Memorandum

LARRY WALKER ASSOCIATES

DATE: 1/18/2019

TO: Ukiah Valley Basin Groundwater Sustainability Agency Technical Advisory Committee

COPY TO: Ms. Sarah Dukett

SUBJECT: **Data Gaps Summary**

Tom Grovhoug, PE

Laura Foglia, PhD
1480 Drew Avenue, Suite 100
Davis, CA 95618
Phone: (530) 753 6400
Fax: (530) 753 7030
tomg@lwa.com
lauraf@lwa.com

Amir Mani, PhD, PE
720 Wilshire Blvd., Suite 204
Santa Monica, CA 90401
Phone: (310) 394 1036
Fax: (310) 394 8959
amirm@lwa.com

This memorandum has been prepared to summarize the past efforts made to analyze data gaps in the phase 1 of the Ukiah Valley Basin Groundwater Sustainability Plan (GSP) project and discuss the recent attempts of the Larry Walker Associates (LWA) team to assess the remaining data gaps considering the newly made available data, results of the phase 1 reports, and discussions with the members of technical advisory committee (TAC). Following the review of this memorandum by the members of the TAC and the Groundwater Sustainability Agency (GSA) and according to the agreement between the County of Mendocino (County) and LWA, it is expected for the Data Gap Analysis Task to be deemed concluded with the consideration of any comments made during the reviews.

This memorandum first describes the requirements outlined in the Department of Water Resources (DWR) GSP Emergency Regulations (Regs) with respect to data gaps. Then, it summarizes the phase 1 report and how it addressed the Regs requirements. Finally, it notes the discussions and decisions made during the TAC meetings and the efforts underway to address the deficiencies that were determined during the process.

Requirements of the DWR GSP Emergency Regulations

Data gap is defined according to the Regs *Section § 351. Definitions* as 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.

Data gaps and their assessment are primarily emphasized in *Section § 354.38. Assessment and Improvement of Monitoring Network*:

> *(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*
>
> *(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*
>
> *(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:*
>
> *(1) The location and reason for data gaps in the monitoring network.*
>
> *(2) Local issues and circumstances that limit or prevent monitoring.*
>
> *(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

As is clear from the above statements, existing data gaps are a major factor in the design and implementation of the monitoring network. Data gaps can be a result of insufficient spatial coverage, insufficient temporal coverage, infrequent temporal data, or bad quality of data.

Identification of data gaps are required to be discussed in the Basin Settings section of the GSP as well as the Hydrogeologic Conceptual Model (HCM) as indicated in the Regs Sections *§ 354.12. Introduction to Basin Setting*, and *§ 354.14. Hydrogeologic Conceptual Model:*

> *§ 354.12. Introduction to Basin Setting*
>
> *This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.*
>
> *§ 354.14. Hydrogeologic Conceptual Model*
>
> *(b) The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
>
> *…, (5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model*

Regs maintain the emphasis on data gaps evaluation and uncertainty estimation by incorporating them as a main criterion in the initial plan evaluation by the DWR and the following periodic evaluations required by the GSA:

§ 355.4. Criteria for Plan Evaluation

…, (2) Whether the Plan identifies reasonable measures and schedules to eliminate data gaps.

(3) Whether the Agency is addressing data gaps and reducing the levels of uncertainty identified in the Plan.

§ 356.4. Periodic Evaluation by Agency

(1) An assessment of monitoring network function with an analysis of data collected to date, identification of data gaps, and the actions necessary to improve the monitoring network, consistent with the requirements of Section 354.38.

(2) If the Agency identifies data gaps, the Plan shall describe a program for the acquisition of additional data sources, including an estimate of the timing of that acquisition, and for incorporation of newly obtained information into the Plan.

To conclude, identification of data gaps and finding appropriate solutions to address such sources of uncertainty is an integral part of the GSP and will be a determining factor in the evaluation of the final plan by the DWR. In addition, it will play a continuing role in the periodic assessments made by the GSA during the implementation and will be a determining factor by the DWR when assessing the effectiveness of the GSP at future milestones.

Summary of Data Gap Analysis report prepared for the Phase 1

LACO Associates prepared the "Data Gap Analysis" report (Data Gap Report) in December 2016 for the Mendocino County Water Agency as part of the Initial Groundwater Sustainability Plan. According to the report, "The primary hydrogeologic concern in the UVGB [Ukiah Valley Groundwater Basin] per the Sustainable Groundwater Management Act (SGMA) is depletion of surface water flows from groundwater extraction. The basin is not adjacent to the ocean and therefore has no risk of saltwater intrusion. The basin is expected to fully recharge in years with normal precipitation and therefore is not expected to be at risk for chronic declines in groundwater levels or excessive depletion of storage (some depletion of storage is inevitable before recharge or discharge can be captured (Bredehoeft, 1982)[1]."

A major concern in the basin stems from the State Water Resources Control Board (SWRCB) dictation that the entire groundwater system in the UVGB is underflow of the Russian River; which is regarded as river flow and therefore supports endangered salmonid species. Underflow wells are not included in SGMA regulations because they are considered surface water diversions. Wells pumping water in the river-channel deposits are generally considered underflow wells, however there is variability in SWRCB classifications.

[1] Bredehoeft, John D., Papadopulos, Stephen S., Cooper, H.H. Jr. (1982) "Groundwater: The Water-Budget Myth." Scientific Basis of Water-Resource Management, Studies in Geophysics, Washington, DC: National Academy Press, pp. 51-57.

According to the reports produced in the Phase 1 of the GSP, DWR's scoring of the basin in the prioritization process, and the discussions of the LWA Team with the members of the TAC and the GSA, there is a scientific and empirical consensus on the depleting surface water resources due to groundwater/surface water interaction being the major undesirable result of the basin. Therefore, Data Gap Report appropriately determines data gaps with a focus on this criterion and based on the proximity to the Russian River and its tributaries, and the overall spatial and temporal density of groundwater monitoring and streamflow gauging data.

According to the Data Gaps Report and LWA Team's discussion with the TAC, there are ten streamflow gauges in the UVGB. The USGS has three streamflow gauges on the Russian River within the UVGB boundary located south of Talmage and on the forks of the Russian River just before the confluence near Coyote Dam. There are also USGS gauges outside of the UVGB upstream of Lake Mendocino and near Hopland. USGS data has been collected since the early 1900s. NOAA has National Marine Fisheries Service (NFMS) gauges on the west branch of the Russian River, York Creek, Robinson Creek, and McNab Creek. California Land Stewardship Institute (CLSI) has three gauges on McNab Creek. In order to assess the impacts of frost protection and agricultural pumping of underflow or groundwater wells close to the Russian River or its tributaries, six additional streamflow gauges were proposed by LACO Associates (three on the Russian River and three on tributaries) that are located among vineyards and agricultural lands (**Figure 1**).

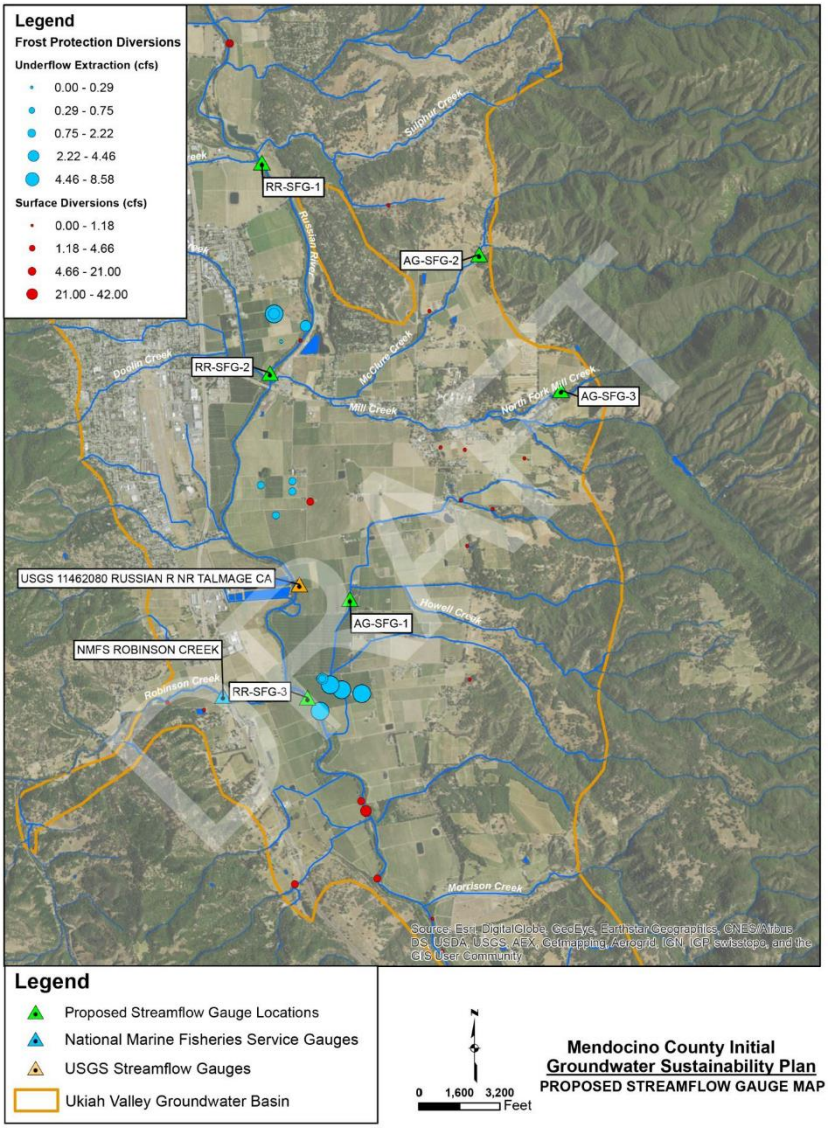

Figure 1. Proposed Streamflow Gauges by LACO Associates

In addition to the streamflow gauges, additional groundwater monitoring wells were proposed in the Data Gap Report to fill data gaps and aid in the characterization of long-term groundwater hydrology. According to the Data Gap Report, there were 38 monitored CASGEM wells in the UVGB at the time with variable number of data points (all less than six points). Four additional wells were monitored by the DWR that have several data points dating back to 1990s. In addition, there was a total of 433 GeoTracker wells within the UVGB boundary for 36 environmental remediation projects. The groundwater monitoring data included 6,546 data points between 1999 and 2016. LACO Associates determined the areas with a low number of monitoring wells and proposed additional monitoring wells to be drilled in those locations, as shown in **Figure 2**. It was proposed that telemetric monitoring data be considered to increase the frequency of data points and provide the capability to see the effects of real-time pumping on river stage and vice-versa. To supplement the information available to assess the groundwater/surface water interaction, Data Gap Report proposes to monitor temperature and other water quality constituents, as well. Moreover,

temporal data gaps exist in the groundwater level data due to the few monitoring wells available with a long history of data. It was proposed to obtain longer timeseries of data by collaborating with agricultural users and stakeholders.

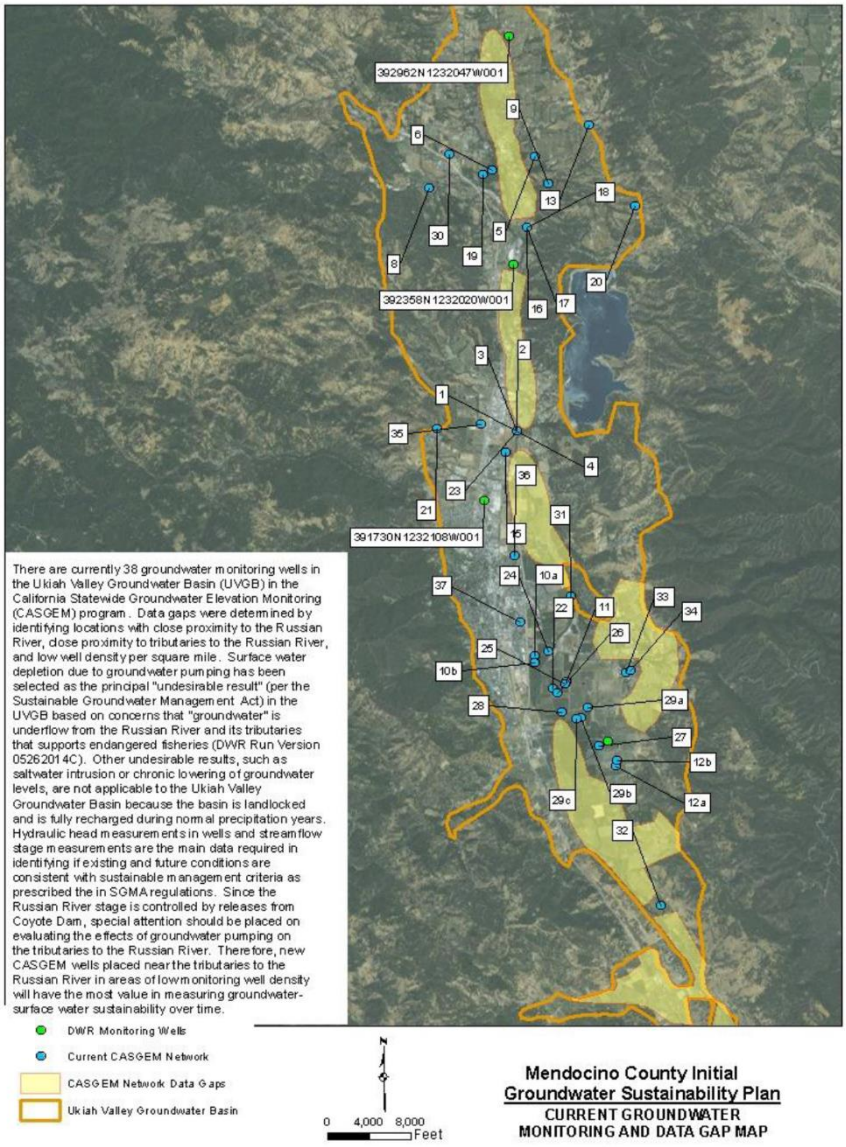

Figure 2. Groundwater Monitoring Data Gaps

Recommendations and comments made by the TAC

After reviewing the Phase 1 reports, gathering data from the public databases, and reviewing the data gathered during the Phase 1, the LWA Team prepared a data summary and discussed the apparent data needs with the TAC and the County. Of course, the assessment was based on an initial review of available data and may be subject to additions as the GSP preparation progresses. **Table 1** shows the summary made available to the TAC.

Discussion with the TAC members during the meeting on 8 November 2018, lead to two major recommendations with regards to addressing the existing data gaps.

First, TAC members believed and the LWA Team agreed that the Phase 1 data gap analysis was based on the lack of spatial coverage without having analyzed if those areas contribute to the improvement of the water budget study or the understanding of the groundwater/surface water interaction. Consensus was to perform further assessments, statistical or experimental, before recommending additional wells to be drilled or gauges to be requested to see if such data would be ultimately helpful in addressing the GSP requirements.

Second, the TAC and the GSA welcomed and emphasized the use of Technical Support Services (TSS) grant made available by the DWR to address some of the data gaps. As a result, the LWA Team has been working with the County to prepare the application materials. The approach proposed have been explained and agreed upon by the GSA and the TAC during their public meetings. The memorandum sent to the County on 27 November 2018 , titled: "Review of Possible Transects to Monitor Surface Water/Groundwater Interaction Based on Existing Wells and Proposed New Wells Using Initial Groundwater Sustainability Plan Findings" details the LWA Team's proposal to obtain additional information on the impacts of groundwater pumpage on Russian River stage and streamflow (the mentioned memo is made available as an attachment to this memorandum). To the Date of this memorandum, the TSS application has passed its first stage and is moving along in its second phase.

The LWA Team will have further discussions about the data gaps with the TAC and the GSA after setting up its Data Management System and upon the review of the HCM Chapter of the GSP. By then, the LWA Team will have a better understanding of the data gaps that would affect the GSA's ability in analyzing and addressing the SGMA requirements within the basin.

Table 1. Preliminary Discussion of available data and data gaps for the UVB proposed for the TAC meeting on 8 November 2018.

Data	Format	Time period	Number	Source	Additional Information
Gathered Data (Phase 1 Data, Public and Online Databases)					
Streams	Shapefile				
Springs	Shapefile				
Water bodies	Shapefile				
Streamflow Measurements	Shapefile/Table	1991-2015	3 inside the basin	USGS	
Precipitation			1	CIMIS	
Precipitation			2	CDEC	
Land Use	Shapefile	2010	1	DWR	
	Shapefile	2014	1	SGMA Portal Land Use Viewer	
	Shapefile	2011	1	NLCD	
	Shapefile	2011	1	Mendocino County	Vector Shapefile with no metadata: its year is not specified.
Geology	Shapefile				
Elevation (DEM)	Raters Lidar	2017		USGS	
					NED DEM from Mendocino County with 30m resolution
Wells	Shapefile/Table		38	CASGEM	Few number of data points
	Shapefile/Table		4	DWR	
	Shapefile/Table	~ 1999 to ~present	433	GeoTracker	Varies based on remediation/cleanup site.
Soil	Map/CSV		1	DWR/SSURGO	

Projected Data Needs Not Yet Available				
Land Use				Local Land Use maps going back to 25 to 30 years ago.
Streamflow Measurements		4	NOAA(NFSM)	Missing timeseries data. Shapefile was not shared but Phase 1 Report has a figure for them.
		3	CLSI	On McNab Creek. Missing respective timeseries data. Shapefile and location are available.
Geologic Cross Sections	Maps	3	LACO Prelim Studies	Missing the maps.
Wells				More areal coverage and additional number of wells to be monitored as part of incorporating them into CASGEM or in the Monitoring Network of the GSP. Well completion reports and geology logs of the wells made available for Phase 1 and any additional logs that could be shared are needed, as well.
River Bed Properties				Some information from MODLFOW file and the LACO Water Budget study made available.

January 18, 2019

Attachment A: LWA Memorandum titled: “Review of Possible Transects to Monitor Surface Water/Groundwater Interaction Based on Existing Wells and Proposed New Wells Using Initial Groundwater Sustainability Plan Findings”

November 27, 2018

Memorandum

LARRY WALKER ASSOCIATES

DATE: 11/27/2018

TO: Ms. Sarah Dukett, Mendocino County

COPY TO:

SUBJECT: **Review of Possible Transects to Monitor Surface Water/Groundwater Interaction Based on Existing Wells and Proposed New Wells Using Initial Groundwater Sustainability Plan Findings**

Tom Grovhoug, PE

Laura Foglia, PhD
1480 Drew Avenue, Suite 100
Davis, CA 95618
Phone: (530) 753 6400
Fax: (530) 753 7030
tomg@lwa.com
lauraf@lwa.com

Amir Mani, PhD, PE
720 Wilshire Blvd., Suite 204
Santa Monica, CA 90401
Phone: (310) 394 1036
Fax: (310) 394 8959
amirm@lwa.com

This memorandum has been prepared to provide supplemental information to the County of Mendocino (County) and the Ukiah Valley Basin Groundwater Sustainability Agency (UVBGSA) for the second round of the Department of Water Resources (DWR) Technical Support Services (TSS) grant application. Information included in this memorandum is exclusively based on publicly available data and the work previously performed during Phase 1 of this project to prepare the groundwater sustainability plan (GSP) for the Ukiah Valley Basin (UVB).

According to the discussions conducted with the UVBGSA, Mendocino County, and the Technical Advisory Committee (TAC), we are proposing an inclusive set of transects that cross the Russian River and include at least three wells to monitor the correlation of groundwater levels with Russian River stage and streamflow. While new streamflow gages would be beneficial, this memorandum focuses on use of the existing gages and proposes transects that best utilize currently available equipment.

Monitoring Approach

We suggest equipping a number of wells in the UVB with continuous transducers for monitoring groundwater elevation and temperature along different transects across the Russian River, as sketched in **Figure 3**. The transducers will be equipped with a telemetry system and will transmit data periodically to a web server. The project team and stakeholders will be able to check these data regularly.

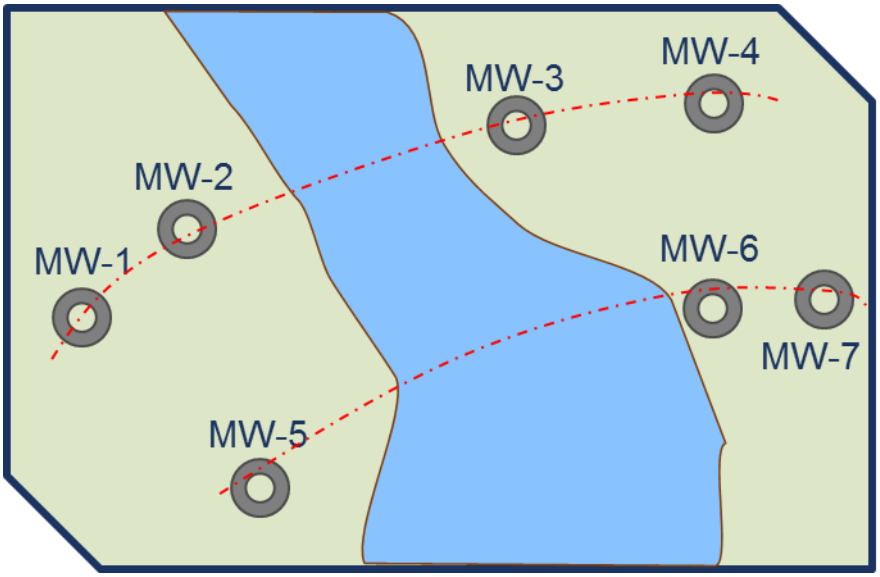

Figure 3. Continuous monitoring network design

This continuous monitoring program will yield the following benefits for the GSA and will help support the development of the GSP:

• Groundwater-surface water interactions will be monitored long-term to ensure that we capture different water years types;

• We will collect information and develop future projections of water available to the natural environment and for multiple beneficial uses;

• We will be able to assess the occurrences and elements attributable to natural factors (e.g., precipitation, infiltration, surface water seepage to groundwater, groundwater discharge to streams) and anthropogenic factors (e.g., pumping, managed aquifer recharge operations) that affect groundwater levels and trends in the vicinity of the river;

• We will identify appropriate monitoring sites to evaluate surface water-groundwater interaction and recharge/discharge mechanisms, including whether groundwater demand is affecting surface water flows; and,

• We will identify vertical hydraulic head differences in the aquifer system and aquifer specific groundwater conditions, especially in areas of potential surface water-groundwater interaction, sensitive ecosystems, and higher recharge potential.

Available Information

In order to select the best possible transects, we relied on the currently available information mostly obtainable from the publicly available datasets and the previous work conducted during the phase 1 of the GSP. Primarily, four different datasets were utilized to obtain required information for decision making:

1) **Well database**: A dataset including 2,412 well records was used to locate available wells. This dataset contains 48 wells that are included in the CASGEM program, 436 wells included in the GeoTracker program, and 1,928 wells that were extracted from the well completion reports. Most of the wells have approximate latitude and longitude calculated as the centroid of their township/range/section specification. These approximate locations were used in our assessment due to lack of better information.
2) **Geologic Map**: The initial hydrogeologic conceptual model (HCM) report and preliminary water budget study (**Figure 4**) produced during phase 1 of the GSP were used as the main resource for our geological inference. Since phase 2 of the GSP has not yet developed its findings with respect to the HCM, those two reports are the best available information at present. Information from these reports concur with the geological maps provided by the DWR in its Sustainable Groundwater Management Act (SGMA) Data Portal, as shown in **Figure 5**.
3) **Public/Private Lands:** The 2017 parcel map was provided by the County and use in this analysis. For this analysis, unassessed parcels were considered to be public lands (**Figure 6**).
4) **Land Use and Land Cover:** Land use and land cover data were used to double check the primary use of the domestic wells within possible transects. Land cover map of 2014 was obtained from the DWR SGMA Data Portal. Land use data was provided by the County and refers to 2010 conditions.
5) **Groundwater elevation/flow gradients:** Groundwater elevation contours provided in the phase 1 preliminary water budget study (**Figure 7**) were used to understand the general flow of groundwater at each side of the river and facilitate decision making.

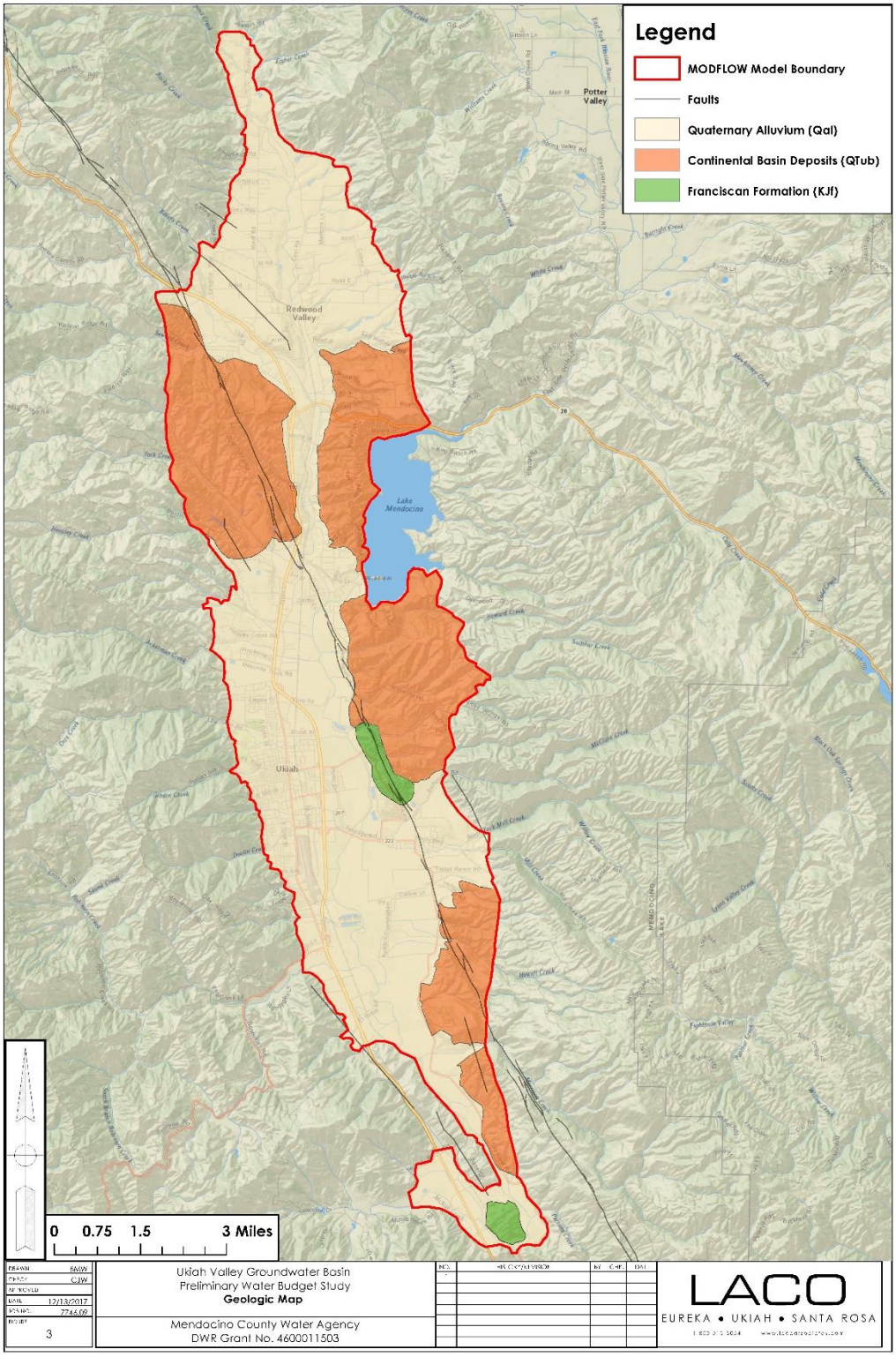

Figure 4. Geologic map extracted from the Ukiah Valley Groundwater Basin Preliminary Water Budget Study

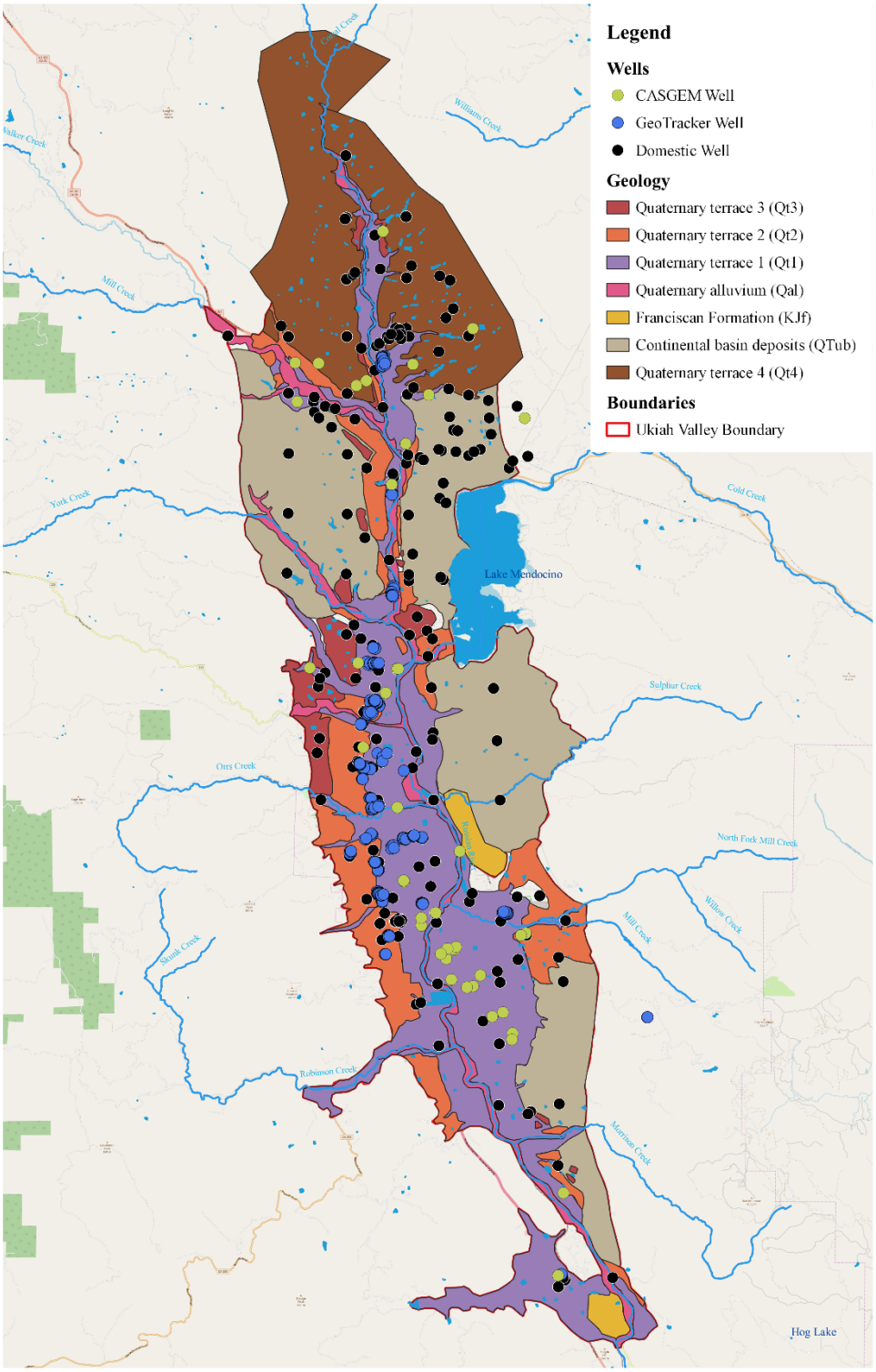

Figure 5. Geologic map extracted from the DWR SGMA Portal showing the wells included in this assessment.

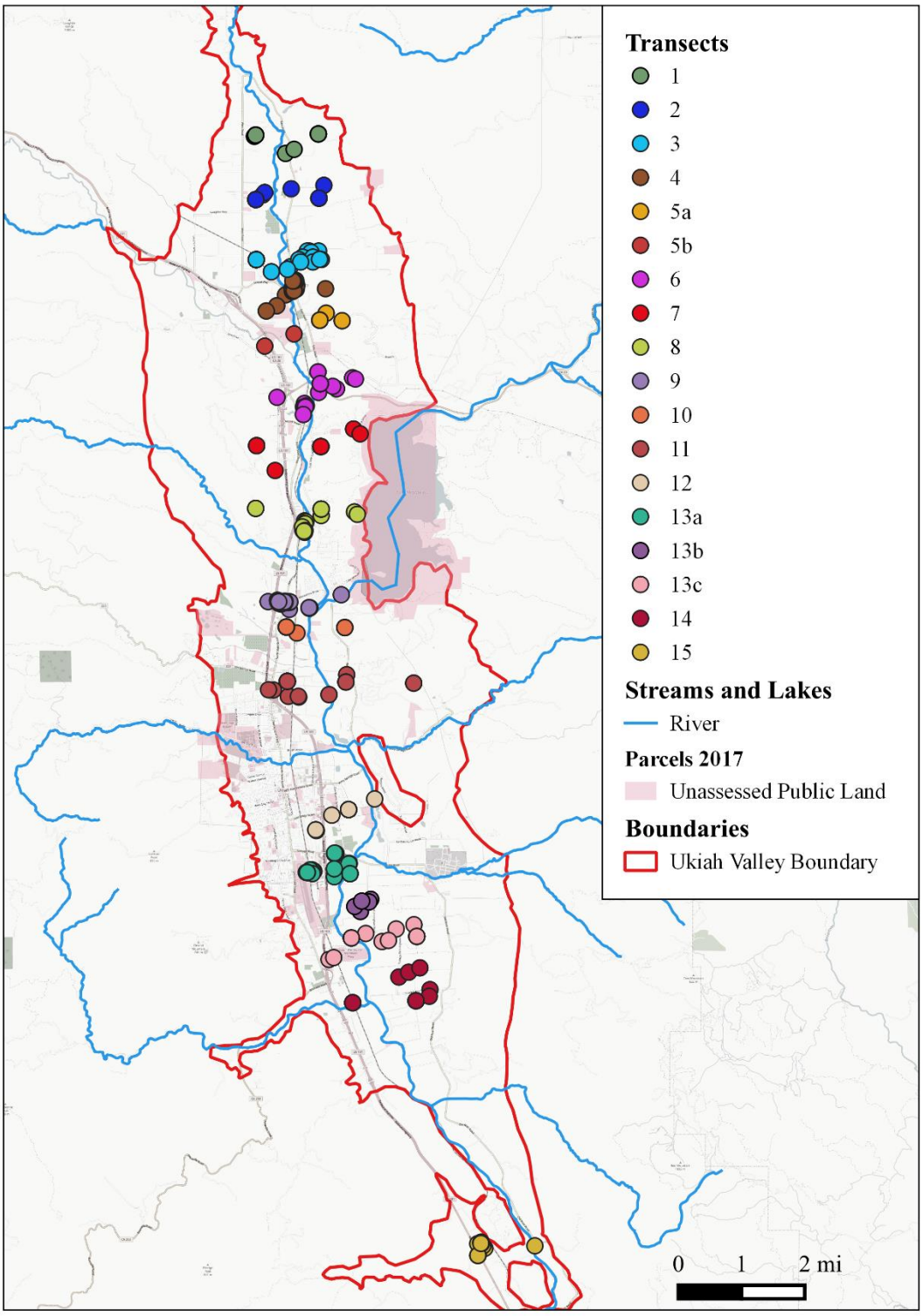

Figure 6. Depiction of all assessed transects and the location of public lands.

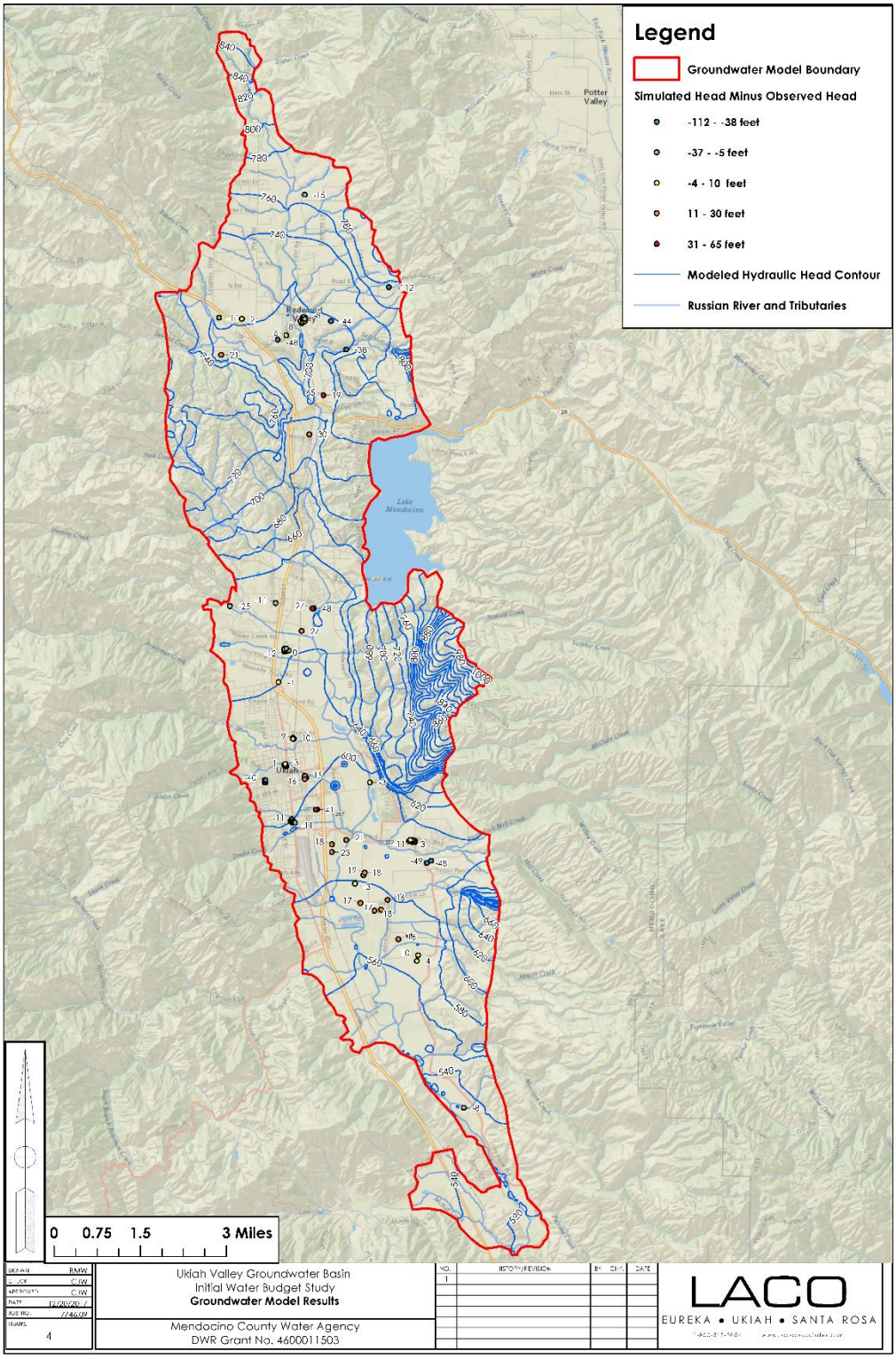

Figure 7. Simulated groundwater elevations provided in the Ukiah Valley Basin Initial Water Budget Study.

Selection Criteria

Based on our recent interviews and discussions with the stakeholders and findings of the phase 1 documents, we established the following set of criteria to guide us in the selection of optimum transect locations:

- transects should include at least 3 wells, preferably four wells, with at least one well at each side and in close proximity of the river;
- preference should be given to wells that are already included in the CASGEM program. GeoTracker wells are the next group of wells to be included. Use of private domestic wells should be avoided unless no other options are available;
- wells selected for a transect should withdraw from the same aquifer. This does not necessarily require all wells to be screened and located within the same geological unit. However, it does require wells to be located within the same layers (Quaternary Alluvium) defined in the phase 1 preliminary water budget report;
- preference should be given to transects that need a maximum of one new well to be drilled. Additional new wells can be proposed for transects where they would increase the knowledge of the surface water/groundwater interaction.
- preference should be given to transects located sufficiently close to the existing streamflow gages;
- selection of the transects should be spatially inclusive and provide sufficient knowledge of the surface water/groundwater interaction for the entire basin; and,
- where new wells are needed to be drilled, available public lands should be proposed for the new well location, if possible, to increase the chances of the transect being implemented.

Proposed Transects

As shown in **Figure 6**, 18 transects were considered in this assessment simply due to the arrangement of wells and their proximity to the river. According to the above-mentioned selection criteria, Ukiah Valley Basin was divided into four geographical regions: 1) North – Redwood Valley, 2) North-Central, 3) South-Central, and 4) South-Drainage Point. Our initial assessment is that having at least one transect in each of these regions will be helpful at understanding the interaction of groundwater and surface water and its spatial variability. However, as mentioned previously, our ability to implement these transects depends heavily on the availability of public wells or volunteer private well owners. It is also highly preferable to use transects close to an available stream gage so that groundwater levels can be correlated with gage height or stream flows. Considering these factors, we decided to propose primary and alternative transects at each region. This will help provide second and third options if, due to the reasons outlined, we are not able to implement the primary transect. Moreover, due to the limited existence of groundwater wells in the South-Drainage Point region (few wells and all for domestic use), an additional primary transect is proposed in the South-Central region. This will provide supplemental information and a better spatial coverage in case no transects are finalized in the South-Drainage Point region. We are awaiting additional information from the City of Ukiah on the new wells drilled in the vicinity of their wastewater treatment plant. Those new wells may be applicable to our proposed transects and help limit the number of new wells we need to drill in the South-Central region.

As shown in **Table 2**, five primary and three alternative transects are proposed for the entire basin. These transects are shown in **Figure 8 - Figure 11** based on their geographical regions. A total of nine new wells are proposed to be drilled, of which five are mandatory for the transects to perform as intended and four are optional to improve their application. Any combination of the proposed transects would lead to a different number of wells to be drilled. For instance, using all primary transects would lead to three mandatory and three optional new wells. With regards to the depth of the wells to be drilled and their respective screening depths, further evaluations will be needed after finalizing the transects and well locations.

Table 2. Summary of the proposed transects including existing and proposed to drill wells.

Section	Well Name	Program/Use	Latitude (Approximate)	Longitude (Approximate)	Geological Unit
North - Redwood Valley #1 (Primary)	T0604500280 MW-6	GeoTracker	39.2640402	-123.2047303	Qt1
	T0604500280 MW-10	GeoTracker	39.2638227	-123.2051953	Qt1
	WCR2001-001925	Domestic	39.263055	-123.207222	Qal
	392606N1232098W001	CASGEM	39.26057	-123.20981	Qt4
	392594N1232129W001	CASGEM	39.25939	-123.21288	Qt4
North - Redwood Valley #2 (Alternative)	***Optional Drilled Well***	***Proposed New Well***	***39.26715***	***-123.21627***	***Qt4***
	Mandatory Drilled Well	***Proposed New Well***	***39.26671***	***-123.20961***	***Qt2***
	T0604500263 MW-9	GeoTracker	39.2660229	-123.2048732	Qt1
	T0604500280 MW-1	GeoTracker	39.2651931	-123.2039004	Qt1
North - Central #1 (Primary)	T0604500351 MW-04	GeoTracker	39.193002	-123.2059654	Qt1
	391918N1232003W001	CASGEM	39.19177	-123.20031	Qt1
	391918N1232003W002	CASGEM	39.19177	-123.20031	Qt1
	391918N1232003W003	CASGEM	39.19177	-123.20031	Qt1
	391918N1232003W004	CASGEM	39.19177	-123.20031	Qt1
	Mandatory Well to Drill	***Proposed New Well***	***39.19176***	***-123.19797***	***Qal***
	391917N1232000W001	CASGEM	39.191747	-123.200031	Qt1
North - Central #2 (Alternative)	WCR0000323[1]	Domestic	39.18736	-123.20698	Qt1
	WCR2010-005036	Domestic	39.18736	-123.20698	Qt1
	WCR2011-004046	Domestic	39.18736	-123.20698	Qt1
	391860N1232039W001	CASGEM	39.185992	-123.20388	Qt1
	Mandatory Well to Drill	***Proposed New Well***	***39.18565***	***-123.19974***	***Qal/Qt1***

Section	Well Name	Program/Use	Latitude (Approximate)	Longitude (Approximate)	Geological Unit
South – Central #1(a) (Primary)	391252N1231822W001	CASGEM	39.125238	-123.182166	Qt1
	391248N1231848W001	CASGEM	39.124837	-123.184821	Qt1
	391246N1231827W001	CASGEM	39.124642	-123.182678	Qt1
	391236N1231869W001	CASGEM	39.12361	-123.18687	Qt1
	Mandatory Well to Drill	***Proposed New Well***	***39.12247***	***-123.19536***	***Qt1***
	391225N1231852W001	CASGEM	39.12245	-123.1852	Qt1
	Optional Well to Drill	***Proposed New Well***	***39.12192***	***-123.19844***	***Qt1***
	Optional Well to Drill	***Proposed New Well***	***39.11877***	***-123.19263***	***Qal/Qt1***
South – Central #1(b) (Primary)	391185N1231747W001	CASGEM	39.11847	-123.17469	Qt1
	391174N1231836W001	CASGEM	39.11744	-123.18362	Qt1
	391159N1231770W001	CASGEM	39.11586	-123.17695	Qt1
	391156N1231788W001	CASGEM	39.1156	-123.17882	Qt1
	Optional Well to Drill	***Proposed New Well***	***39.11321***	***-123.18304***	***Qal/Qt1***
	WCR2001-003345	Domestic	39.111944	-123.193055	Qt1
	WCR0287224	Domestic	39.111507	-123.194447	Qt2
South - Central #2 (Alternative)	391096N1231677W001	CASGEM	39.1096	-123.1677	Qt1
	391086N1231710W001	CASGEM	39.1086	-123.17101	Qt1
	WCR2010-003208	Domestic	39.1075	-123.173888	Qt1
	391046N1231647W001	CASGEM	39.104619	-123.164739	Qt1
	391031N1231649W001	CASGEM	39.103106	-123.164941	Qt1
	WCR0040170[1]	Domestic	39.10208	-123.16885	Qt1

Section	Well Name	Program/Use	Latitude (Approximate)	Longitude (Approximate)	Geological Unit
South - Drainage Point #1 (Primary)	T0604593406 MW-1	GeoTracker	39.0466055	-123.1495974	Qt1
	390466N1231507W001	CASGEM	39.0466	-123.1507	Qt1
	WCR2012-001494	Domestic	39.046111	-123.133888	Qt1
	Mandatory Well to Drill[2]	***Proposed New Well***	***39.04605***	***-123.13802***	***Qt1***

1 Well name represents the group of domestic wells located in that vicinity.

2 Proposed well is not located on public land and the location should be further assessed and optimized.

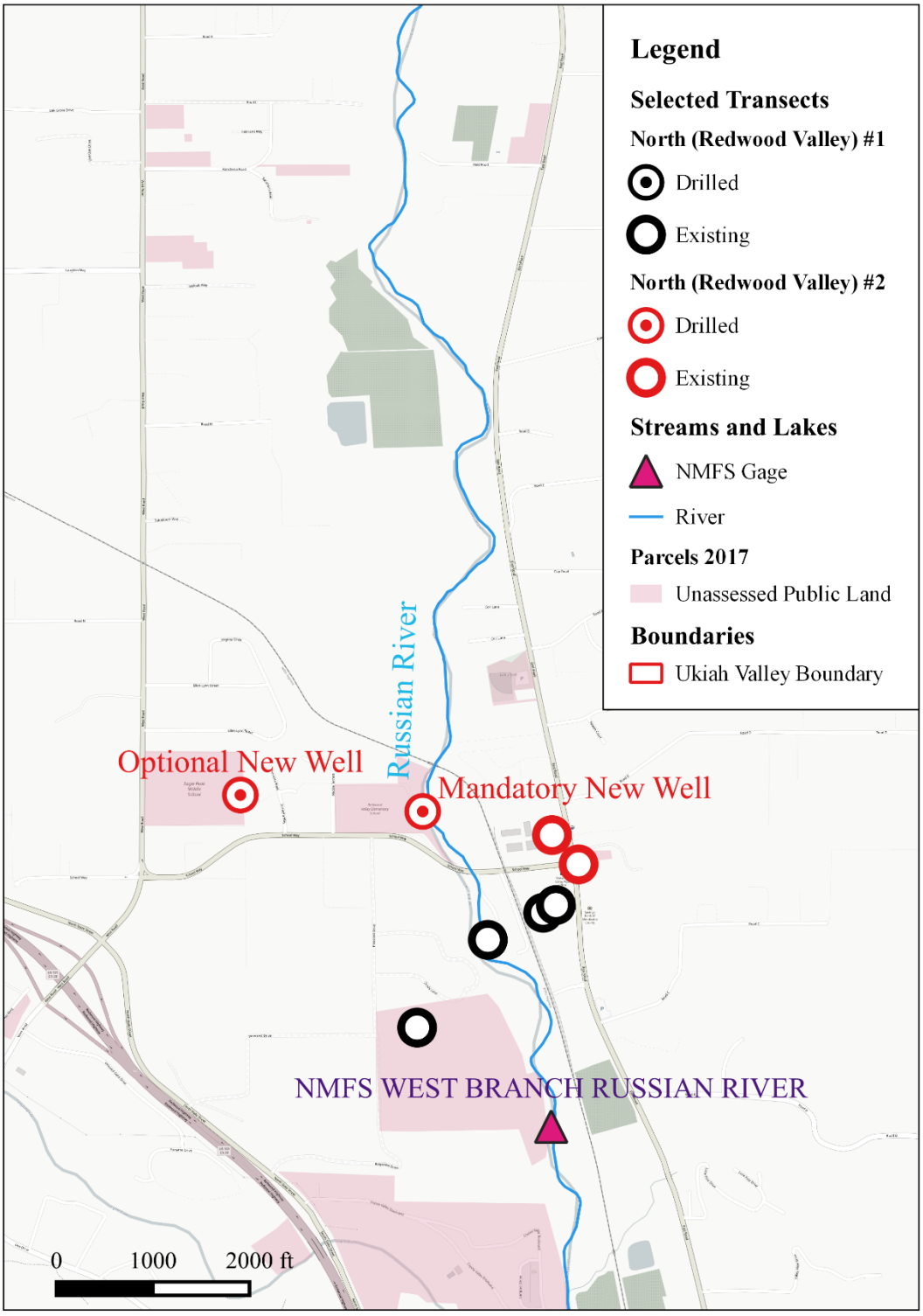

Figure 8. Proposed transects for the North-Redwood Valley Region.

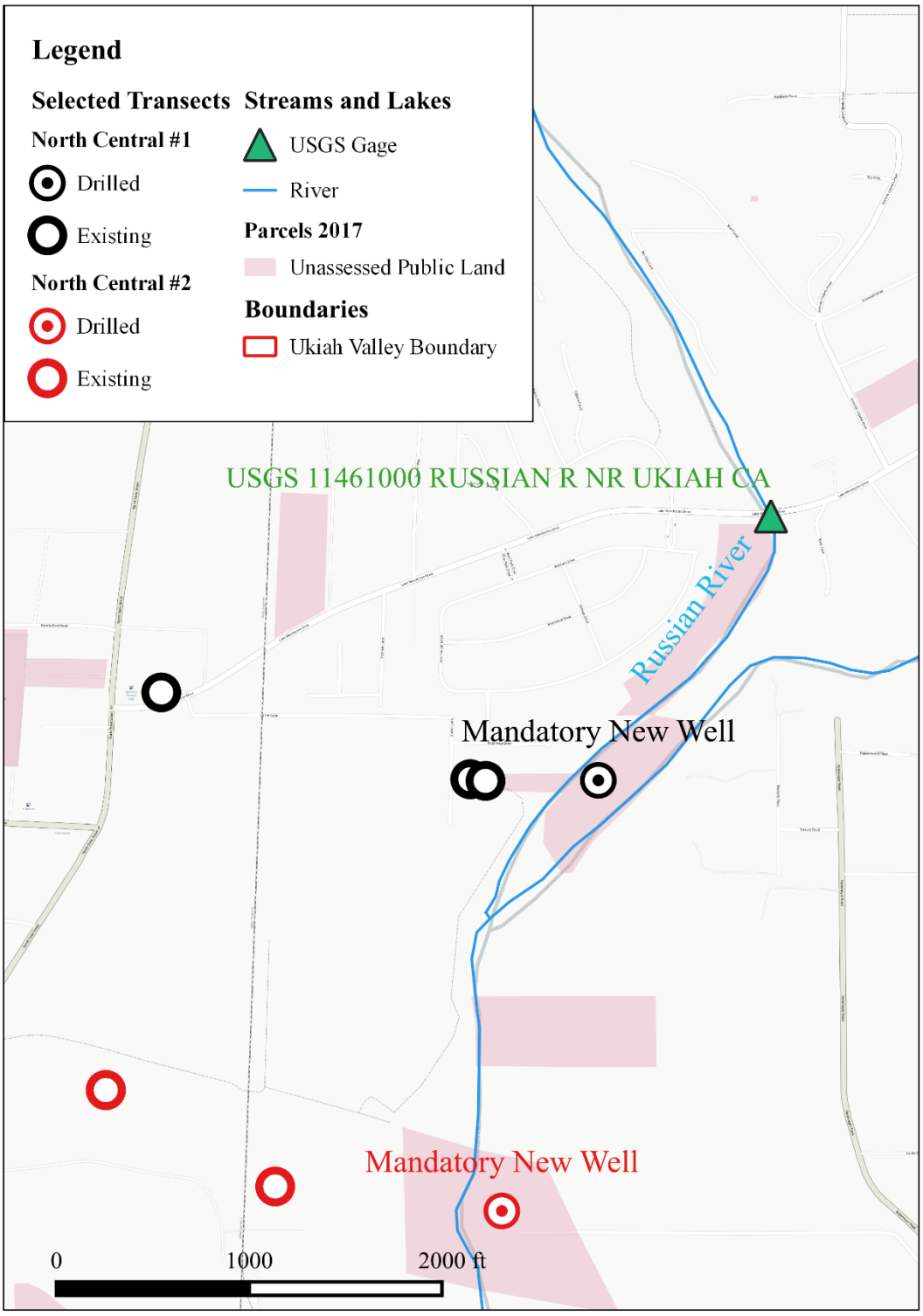

Figure 9. Proposed transects for the North-Central Region.

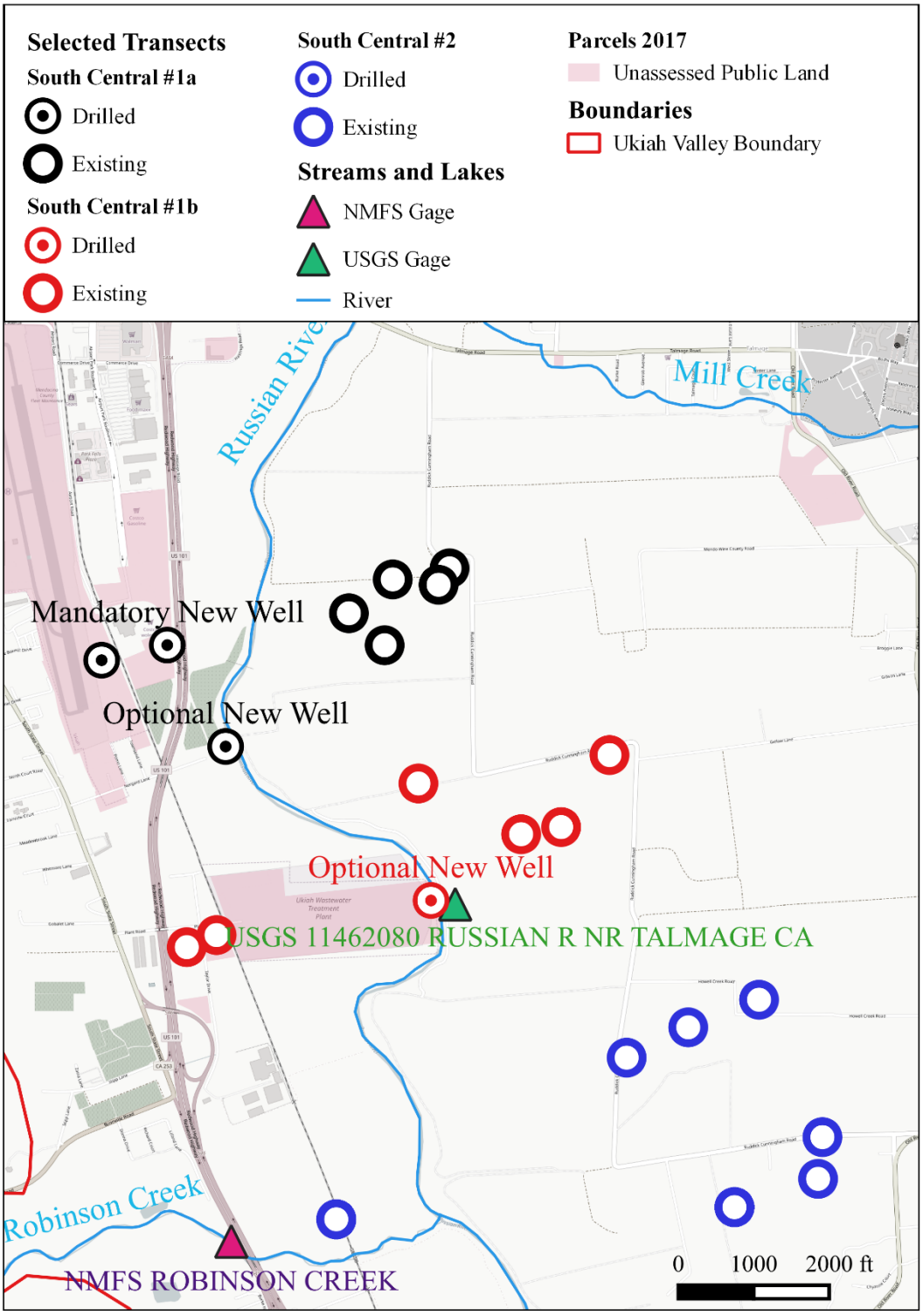

Figure 10. Proposed transects for the South-Central Region.

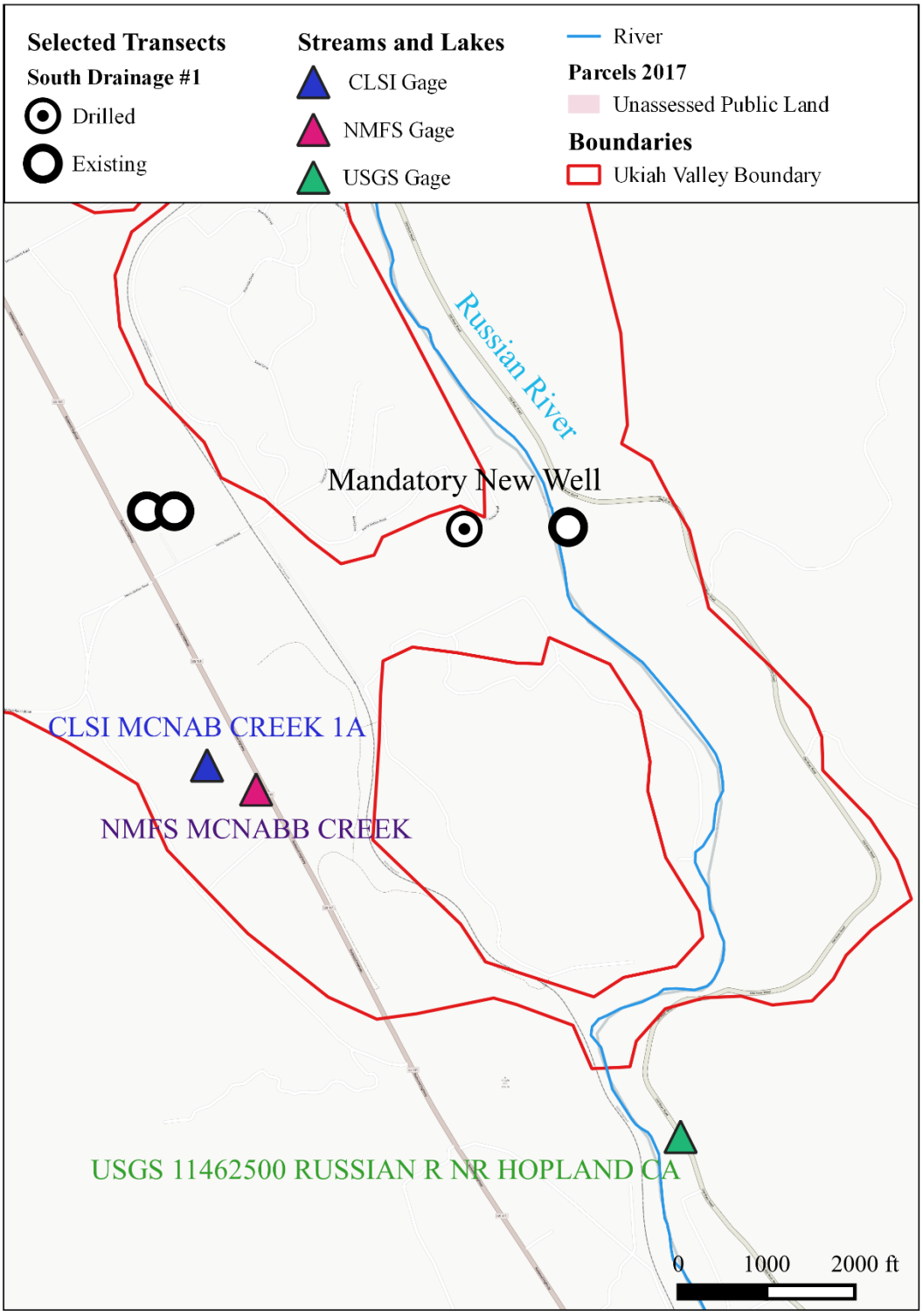

Figure 11. Proposed transects for the South-Drainage Point Region.