

TO:	Bryan Bondy UVRGA GSP Manager
FROM:	Kear Groundwater P.O. Box 2601 Santa Barbara, CA 93120-2601
DATE:	September 30, 2018
SUBJECT:	Report of Groundwater Level and Temperature data, spring 2017 to summer 2018 Upper Ventura River Groundwater Basin Ventura County, California

This memorandum provides a summary of Kear Groundwater's (KG) data collection, summarization and review of groundwater level and temperature logging of six wells in the Upper Ventura River Groundwater Basin. This effort is a streamlined reporting to support the Upper Ventura River Groundwater Agency (UVRGA) and its data gap analysis tasks in preparation of a groundwater sustainability plan for the managed basin.

The network of six monitoring points, selected by UVRGA board members and their agencies' staffs in early 2017 contributes to Task 2, with the objective to fill data gaps, including improved characterization of the hydrogeologic conditions to serve groundwater planning and management activities. Specifically, this report addresses Task 2.1 – Establish and analyze data from well monitoring network.

In April and May of 2017, the UVRGA installed data loggers (Solinst Levelloggers) in six wells with long-term records to acquire groundwater hydrographs based on multiple daily readings at key locations extending over a 6-mile reach of the basin (Figure 1). The loggers provide water level and temperature readings at 90-minute intervals. The data from these loggers are part of a long-term monitoring program and will be critical for developing a conceptual groundwater model as well as calibrating the SWRCB's surface water-groundwater model. Frequent daily readings are necessary to better understand historical records, which were only based on bimonthly or quarterly manually collected data.

All well owners provided written permission allowing the UVRGA and its consultants access to install the loggers and periodically monitor the wells.

KG16-0313



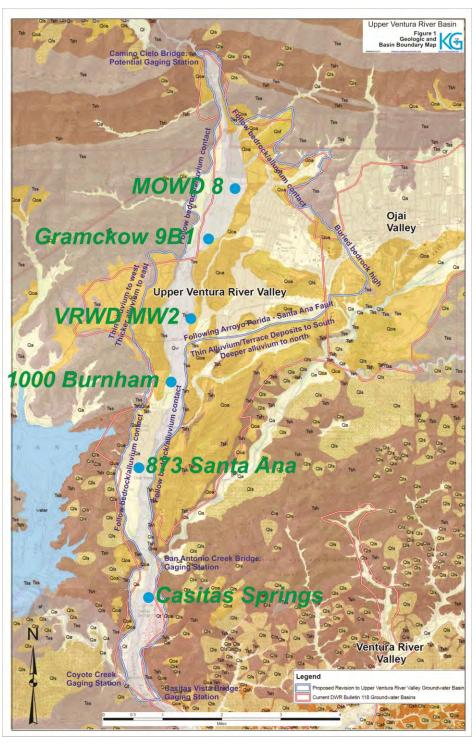


Figure 1. Locations of datalogger-equipped wells monitored by the UVRGA. Base map is the geologic map showing 2016 UVRGA Basin Boundary in blue.

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The six monitored wells are described in the following table, and details of the water level and temperature hydrographs over the 15-month monitoring period are presented in the following graphics and discussions.

Table 1 – Monitored Well Information								
Well	Depth	Use	Casing Diameter	Owner	SWN			
MOWD Well No. 8	144 (70 to 120 perf)	Municipal Supply	28	MOWD	04N/23W-4J1			
Gramckow 9B1	180	Agricultural Supply	16	Gramckow	04N/23W-9B1			
VRWD MW2	136 (66-126 perf)	Monitoring	2	VRWD	None (newer monitoring well unassigned state well number)			
1000 Burnham Road	101	Agricultural Supply	8	Private	04N/23W-20A1			
873 Santa Ana	65	Domestic and irrigation	12	Vega	04N/23W-29F2			
Casitas Mobile Home Park	70 (44-65 ft perf)	Inactive	24	СНМР	3N/23W-5B1			

Procedures

Six wells were selected in early 2017 by UVRGA directors and respective agency staff for monitoring based on geographic distribution and availability. Staff procured agreements with

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well owners to allow for access, and six levelloggers were installed on cables near the bottoms of each well. All loggers were programmed to record data on temperature and water levels on 90-minute intervals. On installation in April and May 2017, water levels were measured to anchor automated water levels going forward. KG staff has downloaded all data from loggers on two occasions, January 2018 and July 2018, and three wells on September 21, 2018, measuring depths to water in the wells to confirm and anchor the reported depths to water shown in Figure 3 (field data sheets are attached). The effect of barometric fluctuations on groundwater levels in these vented wells is considered of relatively low significance given the narrow range of air pressures over the monitoring periods; therefore the data were not corrected for barometric pressure fluctuations.

Raw Data graphs are presented on Figures 2A through 2F. Digested depth to water and groundwater elevation graphs are presented as Figure 3 and 4. Appendix A includes an excel file with raw and adjusted data sets.

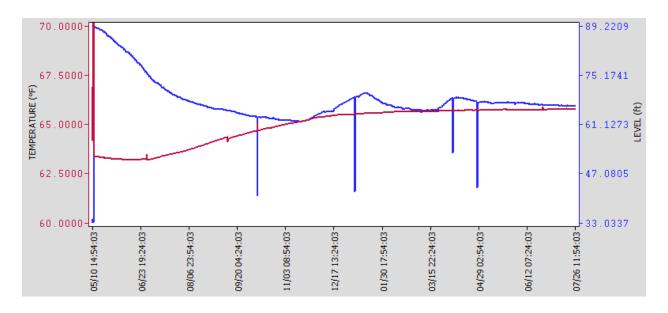


Figure 2A: Raw graph, Meiners' Oaks Water District Well No. 8, May 10, 2017 to July 26, 2018.

In the above graphs of MOWD Well No. 8, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 33 and 89 feet. Temperature, in red, references to left y-axis and shows increase of just over 2 degrees F with recession of

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water levels in summer and fall 2017 then a plateau since winter 2017-18. Well is not typically pumped due to high nitrate issues.

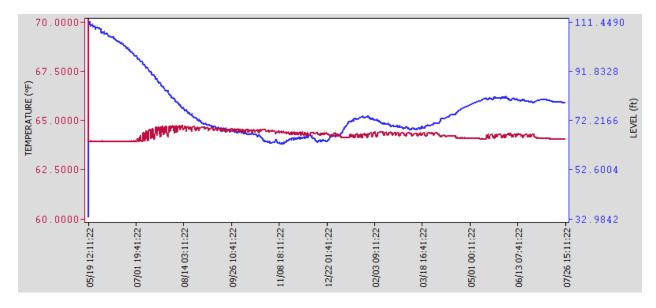


Figure 2B: Raw graph, Gramckow Well 9B1, May 19, 2017 to July 26, 2018.

In the above graphs for Gramckow Well 9B1, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 33 and 111 feet. Temperature, in red, references to left y-axis and shows relatively stable water temperatures near 64 degrees. Well is not typically pumped, but water level is affected by proximal municipal supply wells.

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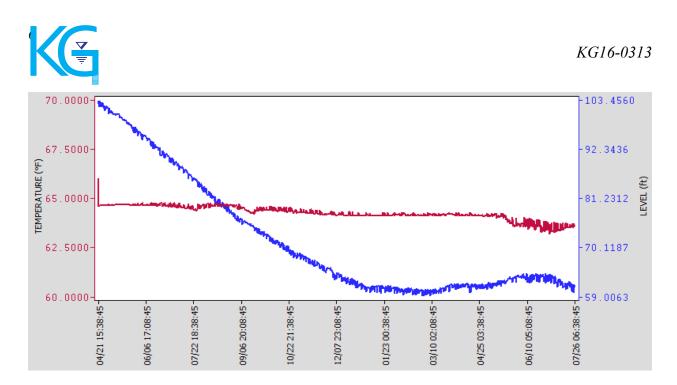
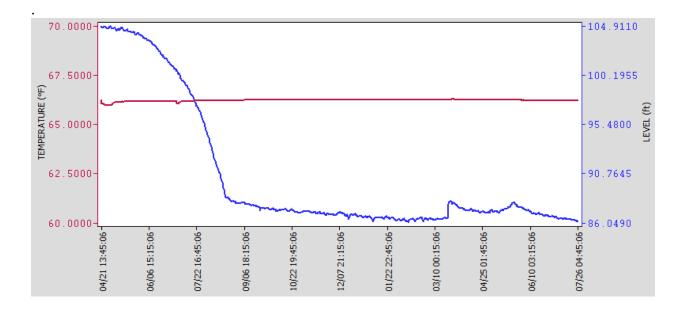


Figure 2C: Raw graph, Ventura River Water District MW2, April 21, 2017 to July 26, 2018.

In the above graphs VRWD MW2, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 59 and 103 feet. Temperature, in red, references to left y-axis and shows a slight decrease throughout the monitoring period. Well is not pumped as it is for monitoring only, but water levels therein are is affected by proximal municipal supply wells.



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Figure 2D: Raw graph, 1000 Burnham Road Well, April 21, 2017 to July 26, 2018.

In the above graphs for the 1000 Burnham Road Well, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 86 and 105 feet. Temperature, in red, references to left y-axis and shows very little change from a 66 degree temperature throughout the year.

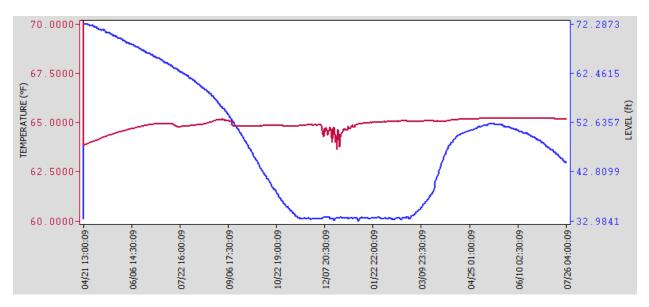


Figure 2E: Raw graph, Vega Well, April 21, 2017 to July 26, 2018.

In the above graphs of the Vega Well, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 33 and 73 feet. Temperature, in red, references to left y-axis and shows a slight warming during the 2017 recharge period but relatively stable but for a lowering in early December 2017, with nearly 20 feet of recharge exhibited in 2018.

A September 2018 correction of the data set indicates that the logger may have been raised and was not submerged between November 2017 and March 2018.

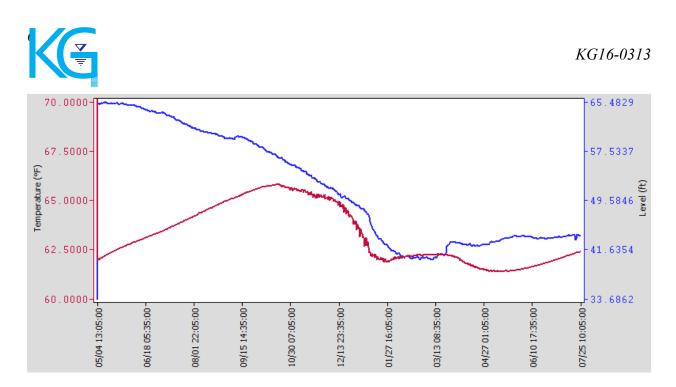


Figure 2F: Raw graph, Casitas Springs Mobile Home Park, May 4, 2017 to July 25, 2018.

In the above graph for the well at the Casitas Mobile Home Park, the water level is in feet above logger (plus 33 ft for atmospheric pressure) in blue and referenced to right y-axis between 33 and 65 feet. Temperature, in red, references to left y-axis and shows the most variability of any of the wells with nearly 3 degrees over recharge and discharge patterns. Well is not pumped as it is for monitoring only, but is in the "live reach" of the River where groundwater daylights and flows as surface water.



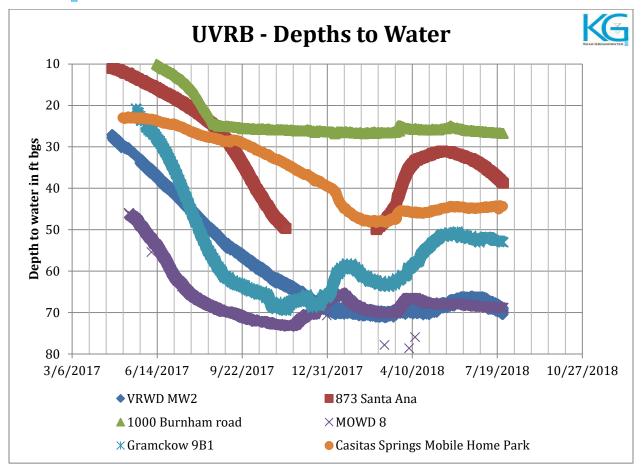


Figure 3. Depths to water in observation points, Spring 2017 to Summer 2018. Note that in the 873 Santa Ana Well, the logger was likely raised and not submerged from 13 November 2017 to 25 February 2018 so data are omitted as they were atmospheric only.

Because the logger data are generated in feet above loggers, KG has digested the graphical data to reflect depths to water and groundwater elevations on Figures 3 and 4, respectively.

Depths to water ranged from spring highs in 2017 of between 10 and 47 feet below reference points, which are tops of sounding tubes or well casings where absent sounding tubes. Summer 2017 nadirs were between 45 and 73 feet. Recharge was indicated with an increase in water levels between 2 and 20 feet in the winter and spring 2018, though distribution was variable.



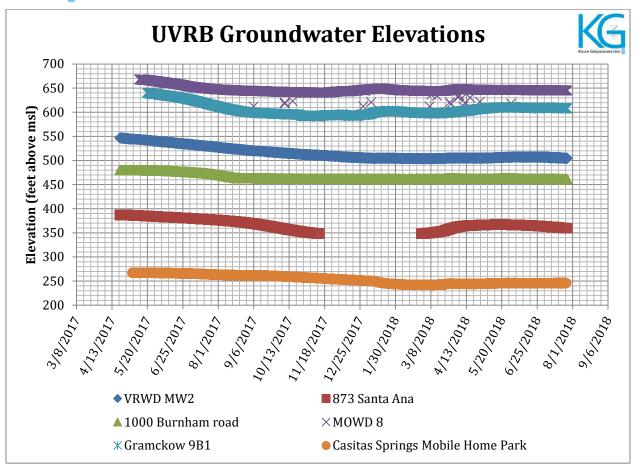


Figure 4. Groundwater elevations at six monitoring points in the UVRGB. Note that in the 873 Santa Ana Well, the logger was likely raised and not submerged from 13 November 2017 to 25 February 2018 so data are omitted as they were atmospheric only.

When the water levels are presented relative to sea level and placed on an equitable scale, the effects of water level change is muted, and the north-to south flow is clearly predominant and consistent. A gradient of 400 ft per the 30,600 feet of linear length calculates to a southward gradient of 0.013 ft/ft, which mimics topography in the area and is relatively steep compared to many other groundwater basins.

In keeping with the groundwater sustainability planning, the existing network of logging wells should continue and be augmented with additional wells to increase the area with continuous water level coverage. Fire effects on groundwater system may be better understood by comparing 2018 to subsequent water years with the detailed temporal monitoring currently being

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collected.

We look forward to our continued involvement with the monitoring program and interpretation of the results to affect an increase in basin understanding and management.

Please do not hesitate to contact us with any questions.

Best Regards,

Jordan Kear Principal Hydrogeologist Professional Geologist No. 6960 California Certified Hydrogeologist No. 749

Attachment: Field Data sheets

- Appendix A: Excel file containing raw logger data (.xls)
- Appendix B: Raw levelogger files (*.xle)

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GROUNDWATER LEVEL MEASUREMENT FIELD DATA SHEET

A	B	E	Δ	E	F	6	н
			RPE (FT	RPH		GWE (FT	
WELL ID	DATE	TIME	AMSL)	(FT AGL)	DTW (IT)	AMSL)	NOTES
Researched	Record	Record	Researched	Measured	Measured	D-F	
1000 Bornham	4/21/17	145P	488	ø	26.55*	461.95	Sot logo 64/1 Sot logo 64/1 Sot logo 97/1
VEZA	4/21/17	ZZUP	398	2.10	25.42	372.58	Soflying 64/1
VEZA VIEWD //WZ	9/21/17	3 JUPM	574	R	27.77	346.23	Sot loyna 9711
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GROUNDWATER LEVEL MEASUREMENT FIELD DATA SHEET

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WELL ID	DATE	TIME	RPE (FT AMSL)	RPH (FT AGL)	DTW (FT)	GWE (FT AMSL)	Notes
Researched	Record	Record	Researched	Measured	Measured	D-F	
CARTAS MAP	1/25/18	230PM			45.86		
VEGA	1/25/18	29JPM			(4.274	F	affect, corrected inde
1000 Bush	1/25/18	30000			45.01×		effect, corrected inde
VIEW MW	1/25/18	SINM			69.96		Mr. Jeanson
Grankow 9B	1 1/25/18	FOURM			58.55		
Mould &	1/25/18	SOUPM			67.06		
CAR ITING M	This 18	101SAM			44.35		
VER	7/26/18	295PM			53.225	K	gfset, corrected in
1 mar Bunchun	7/26/18	31.0PM			95.18		offset, corrected in
MUS MW2	7/21/18	ZISPA			69.96		TWO, our to
MOND 8		13011			68.87		
Granher 9B	17/26/18	350PM			53.08		
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CASINO M	19/21/18	1:00PM			45.89 27.63		
1000 Berch	9/11/18	10:30AM			27.63		
VELA	9/21/18	io : 50AM			47.59		
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WELL ID	DATE	TIME	RPE (FT AMSL)	RPH (FT AGL)	DTW (FT)	GWE (FT AMSL)	NOTES
Researched	Record	Record	Researched	Measured	Measured	D-F	
CASIONMHP	5/4/17	200	290	3.00	22.97	267.03	Set logre @ SU/1
Mans 8	5/11/17	335	714	6.00	46.00	669,00	St loggere 1024
Gramkun DB1	5/19/17	500 PM	661	3.00	20,75	640.25	Set loggere 90f
	-						

GROUNDWATER LEVEL MEASUREMENT FIELD DATA SHEET

ATTACHMENT: Field Data Sheets

NOTES TO DATA SET CORRECTIONS:

Discrepancies between County data sets and UVRGA data were noted on review of information in Summer 2018.

The discrepancies seem to be part of both measurement methods and an artifact of logger cable windings. In the 873 Santa Ana, or Vega Well (29F2), the logger appeared to be moved after (or concurrently with) our reference depth to water measurement coupled with an offset sounder issue (using an older now out-of-service sounder). The logger itself may have been out of the water for a period of time, so data from November 13, 2017 to February 25, 2018 have been removed from depth to water and elevation calculations as they represent atmospheric pressures only.

In the Burnham Road well (20A1), the discrepancies appear to commence with the reference depth to water measurement coupled with an offset sounder issue (using an older now out-of-service sounder).

We removed the tangled logger cable from 29F2 and have replaced it with a separate new cable.

The County chalk-and-tape measurement is also offset by up to a foot or so from our new electric sounder as well.

Ultimately, re-anchored water levels from the loggers to September 2018 measurements and back calculated all data to a new "effective logger depth" the discrepancies were reconciled as reported herein.