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Evaluation of Potential Unreasonable Impacts from EP Phase I Pumping

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Introduction

It was determined that the 2.5 million gallons per day (MGD) volume requested by EP has the potential to cause an unreasonable impact on surrounding water-supply wells (Hunt and Smith, 2018). A review of the EP aquifer test data and surrounding water-supply wells indicated that drawdown from EP pumping would result in a water level below the pump level in certain wells, and thus be unreasonably impacted by EP's pumping (**Table 1**; Hunt and Smith, 2018). The findings were based primarily on measured data from the EP aquifer test (WRGS, 2017a; BSEACD, 2017) and did not need modeled values to make the determination, although modeling further supported those results and resulted in broader and larger magnitude potential unreasonable impacts (Hunt and Smith, 2018).

The question was posed to the Aquifer Science team from the BSEACD general manager as to what volume could EP produce from the existing well field that would not result in potential unreasonable impacts during Phase I pumping, assuming a 6-month duration of Phase I. It was also assumed that avoidance measures, such as lowering pumps, would be completed during Phase I. An evaluation was done prior to the draft recommendation by the General Manager, but no formal notes were published. This technical memorandum is meant to document those evaluations and re-evaluate those results with the benefit of new additional water-level data since the evaluations were done in early 2018.

Methods

Analytical models with the same aquifer parameters used in the evaluation of potential unreasonable impacts (Hunt and Smith, 2018) were run to address the question of impacts using incremental amounts of pumping at the EP well field. Additional information on methods, aquifer parameters, and proportional pumping rates for each well are described in BSEACD (2018) and Hunt and Smith (2018). The analytical models used in these evaluations yield similar results to other analytical models (Oliver, 2018; WRGS, 2017b). The evaluation for the potential for unreasonable impact summarized in Hunt and Smith (2018) assumed about 50 ft of natural decline in water level due to drought. However, recent data (**Figure 4**) from some of the monitor wells indicates that the natural decline of water levels due to drought (April 2017 to August 2018) was at about 65 feet. Therefore, this value is being used in the analyses for unreasonable impacts.

Results

An evaluation of the effects of pumping for a 6-month period at 10%, 20%, and 30% of the total requested 2.5 MGD (**Table 2**) is documented in this memo. Results of the drawdown evaluation are presented in **Tables 3, 4, and 5**, and **Figures 1, 2, and 3**. Results of the evaluation indicate that 10% (0.25 MGD) and 20% (0.5 MGD) of the requested pumping volume have

very little to no potential for unreasonable impact to water levels (Tables 3 and 4). Results of the evaluation indicate that a pumping rate of 30% of the requested volume (0.75 MGD) has the potential for unreasonable impacts to water levels in the Woods #1 well (**Table 5**). It is estimated that the temporary pump in the Escondida well would be above the water level in all three scenarios. However, the pump setting for this well was for well testing purposes and represents a shallower than normal placement of the pump. A final, permanent setting of the pump would likely be much deeper. Accordingly, we did not use the Escondida well to determine the potential for unreasonable impacts for Phase I evaluations. Water-level drawdowns that do not go below the level of a pump are not considered to be unreasonable impacts (**Table 4**).

Conclusion

The results of our evaluations indicate that the 0.5 MGD volume for a 6-month Phase I has a very little to no potential for unreasonable impacts. However, 0.5 MGD could produce a greater potential for unreasonable impacts if: 1) avoidance measures have not been completed before the end of a 6-month Phase I; 2) if water-level data indicate that natural drought drawdown estimates would be greater than 65 ft in the Cow Creek; and 3) if the actual pumping distribution and magnitude differs substantially from those modeled in **Table 2**.

References:

BSEACD, 2017, Hydrogeologic Setting and Data Evaluation: 2016 Electro Purification Aquifer Test, Cow Creek Well Field: Hays County, Texas. Barton Springs Edwards Aquifer Conservation District, Technical Memo 2017-1010, 39 p.

BSEACD, 2018, Aquifer Parameter Estimation for the EP Well Field, Hays County, Texas. Barton Springs Edwards Aquifer Conservation District, Technical Memo 2018-0213, 28 p.

Hunt, B.B. and Smith, B.A., 2018, Evaluation of the Potential for Unreasonable Impacts from the EP Well Field, Hays County, Texas. Barton Springs/Edwards Aquifer Conservation District. Technical Memo 2018-0219. 13 p.

Oliver, W., 2018, Recalibration and Predictive Simulations of the Analytic Element Tool to Evaluate the Trinity Aquifer in Hays, County, Texas. Technical Memorandum. April 18, 2018.

Wet Rock Geological Services (WRGS), 2017a, Hydrogeologic Report of the Electro Purification, LLC Cow Creek Well Field: Hays County, Texas. Report of Findings, July 2017, WRGS 17-001, 80 p + appendices

Wet Rock Geological Services (WRGS), 2017b, Administrative Completeness Review of a Production Permit Application by Electro Purification LLC, for authorization to produce groundwater from the Middle Trinity aquifer. Letter in response to BSEACD. December 14, 2017, 29p + appendices

Table 1. *Results of aggregated aquifer-test drawdown relative to pump depth within monitor wells. Table modified from Hunt and Smith (2018).*

Well Name	*Well Depth (ft)*	*Pump Intake Depth (ft)*	*Static Water Level depth (ft)**	*Static: Water relative to pump (ft)*	*Aquifer Test Aggregate Drawdown (ft)*	*Aquifer Test Drawdown: Water relative to pump (ft)*
Bowman	850	700	291	409	205	204
Wood #1	790	500	285	215	192	23
Ochoa	810	660	261	399	212	187
Lowe	860	760	248	512	159	353
Escondida	930	460**	343	117	99	18

*10/21/2016, high and wet conditions

**temporary pump depth for testing purposes

Table 2. *Requested pumping rate and reduced proportional pumping rates*

Volume (MGD)	*Bridges1*	*Bridges2*	*Bridges3*	*Bridges4*	*Odell1*	*Odell2*	*Odell3*	*Total (gpm)*
2.5	645	148	48	66	95	560	175	1737
0.75	194	44	14	20	29	168	53	521
0.5	129	30	10	13	19	112	35	347
0.25	65	15	5	7	10	56	18	174

Table 3. *Table showing drawdown relative to pump in monitor wells following 6 months of pumping at 0.25 MGD.*

Well Name	*Well Depth (ft)*	*Pump Intake Depth (ft)*	*Static "drought" Water Level depth (ft)**	*Static drought: Water relative to pump (ft)*	*0.25 MGD Drawdown (ft)*	*0.25 MGD Water relative to pump (ft)*
Bowman	850	700	391	309	41	268
Wood #1	790	500	385	115	40	75
Ochoa	810	660	361	299	51	248
Lowe	860	760	348	412	43	369
Escondida	930	460	443	17	27	-10

*10/21/2016, high and wet conditions, add 100 ft to account for drought

*note the Wood 01 August 2018 static depth was 338 ft

Table 4. *Table showing drawdown relative to pump in monitor wells following 6 months of pumping at 0.5 MGD.*

Well Name	*Well Depth (ft)*	*Pump Intake Depth (ft)*	*Static "drought" Water Level depth (ft)**	*Static drought: Water relative to pump (ft)*	*0.5 MGD Drawdown (ft)*	*0.5 MGD Water relative to pump (ft)*
Bowman	850	700	391	309	83	226
Wood #1	790	500	385	115	82	33
Ochoa	810	660	361	299	101	198
Lowe	860	760	348	412	86	326
Escondida	930	460	443	17	54	-37

*10/21/2016, high and wet conditions, add 100 ft to account for drought

*note the Wood 01 August 2018 static depth was 338 ft

Table 5. *Table showing drawdown relative to pump in monitor wells following 6 months of pumping at 0.75 MGD.*

Well Name	*Well Depth (ft)*	*Pump Intake Depth (ft)*	*Static "drought" Water Level depth (ft)**	*Static drought: Water relative to pump (ft)*	*0.75 MGD Drawdown (ft)*	*0.75 MGD Water relative to pump (ft)*
Bowman	850	700	391	309	122	187
Wood #1	790	500	385	115	121	-6
Ochoa	810	660	361	299	152	147
Lowe	860	760	348	412	128	284
Escondida	930	460	443	17	81	-64

*10/21/2016, high and wet conditions, add 100 ft to account for drought

*note the Wood 01 August 2018 static depth was 338 ft

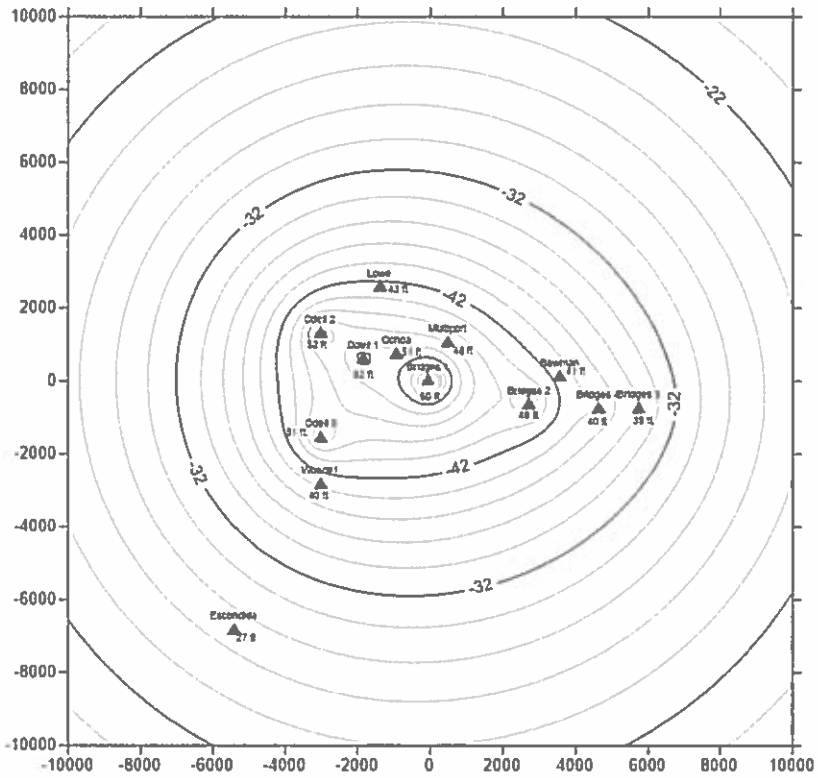

Figure 1. *Modeled drawdown from 0. 25 MGD for 6 months. Contours are 2-ft intervals.*

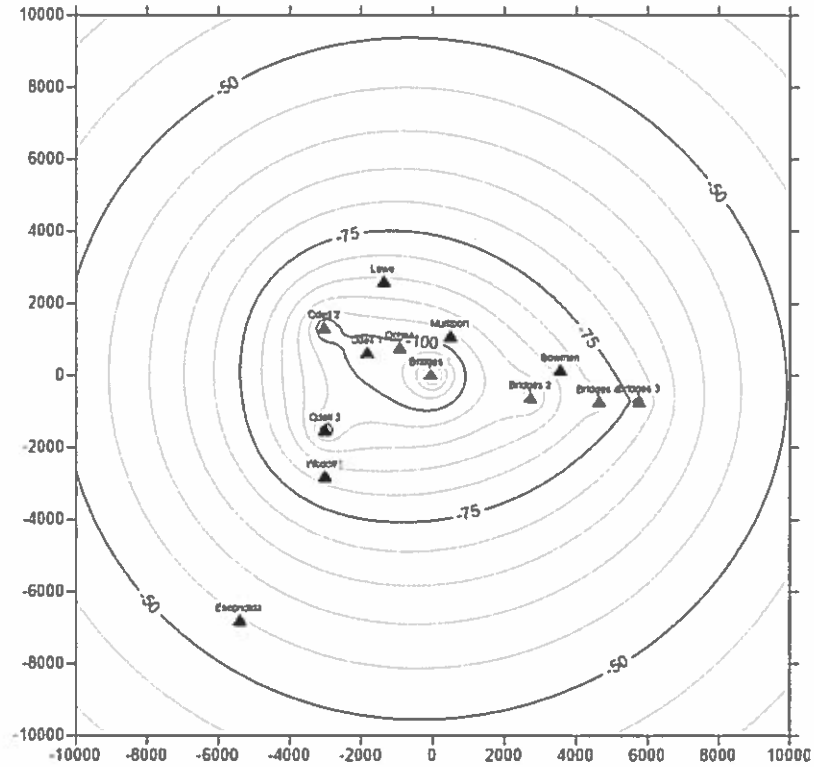

Figure 2. *Modeled drawdown from 0. 5 MGD for 6 months. Contours are 5-ft intervals.*

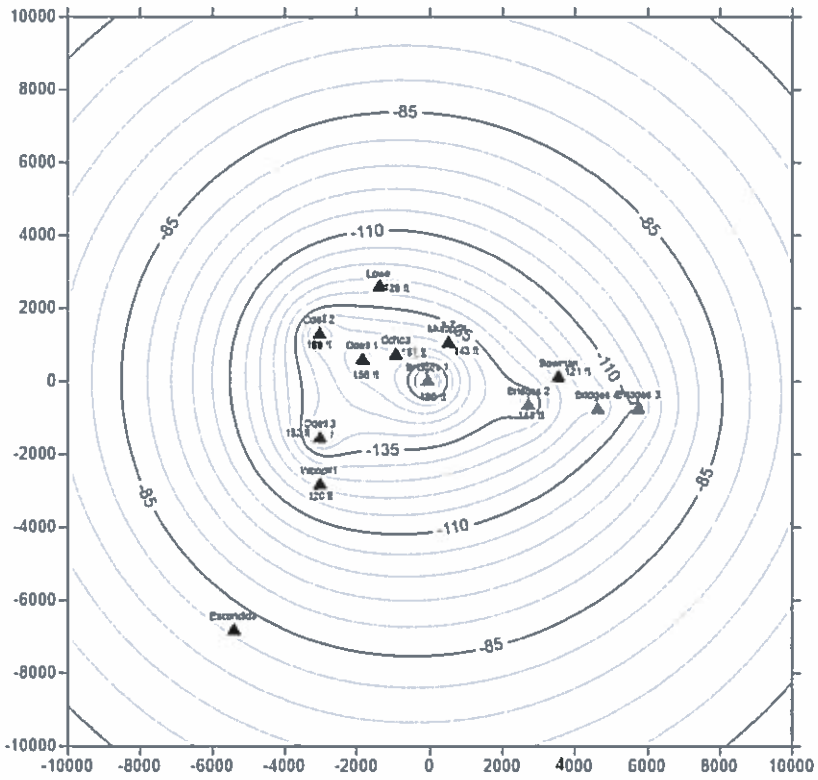

***Figure 3.** Modeled drawdown from 0. 75 MGD for 6 months. Contours are 5-ft intervals.*

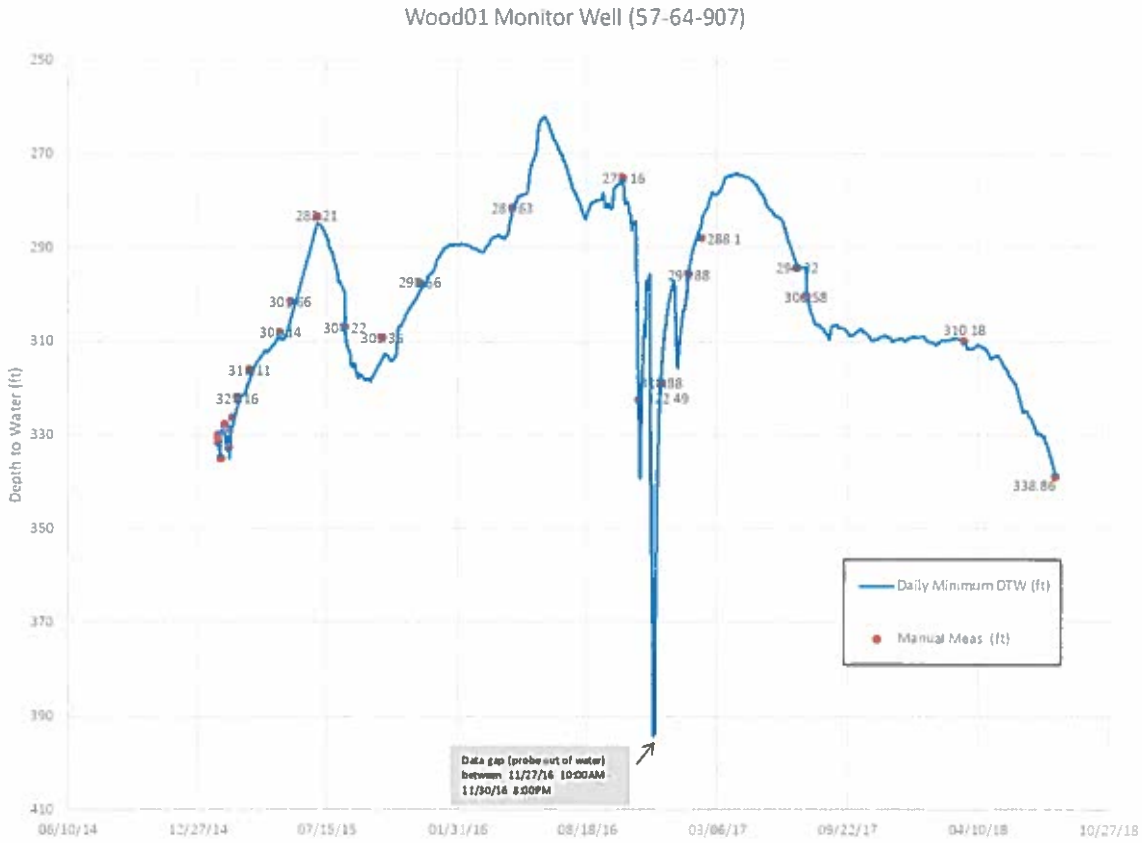

***Figure 4.** Measured water levels at the Woods #1 (Cow Creek) monitor well.*