

EXHIBIT 33

Exhibit B

TODD GROUNDWATER

September 5, 2019

To: Craig Parton
Price Postel & Parma LLP
Antelope Valley Watermaster Legal Counsel

From: Kate White, Senior Engineer
Maureen Reilly, Senior Engineer
Todd Groundwater, Watermaster Engineer

Re: Groundwater Production on Zamrzla Parcels

Todd Groundwater was asked to calculate groundwater production in 2018 on 5 parcels of land owned by the Zamrzla family and located in the adjudicated area of the Antelope Valley Groundwater Basin. The Zamrzlas are believed to have used groundwater for agricultural irrigation on these parcels during 2018. Their wells, however, are not metered. These groundwater production calculations are required in order to determine the amount of the 2018 Replacement Obligation for which the Zamrzlas will be responsible under the terms of the 2015 Judgment and Physical Solution (see Sections 3.5.39-3.5.41 and Section 9.2 et al. of the Judgment).

Table 1 summarizes information provided in part by the Zamrzlas and also includes 2018 groundwater production calculated by Todd Groundwater. The left-hand side of Table 1 provides information concerning the Zamrzla parcels and includes a brief summary of annual groundwater production, estimated future production, and estimated 2018 production information provided by the Zamrzlas. The four columns on the right-hand side of the table summarize Todd Groundwater estimated 2018 "irrigation" (i.e., groundwater production).

The analytical process engaged by Todd Groundwater in order to calculate irrigation or groundwater production on the 5 Zamrzla parcels for 2018 was as follows.

1. We analyzed 2018 USDA satellite imagery of the 5 parcels and calculated irrigated acreages (USDA, 2019). Figure 1 shows the USDA color-infrared (CIR) satellite imagery of the area comprising the Zamrzla parcels. CIR infrared imagery is a widely used industry standard for interpretation of natural resources. Red tones are associated with live vegetation; intense reds indicate vegetation that is growing vigorously and is dense. An irrigated alfalfa field would be an example of such vegetation¹.

¹ An evergreen forest, which may be quite dense vegetatively, will not appear as a similar bright red because its level of growth activity is less, compared to irrigated alfalfa. As the vigor and density of vegetation decreases, the tones may change to light reds and pinks. If plant density becomes low enough the faint reds may be overcome by the tones of the soils on which the plants are growing. The ground areas in this case will appear in shades of white, blue, or green depending on the kind of soil and its moisture content. As plant vigor decreases, the vegetation will show as lighter shades of red and pink, various shades of greens, and possible tans. Dead vegetation, wheat stubble as an example, will often be shades of greens or tans. From https://www.usqs.gov/faqs/what-do-different-colors-a-cir-aerial-photograph-represent?qt-news_science_products=7#qt-news_science_products.

Irrigation was calculated to occur on the entire area of Parcels 3220-006-002, 3220-006-003, and 3220-001-027. Red or faint red areas extend throughout these parcels; it is unlikely that the red color would persist if no irrigation had occurred in 2018. The intensity of red can vary depending upon how recent the last alfalfa cutting occurred. About 18 acres of Parcel 3220-006-026 and 6 acres of Parcel 3220-001-028 were calculated to be irrigated. Omitted areas include those around the houses.

2. We used crop coefficients obtained from Nebeker (2007) for crops grown in the Antelope Valley.
3. We multiplied the crop coefficients by the 2018 Palmdale Station 197 monthly reference evapotranspiration totals (CIMIS, 2019) to get annual water use values of 6.0 acre-feet (AF)/acre for pasture/sod and 5.9 AF/acre for alfalfa.
4. Net water use rates were then scaled down to 5.0 AF/acre to take into account any uncertainties associated with estimating irrigated acreages from the CIR imagery.
5. We multiplied the estimated irrigated areas by the net water use rate of 5.0 AF/acre to compute the following 2018 production estimates:
 - Johnny Lee and Jeanette Zamrzla: 80 AF (5 AF/acre x 16 acres)
 - Johnny and Pamela Zamrzla: 490 AF (5 AF/acre x 98 acres).

References

California Irrigation Management Information System (CIMIS), 2019, Palmdale Station 197 2018 Monthly Reference Evapotranspiration Data, <https://cimis.water.ca.gov/>, accessed May 2019.

Nebeker, Eugene, 2007, An Estimate of Crop Water Requirements in the Antelope Valley, April 19, 2007.

United States Department of Agriculture Farm Service Agency (USDA), 2019, National Agriculture Imagery Program (NAIP), <https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/>, accessed May 2019.

Table 1. Zamrzla Production Information

Parcel Owner	Previously Supplied Information ¹							Zamrzla Recent Estimate of 2018 Irrigation (AFY)	Todd GW Estimated 2018 Irrigation			
	Parcel	Total Acres	Recent Irrigated Area (acres)	# Wells	Annual Production 2016-2018 (AFY)	Estimated Future Annual Production (AFY)	Crops		Estimated 2018 Irrigated Area ² (acres)	Net Water Use Rate ³ (AF/acre)	Used Net Water Use Rate ⁴ (AF/acre)	Estimated 2018 Irrigation (AFY)
Johnny and Pamela Zamrzla	3220-006-002	39.2	80 (current design)	0	2016: 487 AF 2017: 349.2 AF 2018: 0 AF	256	Alfalfa, Grain Hay, Sudan Grass	0	40	5.9	5.0	200
	3220-006-003	40		1					40	5.9	5.0	200
	3220-006-026	40	5 (current design, up to 40 in the past) plus domestic use	1	2016: not provided 2017: 47.7 AF 2018: 75.29 AF	100	Permanent Pasture	75.29	18	6.0	5.0	90
Johnny Lee and Jeanette Zamrzla	3220-001-027	10	15 (current design)	0	2016: not provided 2017: 53.29 AF 2018: 18.46 AF	200	Hay	18.46	10	6.0	5.0	50
	3220-001-028	10		1			Pasture grass		6	6.0	5.0	30
Totals	-	139.2	-	3	-	556	-	93.75	114	-	-	570

1. From summary information provided from the Zamrzlas dated March 16, 2019 and September 2018.

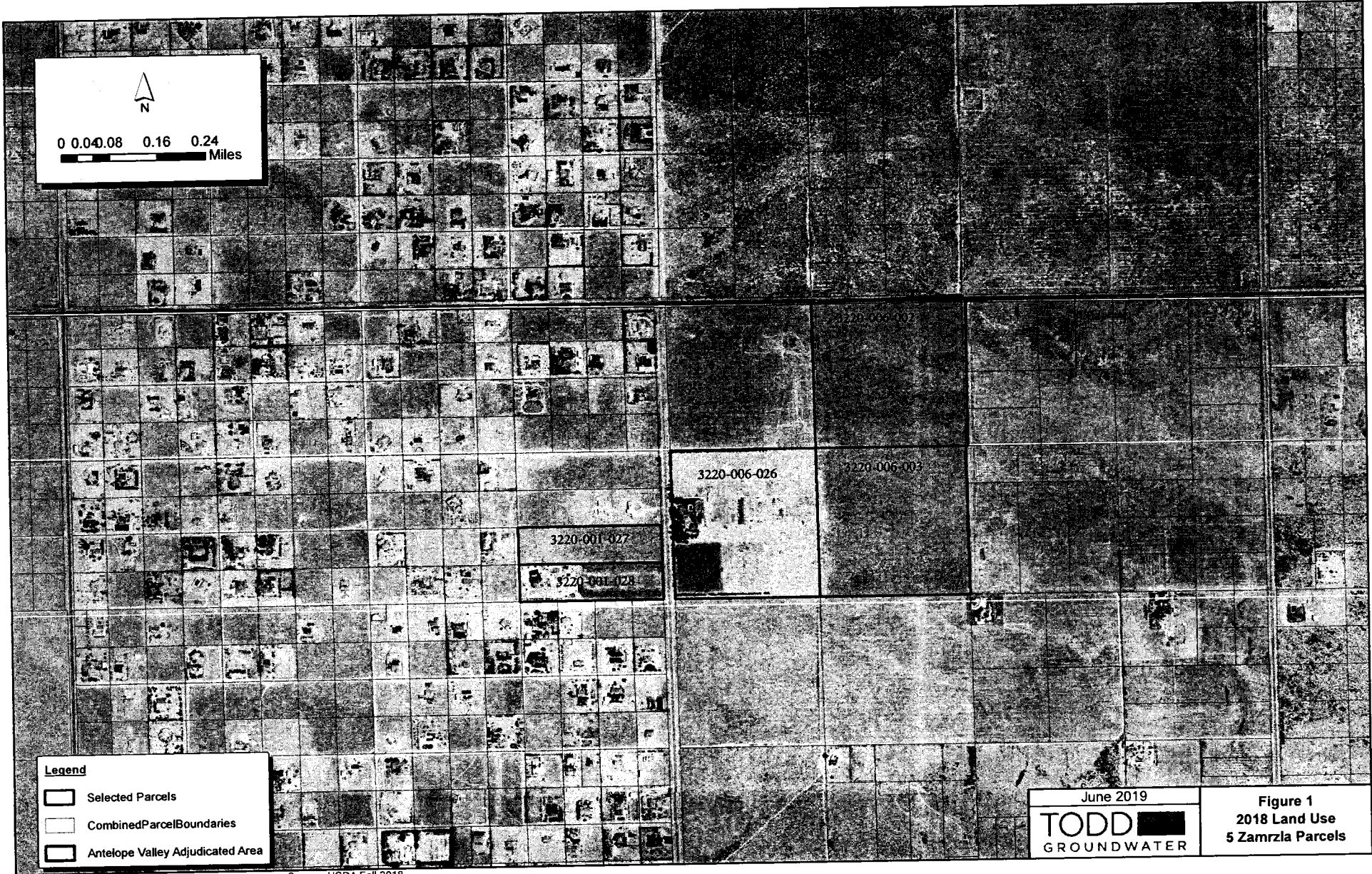
2. Irrigated areas were calculated from a USDA Fall 2018 satellite infrared image, which shows vegetation in red (shown on Figure 1).

3. Assumed that alfalfa was grown on 3220-006-002 and -003 and used an alfalfa net water use rate of 5.9 AF/acre from Nebeker (2007) and 2018 monthly Palmdale ETo values (CIMIS, 2019).

Assumed that pasture/sod was grown on 3220-001-028 and 3220-006-026 and used a pasture/sod net water use rate of 6.0 AF/acre from Nebeker (2007) and CIMIS (2019).

Assumed that hay was grown on 3220-001-027 and has a similar water requirement as pasture/sod.

4. Scaled net water use rates down to 5.0 AF/acre to take into account uncertainties of actual irrigated acreages.



N

0 0.04 0.08 0.16 0.24
Miles

Legend

- Selected Parcels
- Combined Parcel Boundaries
- Antelope Valley Adjudicated Area

June 2019

TODD
GROUNDWATER

Figure 1
2018 Land Use
5 Zamrzla Parcels

Source: USDA Fall 2018