

# SJRRP Flow Bench Evaluation

February 1, 2024

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## Introduction

The following Flow Bench Evaluation (FBE) documents current releases and groundwater conditions and evaluates a recommended increase in Restoration Flow based on an Ad Hoc Flow Recommendation from the Restoration Administrator (RA) approved on January 27, 2024 (and incorporated into the initial RA Recommendation for Restoration Year 2024). The objective of this flow change is to exactly expend the remaining Restoration Allocation for 2023 on February 29, 2024. Through January, the approved Restoration Flow Recommendation has been a total of 255 cfs at GRF (250 cfs of Restoration Flow).

This FBE evaluates the current releases and groundwater conditions monitored as of January 31 and confirms that the RA Recommendation for a 390 cfs total at GRF through February is within Seepage Management Plan (SMP) thresholds. Note that use of “FBE” throughout the report refers specifically to the FBE model-based analysis described in Appendix J of the SMP.

As of January 31, 2024:

1. Channel conveyance: Flow rates are below known conveyance thresholds.
2. Operations Conference Call: An operations call was held on January 31. No known operational constraints were identified on the call.
3. Seepage Hotline Calls: The seepage hotline has received no calls regarding Restoration Flows in Water Year 2024.
4. Real-time wells: A number of real-time equipment locations are currently going through equipment upgrades. All functioning telemetered groundwater monitoring well levels are below SMP thresholds.
5. Priority wells: Weekly groundwater measurements in priority wells, both real-time and manually measured, indicate that all wells are below well thresholds. Note that manual monitoring efforts may be impacted by storm conditions, but data is collected using dataloggers at most locations and will be downloaded at the next opportunity.
6. Flow Stabilization: Flows past GRF were stable through mid-January for meeting the total target of 255 cfs. Recent storms have caused flows to fluctuate later in January due to tributary inflows and corresponding adjustments at Friant Dam. The stable flow period with Friant releases of 428 cfs through January 20 is used in this FBE to represent the conditions prior to the proposed Restoration Flow increase to avoid storm fluctuations.
7. Projected Groundwater Level Changes: With the recommended increase, groundwater levels are projected to increase between 0.4 ft and 2.1 ft depending on well location (see Summary).
8. Levees: LSJLD has not expressed concerns about current flows.

9. Water Districts: The SJRECWA has not identified any operational concerns.

**Data**

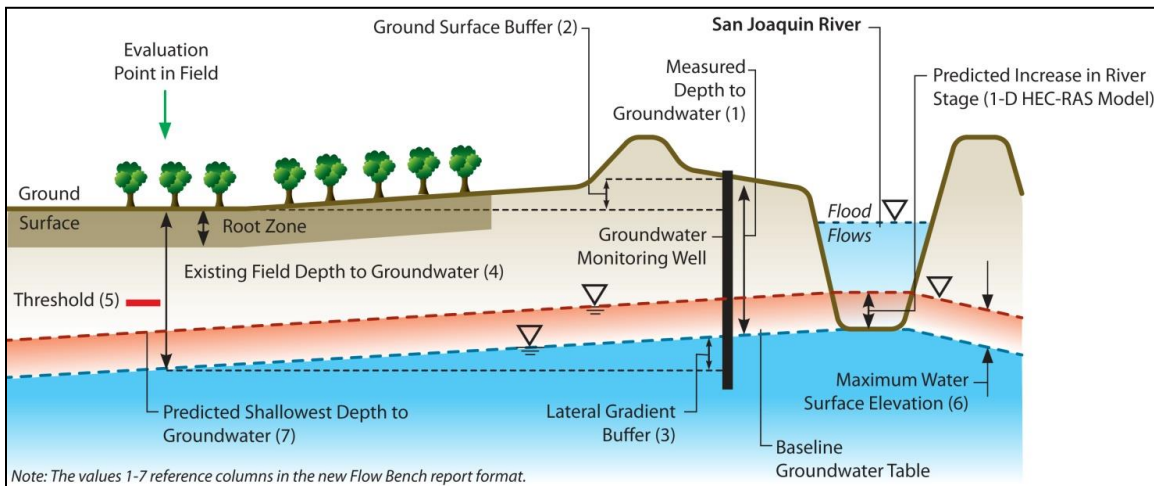
The following Data section considers groundwater monitoring measurements collected prior to the recommended flow increase between January 30 and January 31. These values are referred to as “pre-condition” to inform current groundwater levels before any changes to Restoration Flows. In the Analysis section, the “projected” values indicate the results from this FBE model-based analysis given the proposed flow changes from the Ad Hoc RA Recommendation.

Table 1 summarizes measurements that were reported from the field and are reported in the Weekly Groundwater Report with a publish date for the week ending February 3, 2024. Reclamation publishes the Weekly Groundwater Report with manual measurements via electronic well sounder on the SJRRP website [HERE](#). To calculate field depths, Reclamation adds ground surface buffers and lateral gradient buffers to measured groundwater depths in the well (Equation 1, Figure 1).

$$Field\ Depth_{Current} = D_{well} - GS_{Buffer} + LG_{Buffer} \tag{1}$$

Where:

- Field Depth<sub>Current</sub>* Current groundwater level depth in the field
- D<sub>Well</sub>* Current groundwater level depth as measured in the monitoring well
- GS<sub>Buffer</sub>* Ground surface buffer, or the difference in elevation between the well and the field
- LG<sub>Buffer</sub>* Lateral gradient buffer, to account for losing reaches where the groundwater table slopes away from the river (if any)



**Figure 1. Conceptual Model for Observed Groundwater Level Method**

The pre-condition well data in Table 1 show acceptable conditions throughout the critical monitoring locations with groundwater levels below thresholds. Again, the pre-condition data

represents the levels observed prior to the flow changes based on the Ad Hoc RA Recommendation.

**Table 1. Pre-Condition Well Data**

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	Date Measured	2 - Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	5 - Field Threshold (feet bgs)	Comment
FA-9	2A	9.0	1/30/2024	2.0	2.5	9.5	6.0	Acceptable
MW-09-47	2A	8.7	1/30/2024	2.5	3.3	9.5	7.7	Acceptable
MA-4	2A	12.3	1/30/2024	6.1	4.6	10.8	7.0	Acceptable
MW-09-49B	2A	5.7	1/30/2024	1.7	2.4	6.5	6.0	Acceptable
MW-09-54B	2B	14.8	1/30/2024	7.9	2.0	8.9	7.0	Acceptable
MW-09-55B	2B	8.9	1/30/2024	3.7	6.5	11.8	6.0	Acceptable
PZ-09-R3-5	3	10.6	1/31/2024	1.2	-	9.4	5.7	Acceptable
PZ-09-R3-7	3	8.7	1/31/2024	0.7	1.1	9.1	6.5	Acceptable
MW-18-80B	4A	11.5	1/31/2024	4.2	1.2	8.5	6.7	Acceptable
MW-17-225	4A	10.0	1/31/2024	2.9	1.1	8.2	6.5	Acceptable
MW-10-89	4A	11.6	1/31/2024	1.0	-	10.6	6.5	Acceptable

bgs = below ground surface; GW = groundwater

## Analysis

Although groundwater levels have fluctuated due to recent storms, using the most recent groundwater measurements compared to the period of stabilized flow releases through January 20 provides a conservative evaluation of the recommended flow change. That is, groundwater levels are still projected to be within thresholds despite an anticipated increase from the already elevated, dynamic pre-conditions. After consideration of an increase in target from 255 cfs to 390 cfs at GRF based on the Ad Hoc RA Recommendation, the largest anticipated water level increases were estimated based on the concept illustrated in Figure 2. The projected water level increases are not expected to exceed the nearest field threshold. After implementation of the recommended Restoration Flows, subsequent FBEs may be completed to assess stabilizing conditions.

Table 2 shows the flow rates used to evaluate projected groundwater depths. Pre-condition flows are based on the stable flow period with Friant releases of 428 cfs through January 20. The comparison of pre-condition and projected flows informs the estimated change in groundwater levels resulting from the Ad Hoc RA Recommendation.

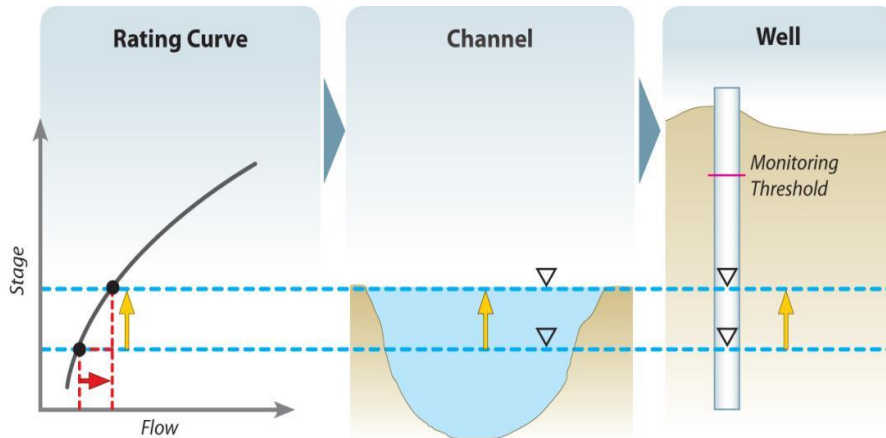


Figure 2. Conceptual Relationship between River Stage and Groundwater Levels

Table 2. Anticipated Change in Flows with Ad Hoc RA Recommendation

	Pre-condition Flows (cfs)	Projected Flows for Evaluation (cfs)
Reach 2A <sup>1</sup>	255	390
Reach 2B <sup>2</sup>	200	325
Reach 3 <sup>3</sup>	270	350
Reach 4A <sup>4</sup>	190	295

<sup>1</sup> Source: GRF target

<sup>2</sup> Source: CDEC

<sup>3</sup> Sum of Arroyo Canal Demands and Restoration Flow order at Sack Dam

<sup>4</sup> Source: Restoration Flow order at Sack Dam

Table 3 shows the change in groundwater levels for the projected flow of 390 cfs at GRF based on estimated changes in river stage and the conceptual models shown in Figures 1 and Figure 2. Field depths are calculated by taking the most recent measurements from Table 1, adding the ground surface and the lateral gradient buffers, and subtracting the maximum predicted stage increase (Equation 2).

$$Field\ Depth_{Predicted} = Field\ Depth_{Current} - WSEL_{Max\ Increase} \quad (2)$$

## Summary

This analysis, in combination with recent field measurements, indicates acceptable conditions for up to 390 cfs past GRF, including the proposed 385 cfs of Restoration Flows. Groundwater levels and flow gages will continue to be monitored. Reclamation retains the right to recapture Restoration Flows in Mendota Pool to adjust for any Restoration Flow constraints. Subsequent FBEs will be performed to inform any other potential flow changes. Note that any incoming storms may further cause groundwater levels to fluctuate, but the portion of flow that is accounted for as Restoration Flows given a target of 390 cfs total at GRF is within SMP thresholds as documented by this FBE analysis.

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**Table 3. Predicted Groundwater Levels for Priority Wells with Target Flow of 390 cfs at GRF**

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	Date Measured	2-Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	6 - Predicted WSEL Change (feet)	7 - Predicted Shallowest GW Depth (ft bgs_field)	5 - Field Threshold (feet bgs)	Comment
FA-9	2A	9.0	1/30/2024	2.0	2.5	9.5	0.5	9.0	6.0	Acceptable
MW-09-47	2A	8.7	1/30/2024	2.5	3.3	9.5	0.5	9.0	7.7	Acceptable
MA-4	2A	12.3	1/30/2024	6.1	4.6	10.8	0.5	10.3	7.0	Acceptable
MW-09-49B	2A	5.7	1/30/2024	1.7	2.4	6.5	0.5	6.0	6.0	Acceptable
MW-09-54B	2B	14.8	1/30/2024	7.9	2.0	8.9	0.7	8.2	7.0	Acceptable
MW-09-55B	2B	8.9	1/30/2024	3.7	6.5	11.8	0.7	11.0	6.0	Acceptable
PZ-09-R3-5	3	10.6	1/31/2024	1.2	-	9.4	0.4	9.0	5.7	Acceptable
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