MEMORANDUM

To: Project Manager
Attn: Jennifer McConnell

From: John Anderson
Hydrologist

SUBJECT: Drawdown Cone of Depression from Troutlodge AEM Drain Model

Please find attached a graphical representation of the cone of depression for the Troutlodge Analytical Element Model (AEM) generated by Brandon House (2020) at the TSC. These figures were generated using Aqtesolve forward solution and Surfer Contouring Software to show visually the cone of depression which can be expected at different pumping rates.

Drawdown was calculated using a line of pumping wells in Aqtesolve. The wells were pumped at a predetermined pumping rate (5, 10, 20, 30, 40, 50, and 60 gpm) set at 5-foot increments along the length of the proposed drain. There are 81 wells total for a length of 400 feet. This corresponds to 0.9, 1.8, 3.6, 5.4, 7.2, 9.0, and 10.8 cfs shown in the attached figures. A constant head boundary condition is located parallel to the drain offset 200 ft to the north and 670 ft to the south of the drain. ***[see comments 1 and 2 below]*** The aquifer conductivity was set at 1000 ft/day ***[see comment 3 below]*** with aquifer thickness of 30 ft. The wells modeling the drain partially penetrate the aquifer to a depth of 15 feet. The drawdown cone of depression was output using a GRID file and displayed in Surfer. Contours shown are for displacement greater than 0.5 ft. Constant head boundaries are modeled using an infinite array of image wells per (Ferris et all, 1962).

Drawdown cannot occur below the bottom of the drain. The maximum discharge which can be provided by the drain is approximately 5.4 cfs ***[see comment 4 below]*** according to current conditions. If the water table were to rise by 2 additional feet, the drain has capacity for the additional water surface elevation. The higher flows have been tabulated to provide this as reference. The maximum capacity of the discharge pipe is 10.0 cfs. ***[see comment 5 below]***

References

Ferris, J.G., D.B. Knowles, R.H. Brown and R.W. Stallman, 1962. Theory of aquifer tests, U.S. Geological Survey Water-Supply Paper 1536 E, 174p.

House, Brandon, 2020. 2-D Analytic Element Groundwater Flow Model for Troutlodge Interceptor Drain, US Bureau of Reclamation.

LIST OF FIGURES

ATTACHMENT 1 – TRENCH DRAWDOWN PUMPING RATE 0.9 CFS
ATTACHMENT 2 – TRENCH DRAWDOWN PUMPING RATE 1.8 CFS
ATTACHMENT 3 – TRENCH DRAWDOWN PUMPING RATE 3.6 CFS
ATTACHMENT 4 – TRENCH DRAWDOWN PUMPING RATE 5.4 CFS
ATTACHMENT 5 – TRENCH DRAWDOWN PUMPING RATE 7.2 CFS
ATTACHMENT 6 – TRENCH DRAWDOWN PUMPING RATE 9.0 CFS

ATTACHMENT 7 – TRENCH DRAWDOWN PUMPING RATE 10.8 CFS

Comments provided on this summary document by Mike Procsal, Geologist, Bureau of Reclamation, Columbia-Pacific Northwest Region on June 25, 2020

Comment:

1. Rocky Ford Creek is likely hydraulically connected to the gravel or sand gavel groundwater aquifer of which the trench is designed to drain. Have we considered losses of Rocky Ford Creek into this water bearing subsurface zone that we are trying to drain? It seems like a constant head boundary also exists just upstream of the facility… Perhaps that is part of the design?- drain the GW, give Rocky Ford creek the ability to lose surface water into this new pore space and redirect part of its flow through the subsurface and out the drain? I guess in the end it doesn't matter if the head difference is still there and the drainpipe can accommodate the flow.

2. During drilling of TL-19-1 and TL-19-2 the groundwater elevation encountered was lower (deeper) than the static groundwater elevation indicating a potentially confined system along the southern boundary. Just thought I'd point this out in case you or Brandon intend to provide a more detailed write-up of the aquifer characteristics.

3. Do we have any analysis (slug testing, pump out tests) that can back up this K estimate? I see in Brandon's report that is it estimated based on sand and gravel from literature. It would be nice if we had some type of field testing to support this number.

4. Should this be 5.2 cfs?

5. Should this be 10.2 cfs?