



STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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June 24, 2013

Ms. Marlea Harmon
Chevron Environmental Management Company
6101 Bollinger Canyon Rd – Room 5228
San Ramon, CA 94583

Re: Chevron Bulk Plant Camas - WA Site / ISIS No. 1043
Agency Comments on July 26, 2012 Draft Final
Remedial Investigation / Feasibility Study Report

Dear Ms. Harmon:

The Washington State Department of Ecology (Ecology) has reviewed the above-referenced report prepared by Science Applications International Corporation (SAIC) on behalf of Chevron Environmental Management Company (Chevron). Ecology also examined issues of potential concern.

The draft report was received prior to a formal agency declaration that the Remedial Investigation (RI) for this Site was complete. However, such a declaration—notwithstanding a recent minor cleanup-level exceedance in a single groundwater monitoring well—would have been issued by Ecology following receipt of groundwater monitoring reports for the third and fourth quarters of 2012 if it had been complimented by repeat sampling of the 1994 and 2004 soil sample locations that had significant contamination. After either 8 or 18 years (depending on sample date), the current levels of contamination could be significantly lower, possibly reducing the likelihood that the more complex cleanup alternatives presented in the Feasibility Study (FS) are needed.

In addition to the report review, Ecology conducted an independent assessment of the potential risk of Site contaminants reaching City of Camas drinking water well No.6, located approximately 100 yards north-northeast of the Site's primary source area. The agency considers avoiding contamination of this well a major objective of the Site cleanup. Ecology's situation analysis indicated a nearly negligible threat to the well.

Ecology declares the RI complete contingent on Chevron's conducting a soil sampling and analysis project to characterize the *current* contamination levels that exist in areas delineated by red boundaries in Figures 4 and 5 of the draft RI/FS report (areas that are beneath the bottom of 1994 interim-action excavation pits) plus the soil between those boundaries and the water table. Ecology is requiring submittal of a Work Plan for this supplemental investigation, without which the agency would not accept a cleanup approach employing only Monitored Natural Attenuation (MNA). Ecology considers the FS section of the combined RI/FS report to be subject to possible needed revisions if subsurface soil concentrations have diminished significantly since the 1994 and 2004 samples were analyzed, bolstering evidence that natural attenuation has occurred and may be a viable approach for remediation.

Specific Ecology Comments on the Draft Final RI/FS Report:

1. Page 4, Section 3.2. The referenced groundwater flow-direction rose diagram on Figure 6, based on pre-2008 data, indicates an average azimuth bearing of 291°. Using a vector analysis algorithm, Ecology calculated a gradient-weighted average azimuth bearing of 275° for 20 quarters (2007-2011). This is close to the Figure 6 value, and both suggest a *long-term* flow direction bearing that is more than 90° counterclockwise from the direction to city well No.6. Using very conservative assumptions, Ecology estimated long-term asymptotic particle-track bearing of 315°, which is 70° counterclockwise from the city well direction.

2. Page 4, Pathway Table: The "Applicability" comment associated with the *Groundwater to surface water/sediment* pathway indicates that the possibility of contaminated groundwater reaching surface water is eliminated because of the distance. This is true for most intents and purposes, but it is indeed possible that some level of contaminants—although well within all applicable standards—could exist in the groundwater from beneath the Site reaching surface water.
3. Pages 7-8, Section 5.3 and Appendix F. The use of Ecology's MTCA calculation approach for determining Method B cleanup levels (CUL) for soil appears correct. Although the laboratory analytical methods for carbon-number petroleum fractionation and for the ranges of TPH prescribe mass concentration units (mg/kg) on a dry basis, and it is very likely that the chosen laboratory reported the results correctly. However, the laboratory report for samples (including SB-2-19, the one used for the CUL determination) only referenced the method, and did not explicitly indicate that the results were on a dry basis. This should be confirmed.
4. Page 11, Sections 7.2 and 7.2.1. Both an "Alternative 2" and an "Alternative 2A" are used in describing the subject remediation approach. There is only one approach mentioned in this section; hence, it is likely that only "Alternative 2" is the appropriate name.
5. Page 12, Section 7.4.1. The third sentence is inaccurate unless it ends with "above cleanup levels."
6. Page 13. In the first sentence in the second complete paragraph, "most permanent" should be used instead of "permanent" alone.
7. Page 15, last sentence. Although the sentence indicates that present worth calculations used three discount rates (3, 5, and 7 percent), the cost breakdown for each of the four finalist remediation alternatives in Appendix G does not address these rates. Because the time periods assigned to the alternatives is not extensive, the rate selection may not make a relatively significant difference unless the required duration becomes longer than anticipated. Nevertheless, the text section and the appendix tables table should be consistent and offer explanations of use or non-use of discount rates.
8. Page 15, last sentence. Please note that the final Cleanup Action Plan (CAP) will be an Ecology document.
9. Table 4, Summary of Cleanup Action Alternatives. The suspended dot symbol under Alternative 4 on the "Off-Site Disposal" line should be removed, because such disposal would not be significant compared to excavated soil (and no costs for this activity were included in the cost summary in Appendix G). There could possibly be minor disposal costs associates with depleted carbon absorption media if it is employed (and disposed instead of regenerated), but no mention was made of this process unit in the report.
10. Table 3. Under on-site treatment, in-situ treatment employing oxygen-releasing chemicals (ORC) was not included. The same constraint that led to the rejection of bioremediation (i.e., difficulty on uniform distribution of the treatment medium into the vadose-zone soil) may apply to ORC use, but no mention of this method was made. Was it rejected in an earlier group subjected to vetting?

Ecology Requirements Related to the Draft Final RI/FS Report:

- A. Before August 15, 2013, submit a draft Work Plan to characterize the nature and extent of contaminants in the vadose-zone regions delineated by red boundaries in Figures 4 and 5 of the draft RI/FS report plus the soil between these regions and the water table.
- B. Confirm that the mass concentration values in the laboratory reports and subsequently used in the calculation of Method B cleanup levels were indeed on a dry basis.
- C. Expand, with explanation, Chevron/SALC's use/non-use of present-worth discount rates for the costs related to the remediation alternatives.
- D. Explain why ORC use and bioventing were not included in Table 3 (*Initial Screening of Cleanup Alternative Components—Soil and Groundwater*).

Ecology Assessment of Site Groundwater Flow Direction

Of particular concern regarding the Site is the proximity of Camas City Well No.6, located across the Site-adjacent railroad tracks approximately 300 ft north-northeast of the source area (see attached Figure 1). The five-year (2007-2011) prevailing groundwater flow direction—including times when No.6 well was operating—is towards the west (azimuth bearing of 275°). When operating, this city well affects the groundwater flow direction beneath the Site, causing it to flow generally towards the north. The horizontal and vertical spatial relationship between the source area and city well No.6 is shown in Figure 2.

In 2008, groundwater monitoring wells No. 15 and 16 were installed north of the primary source area. Although contaminants have never been detected in samples from these two Ecology-required sentinel wells, Ecology desired additional evidence to support a basis upon which the agency could reasonably conclude that the threat of Chevron-Site contaminants entering the No. 6 well screen is essentially negligible. The following evidence provides that confidence basis:

- The extremely high petroleum hydrocarbon concentrations previously existing in the Site monitoring wells near the primary source area have diminished greatly—with near consistent non-detectable contamination or levels below MTCA CULs. The most recent data (December 2012 and March 2013) indicated all current monitoring well samples were within CULs. See Table 1.
- The groundwater is not likely to move to city well No. 6. Table 2 presents the derivation of the average groundwater flow direction based on quarterly sampling event flow determinations over multiple years. A vector-based method for averaging individual azimuth bearings was employed and the directions were weighted by the respective measured groundwater gradients. The five consecutive recent years in which data were collected in all four quarters were selected for estimating a representative prevailing flow direction. For 2007 through 2011, the weighted vector average for each quarter (ie, the average of five 1st-qtr events, five 2nd-qtr events, etc.) was calculated. The five-year prevailing azimuth direction was also determined:
 - Average groundwater flow direction for five 1st quarters: 272°
 - Average groundwater flow direction for five 2nd quarters: 280°
 - Average groundwater flow direction for five 3rd quarters: 278°
 - Average groundwater flow direction for five 4th quarters: 265°
 - Average groundwater flow direction for all 20 quarters: 275° (prevailing direction)
- Data presented in Figure 3 indicate the water table elevation for each quarter year-over-year is quite consistent. This adds confidence to predictions based on quarterly measurements of flow direction.
- As shown in Figure 4, Camas City Well No.6 pump operates for only limited periods (primarily June, July, and August), and its use had decreased in recent years. This makes the conservative assumptions for the water particle track estimate (next bullet) even more conservative than what may be apparent.
- Because the groundwater flow direction does shift toward the north when the subject city well is operating, Ecology estimated what path a particle of groundwater would follow over time. The assumptions made for the worst-case estimate included city well No.6 operating for 25% of the time and that during operation, the groundwater would flow towards the northeast (the most extreme direction shift measured). The upper plot on Figure 5 illustrates what the path would be with a conservative 25%/75%-NE/W time-direction scenario assuming equal velocity in each direction (W used here is 275°, not quite true west). The slope in the illustration is exaggerated for conservatism.
- The oscillating black line on lower plot of Figure 5 is the azimuth bearing (relative to a particle's original position) as a function of time. The bearing after a long time (ie, its asymptotic value) would be near 315° azimuth (northwest) using the 25/75-45°/275° time-direction assumption.

Clearly, the probability of groundwater beneath the source area transporting contaminants to the Camas City Well No.6 is minimal. Nevertheless, Ecology has appraised Chevron that the agency may, as part of compliance confirmation efforts, require the installation of another groundwater well(s) at the north edge of the Site property in the direction of the city well.

Please contact me if you have questions or comments.

Regards,


Rod Schmall
Ecology Site Manager

Attachments

cc: Alex Shook, Don Wyll / SAIC
Kent Zeigler / Triangle Resources P.O. Box 1101, Camas, WA 98607
Scott Rose / Ecology-SWRO
Central Files / Ecology-SWRO

Certified Mail / Return Receipt (7011 0470 0002 9304 6808)

Figure 1

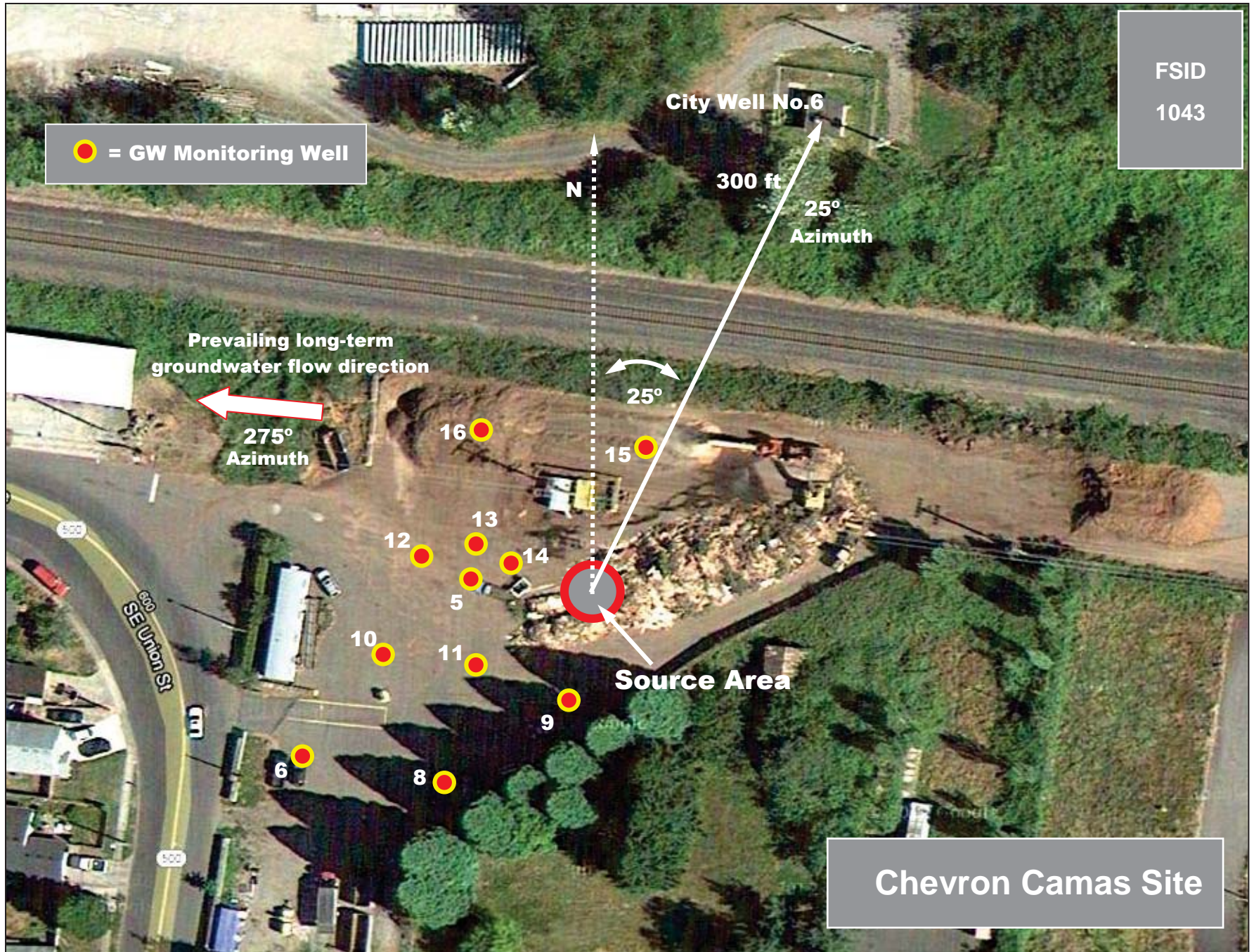


Figure 2

Location of Camas City Well No.6 Relative to Chevron/Camas Cleanup Site

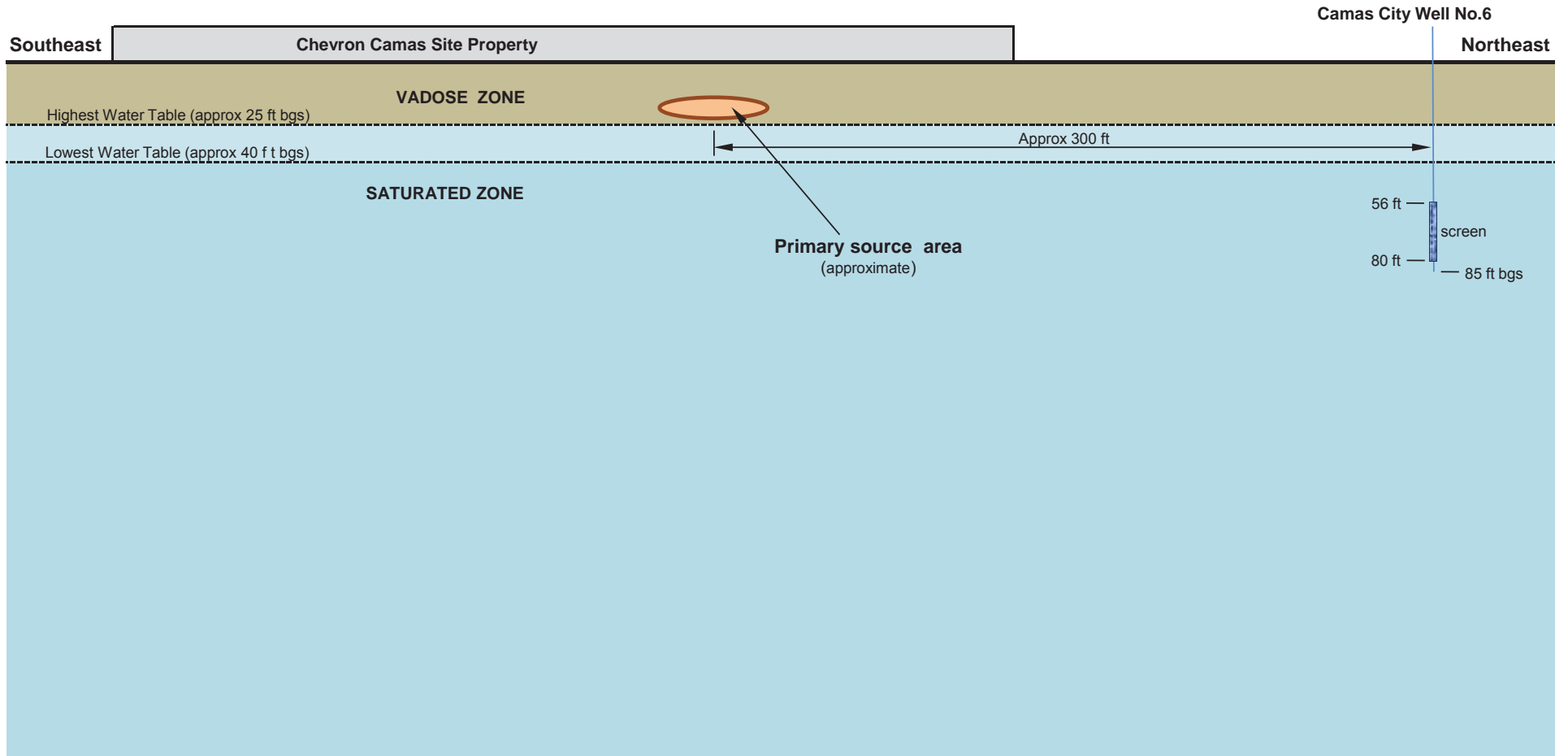


Table 1

Chevron/Camas - Groundwater Data																		
Well No.	Most Recent Concentration				Most Recent Exceedance						Highest Concentration Measured							
	TPH for Indicated Range				TPH for Indicated Range				Benzene		TPH for Indicated Range							
	Diesel	Hvy Oil	Gas	Date	Diesel	Hvy Oil	Gas	Date	µg/L	Date	Diesel	Mo/Yr	Hvy Oil	Mo/Yr	Gas	Mo/Yr	Benzene	Mo/Yr
(µg/L)	(µg/L)	(µg/L)		(µg/L)	(µg/L)	(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		(µg/L)		
5	65	90	210	3/4/13	---	680	---	6/30/11	19	11/29/94	7900	Dec/09	3500	Mar/08	3600	Nov/94	19	Nov/94
6	D <28/43	220/410	<50	3/4/13	---	*640	---	12/3/12	ND	---	3500	Sep/08	210,000	Sep/08	ND	---	ND	---
8	<29	<67	<50	12/3/12	---	---	---		ND	---	ND	---	ND	---	ND	---	ND	---
9	<31	<71	<50	12/3/12	600	---	---	6/30/11	ND	---	600	Jun/11	ND	---	ND	---	ND	---
10	<28	140	<50	12/3/12	---	530	---	3/25/11	ND	---	ND	---	1600	Dec/10	ND	---	ND	---
11	<28	<66	<50	12/3/12	---	---	---		ND	---	ND	---	ND	---	ND	---	ND	---
12	<28	<66	<50	3/4/13	700	1400	---	6/30/11	ND	---	5800	Dec/08	12,000	Dec/08	ND	---	ND	---
13	96	120	<50	² 6/24/08	---	1100	---	3/15/07	ND	---	4200	Sep/06	5300	Sep/06	1100	Nov/05	ND	---
14	<29	<68	<50	² 3/25/11	1100	---	---	3/25/11	ND	---	1100	Aug/04	ND	---	ND	---	ND	---
15	<31	<72	<50	² 6/4/12	---	---	---		ND	---	ND	---	ND	---	ND	---	ND	---
16	<29	<67	<50	12/3/12	---	---	---		ND	---	ND	---	ND	---	ND	---	ND	---
MTCA A:	500	500	800/1000 ¹		500	500	800/1000 ¹		5		500		500		800/1000 ¹		5	

¹ 1000 µg/L if benzene is not present (it is not)
² Abandoned following this date
D = Duplicate samples analyzed

** Duplicate sample analysis result was 480*

Bold font indicates concentration above MTCA Method A Cleanup Levels

Table 2

Chevron Camas Cleanup Site -- Groundwater Flow

Year	Qtr	Date	Direction (Approx)	Azimuth (nearest 5°)	Gradient (ft/ft)	Ft Elev (MMW 10)	Camas City Well - No. 6 pumping?			
							1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2012	4	9/4	?	?	?	4.65				
	3	6/4	SW	250	0.001	12.21				
	2	3/5	W	265	0.035	8.21				
							Azimuth Degrees			
							Gradient Values			
2011	4	12/6	SW	220	0.001	6.79				
	3	9/30	SW	250	0.001	3.36				
	2	6/30	W	265	0.001	18.37	No			
	1	3/25	W	265	0.001	12.20				
2010	4	12/15	W	265	0.002	11.90				
	3	9/24	SW	245	0.001	2.35				
	2	6/16	SW	250	0.001	16.32	No			
	1	3/26	SW	245	0.001	5.81				
2009	4	12/9	W	275	0.005	5.38				
	3	9/18	W	275	0.001	1.95				
	2	6/12	N-NW	245	0.001	13.91	Yes			
	1	3/27	SW	240	0.001	8.00				
2008	4	12/13	W	275	0.001	6.06				
	3	9/19	W	270	0.001	1.57				
	2	6/24	N	5	0.001	19.52	Yes			
	1	3/20	W	265	0.004	14.63				
2007	4	12/6	W-SW	245	0.001	16.37				
	3	9/25	NW	295	0.004	5.22				
	2**	6/21	N	360	0.002	14.21	Yes			
	1	3/15	NW	290	0.005	16.02				
2006	4	12/5	SW	240	0.004	14.86				
	3	9/21	N-NW	355	0.004	7.46				
	2	6/22	NW	320	0.025	19.15				
								Azimuth Degrees		
							Gradient Values			

** Camas City Well No.6 was operated at near capacity on 6/21 and the preceding 17 days

6/12/09: 994,000 gal (48% of nameplate capacity)
 6/24/08: 1,906,000 gal (91% of capacity)

All Qtrs with Data	Number:				Arith Ave:
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	
Number:	6	7	7	6	6
Highest:	290	360	355	275	0.035
Lowest:	240	5	245	5	0.001
Arith Ave:	0.008	0.004	0.002	0.002	0.002

"4-Qtr" Yr Data (2007-2011)	Number:	5	5	5	5	5	Number:	5	5	5	5	5
Highest:	290	360	295	275	275	275	Highest:	0.005	0.002	0.004	0.005	0.005
Lowest:	240	5	245	220	220	220	Lowest:	0.001	0.001	0.001	0.001	0.001
Vector Ave:	261	278	267	256	256	256	Arith Ave:	0.002	0.001	0.002	0.002	0.002

"4-Qtr" Yr Data (2007-2011) (WEIGHTED)	Number:	5	5	5	5	Number:	5	5	5	5
Highest:	290	360	295	275	275	Highest:	0.005	0.002	0.004	0.005
Lowest:	240	5	245	220	220	Lowest:	0.001	0.001	0.001	0.001
Vector Ave:	272	280	278	265	265	Vector Ave:	0.002	0.001	0.002	0.002

← Vector average weighted with gradient values

Non-weighted Vector Ave of these five-yr quarterly averages: **274°**

Weighted Vector Ave of all 20 quarters 2007-2011: **275°**

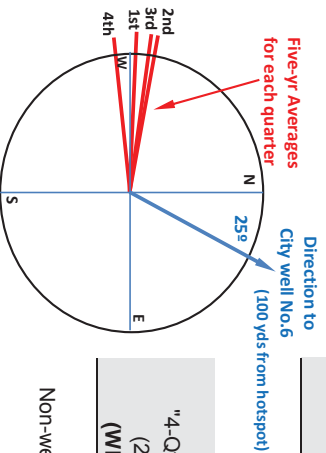


Figure 3

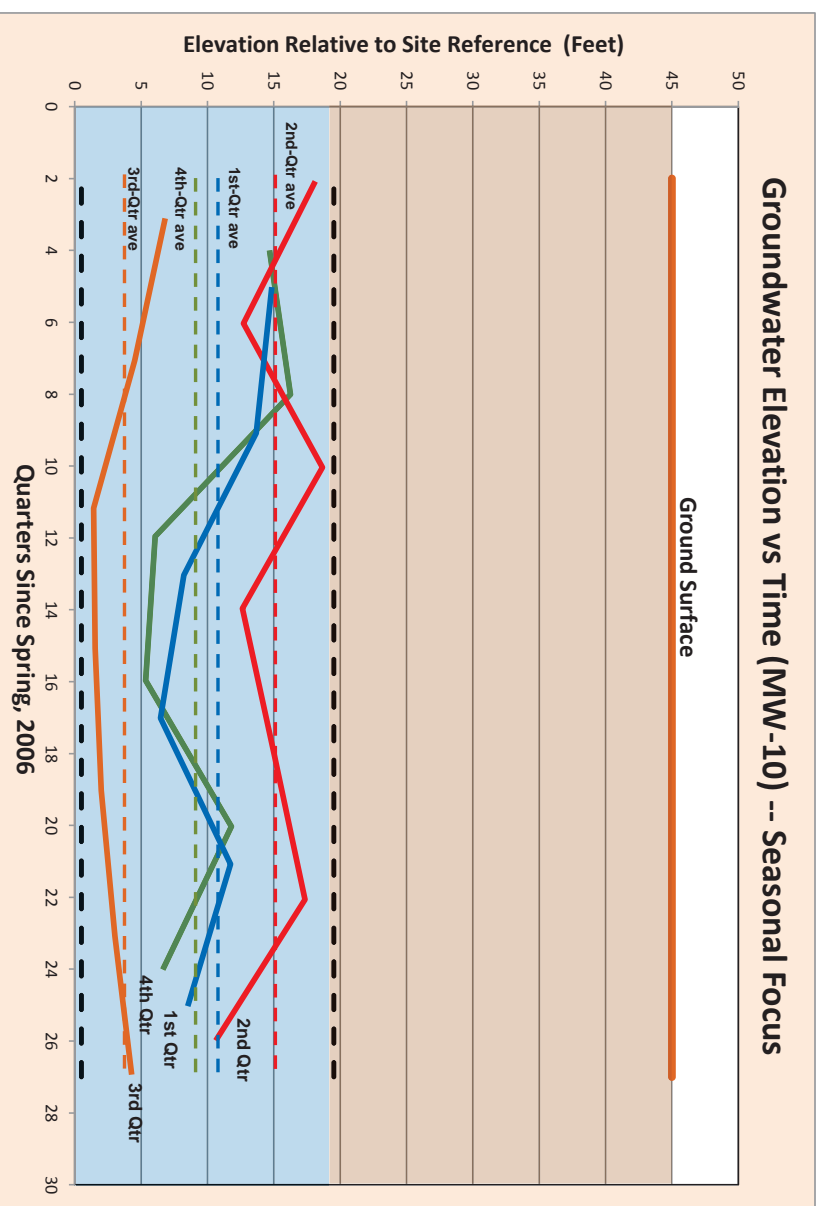
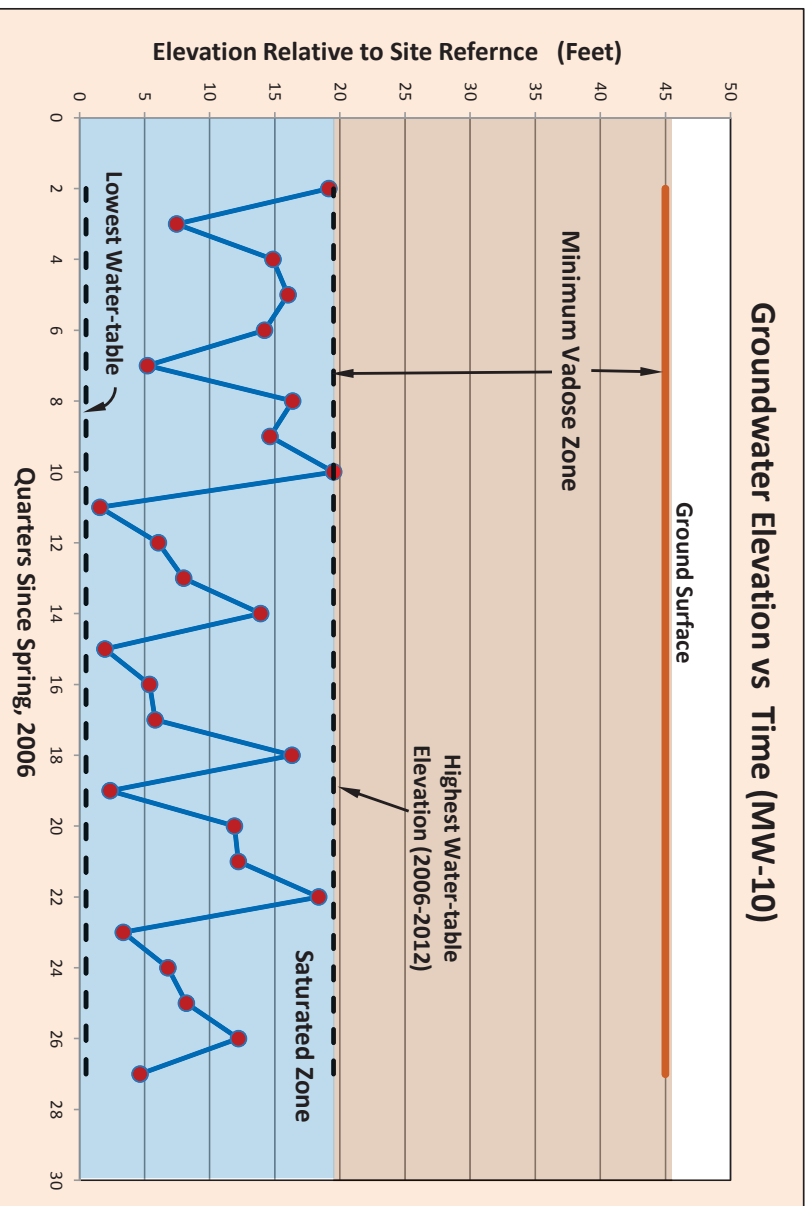


Figure 4

Camas City Well No.6 Data:

	Million Gallons											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	4.837	0.043				49.594	58.556	0.103		57.212		
2008	0.080	10.021			9.795	54.817	58.721	36.205	0.073		0.874	1.480
2009			0.213	0.014	11.366	23.605	21.206	27.046	3.722	0.050		
2010		1.195					0.221		0.271	7.173		
2011	(no pumping of well No.6 in 2011)											

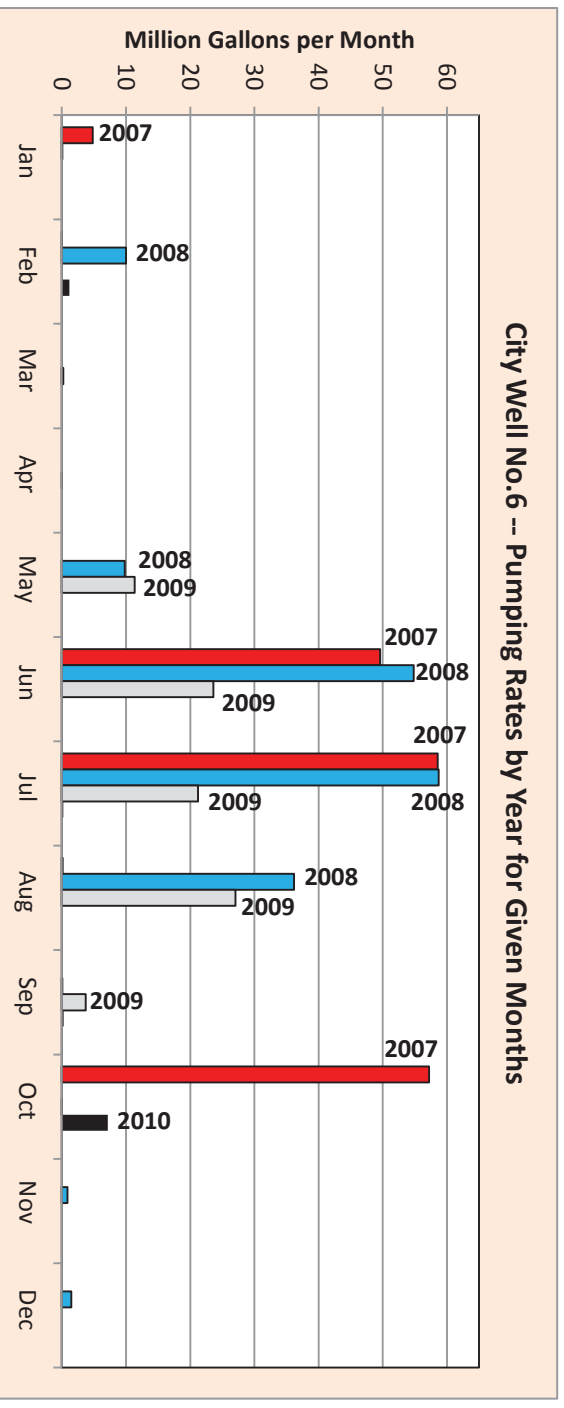
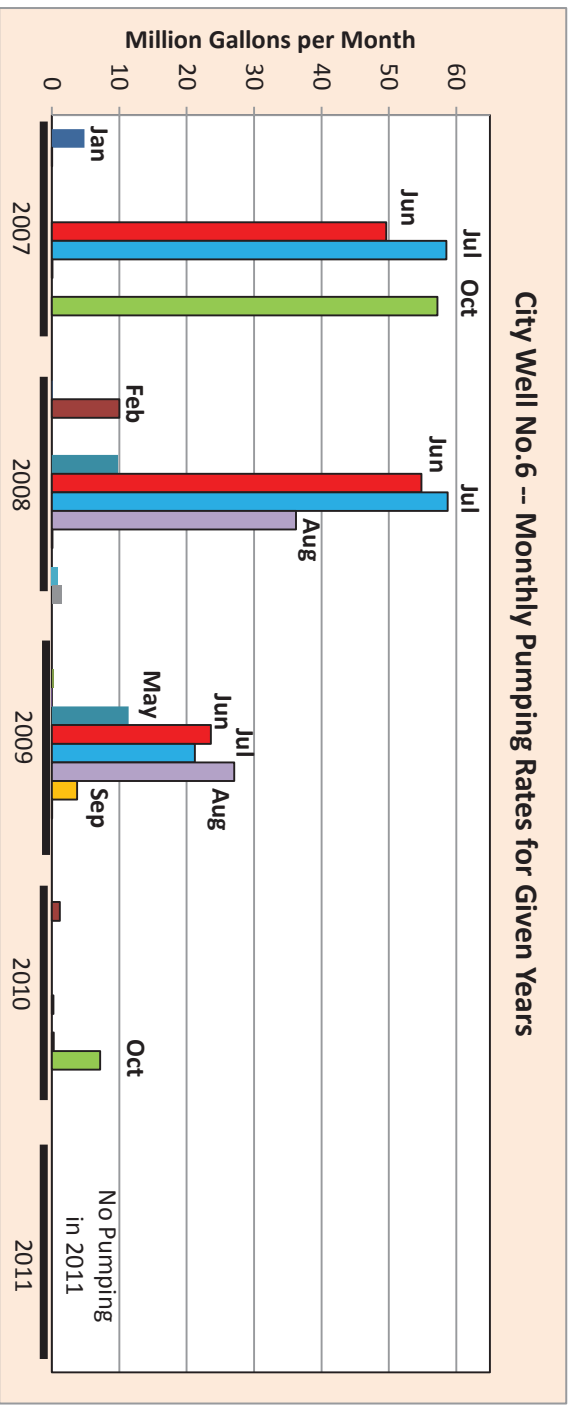


Figure 5
Groundwater Flow Direction / Particle Path Estimate

- Assumptions:
- Northeast groundwater flow direction for 25% of the time
 - 275° Azimuth groundwater flow direction for 75% of the time
 - Same flow velocity for both of the above directions

