TULARE LAKE SUBBASIN
WATER QUALITY MANAGEMENT PLAN

(version 0.1 - 3/4/26)

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1 Document Scope and Application

Geosyntec Consultants, Inc. (Geosyntec) has prepared this Sampling and Analysis Plan (SAP) to be included as an Appendix in the updated 2025 GSP for the Tulare Lake Subbasin (Figure 2-1 of GSP). The objective of this SAP is to establish consistent field data collection and laboratory analytical procedures and protocols for sampling groundwater quality. The SAP incorporates pertinent protocols presented in the Department of Water Resources (DWR) Best Management Practices for the Sustainable Groundwater Management of Groundwater Monitoring Protocols, Standards, and Sites (DWR 2016b).

A critical part of the Sustainable Groundwater Management Act (SGMA) is avoiding significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies. This SAP details the analytical methods, Quality Assurance Project Plan (QAPP) procedures, and that support the process for confirming the event of a Minimum Threshold exceedances as detailed in the Minimum Threshold Exceedance Policy outlined in Chapter 4.5. Together with the monitoring locations discussed in Chapter 5, these tools were designed to evaluate water quality conditions across the Subbasin. See Appendix I for a discussion of tiered management response actions for addressing water quality concerns.

1.1 SAP and QAPP Applicability

This SAP serves to establish a monitoring plan and consistent monitoring procedures associated with the sustainability indicator for degraded water quality. This SAP details:

- Water sample collection procedures
- Laboratory analytical methods
- Data Quality Assurance (QA) and Quality Control (QC) procedures
- Sampling locations
- Sampling schedule

This SAP formalizes field techniques and procedures of the Quality Assurance Project Plan (QAPP, See Section 3). The QAPP provides a framework for implementing procedures for field sampling, chain-of-custody, sample transportation, laboratory analysis, and reporting that will yield defensible data of known quality. Together, the SAP and QAPP are designed to facilitate data collection such that data are of acceptable quality to meet project requirements.

1.2 TLSB Principal Decision Making

The SAP principal decision makers are the five GSAs within the Subbasin:

- South Fork Kings GSA
- Mid-Kings River GSA
- El Rico GSA
- Southwest Kings GSA
- Tri-County Water Authority

These decision makers will use data collected in accordance with this SAP in their management decision making process. Each of the five participating GSAs operate under an Interim Operating Agreement (effective September 1, 2017) to facilitate coordination and management actions. The Interim Operating Agreement is categorized as a legal agreement and ensures communication and coordination of the data and methodologies used by each GSA in developing the GSPs within the Subbasin for several factors, including groundwater elevation and extraction data, surface water supply, total water use, change in groundwater storage, water budget, total water use, and sustainable yield.

2 Tulare Lake Subbasin Groundwater Quality Monitoring Sites

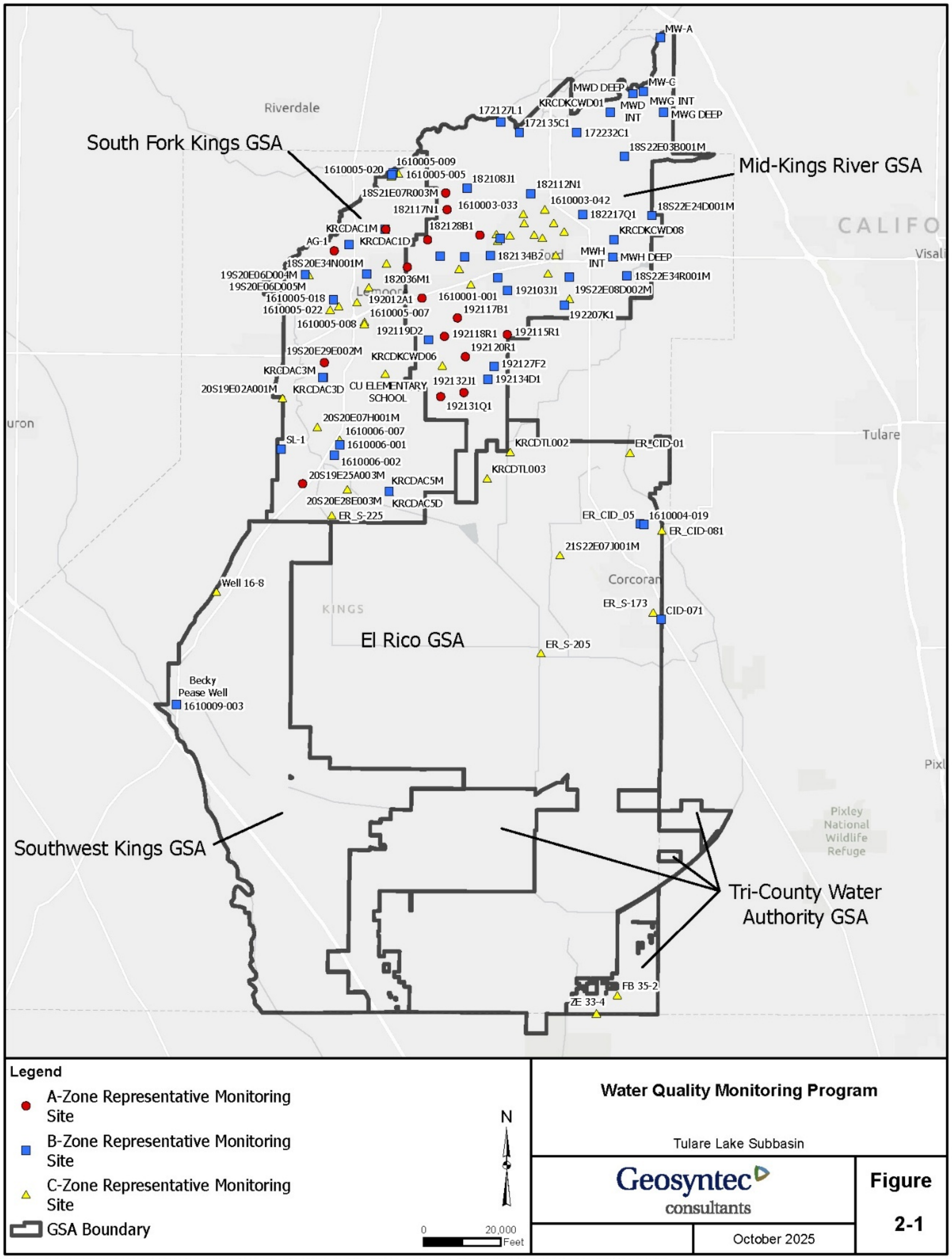
The SAP includes the identification of all current groundwater representative monitoring sites (RMS) for groundwater quality monitoring. Included are the locations of the RMS wells and the owning GSA responsible for monitoring the RMS.

2.1 Groundwater Quality Representative Monitoring Sites

RMS for groundwater quality are a subset of the RMS network. The RMS network is utilized to track the sustainable management criteria set forth in the TLSB GSP (Define in intro). Specifically, the TLSB RMS network monitors sustainability indicators that are likely to pose an undesirable result (UR) within the Subbasin. RMS for groundwater quality then track any significant and/or unreasonable degradation of groundwater quality that may result from groundwater management.

The RMS are representative of groundwater conditions for their respective representative monitoring areas (RMA). RMAs throughout the subbasin are not only defined by their longitudinal extent but also by a vertical dimension representative of a specific portion of an aquifer. Any wells within the boundaries of an RMA then have their groundwater conditions represented by RMS characteristics.

A map of the groundwater quality RMS network is presented in Figure 2-1 below.



P:\GIS\Tulare Lake Subbasin\Tulare Lake Subbasin.aprx\TLSB_WQ_RMS_RMA_All_Zones 10/17/2025 1:39 PM (Mark.Pratt)

Figure 2-1

It is important to note that field personnel are not expected to sample all listed RMS sites for groundwater quality as the TLSB RMS Network is comprised of wells included in existing groundwater monitoring programs such as the Groundwater Ambient Monitoring and Assessment (GAMA) Program and the Irrigated Lands Regulatory Program (ILRP). Information regarding which wells field personnel will be gathering data from is stored in the TLSB DMS.

2.1.1 El Rico GSA Groundwater Quality RMS

Table 2-1 provided below lists the current monitoring sites for groundwater quality in the TLSB RMS network.

Table 2-1

Well ID	Aquifer	RMA	Well Type
CID-071	B	B-12	Unknown
ER_CID_05	B	B-37	Unknown
1610004-019	B	B-37	Municipal
21S22E07J001M	C	C-16	Monitoring
ER_CID-01	C	C-17	Unknown
ER_CID-081	C	C-17	Unknown
ER_S-173	C	C-15	Unknown
ER_S-205	C	C-16	Unknown
KRCDTL002	C	C-18	Irrigation
KRCDTL003	C	C-6	Irrigation

El Rico GSA currently has zero (0) groundwater quality RMS in the A-zone aquifer, three (3) groundwater quality RMS in the B-zone aquifer, and seven (7) groundwater quality RMS in the C-zone aquifer. El Rico GSA then has a current total of ten (10) RMS for groundwater quality.

2.1.2 Mid-Kings River GSA Groundwater Quality RMS

Table 2-2 provided below lists the current monitoring sites for groundwater quality in the TLSB RMS network for Mid-Kings River GSA.

Table 2-2

Well ID	Aquifer	RMA	Well Type
192132J1	A	A-1	Monitoring
192120R1	A	A-2	Monitoring
192115R1	A	A-15	Monitoring
182128B1	A	A-17	Monitoring
192131Q1	A	A-29	Monitoring
192118R1	A	A-3	Monitoring
192012A1	A	A-8	Monitoring

Well ID	Aquifer	RMA	Well Type
182130D1	A	A-16	Monitoring
192117B1	A	A-14	Monitoring
182117N1	A	A-18	Monitoring
182036M1	A	A-11	Monitoring
18S21E07R003M	A	A-19	Unknown
192134D1	B	B-9	Monitoring
192127F2	B	B-14	Monitoring
192119D2	B	B-43	Monitoring
192207K1	B	B-17	Monitoring
192103J1	B	B-18	Monitoring
192103B1	B	B-15	Monitoring
182132A1	B	B-23	Monitoring
182134B2	B	B-19	Monitoring
182112N1	B	B-30	Monitoring
182108J1	B	B-26	Monitoring
172127L1	B	B-33	Monitoring
182217Q1	B	B-29	Monitoring
172135C1	B	B-32	Monitoring
172232C1	B	B-34	Monitoring
18S21E31B001M	B	B-21	Unknown
18S22E03B001M	B	B-31	Unknown
18S22E24D001M	B	B-40	Irrigation
18S22E34R001M	B	B-16	Domestic
KRCDKCWD01	B	B-44	Irrigation
KRCDKCWD05	B	B-28	Irrigation
KRCDKCWD08	B	B-27	Irrigation
MW-A	B	B-36	Monitoring
MW-C	B	B-35	Monitoring
MWD INT	B	B-38	Monitoring
MWG INT	B	B-39	Monitoring
MWH INT	B	B-41	Monitoring
1610003-044	B	B-17	Municipal
19S22E08D002M	C	C-19	Monitoring
KRCDKCWD06	C	C-9	Unknown
MWH DEEP	C	C-19	Monitoring
MWD DEEP	C	C-22	Monitoring
MWG DEEP	C	C-22	Monitoring
1610001-001	C	C-9	Municipal
1610001-007	C	C-9	Municipal
1610003-031	C	C-20	Municipal

Well ID	Aquifer	RMA	Well Type
1610003-039	C	C-20	Municipal
1610003-036	C	C-20	Municipal
1610003-041	C	C-20	Municipal
1610003-033	C	C-20	Municipal
1610003-040	C	C-20	Municipal
1610003-026	C	C-20	Municipal
1610003-028	C	C-20	Municipal
1610003-043	C	C-20	Municipal
1610003-042	C	C-20	Municipal
1610003-037	C	C-20	Municipal
1610003-034	C	C-20	Municipal

Mid-Kings River GSA currently has twelve (12) groundwater quality RMS in the A-zone aquifer, twenty-seven (27) groundwater quality RMS in the B-zone aquifer, and nineteen (19) groundwater quality RMS in the C-zone aquifer. Mid-Kings River GSA then has a current total of fifty-eight (58) RMS for groundwater quality.

2.1.3 South Fork Kings GSA Groundwater Quality RMS

Table X provided below lists the current monitoring sites for groundwater quality in the TLSB RMS network for South Fork Kings GSA.

Well ID	Aquifer	RMA	Well Type
19S20E29E002M	A	A-4	Monitoring
20S19E25A003M	A	A-20	Piezometer
AG-1	A	A-10	Agricultural
KRCDAC1S	A	A-13	Monitoring
1610005-009	B	B-25	Public
18S20E34N001M	B	B-22	Domestic
KRCDAC3D	B	B-10	Monitoring
KRCDAC5M	B	B-8	Monitoring
LR-4	B	B-42	Agricultural
SL-1	B	B-7	Monitoring
1610006-001	B	B-7	Municipal
1610006-002	B	B-7	Municipal
1610005-003	B	B-25	Municipal
1610005-018	B	B-10	Municipal
1610005-011	C	C-10	Public
1610005-020	C	C-10	Public
19S20E06D005M	C	C-8	Irrigation

20S20E07H001M	C	C-7	Domestic
20S20E28E003M	C	C-5	Irrigation
KRCDAC5D	C	C-6	Monitoring
1610006-007	C	C-7	Municipal
1610005-021	C	C-8	Municipal
1610005-007	C	C-7	Municipal
1610005-010	C	C-10	Municipal
1610005-022	C	C-8	Municipal
1610005-005	C	C-21	Municipal
1610005-008	C	C-7	Municipal
1610005-006	C	C-10	Municipal

South Fork Kings GSA currently has zero (0) groundwater quality RMS in the A-zone aquifer, three (3) groundwater quality RMS in the B-zone aquifer, and seven (7) groundwater quality RMS in the C-zone aquifer. South Fork Kings GSA then has a total current total of ten (10) RMS for groundwater quality.

2.1.4 Southwest Kings GSA Groundwater Quality RMS

Table X provided below lists the current monitoring sites for groundwater quality in the TLSB RMS network for Southwest Kings GSA.

Well ID	Aquifer	RMA	Well Type
Becky Pease Well	B	B-2	Municipal
1610009-003	B	B-2	Municipal
Well 16-8	C	C-4	Irrigation

Southwest Kings GSA currently has zero (0) groundwater quality RMS in the A-zone aquifer, two (2) groundwater quality RMS in the B-zone aquifer, and one (1) groundwater quality RMS in the C-zone aquifer. Southwest Kings GSA then has a current total of three (3) RMS for groundwater quality.

2.1.5 Tri-county Water Authority GSA Groundwater Quality RMS

Table X provided below lists the current monitoring sites for groundwater quality in the TLSB RMS network for Tri-county Water Authority GSA.

Well ID	Aquifer	RMA	Well Type
FB 35-2	C	C-11	Irrigation
ZE 33-4	C	C-11	Irrigation

Tri-county Water Authority GSA currently has zero (0) groundwater quality RMS in the A-zone aquifer, zero (0) groundwater quality RMS in the B-zone aquifer, and two (2) groundwater quality RMS in the C-zone aquifer. Tri-county Water Authority GSA then has a current total of two (2) RMS for groundwater quality.

2.2 RMS Network Updates

The RMS network is designed to be adaptive meaning that wells (and stations) can either be removed from the network or added to the network. RMS may be removed partially meaning that a well previously used for groundwater quality and groundwater level data may be only monitored for one of those parameters moving forward. Conversely, where data gaps are identified then RMS will be proposed to fill said data gaps.

3 Groundwater Quality Sampling Procedure

This section details the protocols that must be taken when collecting groundwater quality samples. Protocols are outlined for field personnel that include field preparation and sampling methodologies based on well types. This procedure has been standardized to collect quality data and yield reproducible results.

3.1 Field Safety

Field data collection in the TLSB presents inherent hazards for field personnel and necessary precautions must be taken when collecting data. Field personnel must be equipped with an appropriate level of personal protective equipment (PPE) and attire to safely collect data while being exposed to the environment for extended periods of time. While not comprehensive field personnel can expect to face (1) various weather-related conditions, (2) potential exposure to chemicals and matrix constituents, (3) travel related hazards, and (4) site specific and terrain hazards. Along with supporting the logistics of sample retrieval, a buddy system will be enforced to improve supervision, communication, and general adherence of safety protocols.

3.1.1 Weather Safety

Data collection for groundwater quality is scheduled to occur semi-annually with one data collection event occurring in the Spring and the other data collection event occurring in the Fall. Both seasons can present local weather challenges for field personnel, with the primary concern being heat illness. Field personnel must take all precautions necessary to limit sun exposure and prevent heat illness. Notable precautions include:

1. Remaining hydrated through ample water breaks and electrolyte drinks as needed.
2. Limiting sun exposure through pop-up shade or wearing long clothes.

3. Keeping cool by taking breaks on an as needed basis.
4. Viewing the National Weather Service Index to assess the risk level for heat illness.

Regardless of the current weather condition(s) field personnel should take time to prepare by consulting the weather forecast. Forecasted weather allows for the selection of field personnel that have been acclimated to the local weather and selection of appropriate attire.

3.1.2 Chemical Safety

The collection of groundwater quality data poses the risk of exposure to chemicals (some of which can be found in the sample bottles used for preservation) and groundwater contaminants. As part of the PPE, field personnel must wear appropriate gloves (e.g. neoprene gloves) when collecting samples. Field personnel will also have access to protective eyewear and face shields if requested.

3.1.3 Terrain Considerations

The RMS network for groundwater quality data covers a large area of the Subbasin. As such, the terrain in which the wells are located can vary greatly. Field personnel must be cautious of terrain conditions typically found in both urban and agricultural environments. Uneven terrain can present slips, trips, and falls; wild growth can hide animals or unstable terrain. All field personnel must be trained to wear PPE and traverse multiple terrain types prior to a data collection event.

3.2 Field Preparation

In order to establish consistent data collection procedures, consideration must be given to all field preparation processes as they are conducive in creating reproducible data conditions and limit human error. Data collection for groundwater quality is conducted on a semi-annual basis and field personnel must follow the field preparation protocols prior to each sampling event.

3.2.1 Coordination

The TLSB RMS network for groundwater quality is built from various wells with each well having been constructed for different operational purposes. Currently the TLSB RMS network for groundwater quality includes active agricultural/irrigation wells. Well owners and operators of these irrigation wells typically adhere to a predetermined irrigation schedule. This effectively imposes a temporal limit for when groundwater quality samples can be collected (this is in addition to the program semi-annual schedule) along with general access considerations.

Coordination between field personnel collecting groundwater data and well owners/operators must be conducted at least two weeks prior to a data collection event. Coordination can include telephone conversations, email, or cellular texting if it is the preferred method of contact for a well owner/operator. The desired outcomes of any coordination between a well-owner/operator and field personnel are:

1. Documented confirmation that access to a well will be granted to field personnel.
2. Documented confirmation that the well will be operating or a well operator will be present such that field personnel can collect groundwater samples.
3. Documentation of any information (regarding access or field conditions) that a well owner/operator wishes to relay to field personnel.

Contact information and crucial access information is documented in the TLSB DMS as it pertains to an RMS for groundwater quality or groundwater water levels.

3.2.2 Sample Bottle Preparation

Coordination with a lab must also occur prior to the week of the field sampling event. When coordinating with a lab it must be established that:

1. The lab has the facilities or means to run a lab analysis on all COCs.
2. The lab has the facilities or means to run a lab analysis using the specified methods.
3. Field personnel can collect the required volume of water needed by the lab to run the requested analysis.

The COCs for TLSB along with the analysis method are shown in Table X below.

Analyte	Method
TDS	SM 2540C
Nitrate	EPA 300
Arsenic	EPA 200.8
Uranium	EPA 200.8
Gross Alpha	EPA 900.0
Sulfate*	EPA 300
Chloride	EPA 300
1,2,3 - TCP	524 SRL

The procedure that must be followed to ensure proper preparation of the sample bottles is as follows:

1. Sample bottles must be ordered from the contracted lab with sufficient time to ensure field preparation.
    a. Some sample bottles will have sample preservatives meaning that the sample bottles must not be ordered so far in advance that the sample preservatives expire.

2. Inventory of the received bottles must be taken, ensuring that
    a. the correct bottle types have been given,
    b. where applicable the sample bottles must contain the proper preservative and,
    c. sufficient sample bottles have been given to collect the necessary volume of groundwater.
3. Review any instructions regarding sampling either by the lab or PM.
    a. Questions regarding any sampling instructions must be relayed to the PM.
4. The sample Chain of Custody form must be pre-populated[1] where applicable.
5. Sample bottles labels must be pre-populated where applicable.
    a. Known information can include sample site, sample ID, etc.
6. The field Sample Log must be pre-populated where applicable.
7. Sample bottles must be stored in a protective, insulated container, that is suitable for transit until field sampling commences.

3.2.3 Equipment and Sampling Supplies

A comprehensive list of equipment that must be taken for groundwater quality data collection is provided in Attachment X. Table X below lists what equipment must be brought out along with the intended purpose of the item.

Item	Purpose
PPE	Personal Protective Equipment includes field boots and long clothing.
Calibrated Field Meter	Ensure field parameters for pH, temperature, and turbidity are stable.
Sample Container	Act as a reservoir to hold groundwater when conducting field measurements.
Clean Wipes/Rags	Used in cleaning the field meter or sampling equipment.
Deionized Water	Used in cleaning the field meter.
Sample Bottles	Given by laboratory that will conduct matrix analyses; bottles will contain the samples.
Disposable Gloves	Neoprene (or adjacent material) gloves to be worn when collecting samples.
Ice Chest(s)	Insulate storage for holding collected samples.
Ice Pack	To be stored in the ice chest with samples to keep temperatures cool throughout transit.
Writing Utensils	Blue or Black ink Pens for documentation and markers.
Chain of Custody Form	Document integrity of sample transport and custody.
Field Log	Document field parameters for future reference.
SOP	Standard operating procedures on standby for quick reference.

[1] Any documentation done for TLSB Groundwater Quality sampling must be done so in non-erasable blue or black ink. Best practice dictates that mistakes are struck out, replaced by the correct information, and proceeded with initials and the date.

Item	Purpose
Spare Bottles	Spare sample bottles; contingencies.
Batteries	Additional power reserves for field meters.
Tools	General tools for access (e.g. wrench, a prying tool, etc.)
Hydrasleeves	Passive sampling bailers for collecting monitoring well samples.

3.3 Sampling Methodology

The sampling standard operating procedures are defined in section 3.3.2, but consideration must be given to the intended operation of the well from which samples will be collected.

3.3.1 Agricultural Wells

Samples taken from agricultural wells must be cognizant of both the semiannual groundwater data collection schedule and their respective irrigation schedules.

For the Spring event, ideally groundwater samples will be collected provided that the well has been operational long enough to clear the well column of stagnant water. This process can take up to a week. Prior to collecting the groundwater sample, field parameters (conductivity, pH, temperature, and turbidity) must be measured and recorded. Sample collection can only begin once the field parameters have stabilized.

For the Fall event field personnel must have coordinated with well owners and operators to ensure access prior to the end of the irrigation season. Groundwater level data collection must occur within a two-week period following groundwater quality data collection.

Groundwater will be collected from agricultural wells out of either a sampling port, auxiliary spigot, or any other port identified by the well operator that is upstream of any filters and/or injection lines.

3.3.2 Municipal Wells

Samples taken from municipal wells must only be taken provided that (1) the well has been operational long enough to clear the well column of stagnant water, and (2) the measured field parameters (conductivity, pH, temperature, and turbidity) have stabilized.

Groundwater will be collected from municipal wells out of either a sampling port, auxiliary spigot, or any other port identified by the well operator that is upstream of any filters.

3.3.3 Domestic Wells

Samples taken from domestic wells must only be taken provided that (1) the well has been operational long enough to clear the well column of stagnant water, and (2) the measured field parameters (conductivity, pH, temperature, and turbidity) have stabilized.

Groundwater will be collected from domestic wells out of either a sampling port, auxiliary spigot, or any other port identified by the well operator that is upstream of any filters.

3.3.4 Monitoring Wells

Groundwater quality samples can only be taken from dedicated monitoring wells provided that the well has been purged of at least three well casings or until the field parameters (conductivity, pH, temperature, and turbidity) stabilize.

Samples taken from dedicated monitoring wells will be collected by using passive samplers such as Hydrasleeves. Where Hydrasleeves are tubular disposable bailers with a polyethylene check valve at the top of the sampler. Hydrasleeves will be deployed at the predetermined depth (coinciding with the well screen interval) and pulled upwards to capture a core of water representative of the well screen interval. Operating procedures regarding the use of Hydrasleeves are further discussed in Section 3.3.5.

3.3.5 Sampling Operating Procedure

Following all field preparations discussed in Section 3.2 the outlined procedure must be followed to ensure consistent groundwater quality data collection:

1) Calibrate all field equipment following the manufacturer's instructions.
    a) Field equipment must be calibrated daily prior to leaving for the field to minimize error and/or delay(s).
2) Pack the lab-provided trip blank (TB) in the cooler; TBs must remain with samples throughout collection, storage, and shipment.
3) Arriving at the site, purging will be conducted as follows:
    a) If water is collected from an operational well (e.g. municipal or agricultural) then flush the sample port at the site to remove stagnant water. Then set the flow rate to approximately 500 mL/min.
    b) If water is collected from a dedicated monitoring well then begin purging three times the well volume and/or verify if the well parameters (conductivity, pH, temperature, and turbidity) are stable.
4) Wear fresh lab-style gloves (e.g. neoprene) at each location.
5) Perform field analyses for conductivity, pH, temperature, and turbidity following the equipment manuals:

a) For conductivity, pH, temperature stir probe in sample, record the stabilized reading, avoid container contact, and rinse with DI water after use.
b) For turbidity, rinse vial with sample, fill/cap, measure, then rinse with DI water. If a meter is used that can also measure turbidity, this step can be ignored.

6) Store probes and sample containers per manufacturer instructions; rinse and wipe probes before storage.
7) Complete chain of custody documentation and Field Sample Log with sample information, field results, flow conditions, and observations.
   a) Add any information or details that have not been pre-filled in the field preparation phase.
8) Label sample bottles with date, time, sampler initials, and site information as needed.
   a) Time is to be recorded following a 24-hour clock (e.g. 1:00 p.m. is recorded as 13:00)
9) Fill bottles per instructions:
   a) Each sample bottle must be filled to the indicated line (typically the neck of the bottle).
   b) Do not overflow bottles with preservatives as this may dilute the preservative and result in an invalid sample.
   c) Fill VOA vials with a convex meniscus; this ensures no air bubbles are trapped in the container. It is important that VOA vials are capped with no headspace while at the same time they do not overflow.
10) Immediately place samples in coolers/ice chests with ice packs.
   a) Only store sample bottles in coolers to prevent contamination.
   b) Ensure the samples are stored such that they are free of excessive movement during transit.
11) Create a photographic record of sample tap and location
   a) If the sampling port or spigot is considerably distant from the RMS, record GPS coordinates for documentation.

3.4 Sample Storage and Transit

Following the collection of a groundwater sample, the samples will be placed in an insulated storage container with an ambient temperature of 4°C unless instructed otherwise by the contracted lab. These temperatures must be held throughout the hold time and transit until they are under the lab's custody.

Hold times are dependent on the analytes; the hold time for the TLSB COCs is based on Nitrates and Nitrites which have a short hold time of 48 hours. Recognizing these short hold times means that (1) samples must be shipped to a lab on the same day they are collected and (2) samples must not be shipped or collected unless the sample collection event is followed by a minimum of two consecutive business days.

More details regarding the storage of samples during a data collection event is presented in Section 3.3.5.

3.5 Field Impediments and Troubleshooting

While field preparation will have been conducted to minimize inconsistencies, uncertainties will occasionally present themselves in the field. Any impediments in collecting groundwater data must be documented in a field log and relayed to the project manager (PM). If the nature of the obstacle involves unusual readings from the field meter(s) then field personnel must take additional readings to confirm the result. If the obstacle regards field or well access, then field personnel must contact the PM to resolve any scheduling conflicts between a well operator and field personnel.

4 Data Quality Assurance and Quality Control

Quality assurance and quality control measures are established for the collection and recording of groundwater quality data. These quality control measures also extend into the preservation, transportation, and analyses of the sample data.

4.1 Water Quality Sampling Best Practices

All groundwater sample collection will be conducted with accordance with best practices:

1. Documentation of field events and conditions that transpired at the time of data collection must occur to interpret any outlying data that may present itself in future analysis.
2. Changes to the groundwater quality RMS network will require approval from the TLSB GSAs.
3. All field equipment must be calculated according to the manufacturer's instructions. Calibration parameters must be documented in a field log held by the field personnel. This field log should also document field equipment readings in addition to any anomalies encountered when taking field readings.
4. Laboratory provided trip blanks must be stored with any field samples collected, where trip blanks will be transported and stored as if they were samples themselves.
5. Groundwater samples must only be collected provided that sufficient purging has been conducted to flush the well. Please see Section x for more details on well purging as it pertains to groundwater sample collection.

6. Chain of custody forms must be completed and provided along with the collected samples.

5 Data Reporting

Sample results must be recorded into the GSA DMS. Data entry will be facilitated through electronic document delivery (EDD) format provided by the contracted lab. Sample results must be in a comma separated value (CSV) format to ensure (1) data is easily imported into the GSA DMS and (2) data entry errors are minimized when importing sample results into the DMS.

Sample results will be reviewed for SMC alignment, meaning the concentrations for the TLSB COCs will be measured against the established MT. In the event that the concentration of one or more COC is greater than its established MT, then the GSA must follow the Groundwater Quality Exceedance Plan outlined in Section 6.

All data will be published and accessible to the public through the SGMA portal and annual reports hosted on the SGMA portal.

6 Groundwater Quality Exceedance Plan

Following the collection and analyses of groundwater quality data, evaluations must be made against the data analysis results and the Subbasin sustainable management criteria. Instances where concentrations for any of the Subbasin COC exceed either their respective minimum threshold (MT) or measurable objective (MO) must be addressed through efforts outlined in the TLSB Groundwater Quality Exceedance Plan. The Subbasin groundwater quality exceedance plan is a standardized procedure established to:

1. Ensure sustainable management criteria for groundwater quality are sufficient in leading the Subbasin to sustainable operating conditions throughout the GSP implementation process.
2. Develop the methodology for evaluating data against the Subbasin's sustainable management criteria.
3. Outline the management actions that TLSB GSAs will take when addressing groundwater quality exceedances. Where management actions include:
   - Identifying wells potentially impacted by degraded groundwater quality.
   - Establishing communication protocols between stakeholders impacted by MT exceedances.

- Establishing investigation protocols for assessing whether MT exceedances result from GSA management.
- Provide stakeholders with resources for addressing groundwater quality impacts including interim drinking water supplies, and well mitigation.
- Reassessing non-groundwater quality sustainable management criteria based on documented (and quantified) groundwater quality MT exceedances.

6.1 Tulare Lake Subbasin Contaminants of Concern and MTs

The COCs identified for TLSB are based on (1) Maximum Contaminant Levels (MCLs) and Secondary Contaminant Levels (SMCLs) set by the Division of Drinking Water (DDW) of the California State Water Resources Control Board (SWRCB) and (2) Water Quality Objectives specific to agricultural operations. COCs for TLSB were selected out of the Title 22 constituents based on a historical presence in the Subbasin with concentrations exceeding the level of concern. The TLSB COCs along with the MTs are summarized in Table X below.

Constituent of Concern	Minimum Threshold
Salinity (measured as TDS)	1,000 $\frac{mg}{L}$
Nitrate (Measured as N)	10 $\frac{mg}{L}$
Arsenic	1.0 $\frac{\mu g}{L}$
Uranium	20 $\frac{pCi}{L}$
Gross Alpha	15 $\frac{pCi}{L}$
Sulfate	500 $\frac{mg}{L}$
Chloride	500 $\frac{mg}{L}$
1,2,3, -TCP	0.005 $\frac{\mu g}{L}$

The MTs for COCs are set to match the lowest criteria of either the MCLs, SMCLs, or the WQOs. With that, the MTs for each respective COC were selected to prevent beneficial users of groundwater from losing access to usable water and/or experiencing a decline in groundwater quality that affects the groundwater's intended land uses.

6.2 Defining TLSB Groundwater Quality Undesirable Results

Under SGMA UR fall under the SMC as a means to indicate whether the sustainability goal set by the subbasin are being met within the Subbasin. There are UR for different sustainability indicators (e.g. groundwater levels, subsidence, etc.), but the UR for groundwater quality is manifested when a deterioration in quality is observed at a collection of RMS wells throughout the subbasin.

The current GSP indicates that for groundwater quality, an undesirable result for groundwater quality is set to occur in the subbasin if any of the following conditions are met:

1. Ten RMS wells record minimum threshold exceedances, caused by groundwater activities occurring after January 1, 2015, within a single water year for any single or combination of COCs;

   Or

2. Five small community wells sampled under DDW regulatory requirements have a new, confirmed MCL exceedance for a COC, attributable to groundwater management actions based on technical analysis;

   Or

3. GSAs are unable to meet mitigation demand for domestic wells impacted by groundwater quality degradation associated with groundwater activities after January 1, 2015

TLSB Groundwater Quality RMS Wells

GSA	No. Wells
El Rico GSA	10
Mid-Kings River GSA	58
South Fork Kings GSA	35
Southwest Kings GSA	3
Tri-County Water Authority GSA	2
TOTAL:	108
Undesirable Result MT:	10

6.3 TLSB Stakeholder Roles and Coordination for Groundwater Quality Exceedance

Implementation of the TLSB Groundwater Quality Exceedance Plan requires communication amongst several agencies or stakeholders working towards sustainability and protecting groundwater quality within the Subbasin. This section identifies agencies and stakeholders that operate within the Subbasin to the capacity of implementing groundwater quality protection and interests.

6.3.1 TLSB GSAs

In part, compliance of SGMA means that the TLSB GSAs are required to uphold the SMCs by monitoring sustainability indicators within the Subbasin. Notably TLSB GSAs are responsible for managing groundwater without the occurrence of URs resulting from GSP implementation. The GSAs, however, are not to be held responsible for impacts that may qualify as URs if they occur or are carried over from preexisting January 1, 2015 conditions.

Specifically for groundwater quality, TLSB GSAs are responsible for:

1. Monitoring groundwater quality seasonally for any signs of degrading water quality.
    a. GSAs must be cognizant of COC concentrations as they exceed the respective MO and subsequentially pose a risk of exceeding the established MT.
2. Reporting groundwater quality analytical results to the public (e.g. SGMA portal uploads).
3. Notifying affected stakeholders if groundwater quality exceedances are confirmed.
4. Providing affected domestic well owners with resources for mitigation in the event of confirmed COC exceedances.
    a. The GSAs have prepared their own respective Well Mitigation Plans that outline how mitigation will be provided and qualifying circumstances.
    b. In cases where an MT exceedance resulted from preexisting January 1, 2015 conditions the GSAs are not responsible for providing well mitigation. However, the GSAs can aid non-qualifying circumstances by providing the well-owner with resources (e.g. fliers, contact information) for potential solutions.
5. Implementing management actions that stop the degradation of groundwater quality and/or improve groundwater quality where preexisting January 1, 2015 conditions are below the MT.

6.3.2 California Water Boards: Central Valley Regional Water Quality Control Board

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Boards (Regional Boards) collectively make the California Water Boards (Water Boards). The governing regional control board for TLSB is the Central Valley Regional Water Quality Control Board (Central Valley Water Board). Where the Regional Boards and the Central Valley Water Board by extension hold the regulatory responsibility of protecting water quality through the federal Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act.

The Central Valley Water Board regulates discharges of groundwater including designated beneficial uses and water quality objectives. The Central Valley Water Board issues waste discharge requirements with the intent of upholding applicable water quality standards. The

Central Valley Board then regulates the dischargers in the TLSB along with the constituents of their discharge (including shared COCs with the Subbasin GSP). Of particular interest to the Subbasin, the dischargers regulated by the Central Valley Water Board include irrigated agriculture, dairy facilities, industrial dischargers, land application of biosolids, and food processors amongst others.

6.3.3 Irrigated Lands Regulatory Program

The discharge of waste to surface and groundwaters from irrigated lands in the Subbasin are regulated by the Central Valley Water Board through the Irrigated Lands Regulatory Program (ILRP). Specifically, the TLSB waste discharge requirements are outlined in the Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group, Order R5-2013-0120-09 (General Order R5-2013-0120). Implementation of the ILRP allows growers to join a third-party coalition for assistance with compliance of program provisions and administration of reporting requirements. Within TLSB there is one applicable third-party coalition group, the Kings River Water Quality Coalition (KRWCQ).

Under the ILRP the reporting requirements most pertinent to the TLSB SAP are those that monitor shared COCs such as Nitrates. The Kings River Water Quality Coalition must address nitrate loading through:

- Developing an Irrigation and Nitrogen Management Plan
- Developing Nitrate Control Program Early Action Plans
- Annual monitoring that reports nitrogen applied to crops, nitrogen removed, etc.
- Providing outreach on best management practices to aid growers in minimizing nitrate loading
- Groundwater Quality Trend Monitoring including testing on domestic wells

6.3.4 Kings River Water Quality Coalition

The Kings River Water Quality Coalition is a joint powers agency comprised of the irrigation districts within the Kings River service area. While KRWQC is not a regulatory or enforcement agency they are the regional third-party group that bares the responsibility of preparing and submitting various reports outlined in General Order R5-2013-0120. As a third-party KRWQC gives growers that irrigate or operate within the Tulare Lake Basin Area the opportunity to join the coalition for representation and assistance with General Order R5-2013-0120 requirements. The alternative would pass all compliance requirements onto the grower for each farming operation.

Because General Order R5-2013-0120 addresses discharges to surface water and groundwater, the outlined requirements greatly align with the GSA's interest in preserving the groundwater quality within the Subbasin. KRWQC provides a much appreciated role in helping local growers comply with ILRP requirements and subsequently reducing unregulated discharges throughout the Subbasin.

6.3.5 Kings County

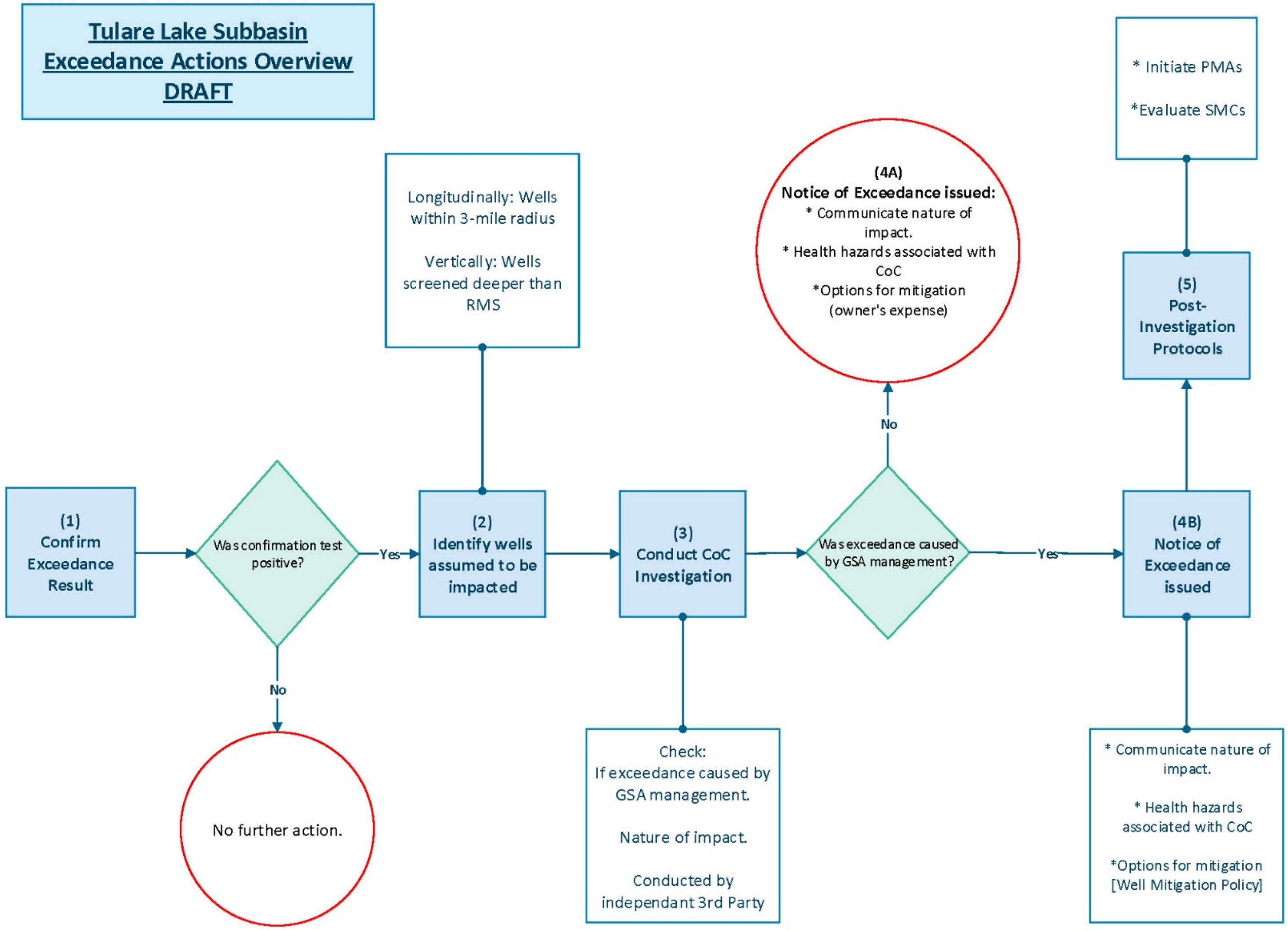
The five TLSB GSAs are within the jurisdictional boundaries of the County of Kings (Kings County) making coordination with Kings County critical in implementing groundwater management. Specifics of the coordination between TLSB GSAs and Kings County are outlined in Section 2 of the GSP.

Kings County has adopted well ordinances to (1) protect the health, safety, and general welfare of the Kings County residents and (2) ensure that groundwater of the County and State are free of contamination and/or pollution. The county ordinances require that any reconstruction, repair, destruction, and construction of wells (e.g. Cathodic protection, water, and monitoring) are regulated through permitting and inspection. Further, the County and TLSB GSAs have begun coordinated efforts to include the GSAs in the well permitting process. Permits for new wells must be approved by the GSAs provided that the construction of a new well will not contribute to the manifestation of UR.

6.4 Groundwater Quality Exceedance Plan

Any exceedances of the groundwater quality MTs must be addressed in a reproducible manner that can mitigate various types of exceedances impacts throughout: varying aquifer conditions, COC exceedances, and affected well types. A general overview of the TLSB Groundwater Quality Exceedance Plan is provided below in Figure X.

Tulare Lake Subbasin Exceedance Actions Overview DRAFT



DRAFT

The TLSB Groundwater Quality Exceedance Plan can be dissected into 5 key steps.

1. Exceedance Result Confirmation – Any lab results reporting that the concentration of any COCs exceeds its respective MT, will need to be confirmed through an independent resample collection and analysis.
2. Identification of Impacted Wells – Following a confirmed COC exceedance, the GSA will identify wells potentially impacted by said exceedance. Impacted wells will be within a representative area whose boundaries extend 3 miles from the RMS well.
3. Exceedance Investigation – The GSA will contract an independent third party to conduct an investigation where the aim is to determine the cause of the COC exceedance and whether the exceedance resulted from GSA management.
4. Stakeholder Communication – Communication with potentially impacted well owners must be established regardless of the results from the exceedance results. The narrative of communication will be dependent on the nature of the COC exceedance and health impacts introduced by the COC.
5. Post-Investigation Protocols – These protocols are dependent on the results of the exceedance investigation where if it is determined that the COC exceedance was induced by GSA management then project management actions (PMAs) will be implemented.

6.4.1 Exceedance Result Confirmation

Any lab results reporting that the concentration of any COCs exceeds its respective MT, will need to be confirmed through an independent resample collection and analysis. First, the GSA must review any lab sheets or field logs corresponding with the sampling event for the RMS well under review. Any events or actions that could have compromised the results of the lab analysis will be noted and put under special consideration. The goal is to ensure that the identified impediment does not interfere with the resample collection and analysis.

The GSA will then collect another groundwater quality sample from the RMS well under review following the established groundwater collection protocols. During this recollection of the sample, field personnel will be required to document extraordinary field conditions (including the well condition).

The sample collected from the well under review for a potential COC exceedance will be sent to the contracted lab for further analysis. If the sample confirmation exceeds the MT for the COC, then the GSA will move forward with the second step of the TLSB Exceedance Plan. If instead the sample confirmation does not confirm an exceedance of the MT for a COC, then no additional action will be taken.

6.4.2 Identification of Impacted Wells

If an RMS well under review has confirmed that there is an MT exceedance, then it is the responsibility of the GSA to identify potentially impacted wells. Under the TLSB Groundwater Quality Exceedance Plan a well is considered to be potentially impacted by an MT exceedance provided that:

1. The well is within a 3-mile radius zone of influence from the RMS well with the confirmed MT exceedance.
2. The well has a screen interval that is equal to or deeper than the screen interval of the RMS well with the confirmed MT exceedance.

Logically, the GSA will first identify all WELL_TYPE_INSERT wells within a 3-mile radius of the RMS well with a confirmed MT exceedance. Then the GSA will use either the subbasin DMS or available resources to query the screen depths of any wells within 3-miles of the subject RMS well. Wells that meet both criteria are then considered to be potentially impacted by an MT exceedance and will be listed for further evaluation.

Identified wells assumed to be impacted by an MT exceedance will be linked to a well owner. Well owners will then be queued to receive notifications from the GSA regarding the MT exceedance. Communication protocols between the well owners of potentially impacted wells and the GSA are further discussed in section X.

6.4.3 Exceedance Investigation

The GSA will conduct an investigation to determine the nature of the impact caused by the MT exceedance and whether the MT exceedance was caused by GSA management policies. The MT exceedance investigation must be performed by an independent and credentialed professional. The investigation will consider nearby geographic extents (including the affected area) and historical records pertinent to characterizing local conditions of any potentially impacted well(s).

In general, all exceedance investigations will incorporate varying factors including (1) data considerations that include historical records and present conditions, (2) geographic considerations and spatial identification, (3) geologic considerations and, (4) operational considerations such as GSA management and agricultural practices. Table x below outlines the considerations that the exceedance investigation will incorporate.

Investigation Consideration Type	Consideration
Data Consideration	Assess well completion reports and well construction of impacted wells.
	Provide or assess hydrogaphs of wells assumed to be impacted
	Provide or assess chemographs of the pertinent COCs for any wells assumed to be impacted by the MT exceedance.
	Consider any available water quality data available for the area prior to January 1, 2015.
	Explore statistical correlation(s) between groundwater levels and concentrations of COC under investigation.
Geographic Consideration	Locate nearby production well (specifically look for new wells or groundwater users).
	Map land use of the affected parcels within 3-mile radius or greater if necessary.
	Determine source of any COC flagged for an MT exceedance.
Geologic Consideration	Describe local geology of impacted areas.
	Assess concentration and magnitude of COC within impacted aquifer.
	Consider any potential earth science or driving mechanisms that may contribute to groundwater quality reduction (e.g. geochemistry, hydrogeology, lithology, etc.).
Operations Consideration	Consider local and adjacent GSA management policies.
	Identify recharge operations either within the 3-mile radius or within plausible proximity.
	Explore statistical correlation(s) between groundwater recharge and concentrations of COC under investigation.

6.4.4 Stakeholder Communication

Communication between the GSA and at-risk well owners will begin following the exceedance result confirmation. The narrative and information conveyed from the GSA to the well owner is dependent upon the type of COC exceeding an established MT, and whether the MT exceedance is a result of GSA management policy. Currently the communication protocols anticipate distributing three letters:

1. The first notice is intended to inform at-risk well owners that there has been an MT exceedance. This letter will emphasize:
    a. Notifying all domestic and non-public wells within a three-mile radius that an RMS has a confirmed exceedance for some COC.
    b. Notification of the first letter does not indicate that any wells other than the confirmed RMS well exceeds the MT for the subject COC(s).
    c. The health risks associated with the subject COC(s).
    d. If the exceeded COC is nitrate, then recipients of the letter will be provided with resources to connect them with free well testing.

2. The second notice is dependent on whether the MT exceedance resulted from GSA management policy. If the results following the exceedance investigation indicate that GSA management did **not** contribute to the MT exceedance then the letter will detail:
    a. A reminder that an MT exceedance for an RMS well within three miles of a RMS occurred.
    b. The cause of the MT exceedance was found to be independent of GSA management and policy.
    c. The public health impacts associated with the COC triggering an exceedance.
    d. Materials and resources available for domestic and non-public well owners regarding well testing.
    e. Materials and resources are available for domestic and public well owners at the well owner's expense.
3. The third notice is dependent on whether the MT exceedance resulted from GSA management policy. If the results following the exceedance investigation indicate that GSA management did contribute to the MT exceedance then the letter will detail:
    a. A reminder that an MT exceedance for an RMS well within three miles of a RMS occurred.
    b. The cause of the MT exceedance was found to be correlated to GSA management and policy.
    c. The public health impacts associated with the COC triggering an exceedance.
    d. The GSA will provide resources to domestic and non-public well owners to begin the Well Mitigation Process including well sampling, interim water supplies, and long-term mitigation.

6.4.5 Post-Investigation Protocols

Post-Investigation Protocols include all actions the GSA must take to (1) quantify and track COC exceedances and (2) prevent future MT exceedances from occurring including implementing efforts that restore groundwater quality conditions.

6.4.5.1 Quantifying Undesirable Results

Discussed in Section 6.2 are the metrics by which the GSA defines an undesirable result. Undesirable results occur when:

1. Within one year (this includes two monitoring events), X RMS wells have a confirmed exceedance result.

2. A cumulative total of 5 small community wells by 2040 test for a new COC exceedance not present before January 1, 2015.
3. The GSA is unable to mitigate groundwater quality degradation.

Based on the approach taken by the GSA to define the groundwater quality UR, it is critical that GSA account for all wells that have a confirmed MT exceedance. Both RMS well and small community well exceedances are tallied against their respective UR metric in the GSA DMS. Additional well inventory includes the tracking of domestic wells assumed to be impacted by an MT exceedance and domestic well confirmed to be impacted by an MT exceedance.

6.4.5.2 Implementing Project Management Actions

Following both the Exceedance Investigation and all communication protocols, the GSA must evaluate ongoing and proposed PMAs. An exhaustive list of PMAs is provided in Appendix n of the GSP. The PMAs associated with combating the degradation of groundwater quality must be evaluated, where schedules, anticipated benefits, and project scales must be considered for expedition.

As an example, consideration for PMAs associated with monitoring groundwater (for levels and quality) will have their frequencies increased. PMAs that will be given more consideration are those that reduce the demand of groundwater and by proxy reduce declining groundwater elevation levels. These types of PMAs will become critical as GSAs collect further data on the correlation between reductions in groundwater and concentrations in COCs.