



**PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS**

TO: Water Rights Section Date 02/23/2015  
 FROM: Groundwater Section Michael Thoma / Gerald Grondin  
Reviewer's Name  
 SUBJECT: Application G- 17858 Supersedes review of July 29, 2014  
Date of Review(s)

**PUBLIC INTEREST PRESUMPTION; GROUNDWATER**

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525.* Department staff review groundwater applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. **This review is based upon available information and agency policies in place at the time of evaluation.**

**A. GENERAL INFORMATION:** Applicant's Name: Tom and Lynne Hill Trust County: Baker

A1. Applicant(s) seek(s) 2.585 cfs from 1 well(s) in the Powder Basin,  
Muddy Creek subbasin Quad Map: Haines / Rock Creek

A2. Proposed use Irrigation; 155.08 ac (supplemental) Seasonality: Mar. 1 – Oct. 31 (245)

A3. Well and aquifer data (**attach and number logs for existing wells; mark proposed wells as such under logid**):

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location. metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
3	PROP <sup>1</sup>	3	Alluvial / Bedrock	2.585	7S/38E-13 NE NE	866 ft S, 115 ft W fr NE cor S13

\* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
3	3420	20-60 <sup>1</sup>	10-20		300	0-18	0-300		100-300			

Use data from application for proposed wells.

A4. **Comments:** <sup>1</sup> The original review included 3 wells. This re-review was initiated to account for changes made to the original application. Specifically the proposed location of well #3 and the targeted aquifer were changed and, upon the request of the applicants' consultant Sara Haynes on 01/07/2015 (see attached email), the applicant has withdrawn wells #1 and #2 from the application. This review is limited only to well #3.

<sup>2</sup> The well is proposed; nearby well logs show "First Water" between 20 and 60 ft and SWL from 10-20. Although many of these wells are < 200 ft deep, with the proposed case and seal interval the proposed well will produce from similar depths and materials. Because there are no deeper wells in this area it is difficult to determine at what depth bedrock will be encountered or if it will be encountered by the proposed well depth. Therefore, this review is based on the proposed depth rather than the actual aquifer material.

A5.  Provisions of the Powder (OAR 690-509) Basin rules relative to the development, classification and/or management of groundwater hydraulically connected to surface water  are, or  are not, activated by this application. (Not all basin rules contain such provisions.)

Comments: \_\_\_\_\_  
 \_\_\_\_\_

A6.  Well(s) # \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, tap(s) an aquifer limited by an administrative restriction. Name of administrative area: \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_

**B. GROUNDWATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070**

B1. Based upon available data, I have determined that groundwater\* for the proposed use:

- a.  is over appropriated,  is not over appropriated, or  cannot be determined to be over appropriated during any period of the proposed use. \* This finding is limited to the groundwater portion of the over-appropriation determination as prescribed in OAR 690-310-130;
- b.  will not or  will likely be available in the amounts requested without injury to prior water rights. \* This finding is limited to the groundwater portion of the injury determination as prescribed in OAR 690-310-130;
- c.  will not or  will likely to be available within the capacity of the groundwater resource; or
- d.  will, if properly conditioned, avoid injury to existing groundwater rights or to the groundwater resource:
  - i.  The permit should contain condition #(s) 7B (Interference); 7F (proposed well location); 7N (annual meas.); 7T (meas. tube); "Large" Water Use Condition;
  - ii.  The permit should be conditioned as indicated in item 2 below.
  - iii.  The permit should contain special condition(s) as indicated in item 3 below;

- B2. a.  Condition to allow groundwater production from no deeper than \_\_\_\_\_ ft. below land surface;
- b.  Condition to allow groundwater production from no shallower than 200 ft. below land surface;
- c.  Condition to allow groundwater production only from the deep alluvial / shallow bedrock groundwater reservoir between approximately 200 ft. and 400 ft. below land surface;
- d.  Well reconstruction is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Groundwater Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): \_\_\_\_\_

B3. **Groundwater availability remarks:** The location of the proposed POA is within alluvial valley-fill material in the northern portion of the Baker Valley. Nearby well logs indicate the thickness of these sediments is > 300 ft and reported well yields from driller's logs are generally < 100 gpm; although deeper wells (> 300 ft) tend to produce slightly higher yields (500 – 1000 gpm). Where wells fully penetrate the sediments, the underlying bedrock is described in well logs as either granitic- or volcanic-origin bedrock and most production is from the alluvial sediments. Well logs generally describe a thick (10s of feet) clay layer near the surface and increasingly confined conditions with depth. However, shallow wells have shallow water levels and shallow "first water" depths and comparable water levels between deep and shallow wells (Figure 3) suggests that the sediments are fully saturated to within a few tens of feet of land surface and that there are not significantly isolated aquifers but more likely a single mixed-lithology aquifer system becoming more confined with depth. The applicant's proposed case and seal depths of 100 ft and 18 ft, respectively, are not sufficient to seal off upper portions of the aquifer so the department proposes well construction (e.g. seal depth) to limit production to > 200 ft depth. A deeper-cased and deeper-sealed well will have a less efficient connection and less impact to nearby surface water streams – See Section C.

**Regarding Appropriation:** A nearby state observation well (BAKE 109; 316 ft total depth; Figure 2) shows stable water levels from 1960-present and other reported water levels in the area also show stable water levels which indicate that groundwater has not historically been over-appropriated. However, several permits have been issued recently in the vicinity of this applicant's proposed POAs that have not been fully exercised (either currently under extension of have not reached completion date, but most have not begun reporting water use). Within a 3 mi radius of the proposed POAs there are permitted rights for > 3000 acres of supplemental irrigation and nearly 1000 acres of primary irrigation (permit G17095: 995 acres primary irrigation). Although these are mostly supplemental irrigation rights, were they all to be exercised, there is potential for over-appropriation of groundwater which could lead to declining water levels. Hence standard drawdown conditions are appropriate and need be enforced.

**C. GROUNDWATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040**

**C1. 690-09-040 (1): Evaluation of aquifer confinement:**

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
3	Bedrock	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>

**Basis for aquifer confinement evaluation:** Well logs from nearby wells often identify 10s of feet of clay near the surface and SWLs in the coarser sediments beneath the clay are higher than where first water bearing zones are found. This analysis assumes the wells are constructed adhering to conditions described in B2.b and B2.c.

**C2. 690-09-040 (2) (3): Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.**

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
3	1	Little Muddy Creek	3400	3380-3480	5285	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	2	Warm Springs Creek	3400	3400-3480	5285	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	3	Powder River	3400	3300	14200	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Basis for aquifer hydraulic connection evaluation:** Although the proposed well will likely encounter confined conditions, comparison of SWLs from shallow and deep wells in the vicinity show little difference in water level (Figure 3). This implies that there is connection between deeper and shallower portions of the aquifer. The shallow portion of the aquifer (the thick, low-permeability, clay layer and upper coarse sediments) is likely hydraulically connected to surface water sources but the hydraulic properties of this material (low hydraulic conductivity) will limit the efficiency of the connection. Moreover, because there are several surface water rights on both the Little Muddy and Warm Springs creeks and because of historically low to dry late-season flows in these creeks, using a conservative approach to hydraulic connection (i.e. one that will produce the least potential injury to existing water rights) is appropriate.

**Water Availability Basin the well(s) are located within:** Powder R > Snake R – AB Unn Str (# 72191)

**C3a. 690-09-040 (4): Evaluation of stream impacts for each well that has been determined or assumed to be hydraulically connected and less than 1 mile from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% natural flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked  box indicates the well is assumed to have the potential to cause PSI.**

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells.** Otherwise same evaluation and limitations apply as in C3a above.

SW #	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

Comments: Tables C3a and C3b do not apply since the proposed well is > 1 mi from surface water sources.

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	1	%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS				2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59		
Interference CFS				0.013	0.034	0.055	0.075	0.094	0.112	0.129	0.146	0.150	0.145
Interference CFS		0.138	0.131										
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.		0.138	0.131	0.013	0.034	0.055	0.075	0.094	0.112	0.129	0.146	0.150	0.145
(B) = 80 % Nat. Q		65.9	103	203	456	714	593	204	107	72.7	70.3	75.1	77.9
(C) = 1 % Nat. Q		0.66	1.03	2.03	4.56	7.14	5.93	2.04	1.07	0.73	0.70	0.75	0.78
(D) = (A) > (C)		No	No	No	No	No	No	No	No	No	No	No	No
(E) = (A / B) x 100		0.21%	0.13%	0.01%	0.01%	0.01%	0.01%	0.05%	0.11%	0.18%	0.21%	0.20%	0.19%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

**Basis for impact evaluation:** Well logs often describe a thick clay layer overlying more productive materials containing sand and gravel. Consequently, Hunt (2003) was used to calculate interference. The presence of thick clay layers near the surface (reported on well logs) and the low-conductivity properties of these materials will likely significantly reduce impacts to nearby surface water sources at distances of > 1 mi (SW #1 and #2). Impacts to SW #2 were not evaluated as the results will be very similar to impacts to SW #1. In fact, the presence of a second surface water source at an approximate equal distance from the proposed POA will further reduce the impacts to both surface water by parsing out interference to both sources. That is, no single source will contribute to full interference. The 80% natural flows in C4a were evaluated for the Powder River WAB (# 72198). Impacts to the Powder River itself (SW #3) were evaluated but are not presented here as they are less than what is estimated for SW #1 and #2 since it is almost 3 mi away.

C4b. **690-09-040 (5) (b)** The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.

- C5.  If properly conditioned, the surface water source(s) can be adequately protected from interference, and/or groundwater use under this permit can be regulated if it is found to substantially interfere with surface water:
- i.  The permit should contain condition #(s) \_\_\_\_\_;
  - ii.  The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions** Well logs in the area indicate increasingly confined conditions with depth but SWLs are similar in shallow wells (< 100 ft) and deep wells (> 300) indicating that there is efficient vertical hydraulic continuity though the aquifer (i.e., not isolated layers / aquifers). Furthermore, SWL depths reported on well logs in the area are generally 10-20 ft below land surface indicating saturation of the upper clay layers. Although saturated and in hydraulic connection to deeper portions of the aquifer, the low conductivity of upper clay zones likely will reduce the efficiency of hydraulic connection and thus reduce impacts of pumping to nearby surface water sources. Pumping from deeper in the aquifer, as recommended by conditions in sections B1 and B2 will further reduce impacts to surface water by further reducing the efficiency of hydraulic connection and by spreading the impacts over a larger area.

**References Used:**

"Powder River Basin". June 1967. State Water Resources Board. Salem, OR.

Trauger, F. D. 1951. "Ground Water Resources of Baker Valley, Baker County, Oregon". U.S. Geological Survey Open File Report.

Brooks, H. C., J. R. McIntyre, and G. W. Walker. 1976. "Geology of the Oregon Part of the Baker 1 by 2 Quadrangle". Dept. of Geology and Mineral Industries, Geological Map Series GMS-7.

Hunt, B. 2003. Unsteady stream depletion when pumping a semi-confined aquifer. Journal of Hydrologic Engineering. Jan/Feb, 2003.

OWRD Well Logs Database – Accessed February, 2015

**D. WELL CONSTRUCTION, OAR 690-200**

D1. Well #: \_\_\_\_\_ Logid: \_\_\_\_\_

D2. THE WELL does not appear to meet current well construction standards based upon:

- a.  review of the well log;
- b.  field inspection by \_\_\_\_\_;
- c.  report of CWRE \_\_\_\_\_;
- d.  other: (specify) \_\_\_\_\_

D3. THE WELL construction deficiency or other comment is described as follows: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

D4.  Route to the Well Construction and Compliance Section for a review of existing well construction.

Figure 1: Water Availability Table

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION						
Watershed ID #: 72191		POWDER R > SNAKE R - AB UNN STR			Exceedance Level: 80	
Time: 11:16 AM		Basin: POWDER			Date: 01/12/2015	
Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.						
JAN	65.90	89.00	-23.10	0.00	25.00	-48.10
FEB	103.00	108.00	-5.36	21.30	30.00	-56.60
MAR	203.00	193.00	10.10	62.40	40.00	-92.30
APR	456.00	352.00	104.00	260.00	40.00	-196.00
MAY	714.00	844.00	-130.00	153.00	40.00	-323.00
JUN	593.00	995.00	-402.00	0.00	40.00	-442.00
JUL	204.00	530.00	-326.00	0.00	25.00	-351.00
AUG	107.00	313.00	-206.00	0.00	25.00	-231.00
SEP	72.70	240.00	-167.00	0.00	25.00	-192.00
OCT	70.30	90.20	-19.90	0.00	25.00	-44.90
NOV	75.10	71.30	3.82	0.00	25.00	-21.20
DEC	77.90	82.90	-5.00	0.00	25.00	-30.00
ANN	241,000	236,000	47,100	29,900	22,000	4,140



Figure 2: Application Overview Map

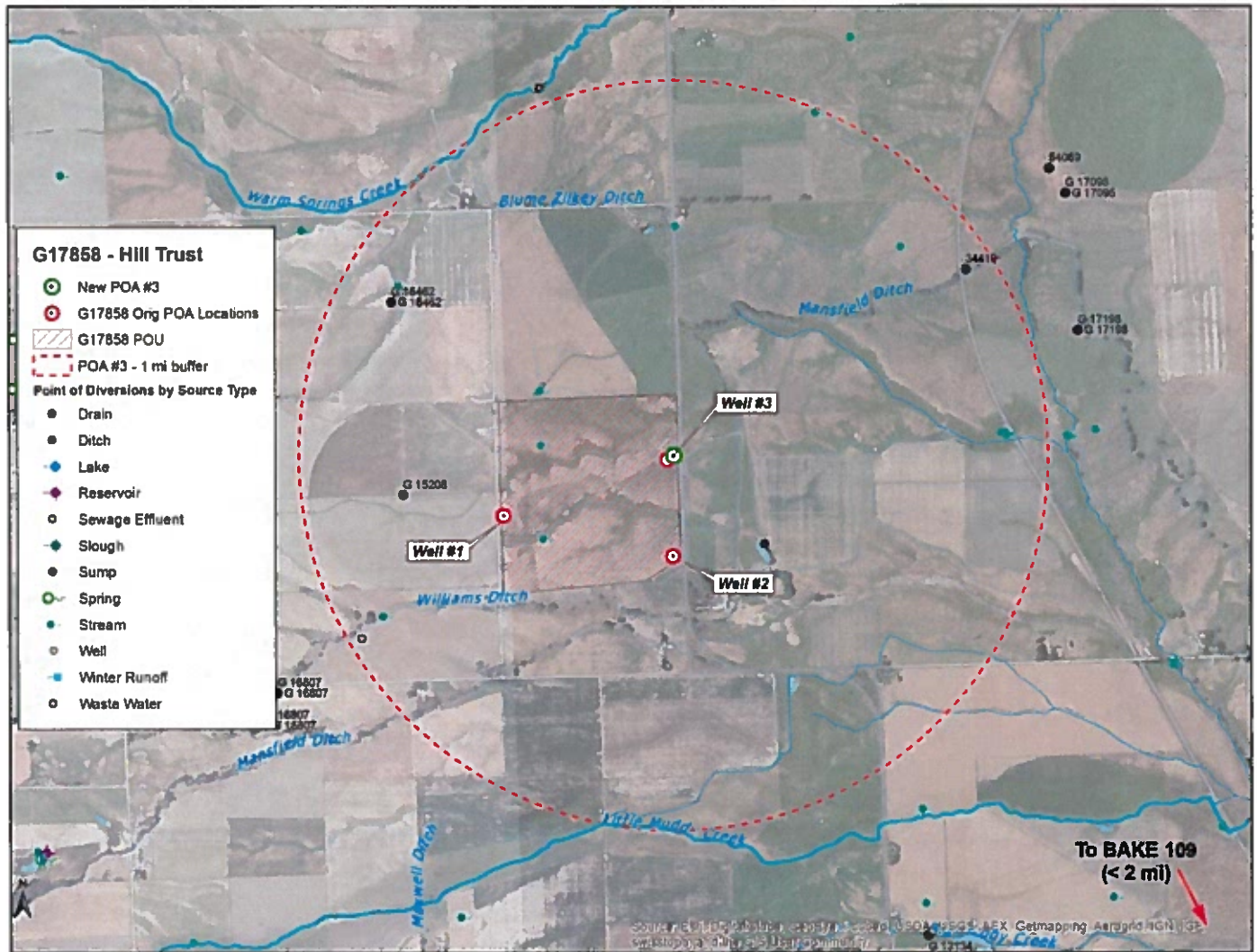
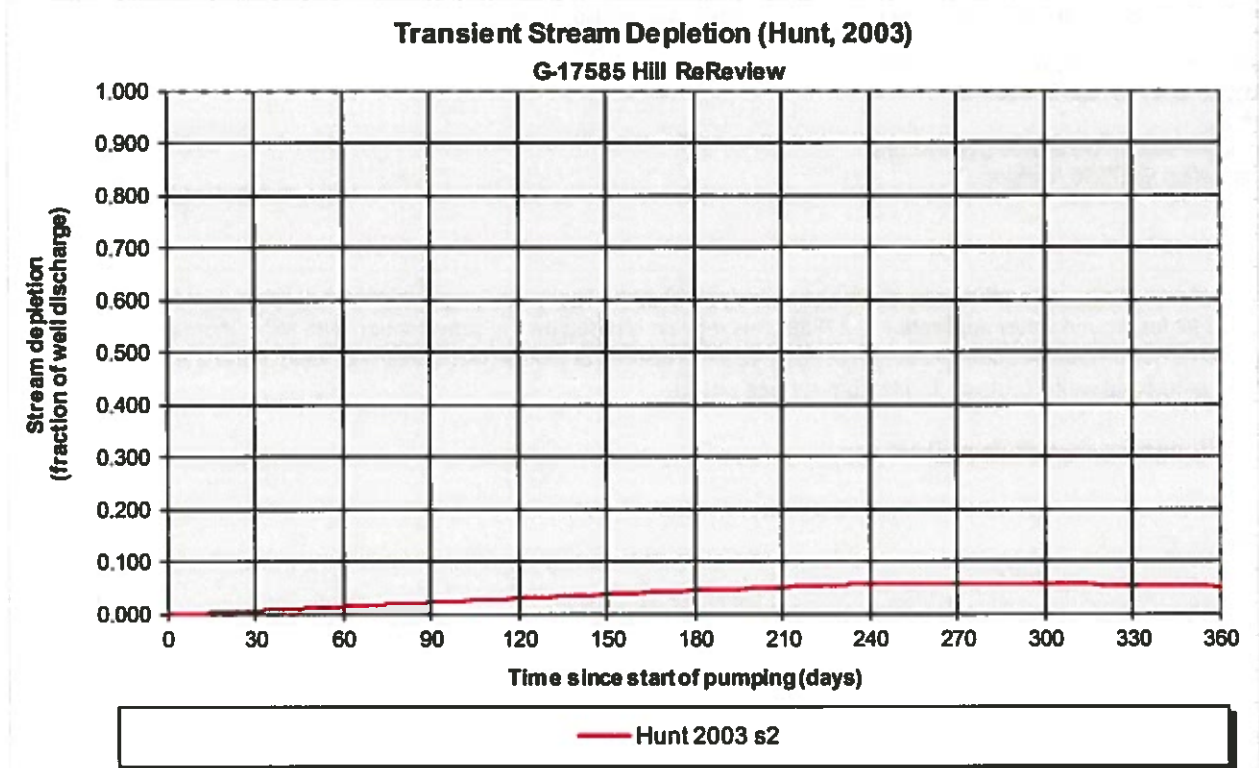






Figure 4: Results of Hunt 2003 surface water interference model



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 245 days						
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Days	30	60	90	120	150	180	210	240	270	300	330	360
H SD 2003	0.52%	1.30%	2.11%	2.90%	3.65%	4.35%	5.01%	5.63%	5.82%	5.62%	5.34%	5.05%
Qw, cfs	2.585	2.585	2.585	2.585	2.585	2.585	2.585	2.585	0.000	0.000	0.000	0.000
H SD 03, cfs	0.013	0.034	0.055	0.075	0.094	0.112	0.129	0.146	0.150	0.145	0.138	0.131

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	2.59	2.59	2.59	cfs
Time pump on (pumping duration)	tpon	245	245	245	days
Perpendicular from well to stream	a	5285	5285	5285	ft
Well depth	d	300	300	300	ft
Aquifer hydraulic conductivity	K	300	300	300	ft/day
Aquifer saturated thickness	b	200	200	200	ft
Aquifer transmissivity	T	60000	60000	60000	ft <sup>2</sup> /day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.1	1	0.1	ft/day
Aquitard saturated thickness	ba	30	20	30	ft
Aquitard thickness below stream	babs	10	5	10	ft
Aquitard porosity	n	0.3	0.3	0.3	
Stream width	ws	10	10	10	ft
Streambed conductance (lambda)	sbc	0.10	2.00	0.10	ft/day
Stream depletion factor	sdf	0.47	0.47	0.47	days
Streambed factor	sbf	0.01	0.18	0.01	
input #1 for Hunt's Q_4 function	t'	2.15	2.15	2.15	
input #2 for Hunt's Q_4 function	K'	1.55	23.28	1.55	
input #3 for Hunt's Q_4 function	epsilon'	0.00	0.00	0.00	
input #4 for Hunt's Q_4 function	lamda'	0.01	0.18	0.01	

**Attachment:****Copy of email from consultant indicating removal of wells #1 and #2 from application**

**From:** Sara Haynes [mailto:sara@browneconsulting.biz]  
**Sent:** Wednesday, January 07, 2015 4:20 PM  
**To:** 'FRENCH Kim R'  
**Cc:** joehillfarming@gmail.com; danahill05@gmail.com  
**Subject:** RE: Application G-17858 Revision

Kim,

As discussed on the phone and based on the conversation I had today with Mike Thoma in the groundwater division, please remove wells #1 and #2 for ground water application G-17858. This request is based on the conversation with Mike Thoma indicating the Division 9 Rules would require evaluation of all three wells instead of independent review of wells 1 and 2 (within 1 mile from surface water) and well 3 (outside 1 mile from surface water).

Please let me know if you have any questions. Thank you.

Sara Haynes  
Browne Consulting  
(541) 523-5170