SJRWMD Responses to Stakeholder Comments Regarding the Draft MFLs for Sylvan Lake, Seminole County, Florida

11/29/2023

Introduction

Comments from Liquid Solutions Group, LLC (LSG) on behalf of Orange County Utilities (OCU) on the proposed Sylvan Lake MFLs, were provided to the SJRWMD on April 1, 2021 (see attached). A follow-up email with additional comments was provided on April 13, 2021 (see attached). This resolution document provides SJRWMD responses to stakeholder comments.

Comments provided on April 1, 2021:

1. **Synthetic Long-Term No-Pump UFA Groundwater Heads Near Sylvan Lake**

   The Sylvan Lake MFL re-evaluation analysis proposes the use of a synthetic long-term (1948-2018) No-Pump (NP) UFA heads series near Sylvan Lake (Well S-0718). This synthetic longterm NP UFA head series was derived from another synthetic long-term UFA heads series representing historical conditions. However, the long-term UFA head series representing historical conditions near Sylvan Lake was calculated based on a mathematical relationship between observed heads at a surrogate (reference) site (Well OR-0047) and observed heads at Sylvan Lake (Well S-0718). The following comment identifies concerns with this process.

   Figure 1 shows a comparison of the long-term rainfall series used in support of the Sylvan Lake MFL re-evaluation study (expressed as cumulative deviation from average rainfall) and the simulated long-term NP UFA head series derived for Well S-0718. As shown in Figure 1, the rainfall pattern and trends deviate from the variability exhibited by the synthetic NP UFA head series for the period from the early 1960's through the late 1980's. Since the NP UFA head series does not include the effect of groundwater withdrawals, the NP UFA head series would be expected to reflect historical rainfall conditions.

   A potential reason for the deviation between NP UFA levels and rainfall trends is the use of Well OR-0047 as a surrogate site for the development of a UFA head series representing historical conditions near Sylvan Lake (Well S-0718). As shown in Figure 2, the use of Well OR-0047 imparts characteristics (anthropogenic and hydrological variability) on Sylvan Lake UFA heads. However, Well OR-0047 and Well S-0718 are located almost 20 miles apart from each other (Figure 3). While the Sylvan Lake MFL re-evaluation analysis shows that a good correlation has existed between the observed heads at these two sites in recent years, extending the UFA head series at Sylvan Lake back in time assumes this correlation also existed historically outside the period of record for S-0718.

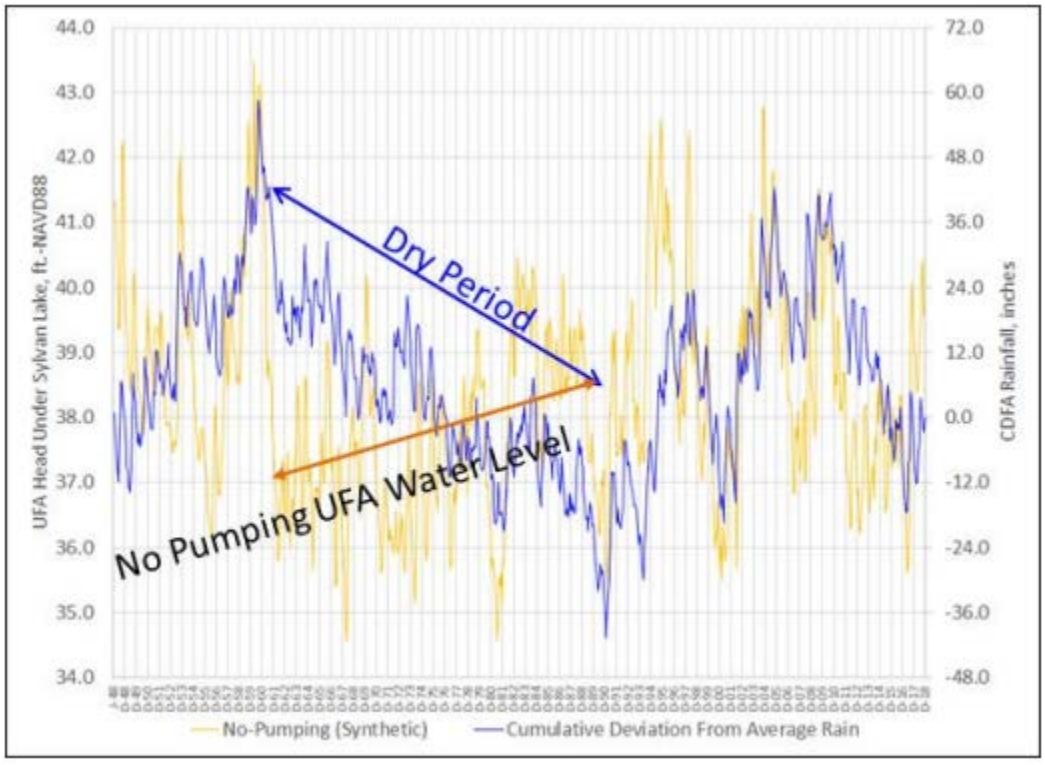

Figure 1. Sylvan Lake NP UFA Head Series and Rainfall.

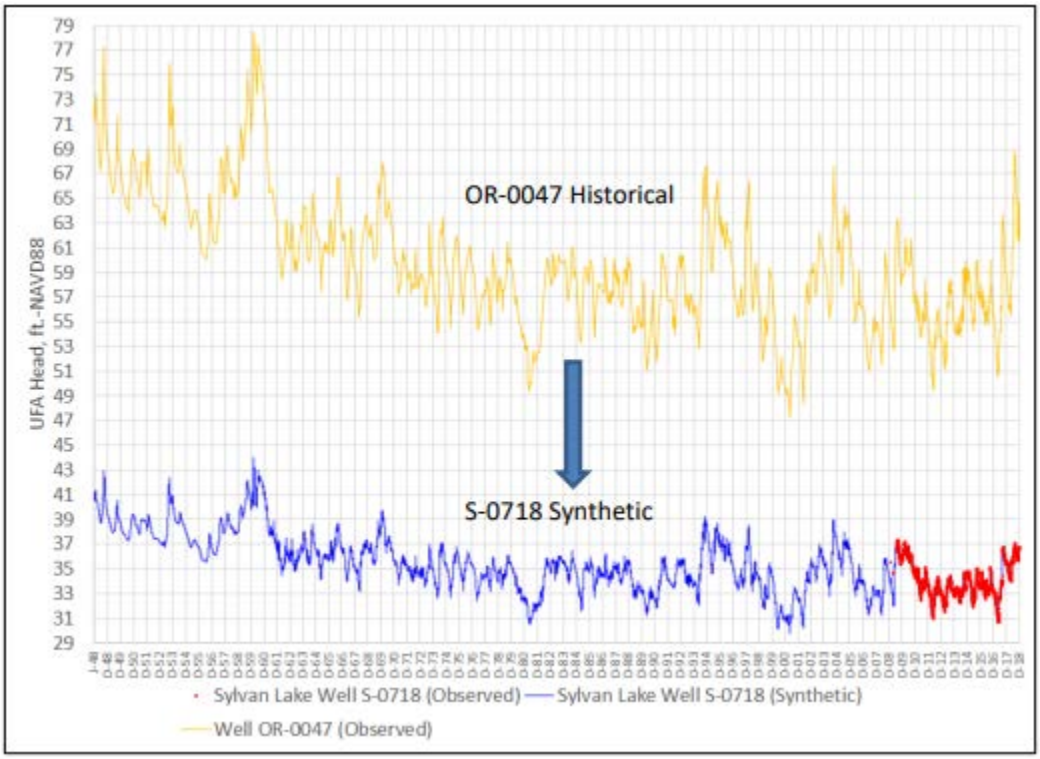

Figure 2. Extension of UFA head series near Sylvan Lake (Well S-0718). OR-0047 Historical S-0718 Synthetic

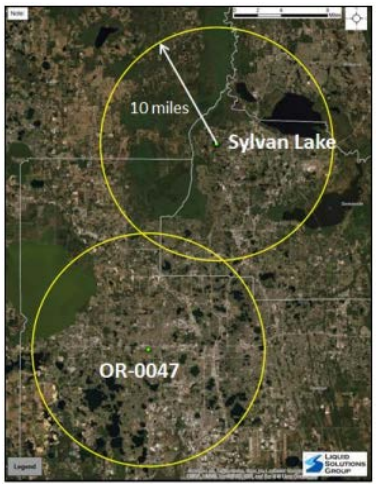

Figure 3. Location of Well OR-0047 and Well S-0718.

A potential major difference between the anthropogenic characteristics of the two UFA wells sites is the historical pumpage. UFA heads variability and trends observed at Well OR-0047 are expected to be more characteristic of pumpage in western Orange County. While heads variability and trends observed at Well S-0718 are expected to be more characteristic of pumpage in Seminole County, closer to Sylvan Lake. Figure 4 shows that historical pumpage in the vicinity of these two sites exhibit different temporal patterns and trends, with pumpage starting to increase in the late 1950's in Orange County (Wekiva Basin pumping used), and in the 1970's in Seminole County (around Sylvan Lake).

To address these concerns, we would recommend that the SJRWMD evaluate methods for adjusting the NP UFA head series for S-0718 to better reflect the historical rainfall conditions. One method could include an adjustment to correct for the temporal anthropogenic differences between these two locations.

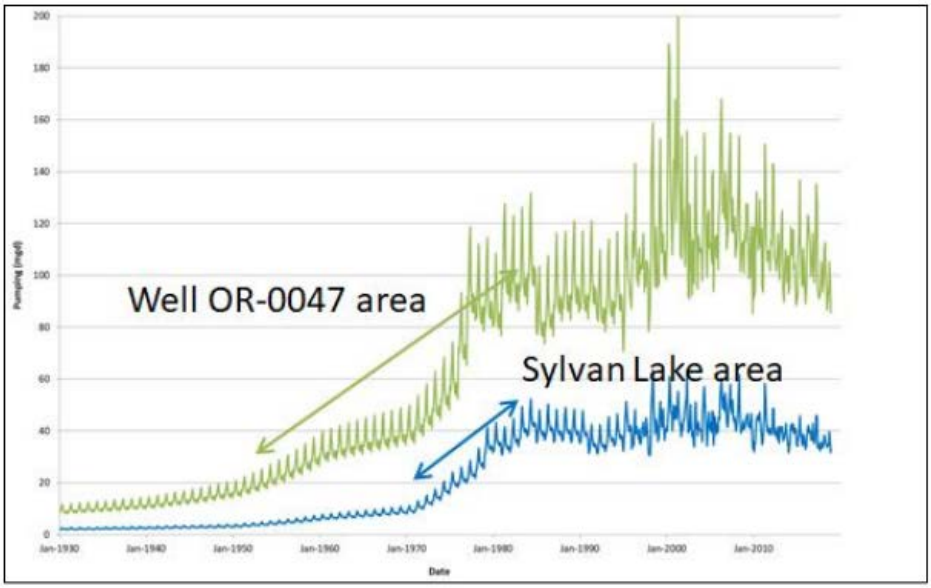

Figure 4. Historical Pumpage near Well OR-0047 and Well S-0718.

SJRWMD Response:

First of all, cumulative rainfall departure from mean is not always a good predictor for groundwater levels since groundwater levels are also influenced by regional recharge that may occur in the past several years. In addition, the rainfall data used in the analysis may not be sufficient to represent regional and local rainfall affecting the groundwater levels in the area. Thus, it is premature to say that "a potential reason for the deviation between NP UFA levels and rainfall trends is the use of Well OR-0047 as a surrogate site for the development of a UFA head series". More in-depth analysis is required to better understand the relationship between rainfall and groundwater levels in the vicinity of Lake Sylvan.

Second, the UFA levels extended with OR-0047 were successfully used to calibrate and validate the model. In addition, as part of Lake Sylvan pumping impact analysis, to address peer review and stakeholder comments, we performed an additional analysis using three buffer zones within 10-, 20- and 30- mile radius of Sylvan Lake to determine how sensitive the estimated pumping impact was to the buffer zone radius. The average 2014-2018 pumping impacts were estimated to be 2.5, 2.7 and 2.9 feet if 10-, 20- and 30-mile buffer were used, respectively. The small difference indicated results were not very sensitive to the pumping distribution within at least 30 miles. Please note that Well OR-0047 is about 20 miles from Sylvan Lake. Thus, we do not think any adjustment to the NP groundwater levels to reflect the historical rainfall conditions is warranted.

2. Development of the Long-Term Current-Pumping Condition UFA Groundwater Heads Near Sylvan Lake

The Sylvan Lake MFL re-evaluation analysis proposes the use of a synthetic long-term (1948-2018) Current-Pumping (CP) UFA heads series near Sylvan Lake (Well S-0718). This synthetic long-term CP UFA head series results from a two-step process: the conversion from historical UFA heads to NP UFA heads, and the conversion from NP UFA heads to CP UFA heads. Currently, this two-step process is based on two different methodologies. The following comment addresses a potential underestimation of the CP UFA head series resulting from this process.

The simulated long-term CP Sylvan Lake stage series is based on a CP UFA head series resulting from the use of the East-Central Florida Transient Expanded (ECFTX) Model. The District is using the ECFTX Model to estimate the drawdown (groundwater impact) resulting from average 2014 through 2018 pumpage, relative to the NP condition. The predicted impact (single offset value) derived from the ECFTX Model is used to convert the long-term NP UFA head series into the long-term CP UFA head series.

In another step of the process, the District is developing a linear regression (Figure 5 and Figure B-14 of Appendix B of the Sylvan Lake MFL re-evaluation draft technical publication) relationship between impact and pumping around Sylvan Lake based on the ECFTX calibration simulation and related derived simulations. This regression relationship was used to estimate historical drawdowns (groundwater impacts) to convert the synthetic long-term historical UFA head series into the long-term NP UFA head series.

Applying these two different methodologies, one based on actual drawdown from an ECFTX 2014-2018 model simulation and another based on linear regression of ECFTX calibration and

related simulations, introduces a potential inconsistency into the process of calculating CP UFA heads.

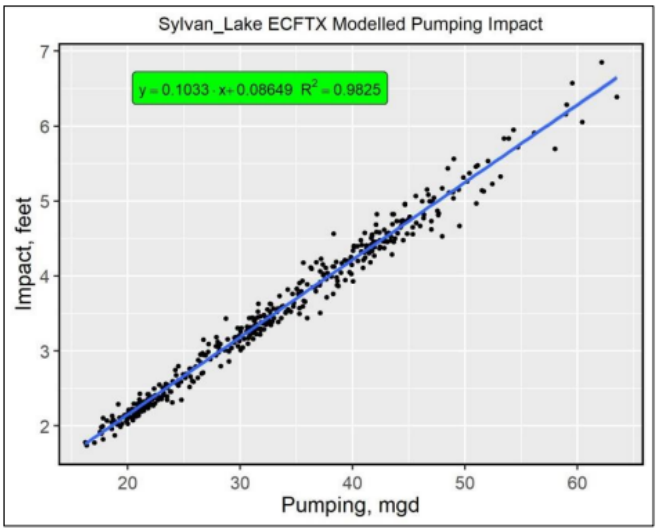

Figure 5. Linear Regression Used to Estimate UFA Historical Impacts for Conversion from Historical Conditions to NP Conditions.

The CP UFA impact produced by the ECFTX 2014-2018 Model is 4.247 ft. However, the average CP UFA impact derived using Figure 5 for monthly pumping from 2014-2018 is 3.955 ft. This difference shows that the linear regression underpredicts current impacts by 0.292 ft., relative to the results derived directly from the ECFTX Model.

As a result, the conversion of the synthetic long-term historical UFA head series into the NP condition is being underestimated by about 0.292 ft. If the long-term NP UFA head series is underestimated by about 0.292 ft., then long-term CP UFA head series is also underestimated by the same amount, because the UFA CP condition is just a constant offset value (4.247 ft.) subtracted from the UFA NP condition. If the UFA CP condition is underestimated, then the simulated long-term CP lake stage series is also underestimated as shown in Table 1.

As shown in Table 1, the use of these different methodologies to convert UFA heads from historical to NP, and then from NP to CP conditions, results in an underestimation of the CP UFA heads (row 5) relative to “observed” current conditions (row 1). As a result, the resulting long-term CP lake stage series would also be underestimated.

It appears that there are multiple methods to increase consistency between the steps in the process of calculating CP UFA heads. We recommend that the SJRWMD evaluate and implement changes to address this concern.

Table 1. District's Proposed NP and CP UFA Conditions.

Row Number	Simulated Daily Series (2014-2018)	District's Proposed Methodology (Two UFA Impacts Estimation Methods)	Notes
1	Average of historical water levels (2014-2018)	33.975	
2	Impact of historical pumping from regression (average of current levels), ft.	3.955	From regression equation
3	NP Average UFA Head, ft.-NAVD	37.931	Average historical + 3.955 ft.
4	Current pumping impact from ECFTX Model, ft.	4.247	ECFTX 2014-2018 sim
5	CP Average UFA Head, ft.-NAVD	33.684	Average NP - 4.247 ft.)

SJRWMD Response:

Please note that Table 1 in the comment shows the results of ECFTX v1.0. All analysis were updated using the latest ECFTX v2.0. To address peer review and stakeholder comments, we performed an additional analysis using three buffer zones within 10-, 20- and 30- mile radius of Sylvan Lake to determine how sensitive the estimated pumping impact was to the buffer zone radius. The average 2014-2018 pumping impacts were estimated to be 2.5, 2.7 and 2.9 feet if 10-, 20- and 30-mile buffer were used, respectively, using the ECFTX v2.0. The small difference indicated results were not very sensitive to the buffer zone radius. However, when compared to the actual ECFTX v2.0 current-pumping model run, the regression based on the 20-mile buffer produced the same drawdown as the drawdown simulated by the model. Thus, the 20-mile buffer was used in the final analysis. Please see the updated appendix B – hydrological analysis technical memorandum for details.

3. Representation of Sylvan Lake Historical Structural Changes

The Sylvan Lake MFL re-evaluation analysis simulates a long-term (1948-2018) lake stage series that is based solely on post 2014 outflow conditions. However, it appears to neglect the effect of manmade lake management changes that have occurred in previous decades. The following comment addresses the need to account for and document lake level changes attributable to historical lake structural changes.

Sylvan Lake's long-term CP lake stage series is simulated using Sylvan Lake's postconstruction outflow values resulting from a structure improvement located at the north end of Sylvan Lake in 2014. Figure 6 shows the outflow structure improvements. However, additional structural changes (i.e., canal construction), further enhancing discharges from the lake, have also occurred historically (Figure 7). The Sylvan Lake MFL re-evaluation does not appear to address or quantify the potential effects resulting from the construction of these historical improvements.

Furthermore, the SJRWMD appears to have conducted most of its assessments (e.g., docks) on the main body of the lake. This appears to be appropriate since docks constructed on manmade canals off of the lake are subject to a variety of factors unrelated to groundwater withdrawals.

Figure 6. Sylvan Lake 2014 Structure Improvement.

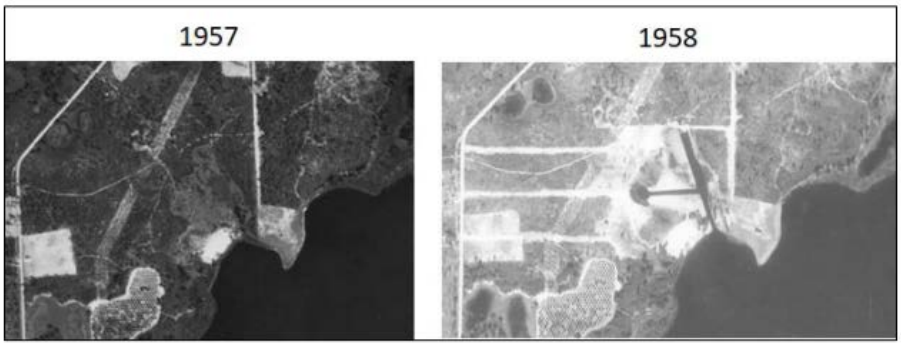

Figure 7. Sylvan Lake Canal Construction.

SJRWMD Response:

A model simulation was performed to simulate the lake levels with the old outlet elevation so that a comparison could be made with the lake levels under new outlet elevation. As expected, the lake level was slightly higher under the old outflow conditions during high water level conditions. The change in the outlet elevation did not have any impact at low water levels. Since the most constraining MFL is frequent low, no additional analysis was necessary. Please see Appendix B of the MFL report for details of this analysis.

The effect of landuse changes including canal construction and urbanization on lake levels are difficult to quantify over time due to lack of information about the timing of those changes. More importantly, model calibration and validation results did not reveal any dramatic shift in

lake levels which could be attributed to landuse changes. Therefore, we do not think any additional analysis is warranted.

Comments provided via email on April 13, 2021:

1. [OCU believes] that in [the case of Sylvan Lake], the use of the P50 lake level value alone, as proposed by the District, is appropriate and adoption of other minimum levels (e.g., other P-values) are not required to protect the water resources associated with Sylvan Lake. The recommended minimum P50 value proposed by the SJRWMD was calculated from the "lake level time series that just meets the most constraining levels (FH and FL)." The recommended minimum P50 level is protective of all 10 water resource values (WRV) assessed as part of the Sylvan Lake Minimum Levels Reevaluation study.

   SJRWMD Response: Noted.

2. While there are some variations in the MFL analysis across different hydrologic regimes, the MFL is based on the expected long-term condition as presented in the draft MFL report. Additionally, the calculated MFL condition for Sylvan Lake shows an interquartile range (P75 to P25) of lake stages of less than 3 feet which further justifies the use of only the P50 water level.

   SJRWMD Response: Noted.

3. Furthermore, we believe that the use of a single MFL value provides a reasonable balance between full protection of the water body and regulatory complexity. Lastly, the SJRWMD proposes to evaluate the MFL approximately every five years. During this analysis, the SJRWMD will "monitor the status of the adopted minimum P50 for Sylvan Lake" and the "MFL status will also be monitored periodically by reviewing multiple exceedance curve percentiles, updated with post current-pumping condition (i.e., observed) water levels." This adaptive management technique provides additional justification that the use of the P50 water level alone is appropriate and protective.

   SJRWMD Response: Noted.