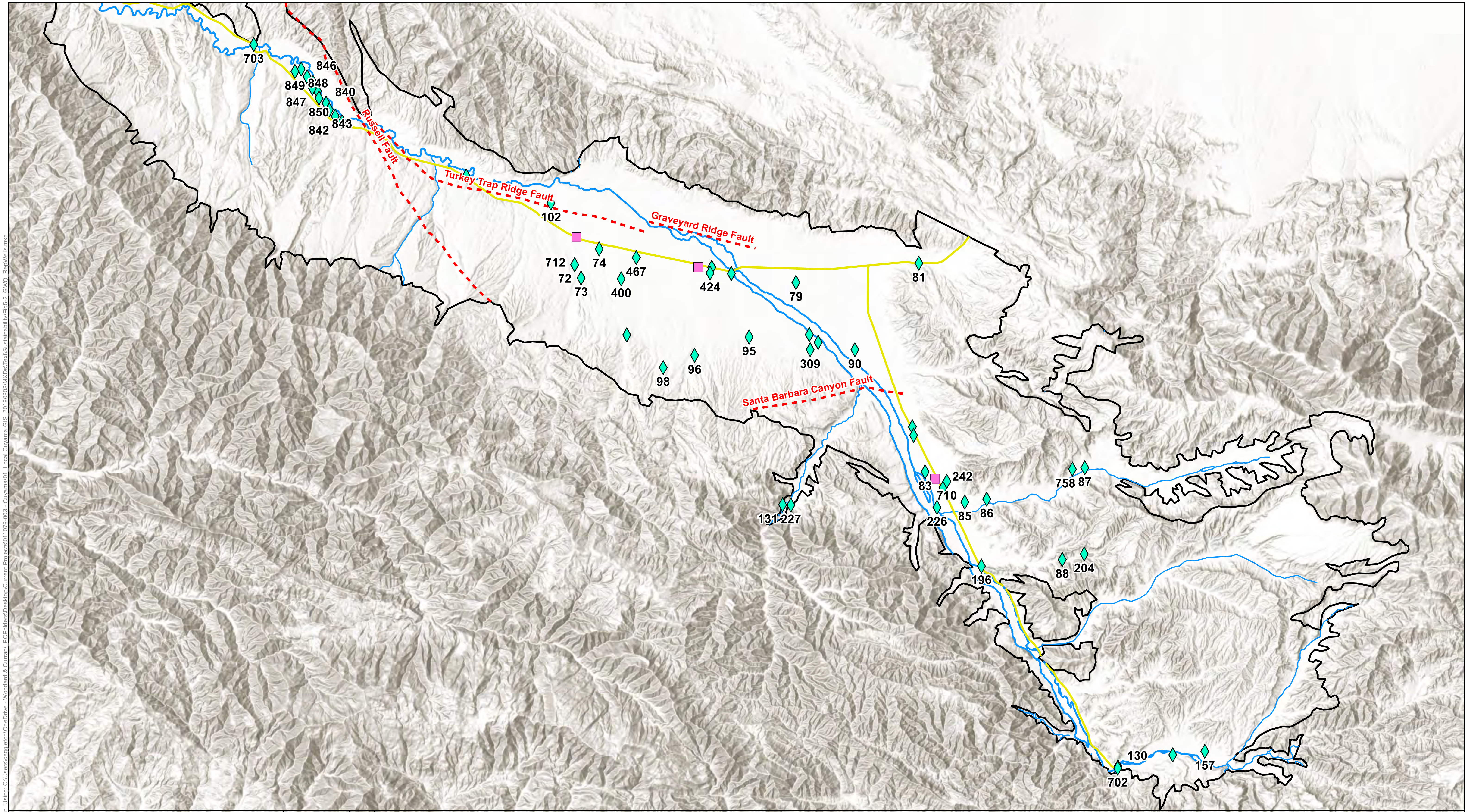

Figure 5-3: Cuyama GW Basin Groundwater Quality Representative Wells

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

January 2019

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Legend

- Cuyama Basin
- Towns
- Faults
- Highways
- Cuyama River
- Streams
- Representative Groundwater Quality Wells

N

0 1.75 3.5 7 Miles

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites

OPTI ID	Well Depth	Screen Interval	Well Elevation	MO	MT	2025 IM	2030 IM	2035 IM
61	357.	Unknown	3681	585	615.2	585 - 593 mg/L	585 - 600 mg/L	585 - 608 mg/L
72	790	340 to 350 ft.	2171	996	1023	996 - 1003 mg/L	996 - 1010 mg/L	996 - 1016 mg/L
73	880.	Unknown	2252	805	855.9	805 - 818 mg/L	805 - 830 mg/L	805 - 843 mg/L
74		Unknown	2193	1500	1833	1538 - 1621 mg/L	1525 - 1692 mg/L	1513 - 1762 mg/L
76	720	Unknown	2277	1500	2306.9	1650 - 1852 mg/L	1600 - 2003 mg/L	1550 - 2155 mg/L
77	980	960 to 980 ft.	2286	1500	1592	1515 - 1538 mg/L	1510 - 1556 mg/L	1505 - 1574 mg/L
79	600	Unknown	2374	1500	2320	1980 - 2185 mg/L	1820 - 2230 mg/L	1660 - 2275 mg/L
81	155.	Unknown	2698	1500	2788	2340 - 2662 mg/L	2060 - 2704 mg/L	1780 - 2746 mg/L
83	198.	Unknown	2858	1500	1726	1620 - 1677 mg/L	1580 - 1693 mg/L	1540 - 1710 mg/L
85	233	Unknown	3047	618	1391.2	618 - 811 mg/L	618 - 1005 mg/L	618 - 1198 mg/L
86	230.	Unknown	3141	969	974.7	969 - 970 mg/L	969 - 972 mg/L	969 - 973 mg/L
87	232.	Unknown	3546	1090	1164.8	1090 - 1109 mg/L	1090 - 1127 mg/L	1090 - 1146 mg/L
88	400	Unknown	3549	302	302	302 - 302 mg/L	302 - 302 mg/L	302 - 302 mg/L
90	800	Unknown	2552	1500	1593	1523 - 1546 mg/L	1515 - 1562 mg/L	1508 - 1577 mg/L
91	980	960 to 980 ft.	2474	1410	1487	1410 - 1429 mg/L	1410 - 1449 mg/L	1410 - 1468 mg/L
94	550	Unknown	2456	1050	1245	1050 - 1099 mg/L	1050 - 1148 mg/L	1050 - 1196 mg/L
95	805.	Unknown	2449	1500	1866	1658 - 1749 mg/L	1605 - 1788 mg/L	1553 - 1827 mg/L
96	500	Unknown	2606	1500	1632	1500 - 1533 mg/L	1500 - 1566 mg/L	1500 - 1599 mg/L
98	750.	Unknown	2688	1500	2400	2040 - 2265 mg/L	1860 - 2310 mg/L	1680 - 2355 mg/L
99	750	730 to 750 ft.	2513	1490	1562	1490 - 1508 mg/L	1490 - 1526 mg/L	1490 - 1544 mg/L
101	200	Unknown	2741	1500	1693	1538 - 1586 mg/L	1525 - 1622 mg/L	1513 - 1657 mg/L
102		Unknown	2046	1500	2351	1853 - 2065 mg/L	1735 - 2161 mg/L	1618 - 2256 mg/L
130		Unknown	3536	1500	1855	1725 - 1814 mg/L	1650 - 1828 mg/L	1575 - 1841 mg/L
131		Unknown	2990	1500	1982	1763 - 1883 mg/L	1675 - 1916 mg/L	1588 - 1949 mg/L
157	71.0	Unknown	3755	1500	2360	1823 - 2038 mg/L	1715 - 2145 mg/L	1608 - 2253 mg/L
196	741	Unknown	3117	851	903.7	851 - 864 mg/L	851 - 877 mg/L	851 - 891 mg/L
204		Unknown	3693	253	268.6	253 - 257 mg/L	253 - 261 mg/L	253 - 265 mg/L
226		Unknown	2945	1500	1844	1695 - 1781 mg/L	1630 - 1802 mg/L	1565 - 1823 mg/L
227		Unknown	3002	1500	2230	1710 - 1893 mg/L	1640 - 2005 mg/L	1570 - 2118 mg/L
242	155	Unknown	2933	1470	1518	1470 - 1482 mg/L	1470 - 1494 mg/L	1470 - 1506 mg/L
269		Unknown	2756	1500	1702	1553 - 1603 mg/L	1535 - 1636 mg/L	1518 - 1669 mg/L

OPTI ID	Well Depth	Screen Interval	Well Elevation	MO	MT	2025 IM	2030 IM	2035 IM
309	1100	Unknown	2513	1410	1509	1410 - 1435 mg/L	1410 - 1460 mg/L	1410 - 1484 mg/L
316	830	Unknown	2474	1380	1468	1380 - 1402 mg/L	1380 - 1424 mg/L	1380 - 1446 mg/L
317	700	Unknown	2474	1260	1337	1260 - 1279 mg/L	1260 - 1299 mg/L	1260 - 1318 mg/L
318	610	Unknown	2474	1080	1152	1080 - 1098 mg/L	1080 - 1116 mg/L	1080 - 1134 mg/L
322	850	Unknown	2513	1350	1386	1350 - 1359 mg/L	1350 - 1368 mg/L	1350 - 1377 mg/L
324	560	Unknown	2513	746	777.2	746 - 754 mg/L	746 - 762 mg/L	746 - 769 mg/L
325	380	Unknown	2513	1470	1569	1470 - 1495 mg/L	1470 - 1520 mg/L	1470 - 1544 mg/L
400	2120.	Unknown	2298	918	975.6	918 - 932 mg/L	918 - 947 mg/L	918 - 961 mg/L
420	780	Unknown	2286	1430	1490	1430 - 1445 mg/L	1430 - 1460 mg/L	1430 - 1475 mg/L
421	620	Unknown	2286	1500	1616	1515 - 1544 mg/L	1510 - 1568 mg/L	1505 - 1592 mg/L
422	460	Unknown	2286	1500	1942	1733 - 1843 mg/L	1655 - 1876 mg/L	1578 - 1909 mg/L
424	1000.	Unknown	2291	1500	1588	1530 - 1552 mg/L	1520 - 1564 mg/L	1510 - 1576 mg/L
467	1140.	Unknown	2224	1500	1764	1598 - 1664 mg/L	1565 - 1697 mg/L	1533 - 1731 mg/L
568	188	Unknown	1905	871	1191.4	871 - 951 mg/L	871 - 1031 mg/L	871 - 1111 mg/L
702		Unknown	3539	110	2074.4	110 - 601 mg/L	110 - 1092 mg/L	110 - 1583 mg/L
703		Unknown	1613	400	4096.8	400 - 1324 mg/L	400 - 2248 mg/L	400 - 3173 mg/L
710		Unknown	2942	1040	1040	1040 - 1040 mg/L	1040 - 1040 mg/L	1040 - 1040 mg/L
711		Unknown	1905	928	928	928 - 928 mg/L	928 - 928 mg/L	928 - 928 mg/L
712		Unknown	2171	977	977.5	977 - 977 mg/L	977 - 977 mg/L	977 - 977 mg/L
713		Unknown	2456	1200	1200	1200 - 1200 mg/L	1200 - 1200 mg/L	1200 - 1200 mg/L
721		Unknown	2374	1500	2170	2003 - 2170 mg/L	1835 - 2170 mg/L	1668 - 2170 mg/L
758		Unknown	3537	900	954.3	900 - 914 mg/L	900 - 927 mg/L	900 - 941 mg/L
840	900	200 to 880 ft.	1713	559	559	559 - 559 mg/L	559 - 559 mg/L	559 - 559 mg/L
841	600	170 to 580 ft.	1761	561	561	561 - 561 mg/L	561 - 561 mg/L	561 - 561 mg/L
842	450	60 to 430 ft.	1759	547	547	547 - 547 mg/L	547 - 547 mg/L	547 - 547 mg/L
843	620	60 to 600 ft.	1761	569	569	569 - 569 mg/L	569 - 569 mg/L	569 - 569 mg/L
844	730	100 to 720 ft.	1713	481	481	481 - 481 mg/L	481 - 481 mg/L	481 - 481 mg/L
845	380	100 to 360 ft.	1712	1250	1250	1250 - 1250 mg/L	1250 - 1250 mg/L	1250 - 1250 mg/L
846	610	130 to 590 ft.	1715	918	918	918 - 918 mg/L	918 - 918 mg/L	918 - 918 mg/L
847	600	180 to 580 ft.	1733	480	480	480 - 480 mg/L	480 - 480 mg/L	480 - 480 mg/L
848	390	110 to 370 ft.	1694	674	674	674 - 674 mg/L	674 - 674 mg/L	674 - 674 mg/L
849	570	150 to 550 ft.	1713	1500	1780	1710 - 1780 mg/L	1640 - 1780 mg/L	1570 - 1780 mg/L

OPTI ID	Well Depth	Screen Interval	Well Elevation	MO	MT	2025 IM	2030 IM	2035 IM
850	790	180 to 780 ft.	1759	472	472	472 - 472 mg/L	472 - 472 mg/L	472 - 472 mg/L

5.6 Subsidence

The Undesirable Result for land subsidence is a result that causes significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

5.6.1 Threshold Regions

Subsidence monitoring does not use threshold regions. Figure 5-4 shows the location of the subsidence representative locations in the Basin.

5.6.2 Representative Monitoring

As discussed in Section 4.9, all Monitoring Network subsidence monitoring stations within the Basin, and three additional sites outside of the Basin, are designated as the representative monitoring sites. Determinantal impacts of subsidence include groundwater storage reductions and potential damage to infrastructure such as large pipelines and canals. However, the Basin does not currently have infrastructure of this type, and storage losses are so small they may be considered superficial.

Subsidence within the central portion of the Basin is approximately 0.5 inches per year, as shown in Section 2.2, Groundwater Conditions. Currently, there are no state, federal, or local standards that regulate subsidence rates.

5.6.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

Although several factors may affect subsidence rates, including natural geologic processes, oil pumping, and groundwater pumping, it is believed that the primary influence within the Basin is due to groundwater pumping. Because current subsidence rates are not believed to be significant and unreasonable, the MT rate for subsidence was set at 2 inches per year to allow for flexibility as the Basin works towards sustainability in 2040. This rate is applied primarily to the two stations in the Basin (CUHS and P521), as the other stations in the Monitoring Network represent ambient changes in vertical displacement, primarily due to geological influences. This level of subsidence is considered unlikely to cause a significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

Subsidence is expected to be influenced through the management of groundwater pumping through the groundwater level MOs, MTs, and interim milestones. Thus, the MO for subsidence is set for zero lowering of ground surface elevations.

Interim milestones are not needed for the subsidence sustainability indicator because the current rate of subsidence is above the MT.

Subsidence rates will be measured in the frequency of measurement and monitoring protocols documented in Section 4.

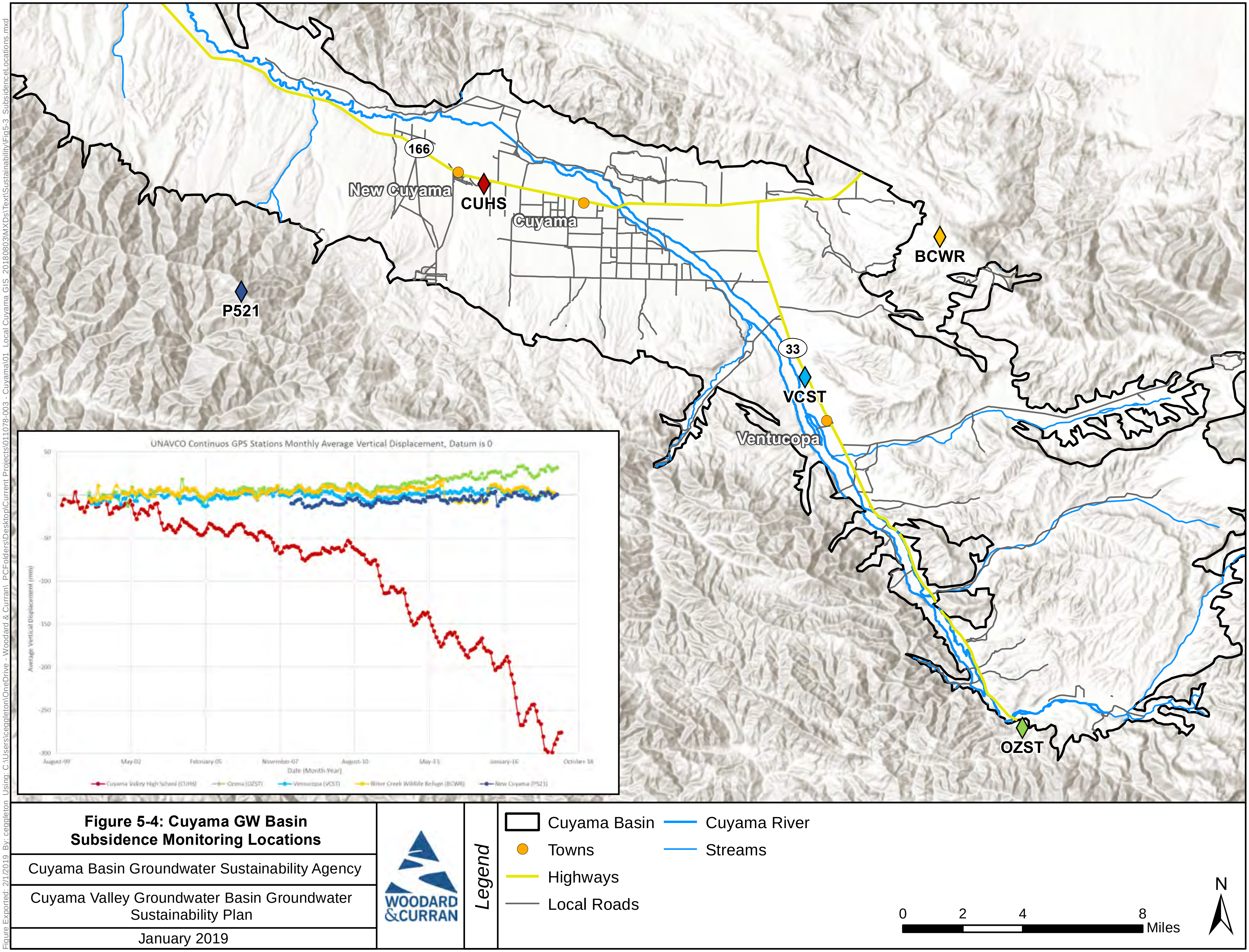

Figure 5-4: Cuyama GW Basin Subsidence Monitoring Locations

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

January 2019

WOODARD & CURRAN

Figure Exported: 2/1/2019 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran_PCFolders\Desktop\Current Projects\011078-003 - Cuyama\01_Local Cuyama GIS_20180803\MXDs\Text\Sustainability\Fig5-3_SubsidenceLocations.mxd

5.7 Depletions of Interconnected Surface Water

The Undesirable Result for depletions of interconnected surface water is a result that causes significant and unreasonable reductions in the viability of agriculture or riparian habitat within the basin over the planning and implementation horizon of this GSP.

SGMA regulations define the MT for interconnected surface water as, "… the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on the beneficial uses of the surface water and may lead to undesirable results." In January 1, 2015 surface flows infiltrated into the groundwater system and are used by phreatophytes, except in the most extreme flash flood events, when surface water flows out of the basin. These flash flood events flow for less than one week of the year. Conditions have not changed since January 1, 2015, and surface flows infiltrate into the groundwater system and are used by local phreatophytes.

Due to conditions in the Basin not being different from January 1, 2015, groundwater level thresholds established in Section 5.2 are considered protective of depletions of interconnected surface water to January 1, 2015 conditions, and the groundwater level thresholds are used by proxy to protect the basin from undesirable results related to depletion of interconnected surface water.

References

California Department of Water Resources (DWR), Irrigated Land Regulatory Program (IRLP), Accessed 1/11/2019. https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/