Memorandum

To:	Dick Ehrman and Dan Schulz - LPSNRD
From:	Clinton Meyer, Jacob Bauer - LRE Water
Reviewed by:	Dave Hume - LRE Water
Date:	5/14/21
Project:	Monolith Wells and Pumping Evaluation
Subject:	LRE Water Summary and Response to Olsson's Monolith Hydrogeologic Analysis Report Addendum (Final) and Additional Requested Model Runs

INTRODUCTION

The purpose of this memorandum is to provide the Lower Platte South Natural Resources District (LPSNRD) with LRE Water's (LRE) review of Olsson, Inc.'s (Olsson) Monolith Hydrogeologic Analysis Report Addendum (final Addendum) that was submitted to LPSNRD on April 28, 2021 on behalf of Monolith Materials (Monolith) and in support of Monolith's application for new water supply wells.

The final Addendum was prepared by Olsson following LRE and LPSNRD's review of Olsson's draft Addendum submitted to LPSND on April 2, 2021. The draft Addendum was prepared in response to requests for additional information following review of Olsson's December 2020 Hydrogeologic Analysis Report (Report), and a follow up meeting between with LPSNRD staff, Monolith, Olsson and LRE on April 12, 2021. Following this meeting, Olsson provided the model files that were reviewed by LRE.

COMMENTS ON ADDITIONAL MODEL RUNS

The final Addendum addresses final requests and describes Olsson's additional groundwater model runs that focus on the following, which are referenced herein and defined as follows:

- **Future Scenario A: Three-Well Moderate Demand -** Pumping demand is distributed across three wells at 320 million gallons per year (MGY) or 609 gallons per minute (gpm) each rather than one well as discussed in Olsson's Report.
    - This scenario captures the potential drawdown within the CPA aquifer. It is reasonable to expect that the maximum drawdown of the aquifer in the wells

and immediate area of the Monolith facility would decrease if the pumping was distributed spatially in three wells.

- **Future Scenario B: Three-Well High Demand -** Pumping demand is supported using three wells pumping at a combined rate of 762 gpm rather than one well, which supports a potential increase in the total pumping rate due to changes in planned operations at Monolith to 400 MGY.

    - This scenario also captures the potential drawdown within the CPA aquifer. It is reasonable to expect that the maximum drawdown of the aquifer in the wells and immediate area of the Monolith facility would decrease if the pumping was distributed spatially in three wells rather than one.

    - This run shows a minor increase in drawdown further away from the Monolith wells compared to the Original Future Demand run and Scenario A.

- **Future Scenario C: Peak Demand** - Pumping demand is set to 1,200 gpm for a short period during the summer using one well, and was summated by running this on top of the Original Future Demand model in the Olsson's Report.

    - This run represents what Monolith may need to pump (up to 1,200 gpm) during a particularly hot summer. This scenario was represented by using the Original Future Demand run and adding 6 months of pumping from one well at 1,200 gpm from April through August in the 14th year of the 50 year model.

    - Reviewing the interpretations for Scenario C it becomes apparent that any additional drawdowns from a short period of time pumping at 1200 gpm will eventually return to the original overall prediction of total drawdown within 18 months. We agree with this interpretation and do not believe an additional 0.5 feet added to the 8.6 feet is significant.

CONCLUSIONS ON ADDITIONAL MODELING FINAL ADDENDUM

LRE reviewed the final Addendum, and for documentation purposes, we provide the following conclusions regarding Olsson's responses to LRE's recommendations and LPSNRD's Board of Director's motions to Olsson's Report:

1. LRE received output files for the three additional model runs listed above. The output files received were the MODFLOW "WEL" and "LST" files of each run. LRE reviewed these runs and compared them to the Original Future Demand run detailed in Olsson's Report. A summary of the runs are listed in Table 1. Based on our review of the input well pumping files, and the associated model output files, the model files were constructed properly and accurately represent the scenario run.

2. The requested sensitivity runs were completed by Olsson, and it is our opinion that the updated sensitivity runs incorporate a reasonable range of possible model parameters. In our opinion, further sensitivity runs are not required.

3. The explanation and directions provided by Olsson on the replication of future drawdown simulations are acceptable.

4. Olsson provides drawdown maps and drawdown versus time plots for Scenario A and Scenario B, and a difference drawdown over time graph for Scenario C.

5. In general, our opinion is that the additional model runs and information provided in the final Addendum capture the requests of the LPSNRD staff, LPSNRD Board of Directors, and LRE. The fact that the three-well models only have a constant pumping rate throughout the model time period as opposed to the variable rate based on predicted demand likely would not change the overall maximum drawdown after the 50 year period aside from some extremely local effects near Monolith's pumping well(s).

6. The additional information submitted regarding the upward gradient from the lower bedrock aquifers is sufficient and addresses the potential for large-scale changes in the upward gradient leading to regional issues in TDS values. Some small increases in TDS are a possibility in the immediate vicinity of the Monolith wells,

but these increases are unlikely to lead to regional issues. Monolith's groundwater monitoring plan will also be in place to monitor for possible changes in quality.

7. The monitoring and well interference protection plans described within Olsson's Addendum will provide protection to other water users and a reasonable level of aquifer monitoring to trigger and identify if drawdown from Monolith's pumping is exceeding threshold values. Upon implementation, the monitoring plan will track drawdown of Monolith's three-well pumping system over the next 50 years.

8. In LRE's opinion, the Report and Addendum addresses Monolith future water use on the CPA aquifer and accounts for the possible effects from climate change.

9. The final Addendum addresses all of LRE's original recommendations and questions.

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TABLE 1. SUMMARY OF MODEL RUNS PROVIDED

Model Run	Scenario/ Model Run Name	Average Monolith Pumping Rate For 50 Years (MGY)	Percent Difference in Pumping from Original Model Reviewed	Note on Pumping Rate	Number of Monolith Wells Pumping	Predicted Maximum Drawdown Produced by Olsson
1	Original Future Demand*	312.64	-	Each time step has variable Monolith pumping based off of what Olsson considered to be predicted demand peaking one month at 774 gpm	1	Olsson's Dec. 2020 Draft Hydrogeologic Analysis Report: 8.5 feet
2	Scenario A: Three-Well Moderate Demand	320	2.35%	Constant pumping at every time step divided into 3 wells (i.e., combined sustained rate = 609 gpm, or 203 gpm each)	3	Final Addendum: 6.8 feet
3	Scenario B: Three-Well High Demand	400	27.30%	Constant pumping at 762 gpm every time step divided into 3 wells (i.e., combined sustained rate = 762 gpm)	3	Final Addendum: 8.6 feet
4	Scenario C: Original Future Monolith with Peak Demand	315.54	0.93%	Each time step has variable Monolith pumping based off of what Olsson considered to be predicted demand with 6 months of pumping at 1,200 gpm starting in April of the 14th year of the 50 year simulation	1	~ 0.5 feet additional drawdown at the Hallam wells

* LRE also received a Calibration Model to the Olsson Future Monolith Prediction, but that is not discussed here.
MGY - Million gallons per year