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## Announcement

You're receiving this invoice at the end of the the 2022 Emergency Ordinance, which was the first year of groundwater pumping restrictions (May 1<sup>st</sup> to September 30<sup>th</sup> 2022) in the Mid-Kaweah Groundwater Sustainability Agency (MKGSA) region. The MKGSA appreciates the cooperation and hard work all of our landowners have done to assist in reaching groundwater sustainability. Starting October 2023, invoices to pre-pay for tiered allocation water will be sent at the start of the water year, and a true-up bill will be send at the end of each water year (end of November) to settle pumping overages (if any) and record credits available for roll-over to the next water year. An invoice description is provided below as a supplementary guide to explain each line item in the attached invoice.

## Invoice Line Item Descriptions

### Table 1

*Column 1: Irrigation efficiency.* Fraction of water assumed to evapotranspire (ET) from applying surface water, if applied. Irrigation efficiencies were assumed to be 75% for flood irrigation and 90% for drip irrigation, based on data and discussions with growers. The remaining water not credited (10-25%) is accounted for in the 10" (0.84 AF/acre) of native yield in the allocation. This column is blank for any APNs that did not receive water.

*Column 2: Assessed Acreage.* Acreage according to the Assessor's Parcel Number (APN), per Tulare County records.

*Column 3: Irrigated Acreage.* Acreage within the APN that is irrigated. This number should be equal to or less than the assessed acreage. This acreage was determined by Land IQ based on irrigated field shapes measured via satellite imagery.

*Column 4: Water Usage.* Total ET measured by LandIQ. Total ET is the sum of water consumed from precipitation, surface water, and groundwater pumping.

*Column 5: Precipitation:* One of three sources of water supply. This column includes the total precipitation calculated on the field. Calculations are derived from a dense network of publically available rain gauges andproprietary rain gauges installed and supplied by LandIQ throughout the region. 80% of this column will be credited in Table 2 and Table 3. The remaining 20% of precipitation was already accounted for in the 10" (0.83 AF/are) of native yield. Precipitation was negligible this year because the 2022 allocation only spanned from May 1<sup>st</sup> to September 30<sup>th</sup>, during which time there was little precipitation. However, this water supply will be significant (~0.8 AF/acre on average) in 2023, because the allocation will span all 12 months (October 1<sup>st</sup> 2022 to September 30<sup>th</sup>, 2023).

*Column 6: Surface Water.* One of three sources of water supply. This includes all surface water supplied by ditch companies, irrigation districts, and wastewater treatment plants. The surface water in Table 1 is the total amount of water applied. Conversely, surface water in Table 2 and Table 3 is the surface water measured by LandIQ as ET, which is corrected for the Irrigation Efficiency in Table 1 Column 1.

*\*Please notify MKGSA staff immediately if any surface water sources are missing by emailing James Fisher at [jmf@tulareid.org](mailto:jmf@tulareid.org).*

*Column 7: Allocation.* One of three sources of water supply. 2.50 AF/acre of ET due to groundwater pumping is allocated per assessed acre (Multiply column 2 by 2.5).

## **Table 2**

*Column 1: Water Supply.* The volume of water from each of the 3 water supply categories in Table 1, corrected for effective precipitation and irrigation efficiencies.

*Column 2: Water supply – Total ET.* Subtract total usage from each water supply category. The bottom row of column 3 shows credits/debits available for usage in 2023. A positive number is a credit, and will be an additional source of water supply for 2023. These credits will be used before all other water supplies in water year 2023 (October 2022 – September 2023). A negative number indicates pumping in the mitigation and/or penalty tier occurred. Mitigation tier does not result in a loss of future water supply, but any volume utilized in the penalty tier yields a corresponding loss of water supply in 2023.

## **Table 3**

*Column 1: Volume Available.* Volume available from all groundwater tiers.

*Column 2: Volume Used.* Volume available for all water supply categories, including surface water supplies (included with effective precipitation and irrigation efficiencies).

*Column 3: Volume Surplus.* The volume of water purchased, but not used in 2022. The most inexpensive water is used until the Total Water Usage demand is met (last row in Table 1). Surplus water is converted to a groundwater credit for 2023. Mitigation tier and penalty tiers are intended to settle (“true-up”) balances above the 2.5 AF/acre.

*Column 4: Volume Purchased.* Tier 1 and tier 2 volumes are automatically enrolled for purchase. Unused water supplies are converted to a groundwater credit for the following year. Therefore, allocation categories should equal the volumes in Column 1.

*Column 5: Rate.* Groundwater rates per acre-ft are described in the [Groundwater rates](#) section below.

*Column 6: Amount.* Amount due for each groundwater tier, calculated as the product of column 4 multiplied by column 5.

## **Terminology & Policies**

### **Purpose of the extraction limitation**

On May 1, 2022 the Mid-Kaweah Groundwater Sustainability Agency (MKGSA) implemented the Emergency Ordinance to Establish a Extraction Limitation for the Mid-Kaweah Groundwater Sustainability Agency Service Area (Emergency Ordinance). This Emergency Ordinance was implemented sooner than anticipated because of the 3-year drought that immediately followed the establishment of minimum acceptable groundwater levels published in the MKGSA Groundwater Sustainability Plan submitted in January 2020. Since establishing those benchmarks in 2020, the MKGSA groundwater levels have declined by approximately 38 feet, on average across the service area. The volume of water lost in just three years was a considerable portion of the allowable groundwater overdraft permitted between 2020 and 2040.

## Billing period

The MKGSA Board approved allocating a 12-month volume of water compressed over a 5-month period (May 1<sup>st</sup> to September 30<sup>th</sup>, 2022). This affords flexibility for both growers and MKGSA staff as the subbasin adjusts to the new water management framework. The 2023 water year will have the same allocation (2.5 AF/acre) but will span over a 12-month period (October 1, 2022 to September 30, 2023).

## Allocation

The allocation for 2022 was 2.50 AF/acre of evapotranspiration due to groundwater pumping (see [Usage calculation](#)). The allocation is calculated for the assessed acreage, not irrigated acreage. Parcel acreage subject to the emergency ordinance but not irrigated (farm roads, equipment storage yards, etc) has an assumed water consumption of 0.00 AF/acre.

## Usage calculation

LandIQ satellite data measures the total evapotranspiration (ET), regardless of the source of water. However, the MKGSA's intent is to calculate the amount of groundwater leaving the system. Therefore, this invoice applies several corrections to convert “total ET” as measured by LandIQ to “ET due to groundwater pumping”. If “ET due to groundwater pumping” values are contested with metered data, this equation will be reversed to convert “pumped groundwater” to “ET due to groundwater pumping” during the appeals process (see [Appeals](#)).

$$ET_{gw} = ET_{total} - C_1S - C_2P$$

$ET_{gw}$  = Evapotranspiration due to groundwater [AF/acre]

$ET_{total}$  = Total evapotranspiration, as measured by LandIQ [AF/acre]

S = Surface water applied, long-term average in TID is approximately 1.3 [AF/acre]

P = Precipitation. Long term average in the MKGSA is 9.7 acre\*inches/acre [AF/acre]

$C_1$  = Irrigation efficiency. Drip irrigation is 90% and flood irrigation is 75% [%]

$C_2$  = Effective precipitation coefficient, defined as the ratio of precipitation entering the soil profile and made available to the plant to total precipitation, estimated as 80% [%]

## Dairies

Dairy footprints (corrals, milking barns, and feed lots) cannot be evaluated adequately using ET data alone. Therefore, these footprints will have an assumed value of 0.5 AF/acre, allowing the rest of the 2.0 AF/acre to be applied for other fields or roll over to a future year.

## Fallow fields

Fields left unirrigated for at least 6 consecutive months may fill out an application setting the ET value to “0”, allowing the full water allocation to be applied to other fields or roll over to a future year. “Total ET” measured on fallow fields must equal 80% of the precipitation that fell on the parcel, indicating the ET measured was rain water, resulting in a net ET usage of 0 (see Usage calculation). If there were any fields fallowed for more than 6 consecutive months but not recognized by this invoice, please indicate the fields fallowed on the Dashboard (under the billing tab) no later than March 3rd, 2023.

## Groundwater rates

Groundwater rates for tier 1 and tier 2 pumping in surface water areas were determined to pay for the equipment, data requirements, software development, and administrative costs required for mandatory state reporting such as Groundwater Sustainability Plan Amendments and the Data Management System. See page 17 of the Emergency Ordinance for a cost breakdown of the MKGSA's expenses to operate ([tinyurl.com/mkgssa-eo-2022](https://tinyurl.com/mkgssa-eo-2022)). The rates for tier 1 and tier 2 pumping in groundwater dependent areas were set to cover those same costs as surface water users, but with the added cost of replacing the overdrafted groundwater pumping with surface water in the future. Therefore, water rates are different for parcels in a surface water district and groundwater dependent parcels outside a water district (*Figure 1*).

| Surface Water User                           |                                                                      | Groundwater Dependent User                 |
|----------------------------------------------|----------------------------------------------------------------------|--------------------------------------------|
| Surface Water                                | 4.50 AF/Acre of ET                                                   |                                            |
| Penalty Tier<br>\$500/AF of ET               | 3.50 AF/Acre of ET                                                   | Penalty Tier<br>\$500/AF of ET             |
| Mitigation Tier<br>\$260/AF of ET            | Groundwater Pumping Limit<br>(Per Section 2.1)<br>2.50 AF/acre of ET | Mitigation Tier<br>\$260/AF of ET          |
| GW Relief Pumping Tier 2<br>\$10.00/AF of ET | 0.83 AF/Acre of ET                                                   | GW Relief Pumping Tier 2<br>\$210/AF of ET |
| GW Relief Pumping Tier 1<br>\$10.00/AF of ET | 0.83 AF/Acre of ET                                                   | GW Relief Pumping Tier 1<br>\$160/AF of ET |
| Native Yield<br>No Cost                      |                                                                      | Native Yield<br>No Cost                    |

Figure 1. Comparison of groundwater cost per acre\*ft (AF) for surface water & groundwater dependent parcels.

## Appeals (surface water & groundwater)

While LandIQ Evapotranspiration data is subject to meticulous scrutiny prior to publication, the MKGSA acknowledges that meter data can be more accurate if complete records are available for a calibrated well meter. Using the conversion in Usage calculation, MKGSA staff will evaluate whether corrections are necessary provided complete meter data are provided to staff within 30 days of invoice receipt (email materials to [jmf@tulareid.org](mailto:jmf@tulareid.org)). Further, if there are any surface water sources incorrectly proportioned or missing from the invoice (e.g. ditch company stock), you may upload the bill and enter the volume entered on your field using the Surface Water tab on the Water Dashboard. If there are also any other abnormalities or issues with your invoice, please bring it to the attention of the MKGSA staff no later than March 3rd, 2023. You can also reach our staff at (559) 686-3425.

## Exemptions

Contact staff immediately ([jmf@tulareid.org](mailto:jmf@tulareid.org)) if one or more land assessed parcels of land do not apply to the Emergency Ordinance. Parcels are subject to the Emergency ordinance if all three conditions apply (1) the land is greater than 4 acres (2) at least 2 acre\*ft are used historically per year and (3) some portion of the land is used for agriculture and is not permanently retired.

## Payment

We request that payment is not made until March 3, 2023 to allow time to accommodate changes that may affect multiple water users and invoices. Payments are due March 31, 2023 by check to the Tulare Irrigation District Office. Please make checks payable to the Mid-Kaweah Groundwater Sustainability Agency.

Mid-Kaweah Groundwater Sustainability Agency  
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