3. UNDESIRABLE RESULTS

This chapter presents the Undesirable Results statements for the Basin. These statements are based on quantitative thresholds on monitoring points described in Chapter 5, which are used here to indicate where Undesirable Results might occur in the monitoring network.

The first section of this chapter is the draft Undesirable Results section. The second section contains guidance from relevant portions of the SGMA regulations about Undesirable Results, and lists guidance about addressing Undesirable Results from the *Sustainable Management Criteria Best Management Practices* (BMPs) (DWR, 2017).

On June 6, 2018, a public workshop was held where sustainability and undesirable outcomes were discussed with the public. Input from stakeholders at the meeting was tabulated, and stakeholder input was tied to the most relevant GSP component. The sorted results were used to guide creation of the Undesirable Results statements, and are included in Appendix A.

3.1 Sustainability Goal

Sustainability Goal: To maintain a sustainable groundwater resource for beneficial users of the Basin now and into the future consistent with the California Constitution.

3.2 Undesirable Results Statements

Undesirable Results are defined in SGMA as one or more of the following effects caused by groundwater conditions occurring throughout the Basin:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable seawater intrusion.
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Undesirable Results related to seawater intrusion are not present in the Basin, and are not likely to occur in the Basin.

Information is provided below for each effect as it applies to the Basin. For the sustainability indicators relevant to the Basin, the discussion does the following:

- Describes the Undesirable Result
- Identifies Undesirable Results
- Identifies potential causes of Undesirable Results
- Identifies potential effects of Undesirable Results on beneficial uses

For any indicator not present, a justification for not establishing Undesirable Results is provided. This information was developed based on the California Water Code, SGMA regulations, BMPs, and stakeholder input.

3.2.1 Chronic Lowering of Groundwater Levels

Description of Undesirable Results

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.

Identification of Undesirable Results

This result is considered to occur during GSP implementation when 30 percent of representative monitoring wells (i.e., 18 of 60 wells) fall below their minimum groundwater elevation thresholds for two consecutive years.

Potential Causes of Undesirable Results

Potential causes of Undesirable Results for the chronic lowering of groundwater levels are groundwater pumping that exceeds the average sustainable yield in the Basin, and changes in precipitation in the Cuyama Watershed in the future.

Potential Effects of Undesirable Results

If groundwater levels were to reach Undesirable Results levels, the Undesirable Results could cause potential de-watering of existing groundwater infrastructure, starting with the shallowest wells, could potentially adversely affect groundwater dependent ecosystems, and could potentially cause changes in irrigation practices, crops grown, and adverse effects to property values. Additionally, reaching Undesirable Results for groundwater levels could adversely affect domestic and municipal uses, including uses in disadvantaged communities, which rely on groundwater in the Basin.

3.2.2 Reduction of Groundwater Storage

Description of Undesirable Results

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.

Justification of Groundwater Elevations as a Proxy

Use of groundwater elevation as a proxy metric for Undesirable Results is appropriate for groundwater storage. The change in storage is directly correlated to changes in groundwater elevation. By setting minimum thresholds for levels, storage is also effectively managed.

Identification of Undesirable Results

This result is considered to occur during GSP implementation when 30 percent of representative monitoring wells (i.e., 18 of 60 wells) fall below their minimum groundwater elevation thresholds for two consecutive years.

Potential Causes of Undesirable Results

Potential causes of Undesirable Results for the reduction in groundwater storage are groundwater pumping that exceeds the average sustainable yield in the Basin, and decreases in precipitation in the Cuyama Watershed in the future.

Potential Effects of Undesirable Results

If reduction of groundwater in storage were to reach Undesirable Results levels, the Undesirable Results could cause potential de-watering of existing groundwater infrastructure and springs, starting with the shallowest wells, could potentially adversely affect groundwater dependent ecosystems, and potentially cause changes in irrigation practices, crops grown, and adverse effects to property values. Additionally, reaching Undesirable Results for reduction of groundwater in storage could adversely affect domestic and municipal uses, which rely on groundwater in the subbasin.

3.2.3 Seawater Intrusion

Seawater intrusion is not an applicable sustainability indicator in the Basin, because seawater intrusion is not present and is not likely to occur due to the distance between the Basin and the Pacific Ocean, bays, deltas, or inlets.

3.2.4 Degraded Water Quality

Description of Undesirable Results

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.

Identification of Undesirable Results

This result is considered to occur during GSP implementation when 30 percent of the representative monitoring points (i.e., 20 of 64 sites) exceed the minimum threshold for a constituent for two consecutive years.

Potential Causes of Undesirable Results

Potential causes of Undesirable Results for the degraded water quality are conditions where groundwater pumping degrades the groundwater quality.

Potential Effects of Undesirable Results

If groundwater quality were degraded to reach Undesirable Results levels, the Undesirable Results could potentially cause a shortage in supply to groundwater users, with domestic wells being most vulnerable as treatment costs or access to alternate supplies can be high for small users. Water quality degradation could cause potential changes in irrigation practices, crops grown, and adverse effects to property values. Additionally, reaching Undesirable Results for groundwater quality could adversely affect municipal uses, including disadvantaged communities, which could have to install treatment systems.

3.2.5 Land Subsidence

Description of Undesirable Results

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.

Identification of Undesirable Results

This result is detected to occur during GSP implementation when 30 percent of representative subsidence monitoring sites (i.e., 1 of 2 sites) exceed the minimum threshold for subsidence over two years.

Potential Causes of Undesirable Results

Potential causes of future Undesirable Results for land subsidence are likely tied to groundwater pumping resulting in dewatering of compressible clays in the subsurface.

Potential Effects of Undesirable Results

If land subsidence conditions were to reach Undesirable Results, the Undesirable Results could potentially cause damage to infrastructure, including water conveyance facilities and flood control facilities roads, utilities, buildings, and pipelines.

3.2.6 Depletions of Interconnected Surface Water

Description of Undesirable Results

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.

Identification of Undesirable Results

This result is considered to occur during GSP implementation when 30 percent of representative monitoring wells (i.e., 18 of 60 wells) fall below their minimum groundwater elevation thresholds for two consecutive years.

Justification of Groundwater Elevations as a Proxy

Use of groundwater elevation as a proxy metric for Undesirable Results is necessary given the difficulty and cost of direct monitoring of depletions of interconnected surface water. The depletion of interconnected surface water is driven by a gradient between water surface elevation in the surface water body and groundwater elevations in the connected, shallow groundwater system. By setting minimum thresholds on shallow groundwater wells near surface water, the CBGSA can to monitor and manage this gradient, and in turn, manage potential changes in depletions of interconnected surface.

Potential Causes of Undesirable Results

Potential causes of future Undesirable Results for depletions of interconnected surface water are likely tied to groundwater production, which could result in lowering of groundwater elevations in shallow aquifers near surface water courses. This could change the hydraulic gradient between the water surface elevation in the surface water course and the groundwater elevation, resulting in an increase in depletion of surface water to groundwater.

Potential Effects of Undesirable Results

If depletions of interconnected surface water were to reach Undesirable Results, groundwater dependent ecosystems could be affected.

3.3 Evaluation of the Presence of Undesirable Results

DWR developed the *Sustainable Management Criteria* BMP (DWR, 2017) to help GSAs develop their sustainability criteria, and to identify the presence of Undesirable Results. The *Sustainable Management Criteria* BMP states: "Undesirable results will be defined by minimum threshold exceedances." The *Sustainable Management Criteria* BMP helps GSAs identify the presence of an Undesirable Result by identifying a quantitative number and location of monitoring points that may be below the minimum threshold prior to a GSA identifying conditions as an Undesirable Result.

This section evaluates current conditions and compares them with the minimum thresholds established in Chapter 5. Using the method identified above for each sustainability indicator, a GSA can identify the presence of Undesirable Results. For the Basin, Undesirable Results are identified at the Basin scale; this scale may be modified by the CBGSA Board if appropriate or necessary in the future.

3.3.1 Chronic Lowering of Groundwater Levels

The Undesirable Result for the chronic lowering of groundwater levels is considered to occur during GSP implementation when 30 percent of representative monitoring wells (i.e., 18 of 60 wells) fall below their minimum groundwater elevation thresholds for two consecutive years (Section 3.2.1).

Chapter 5 discusses how minimum thresholds were selected. Appendix A of Chapter 5 presents the hydrographs of groundwater levels through 2018 and the established depth of the minimum threshold for each monitoring site. Of the 60 monitoring sites, nine were below the minimum threshold in the latest measurement in 2018, which is 15 percent of representative monitoring wells (i.e., 9 of 60), indicating that the Basin does not currently exceed the requirements for an undesirable condition for the chronic lowering of groundwater levels.

3.3.2 Reduction of Groundwater Storage

The Undesirable Result for the reduction of groundwater storage is monitored by proxy using groundwater levels and groundwater level minimum thresholds (Section 3.2.2). Because measurements show that levels are not in an undesirable condition, reduction of groundwater storage is not identified to be in an undesirable condition.

3.3.3 Seawater Intrusion

Seawater intrusion is not an applicable sustainability indicator, because seawater intrusion is not present and is not likely to occur due to the distance between the Basin and the Pacific Ocean, bays, deltas, or inlets (Section 3.2.4). Therefore, there is no possibility of an undesirable result due to seawater intrusion.

3.3.4 Degraded Water Quality

The Undesirable Result for degraded water quality is considered to occur during GSP implementation when 30 percent of representative monitoring wells (i.e., 20 of 64 wells) for water quality exceed minimum threshold levels for two consecutive years (Section 3.2.4).

Discussion of how minimum thresholds were selected is presented in Chapter 5. Table 5-2 in Chapter 5 shows the minimum thresholds and the most recent measurement for each monitoring site. Of the 64 monitoring sites, none were worse than the minimum threshold in the latest measurement in 2018, which is 0 percent of representative monitoring wells (i.e., 0 of 64), indicating that the Basin does not currently meet the requirements for an undesirable condition for degraded water quality.

3.3.5 Land Subsidence

The Undesirable Result for land subsidence is considered to occur during GSP implementation when 30 percent of representative subsidence monitoring sites (i.e., 1 of 2 sites) exceed the minimum threshold for subsidence over two consecutive years (Section 3.2.5).

Chapter 5 discussed how minimum thresholds were selected. The minimum threshold for subsidence has been set at 2 inches per year.

The rate of subsidence at the Cuyama Valley High School (CVHS) station is measured daily. Subsidence at the CVHS station cycles annually, with elastic rebound occurring in the winter, indicated by an annual high. Highs during the period of rebound occur between January 1 and March 10 each year. Measurements taken from January 1, 2017 to March 10, 2017 were compared with measurements from January 1, 2018 to March 10, 2018. Each daily measurement was compared and the difference between each day was averaged. The average decline from a day in 2017 during that period and the same day in 2018 during that period was 33 millimeters (1.3 inches).

The rate of subsidence on the Ventucopa station was 0 inches over the same period. Because neither station showed a rate of subsidence over 2 inches per year, the Basin does not currently meet the requirements for an undesirable condition for land subsidence.

3.3.6 Depletions of Interconnected Surface Water

The Undesirable Result for the depletion of interconnected surface water is monitored by proxy using groundwater levels and groundwater level minimum thresholds (Section 3.2.6). Because measurements show that levels do not currently meet the requirements for an undesirable condition, depletion of interconnected surface water is not identified to be in an undesirable condition.

3.4 References

California Department of Water Resources (DWR). 2018. *Sustainable Management Criteria Best Management Practice.* Sustainable Groundwater Management Program. November. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-6-Sustainable-Management-Criteria-DRAFT.pdf. Accessed March 30, 2018.

4. MONITORING NETWORKS

This chapter discusses the planned monitoring networks needed to guide the Cuyama Basin Groundwater Sustainability Agency (CBGSA) toward their sustainability goals. Monitoring networks need to be established for each sustainability indicator either directly or through monitoring through a proxy. This section satisfies Subarticle 4 of the SGMA regulations. This chapter also discusses the following:

- Monitoring network objectives
- Existing monitoring programs used as part of each network
- Monitoring network establishment for each sustainability indicator
- Monitoring network data gaps, and a plan to fill data gaps if they are present for each monitoring network

4.1 Useful Terms

This chapter describes groundwater wells, water quality measurements, subsidence stations, and other related components. Technical terms are defined below. Figure 4-1 is a diagram of a monitoring well with well-related terms identified on the diagram. Terms are defined here to guide readers through this chapter, and are not a definitive definition of each term:

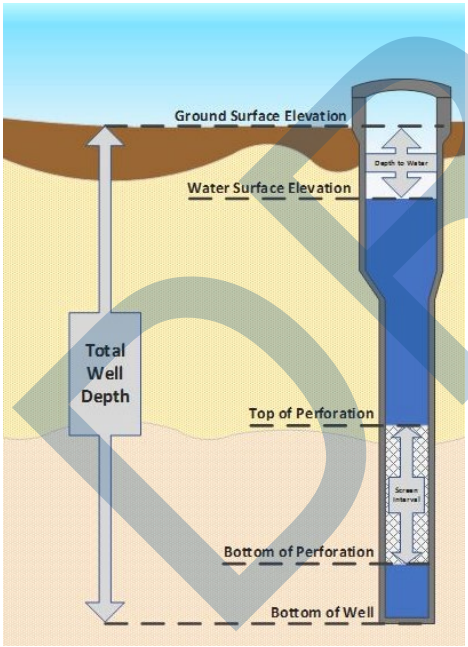

Figure 4-1: Well Completion Diagram

4.1.1 Well-Related Terms

- **Bottom perforation –** The distance to the bottom of the perforation from the ground surface elevation.
- **Depth to water –** The distance from the ground surface or the well' to where water is encountered inside the well
- **Ground surface elevation –** The elevation in feet above mean sea level at the well's location.
- **Screened interval** – The portion of a well casing that is screened to allow water from the surrounding soil into the well pipe. There can be several screened intervals within the same well. Screened interval is usually reported in feet below ground surface (bgs) for both the upper most limit and lower most limit of the screen.
- **Top perforation –** The distance to the top of the perforation from the ground surface elevation.
- **Total well depth** – The depth that a well is installed to. This is often deeper than the bottom of the screened interval.
- **Water surface elevation –** The elevation above mean sea level that water is encountered inside the well

4.1.2 Other Terms

- **Best management practice** – Refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science (Title 23 of the California Code of Regulations [CCR], Article 2).
- **Constituent** – Refers to a water quality parameter measured to assess groundwater quality.
- **Data gap** – Refers to a lack of information that significantly affects the understanding of the Basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a Basin is being sustainably managed (Title 23 of the CCR, Article 2).
- **Depth to groundwater –** This is the distance from the ground surface to groundwater typically reported at a well.
- **Historical high groundwater elevations –** This is the highest recorded measurement of static groundwater elevation (closest to the ground surface) in a monitoring well. Measurements of groundwater elevation are used to indicate the elevation of groundwater levels in the area near the monitored well.
- **Historical low groundwater elevations –** This is the lowest measurement of static groundwater elevation (furthest from the ground surface) in a monitoring well that was recorded. Measurements of groundwater elevation are used to indicate the elevation of groundwater levels in the area near the monitored well.