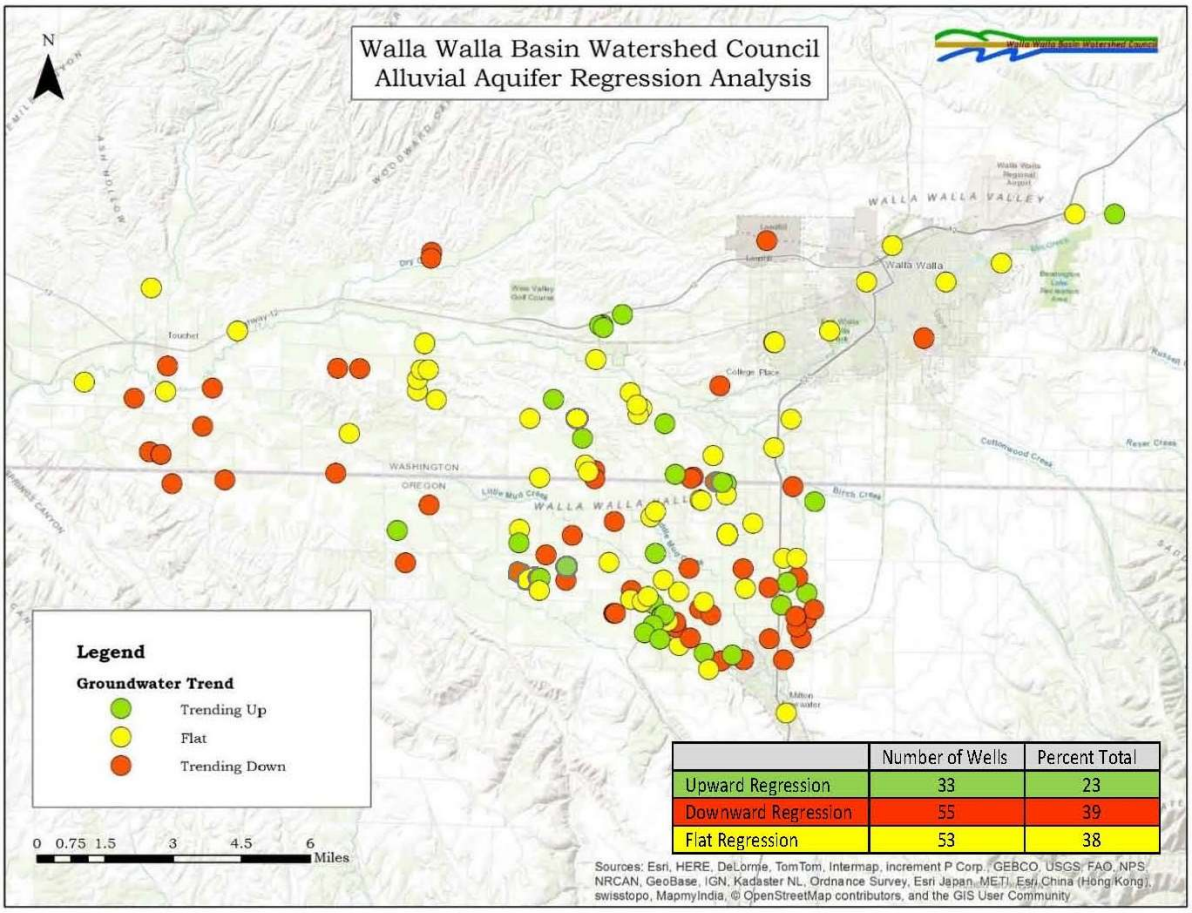
Water Year 2019

Oregon Walla Walla Basin Aquifer Recharge Report



FINAL REPORT

February 2020

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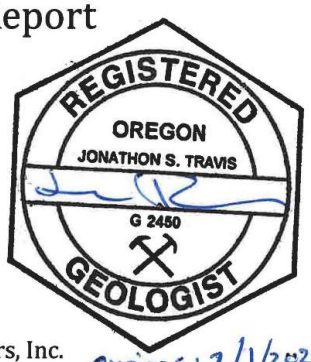

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February 2020

EXECUTIVE SUMMARY

This report summarizes aquifer recharge operations at the Anspach, Barrett, Chuckhole, East Trolley Lane, Fruitvale, Gallagher, Johnson, LeFore, Locust Road, Mud Creek, NW Umapine, Ringer Road, Triangle Road, and Trumbull sites during water year (WY) 2019 and supporting water quality and groundwater level data. The 14 aquifer recharge sites were operated under Limited License 1621 (LL-1621) issued by the Oregon Water Resources Department. This report was prepared per Condition 11 of LL-1621, which requires annual reporting of aquifer recharge site operations.

Source water for the 14 aquifer recharge sites was diverted from the Walla Walla River at the Little Walla Walla Diversion in Milton-Freewater, OR. The water was delivered through existing irrigation water delivery systems to each site's turnout. The WY 2019 recharge season started December 4, 2018 and ended May 15, 2019 but recharge did not occur continuously during this period due to operational and maintenance considerations. The total amount of water diverted under LL-1621 for the WY 2019 recharge season, including estimated seepage losses from the conveyance system, was 6,321 acre-feet (ac-ft). One of the purposes of conducting managed recharge is to mimic lost floodplain processes. If this year's recharge water had instead been flood waters, the volume recharged would have covered the roughly 10 mi^2 central portion of the alluvial fan with one foot of water if it had been released instantaneously.

Groundwater level and water quality data were collected in accordance with the approved monitoring plan for LL-1621. At several groundwater monitoring wells located near recharge sites, groundwater levels increased at the start of recharge and decreased after recharge ended. At other wells water levels responded to seepage from other sources, such as rivers, streams, irrigation ditches or canals, and deep percolation from irrigation.

Groundwater and surface water quality data collected during aquifer recharge activities indicate that aquifer recharge activities are not degrading groundwater quality; rather, recharge activities typically improve groundwater quality due to the generally high quality of the source water.

Continued operation of the 14 existing sites and the addition of three new aquifer recharge sites is dependent on obtaining a new limited license and funding sufficient to conduct the required monitoring.

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LIST OF ACRONYMS

ac-ft	acre-foot
bgs	below ground (or grade) surface
°C	degrees Centigrade
cfs	cubic feet per second
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
FWUA	Fruitvale Water Users Association
GW_##	Groundwater monitoring well #, e.g. GW_14, GW_171
HBDIC	Hudson Bay District Improvement Company
LL	Limited License
mg/L	milligrams per liter
ND	not detected
ODEQ	Oregon Department of Environmental Quality
OWRD	Oregon Water Resources Department
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
WWBWC	Walla Walla Basin Watershed Council
WWRID	Walla Walla River Irrigation District
WY	water year

INTRODUCTION

This report describes groundwater level data, surface and groundwater quality data, and aquifer recharge operations during water year (WY) 2019 (October 1, 2018 – September 30, 2019) for the managed aquifer recharge program conducted by the Walla Walla Basin Watershed Council (WWBWC) in cooperation with the Hudson Bay District Improvement Company (HBDIC), Fruitvale Water Users Association, and Walla Walla River Irrigation District. The recharge program began operating in 2004 at one site and gradually expanded to the 14 sites operational in WY2019.

In the Walla Walla basin, declines in the aquifer and interconnected surface waters have resulted from the channelization of the Walla Walla River distributary system, increased irrigation efficiencies, and increased use of groundwater (pumping) for irrigation and drinking water. As described in the *Walla Walla Basin Aquifer Recharge Strategic Plan* (WWBWC, 2013), the following benefits are expected if the annual volume recharged reaches 20,000 ac-ft:

> "Reversing the loss of storage within the alluvial aquifer will minimize seepage loss in the valley's rivers and streams, increase spring performance and related groundwater input to surface water features, and allow groundwater resources of the alluvial aquifer to continue to be used as a sustainable resource with a secondary or alternative-use benefit to surface water." (p. 79).

During WY 2019, active recharge sites were Anspach, Barrett, Chuckhole, East Trolley Lane, Fruitvale, Gallagher, Johnson, LeFore, Locust Road, Mud Creek, NW Umapine, Ringer Road, Triangle Road, and Trumbull. These sites were operated under Limited License LL-1621 (Appendix A) issued by the Oregon Water Resources Department (OWRD) on October 18, 2016. Source water for aquifer recharge was diverted from the Walla Walla River near Milton-Freewater between December 4, 2018 and May 15, 2019. The recharge sites operated from 3 to 111 days depending primarily on water availability and landowner participation. The total amount of water diverted was 6,321 acre-feet (ac-ft)[1], with the Johnson site and conveyance losses recharging the highest proportions of the total, 44 and 41%, respectively (Figure 1 and Table 1). While the smaller recharge sites contribute a relatively small proportion, they are still an integral and important part of the program because of the recharge that occurs from the conveyances losses when delivering water to the sites – an intentional feature in the design of the program.

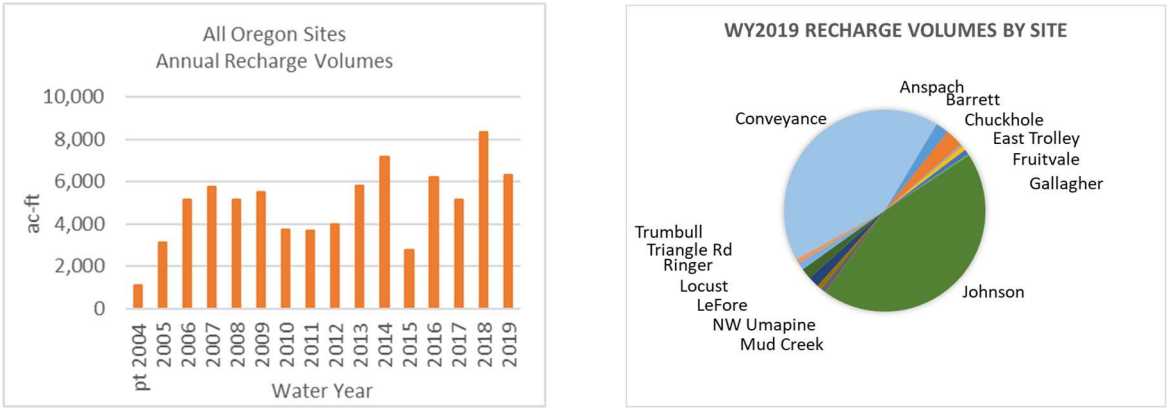


Figure 1. Annual recharge volumes by year (left) and WY2019 recharge volumes by site (right).

[1] One acre-foot is the amount of water needed to cover one acre (a little less than a football field) with one foot of water.

Table 1. Annual recharge volumes (ac-ft) by site, WY2004-2019.

Recharge Year	Anspach	Barrett	Chuckhole	East Trolley	Fruitvale	Gallagher	Johnson	LeFore	Locust	Mud Creek	NW Umapine	Ringer Rd	Triangle Rd	Trumbull	Conveyance Losses	*Sum*
2004	--	--	--	--	--		409	--	--	--	--		--	--	714	***1,123***
2004-5	--	--	--	--	--		1,871	--	--	--	--		--	--	1,277	***3,148***
2005-6	--	--	--	--	--		2,813	--	--	--	--		--	--	2,342	***5,154***
2006-7	--	--	--	--	--		3,234	--	--	--	--		--	--	2,739	***5,772***
2007-8	--	--	--	--	--		2,739	--	--	--	--		--	--	2,406	***5,145***
2008-9	--	--	--	--	--		2,840	--	--	--	--		--	--	2,667	***5,507***
2009-10	--	--	--	--	--		3,734	--	--	--	--		--	--	not estimated	***3,734***
2010-11	--	--	--	--	--		3,700	--	--	--	--		--	--		***3,700***
2011-12	--	--	--	--	--		3,974	--	--	--	--		--	--		***3,974***
2012-13	12	--	--	--	--		4,556	--	--	--	--		--	84	1,175	***5,826***
2013-14	127	210	--	--	--		4,515	--	--	--	499		--	421	1,385	***7,157***
2014-15	23	200	--	--	--		1,560	--	--	--	190		--	116	696	***2,786***
2015-16	532	286	--	--	--		3,959	--	--	--	170		--	262	1,021	***6,230***
2016-17	660	383	13	--	17		2,732	--	--	8	183		13	170	968	***5,148***
2017-18	251	179	25	52	35		3,518	78	56	32	233		103	67	3710	**8,338**
2018-19	135	181	25	45	51	16	2,794	3	56	45	111	111	72	45	2,631	**6,321**
Sum	1,605	1,258	38	52	52		46,154	78	56	40	1,275		116	1,120	21,100	72,742

HYDROLOGIC SETTING

The Walla Walla River system is a bi-state watershed located in northeast Oregon and southeast Washington (Figure 2). The headwaters are located in the Blue Mountains, the crest of which defines the eastern extent of the watershed. The Walla Walla River, Mill Creek and the Touchet River are the three primary surface water channels of the system. They coalesce within the Walla Walla Valley then flow to the Columbia River. The scope of this report is the Oregon portion of the basin, including the Walla Walla River and its distributary network, especially where they flow onto and across the Milton-Freewater alluvial fan.

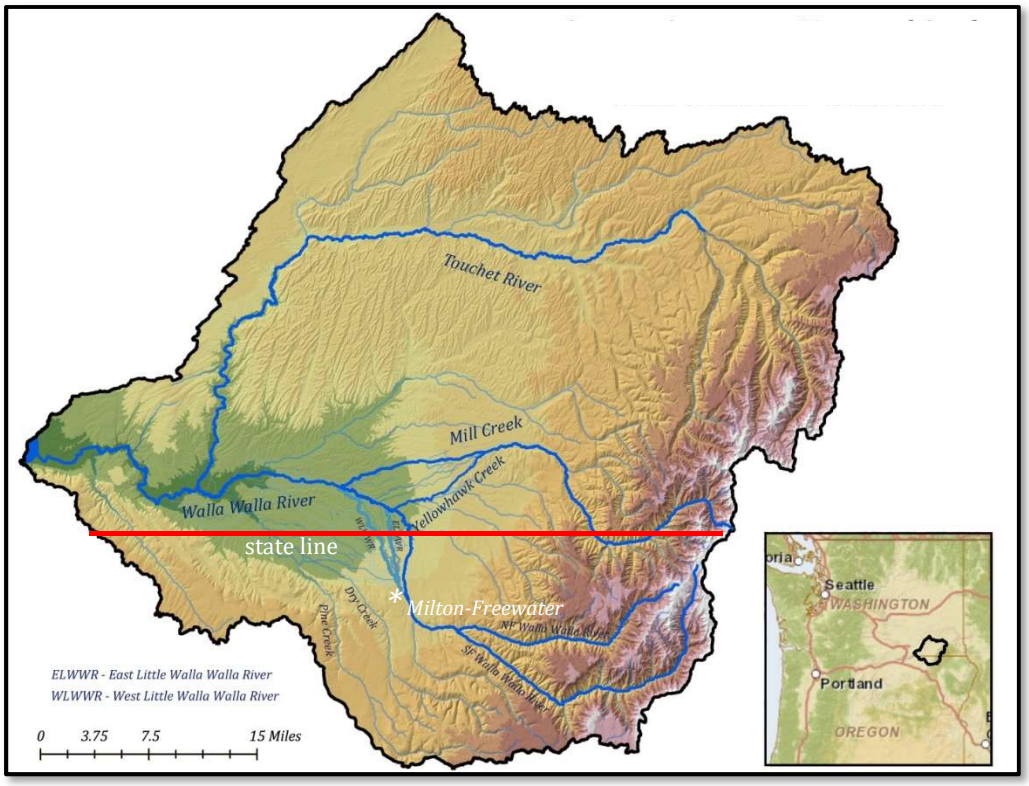


Figure 2. Walla Walla Watershed, including the Walla Walla River and its major tributaries and distributaries.

Groundwater in the Walla Walla basin occurs in two principal aquifer systems: (1) the unconfined to confined suprabasalt sediment (alluvial) aquifer system; and (2) the underlying confined basalt aquifer system (Newcomb, 1965). The basalt aquifer system is regional in character, having limited hydraulic connection to the Walla Walla River, primarily in the canyons of the Blue Mountains. The alluvial aquifer system is the focus of the aquifer recharge program because of its high degree of hydraulic connection with streams on the valley floor. Preferential groundwater flow within the alluvial aquifer is inferred to largely reflect the distribution of coarse sedimentary strata. General groundwater flow direction is from east to west based on contoured groundwater elevations in the alluvial aquifer (Figure 3).

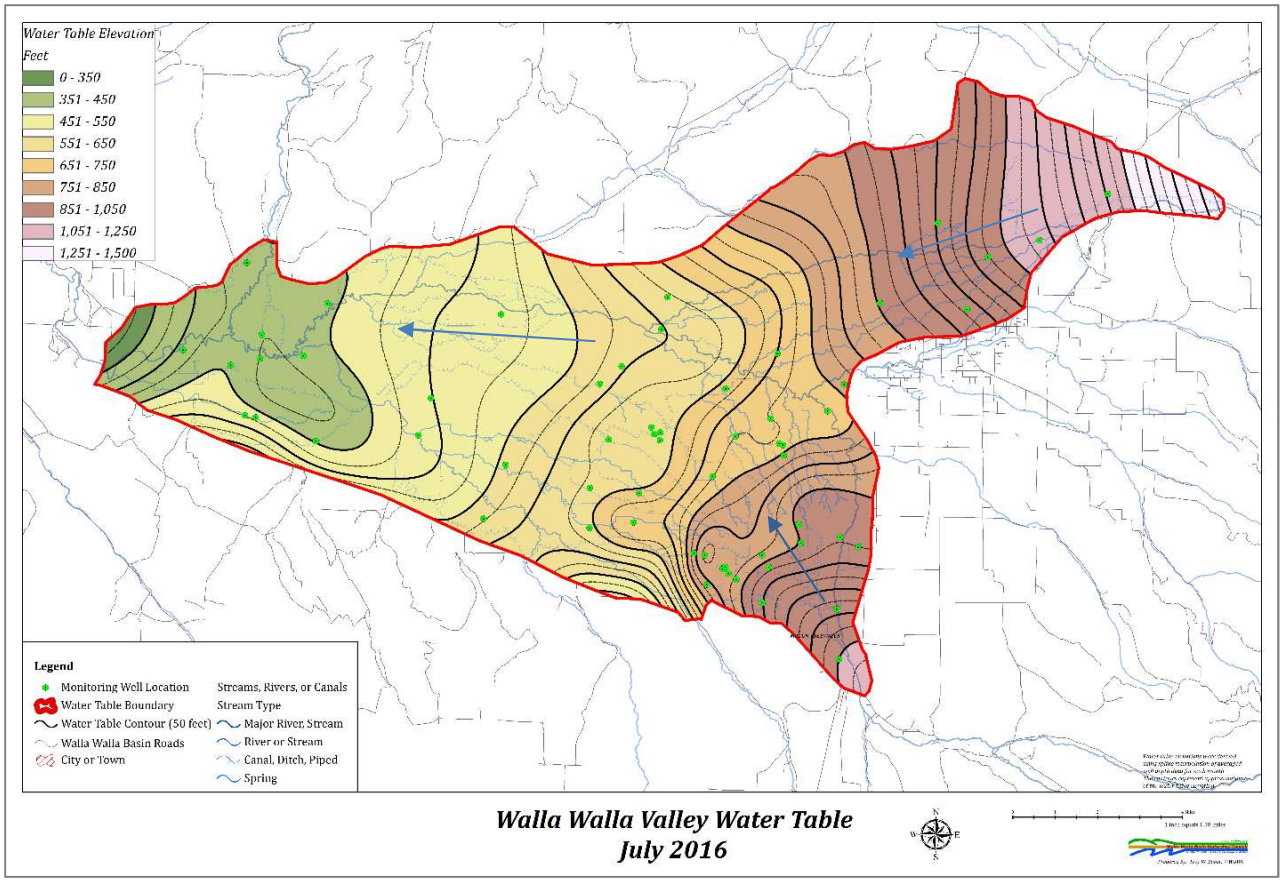


Figure 3. Water table elevation contours for the alluvial aquifer in July 2016.

South of Milton-Freewater, the Walla Walla River exits the steep-walled canyon in the foothills surrounding the valley, divides into a distributary stream system on an alluvial fan on the valley floor, and then, as the distributary streams flow west, coalesce into the main Walla Walla River (Figure 4). A similar pattern exists in the Mill Creek distributary system in Washington. The distributary channels are known today as the East Little Walla Walla River, West Little Walla Walla River, Mud Creek, Yellowhawk Creek, and Garrison Creek.

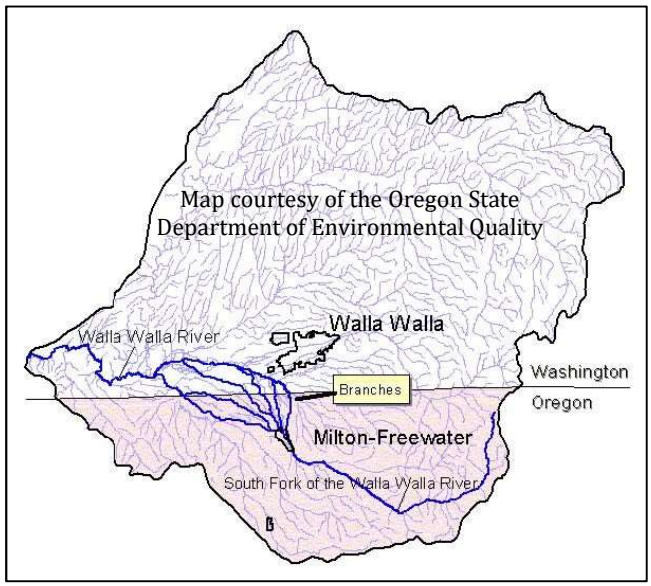


Figure 4. Distributary stream networks of the Walla Walla River originating on the Milton-Freewater alluvial fan.

Prior to the development of water resources in the valley, the distributary channels conveyed large amounts of energy and water across the alluvial fan. The complex channels provided habitat for aquatic species, recharge to the alluvial aquifer system, and cooler water to the Walla Walla River in the form of springs and subsurface inflows to the river resulting from recharge to the aquifer. A headgate installed in the Little Walla Walla River in the 1930's shunted wintertime flows away from the Little Walla Walla River into the Walla Walla River, significantly reducing the system's complexity. Then, in the 1950's, seven miles of levees were constructed along the Walla Walla River to protect the Milton-Freewater area from flooding, severing the connection between the floodplain and the alluvial aquifer. Increasing development led to increasing reliance on the alluvial aquifer as a source of water for irrigation and drinking. In recent years, the listing of steelhead and bull trout as threatened under the Endangered Species Act and the reintroduction of spring chinook salmon led to out-of-court settlement agreements between irrigators and federal fishery agencies to enhance flows in the Walla Walla River. Since 2003, HBDIC and the Walla Walla River Irrigation District leave 25 to 27 cfs of their water rights in the river – roughly one-quarter of their typical summertime diversions during the 1990's – further de-watering the Little Walla Walla River.

Groundwater levels have declined in some places. Out of 11 long-term state observation wells, all had downward trends and three were completely dry by 2009 (Bower and Lindsey, 2010). Declines at GW_16 and GW_19 illustrate long-term trends in portions of the aquifer (Figure 5).

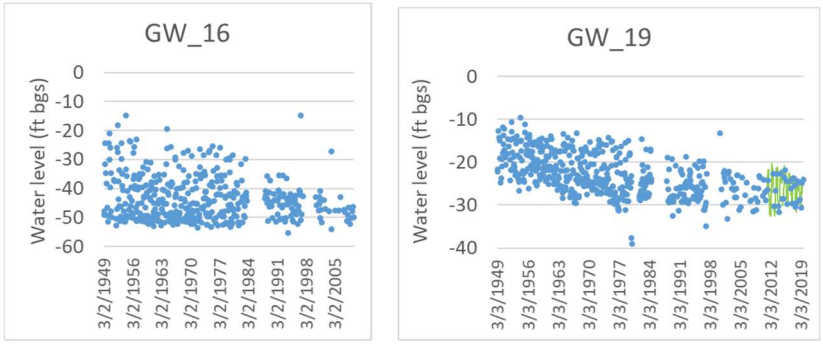


Figure 5. Long-term hydrographs for monitoring wells GW_16 and GW_19.

Because of the interconnectedness between the alluvial aquifer and the streams in the basin, declining groundwater levels result in decreased groundwater contributions to the Walla Walla River and other surface waters, including during critical low-flow periods. The loss of groundwater to streams affects not only the amount of flow in the river but also leads to increased surface water temperature during the low-flow periods, affecting aquatic species and the stream ecosystem. Historically, the estimated yield from 57 mapped springs on the Milton-Freewater and Mill Creek alluvial fans was 50,000 ac-ft (Oregon State Water Resources Board, 1963), or 69 cfs on an annual basis. In contrast, in 2017 the annual discharge from five of the largest springs sourced in the Milton-Freewater alluvial fan was 15.5 cfs (WWBWC, 2019). Flows at McEvoy and Dugger springs were 4-6 cfs and 8-10 cfs, respectively, during summers in the 1930's; by 2009 both springs were dry for portions of the year (Figure 6). However, even under altered modern conditions, groundwater still provides a cooling function to the river. In one study conducted in the summer of 2009, cold water inflows into the Walla Walla River just south of the stateline provided an effective

cooling of approximately 3.15 ˚C (Gryczkowski, 2015). The cold water inflows consisted of groundwater discharge and hyporheic[2] exchange; groundwater discharge was calculated to contribute 20% of the total flow in the river during the study.

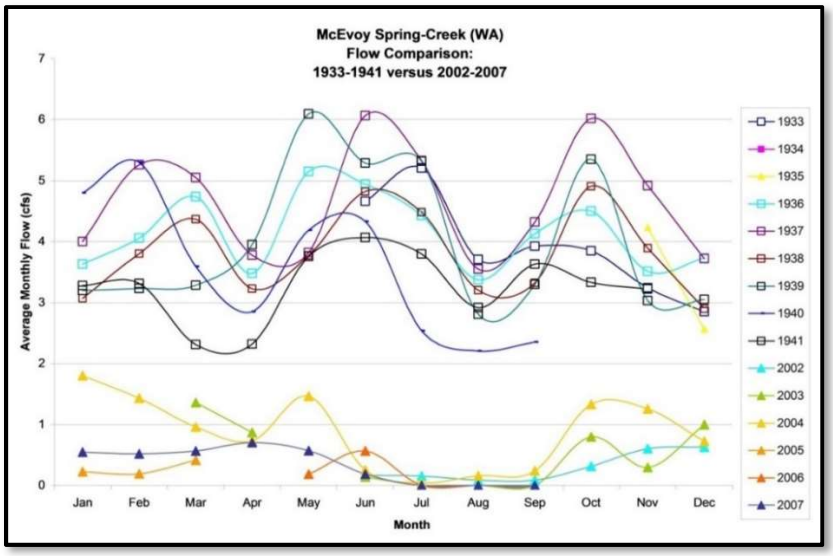
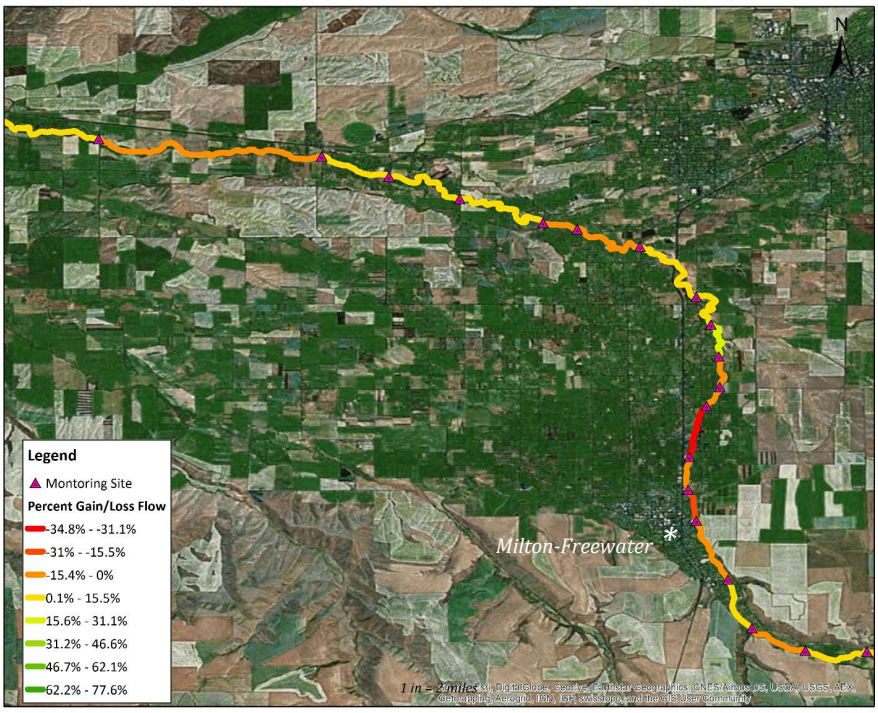


Figure 6. Hydrograph for McEvoy Spring Creek, 1933-1941 versus 2002-2007.

The steep gradients and high hydraulic connectivity between the groundwater levels and water in the river results in high seepage losses -- in some reaches greater than 30 percent (Figure 7).



Gains (positive values, greens and yellows) indicate groundwater discharging to the river.

Losses (negative values, reds and oranges) indicate surface water seeping into the ground (see WWBWC, 2017, for details).

Figure 7. Average percent gains or losses in flow of a segment of the Walla Walla River during seepage runs conducted 2004-2016.

[2] The hyporheic zone is a porous area beneath and alongside a stream bed, where shallow groundwater and surface water mix together.

The existing 14 aquifer recharge sites are distributed across the Milton-Freewater alluvial fan (Figure 8), mimicking the floodplain process of recharge to the aquifer that was lost when the headgate shunted wintertime water to the Walla Walla River and the levees nearly eliminated flooding near Milton-Freewater. While the geological map used as the base map in Figure 8 has been replaced by more a more recent and detailed map (GSI Water Solutions, 2007), the older map was used because it effectively conveys the intentional distribution of the recharge sites across the alluvial fan.

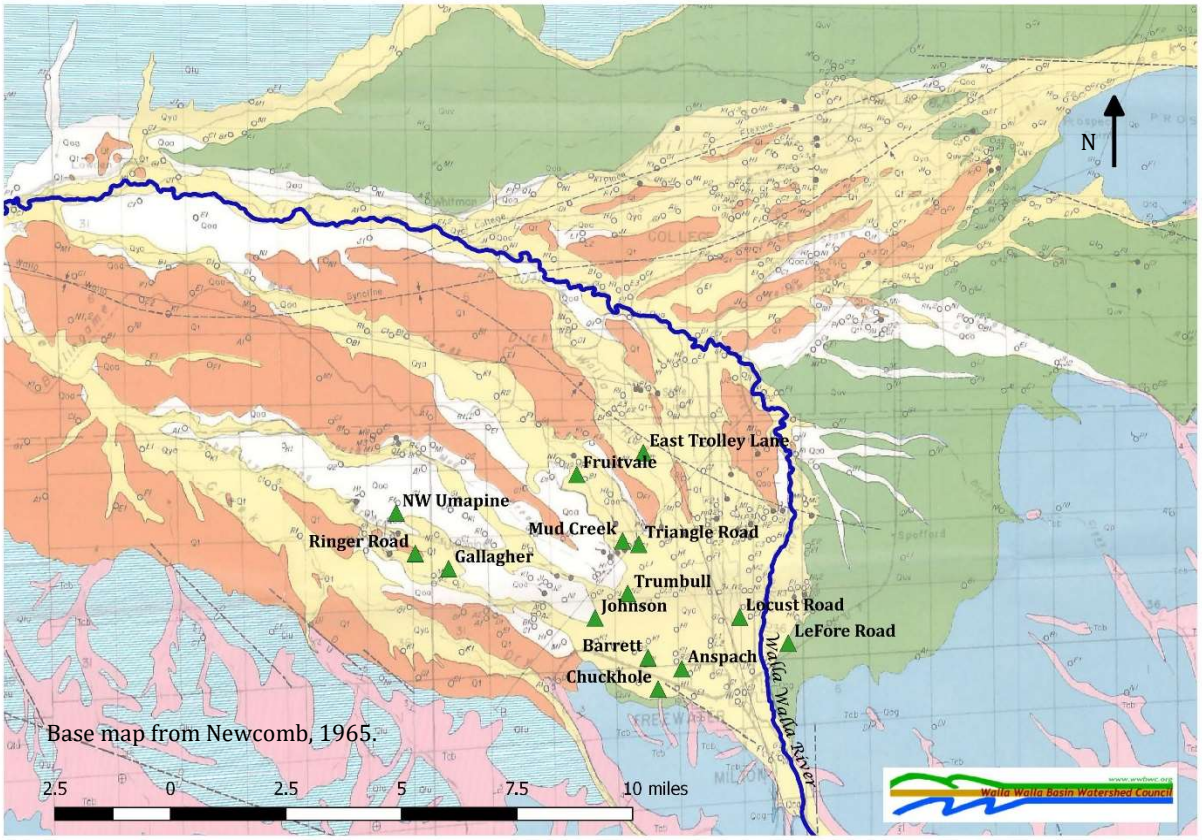


Figure 8. Recharge sites in the Oregon portion of the Walla Walla basin during WY2019 and their location across the alluvial fan.

OPERATIONS

Managed aquifer recharge program operations are summarized, by site, in Table 2. As in previous years, sites typically operated at less than the maximum design capacity listed in the limited license. Depending on the site, this is commonly due to site conditions or operational limitations such as the volume of the source water being unable to completely fill the site's inflow pipe, biofouling of inlet screens, frozen ditches, or infiltration rates, competing demands for water (stock watering or irrigation), equipment failures, plugged subsurface inlet lines, etc.)

Table 2. Summary of MAR Program Operations.

Site	Operated by	Number of Days Operated	Average Recharge Rate (cfs)	Operational Comments
Anspach	WWBWC	80	0.8	The supply line to 1 of the 2 galleries may be obstructed; flow was usually insufficient for the meter to record the values in 1 gallery.
Barrett	HBDIC	72	1.3	--
Chuckhole	Landowner	43	0.3	Recharge volumes were based on last year's due to a battery failure.
East Trolley	WWBWC	85	0.3	As discovered in December 2019, 2 of the gallery lines were clogged with debris. The debris was removed and a screen was added to the inflow line.
Fruitvale	FWUA	88	0.3	--
Gallagher	WWBWC/ Landowner	20	0.4	Site construction didn't finish until near the end of the recharge season.
Johnson	HBDIC/ WWBWC	89	13.6	--
LeFore	Landowner	2	0.8	The landowner passed away but the new landowner intends to operate this site next year.
Locust Rd	Landowner	43	0.7	Recharge volumes were based on last year's due to a battery failure.
Mud Creek	FWUA	88	0.3	--
NW Umapine	HBDIC	29	1.9	Prolonged high winds caused extensive deposition of debris (such as tumbleweeds) in the canal used to supply this site, precluding delivery of water to this site in the fall.
Ringer Rd	WWBWC	90	0.6	--
Triangle Rd	FWUA	90	0.4	--
Trumbull	HBDIC	43	0.5	The site was not operated in the fall at the request of a nearby landowner, who believes recharge from the site is affecting his field, even though during the past two years the recharge site has not been operational when the wet spot appears in his field.

MONITORING

This section describes water availability, individual site operations, groundwater level monitoring, and source and groundwater quality monitoring results. Laboratory water quality testing results are provided in Appendix B. Diverted surface water volumes, recharge volumes and rates, groundwater levels, source water quality and ground-water quality data were collected in accordance with the approved monitoring plan for LL-1621, available at http://www.wwbwc.org/images/Projects/AR/Reports/2016_LL1621_WQPlan_FINAL_sp.pdf. Groundwater level data in the OWRD-requested format were transmitted separately to OWRD.

LL-1621 allows for up to 70 cfs to be diverted from the Walla Walla River for the purpose of testing artificial recharge. Per the conditions of LL-1621, a minimum instream flow amount is required to

remain in the Tum-A-Lum reach of the Walla Walla River depending on the time of year (Table 3). WWBWC coordinated with HBDIC to ensure that this condition of LL-1621 was met during recharge operations in WY 2019. Managed recharge under the limited license did not begin until December 4, 2018 because minimum flow requirements were not met prior to this date. Recharge was interrupted from February 3 to late March for two reasons: (1) the annual maintenance of fish screens at the Little Walla Walla River diversion, which ceases delivery of water to canals and ditches from which the recharge sites receive their water; and (2) a prolonged unusually cold period during which several supply ditches froze and were unable to deliver water. Diversions for aquifer recharge ended on May 15, 2019, as required by the limited license.

Table 3. Minimum instream flows that must be met before water can be diverted for recharge under LL-1621.

Minimum Instream Flow Values for Limited License 1621		
Nov 1 thru Nov 30	***Dec 1 thru Jan 31***	***Feb 1 thru May 15***
64 cfs	***95 cfs***	***150 cfs***

Not all of the water diverted from the Walla Walla River reaches the recharge sites due to seepage through unlined portions of the canal and ditch system and/or evaporative losses. Because recharge operations occur during winter and spring months, evaporative losses are assumed to be negligible. To estimate ditch seepage losses during diversion, different seepage rates were applied to different segments of the conveyance system for the duration of recharge (Table 4). The seepage rates were calculated based on measured seepage losses, diversion rates needed to supply the maximum inflow rates to each recharge site, and duration of the recharge periods. The resulting estimated cumulative seepage loss for WY2019 was 2,631ac-ft.

Table 4. Seepage loss estimates.

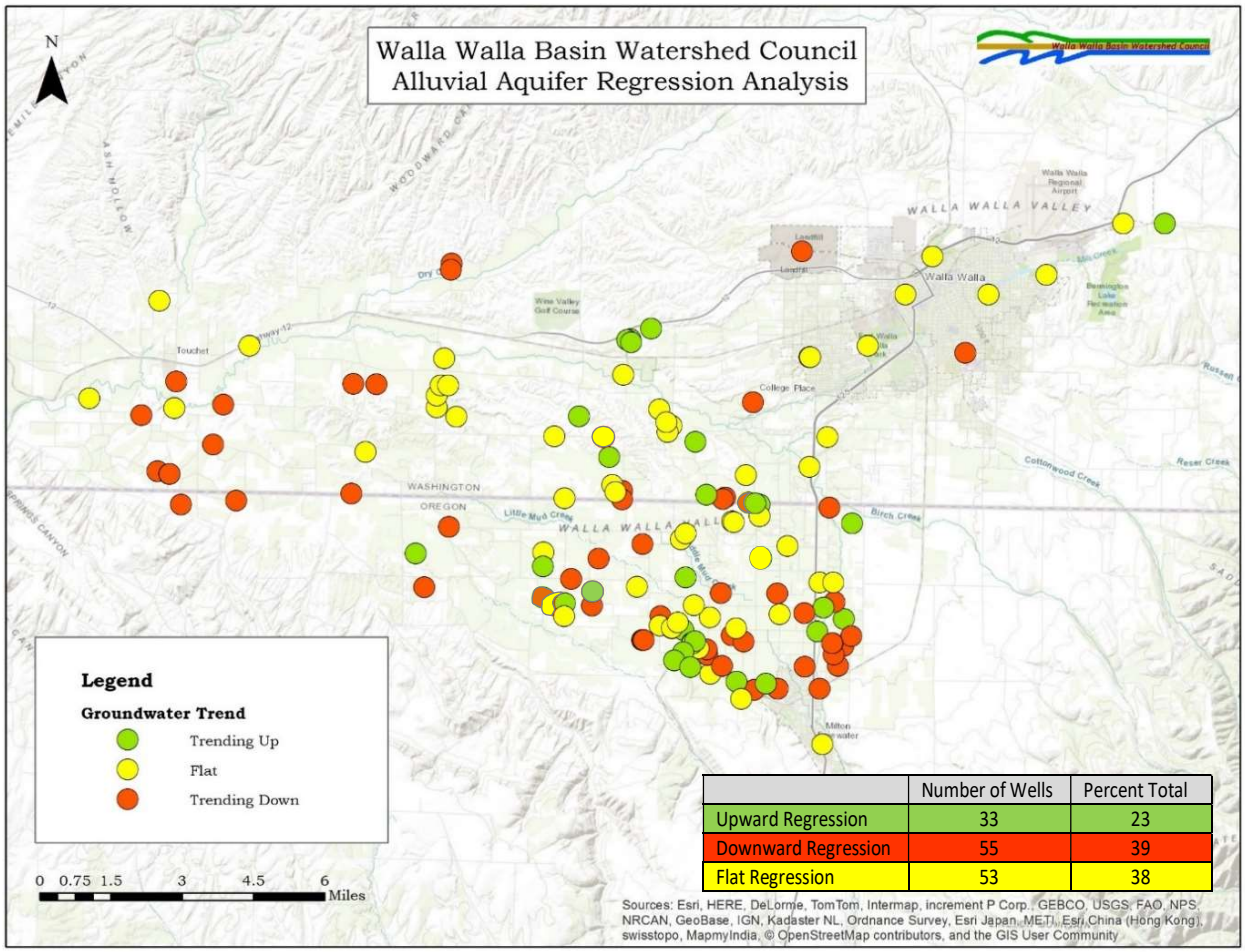
Segment	Length (miles)	Seepage rate (cfs)	Basis	Recharge duration (days)	Convert cfs/mile to ac-ft/mile	Seepage loss (ac-ft) = ac-ft/mile x duration x miles
LWWR Diversion to the Frog	1.6	0.42	1% loss, average of 15 measurements from 2016-2018. Assumed 42 cfs diversion (39 cfs needed for recharge +avg 8% loss). 42 x 0.01 = 0.42	116	0.8	152
White Ditch to Johnson	2.1	2.7	8% loss, avg of 3 time periods, 2010-2013. 8% x 33.5 cfs (max of 31 cfs to Johnson/Anspach/Barrett/Trumbull/Gallagher/Ringer/NW Umapine + 2.5 cfs [8% seepage loss]) = 2.7	89	5.3	992
White Ditch, Johnson to Gallagher	2.5	0.4	8% x 5 cfs (4.5 cfs for Gallagher/Ringer/NW Umpine + 0.4 cfs for seepage loss) = 0.4	90	0.8	174
White Ditch, Gallager to Ringer Rd	0.8	0.28	8% x 3.5 cfs (3.3 cfs for Gallagher/Ringer + 0.3 cfs) = 0.28	90	0.6	40
Richartz to NW Umpine	3.0	0.2	HCP 2004: at 38 cfs 72% eff, so 28% loss. 0.28* 2.7 cfs (2.5 + 0.2 cfs) = 0.2	29	0.4	37
From White Ditch to Barrett	0.1	0.39	HCP 2004: low flow 3.8 cfs eff 87%, so 13% loss. 0.13*3 (2.8 cfs for Barrett + 0.2 cfs loss)	72	0.8	6
From White Ditch to Trumbull	0.7	0.15	assumed similar to White Ditch	43	0.3	9
From Frog to Fruitvale	4.3	0.8	CTUIR & TFT: 0.5 cfs/km. Conversion: 0.5 cfs/km x 1.6 km/mi = 0.8 cfs/mi	88	1.6	599
From Frog to East Trolley	4.1	0.8		85	1.6	552
From Frog to Locust	1.0	0.8		43	1.6	70
sum						*2,631*

Acronyms not previously defined
CTUIR Confederated Tribes of the Umatilla Indian Reservation
HCP Habitat Conservation Planning documentation (Technical Memorandum, Walla Walla HCP – Minimization & Mitigation Plan, HBDIC, Preliminary Draft, 2004, Prepared by Economic and Engineering Services, Inc.
LWWR Little Walla Walla River
TFT The Freshwater Trust

GROUNDWATER LEVELS

OVERVIEW

As part of a separate analysis conducted in 2019, linear regressions using Excel were used to evaluate changes over time in groundwater levels of all monitoring wells currently in WWBWC's monitoring network, not just those wells used to monitor the managed aquifer recharge program. Out of 141 wells, regression lines of data from each well's period of record were up in 33 wells (23%), flat in 53 wells (38%), and down in 55 wells (39%)(Figure 9 and Table 5). A regression line was considered "flat" if there was less than a one-foot difference in the beginning and end of the linear regression line. Out the 14 wells near the three largest recharge sites (Anspach, Barrett, and Johnson), regression lines were up in 50%, flat in 21%, and down in 29%.



	Number of Wells	Percent Total
Upward Regression	33	23
Downward Regression	55	39
Flat Regression	53	38

Figure 9. Direction of regression lines of groundwater level data.

Table 5. Results of linear regressions, by monitoring well.

Site #	POR (CY)	Trend	Site #	POR (CY)	Trend	Site #	POR (CY)	Trend
GW_003	2001-2019	Up	GW_069	2007-2019	Flat	GW_125	2009-2017	Flat
GW_004	2001-2016	Down	GW_070	2007-2019	Down	GW_126	2009-2017	Flat
GW_005	2001-2019	Up	GW_071	2007-2019	Flat	GW_127	2009-2017	Flat
GW_006	2001-2019	Flat	GW_072	2007-2017	Flat	GW_128	2009-2019	Flat
GW_007	2001-2019	Up	GW_073	2006-2019	Up	GW_129	2009-2019	Flat
GW_008	2001-2016	Up	GW_074	2006-2019	Flat	GW_130	2009-2013	Down
GW_009	2001-2019	Down	GW_075	2006-2019	Up	GW_131	2009-2017	Flat
GW_010	2001-2019	Down	GW_082	2008-2017	Down	GW_132	2007-2017	Flat
GW_011	2001-2015	Flat	GW_083	2008-2017	Flat	GW_133	2007-2017	Down
GW_013	2001-2019	Flat	GW_084	1946-2010	Down	GW_134	2011-2017	Flat
GW_014	2001-2019	Down	GW_085	2008-2017	Down	GW_135	2011-2019	Up
GW_015	1988-2019	Flat	GW_086	2008-2017	Down	GW_136	2012-2017	Up
GW_016	1949-2009	Down	GW_087	2008-2017	Flat	GW_137	2012-2017	Down
GW_017	1933-2009	Down	GW_088	2008-2017	Up	GW_138	2012-2017	Down
GW_018	1949-2019	Down	GW_089	2008-2017	Flat	GW_139	2012-2017	Flat
GW_019	1949-2019	Down	GW_090	2008-2017	Down	GW_140	2012-2019	Up
GW_020	1949-2019	Flat	GW_092	2008-2019	Down	GW_141	2013-2019	Up
GW_023	1988-2019	Down	GW_093	2008-2017	Down	GW_142	2013-2019	Flat
GW_025	1933-2004	Down	GW_094	1969-2017	Down	GW_143	2013-2019	Flat
GW_027	1974-2019	Down	GW_095	2008-2017	Down	GW_144	2013-2019	Up
GW_028	2002-2019	Down	GW_096	2008-2017	Down	GW_145	2014-2017	Up
GW_031	2002-2019	Down	GW_098	2008-2019	Up	GW_146	2014-2017	Up
GW_033	2003-2019	Flat	GW_100	2006-2017	Down	GW_147	2014-2017	Up
GW_034	2003-2019	Flat	GW_101	2006-2017	Down	GW_148	2014-2017	Flat
GW_035	2003-2014	Up	GW_102	2009-2017	Flat	GW_149	2014-2017	Flat
GW_036	2003-2019	Down	GW_103	2009-2017	Flat	GW_150	2014-2019	Down
GW_037	2007-2019	Down	GW_104	2009-2017	Up	GW_151	2015-2019	Flat
GW_038	2003-2019	Down	GW_105	2007-2017	Down	GW_152	2015-2019	Down
GW_039	2004-2019	Down	GW_106	2006-2017	Flat	GW_153	2014-2017	Flat
GW_040	2004-2019	Up	GW_107	2006-2017	Flat	GW_154	2015-2017	Flat
GW_041	2004-2019	Down	GW_108	2009-2017	Up	GW_155	2015-2017	Flat
GW_045	2004-2019	Flat	GW_109	2007-2017	Flat	GW_156	2015-2017	Flat
GW_046	2004-2019	Up	GW_110	2007-2017	Flat	GW_157	2015-2017	Flat
GW_047	2004-2019	Flat	GW_111	2006-2017	Flat	GW_158	2015-2017	Flat
GW_048	2004-2019	Up	GW_112	2006-2017	Up	GW_159	2015-2017	Flat
GW_054	2003-2017	Down	GW_113	2007-2017	Up	GW_160	2015-2019	Down
GW_057	2000-2017	Down	GW_114	2006-2017	Flat	GW_161	2015-2019	Down
GW_058	2003-2019	Down	GW_115	2009-2019	Flat	GW_162	2015-2019	Down
GW_060	2004-2019	Up	GW_116	2009-2019	Flat	GW_163	2015-2019	Down
GW_061	2004-2019	Up	GW_117	2009-2019	Flat	GW_164	2015-2018	Up
GW_062	2005-2019	Up	GW_118	2009-2019	Flat	GW_165	2015-2019	Up
GW_063	2005-2019	Down	GW_119	2009-2019	Flat	GW_166	2015-2019	Down
GW_064	2005-2019	Flat	GW_120	2009-2019	Down	GW_167	2015-2019	Down
GW_065	2006-2019	Up	GW_121	2009-2019	Down	GW_168	2015-2019	Down
GW_066	2006-2019	Up	GW_122	2009-2017	Flat	GW_169	2016-2019	Up
GW_067	2007-2019	Up	GW_123	2009-2017	Down	GW_170	2016-2019	Down
GW_068	2007-2019	Down	GW_124	2009-2017	Down	GW_171	2016-2019	Flat

POR = period of record (duration of monitoring)

SPECIFIC SITES

The groundwater monitoring network for the aquifer recharge program consists of 28 wells (Figure 10). The following section presents, by site, the amount of water recharged during WY2019, a map of groundwater monitoring wells associated with each site, and results from monitoring groundwater levels. Each well's hydrograph and the annual shallowest and deepest groundwater levels (the peaks and troughs in the hydrographs) are evaluated.

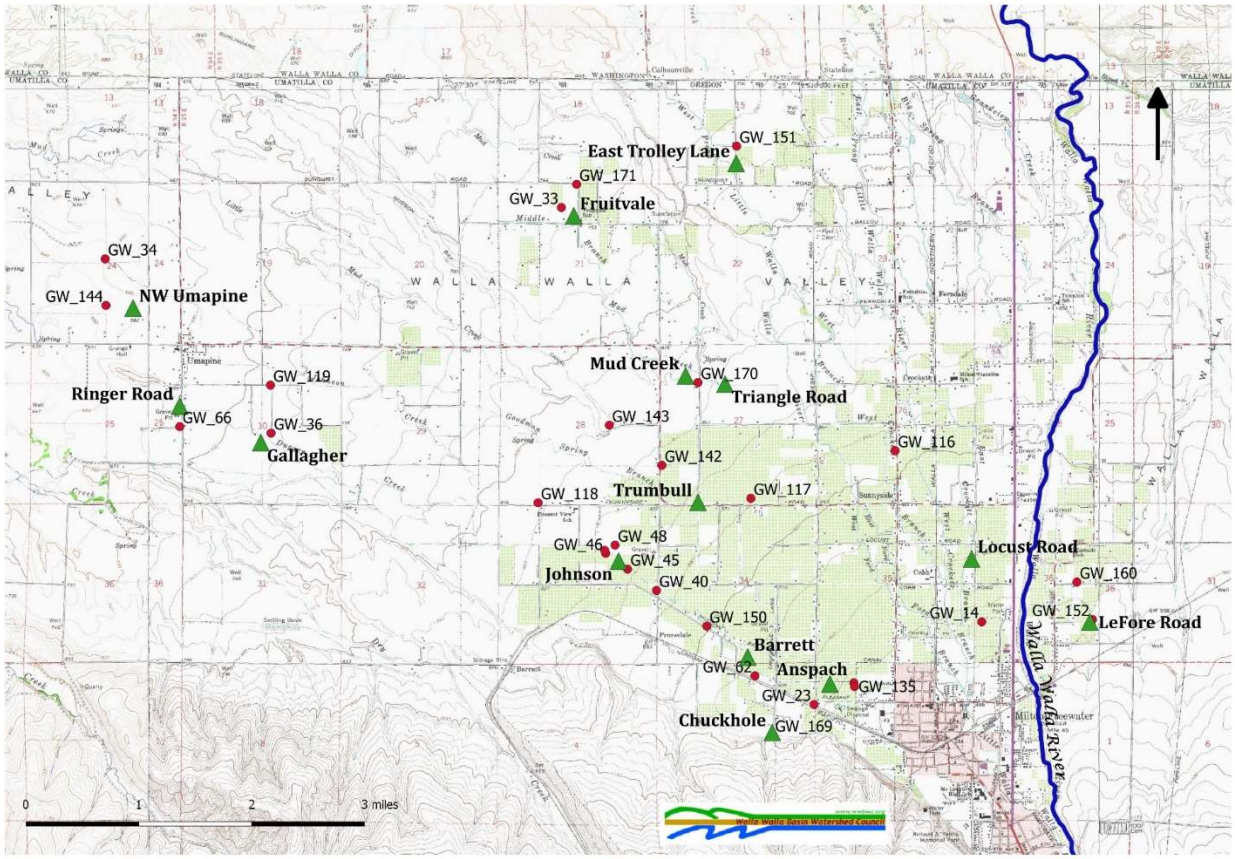


Figure 10. Groundwater monitoring wells and aquifer recharge sites.

ANSPACH SITE

The Anspach site operated for 80 days, recharging 135 ac-ft of water at an average rate of 0.8 cfs.

The site has two upgradient wells, GW_135 and GW_141, and one cross-gradient well, GW_23 (Figure11). The shallowest values at GW_141 increased by more than 10 feet during the early years of managed recharge and have remained elevated despite decreased recharge volumes at this site in the last two years (Figure 12). While GW_141 and GW_135 are upgradient of the recharge site, the timing of the seasonal patterns (Figure 13) suggests both wells are influenced by managed recharge operations, perhaps as a result of groundwater mounding under the Anspach site. At cross-gradient GW_23, quarterly readings preclude observing changes between each month; between years, groundwater levels may be stabilizing after declines in the three previous decades (Figure 14).

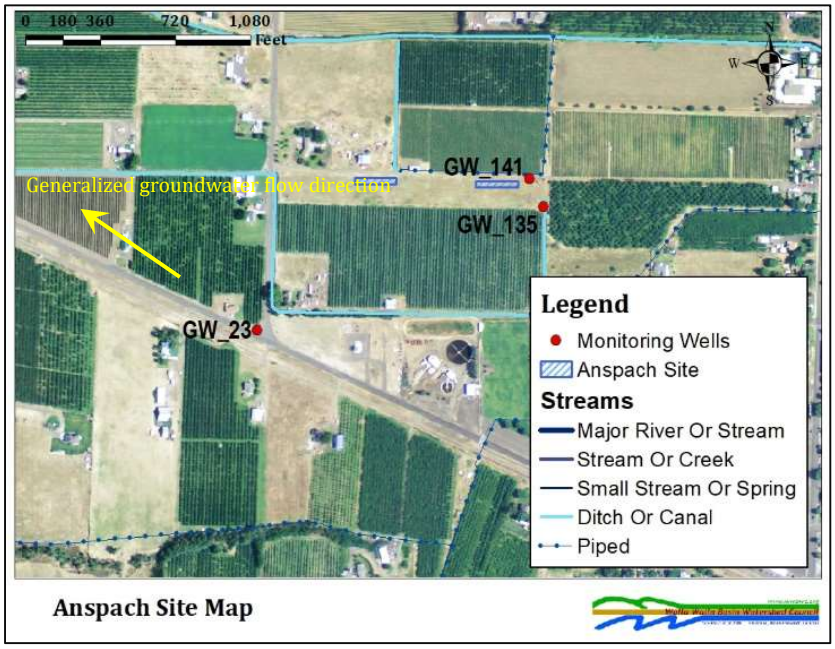


Figure11. Anspach monitoring well locations.

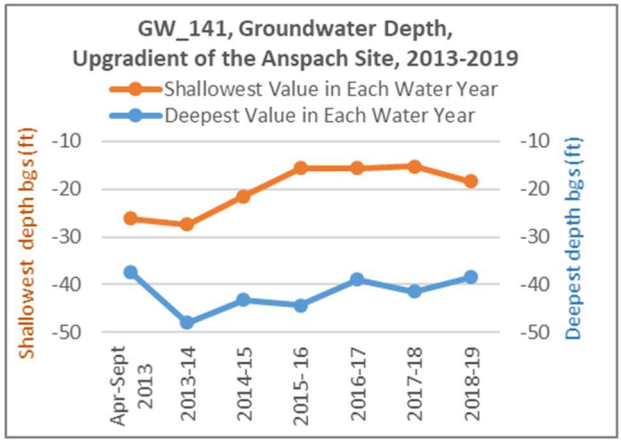
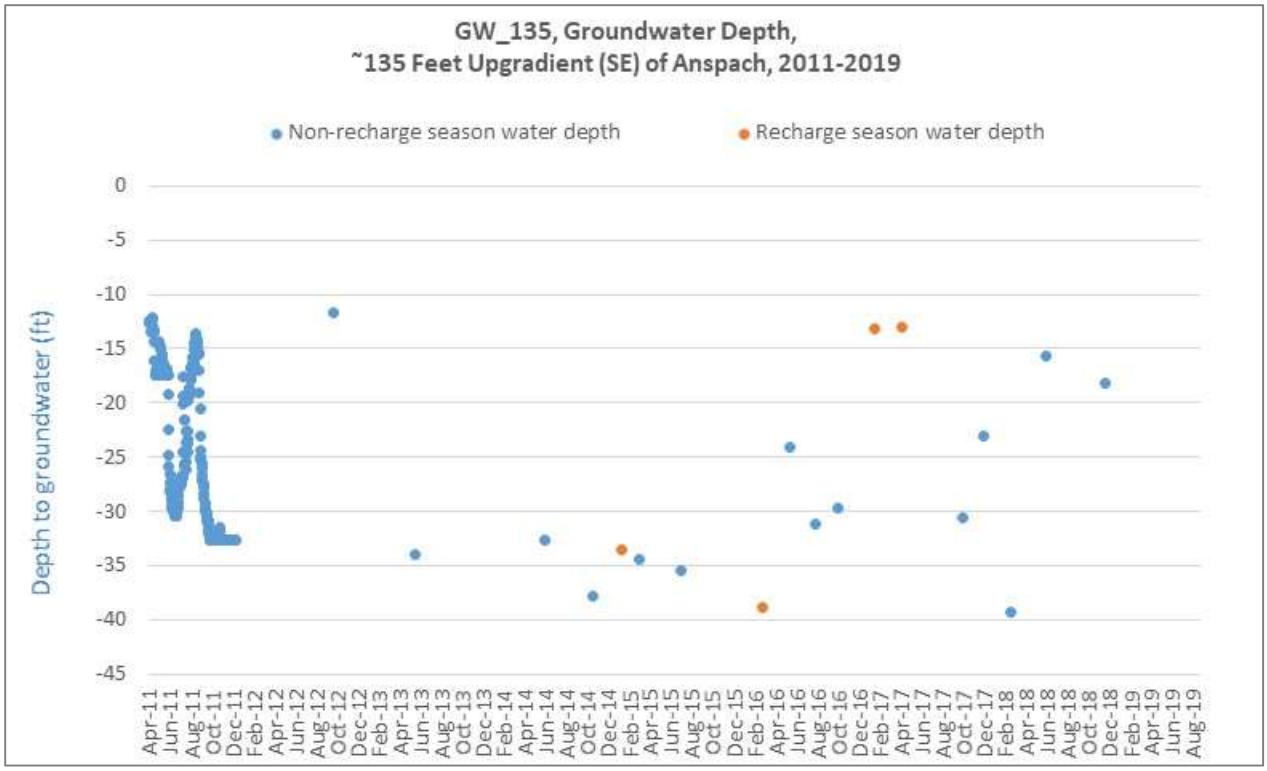


Figure 12. Shallowest and deepest groundwater levels, GW_141.



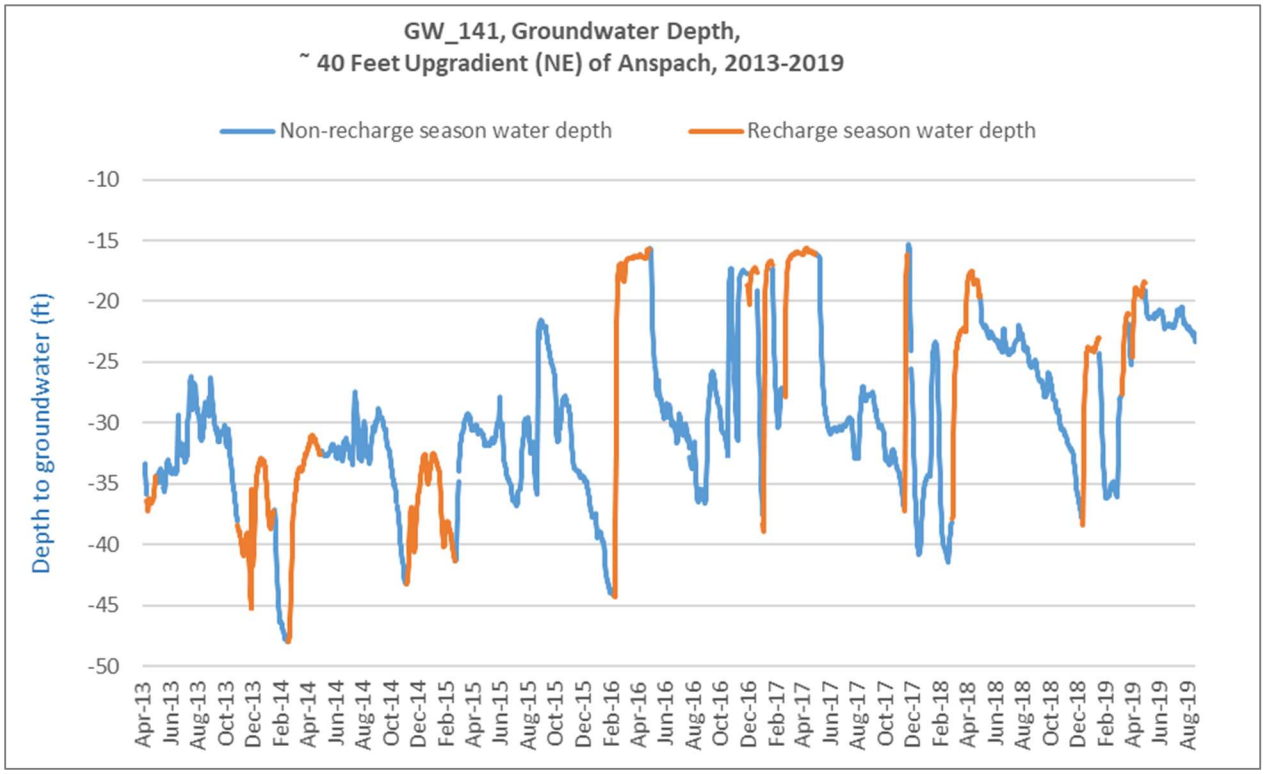


Figure 13. Hydrographs for monitoring wells GW_135 andGW_141.

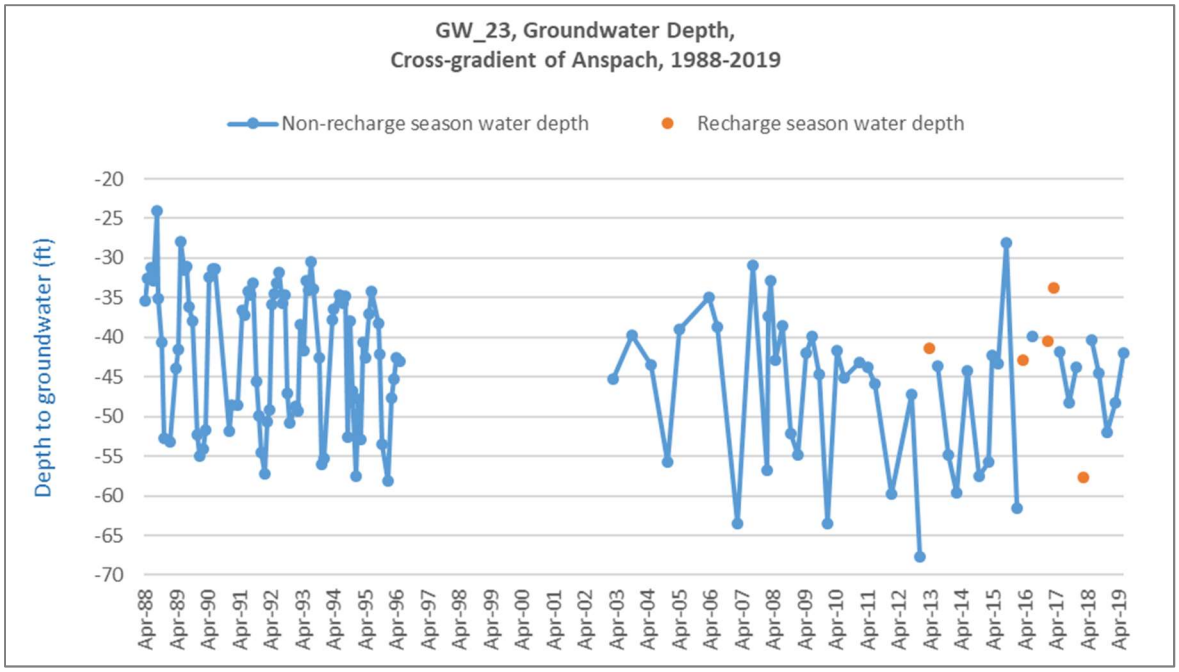


Figure 14. Hydrograph for monitoring well GW_23.

BARRETT SITE

The Barrett site operated for 72 days, recharging 181 ac-ft at an average rate of 1.3 cfs.

GW_62 is upgradient and GW_150 is approximately 0.3 miles downgradient of the site (Figure 15). Responses to recharge operations continue to be observed at upgradient GW_62 -- the shallowest groundwater levels continue to increase since the site began operations in 2013 (Figure 16). At downgradient GW_150, the timing of peaks and troughs (Figure 17) indicate influences on groundwater levels other than just the operation of the Barrett site.

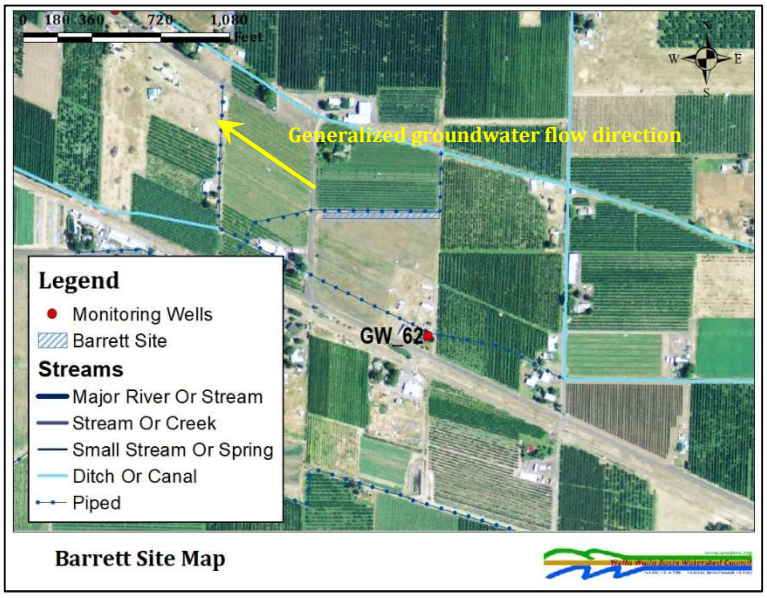
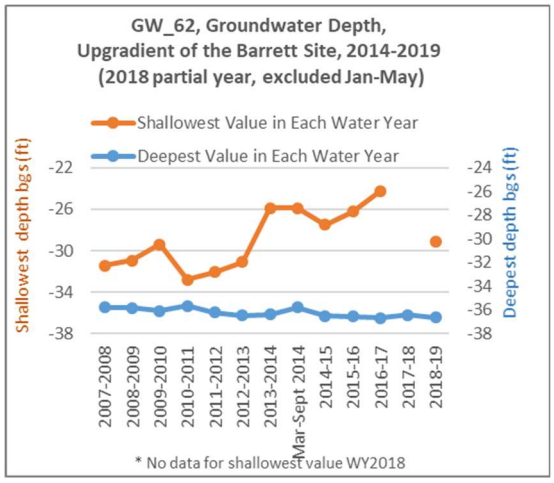


Figure 15. Barrett monitoring well locations.



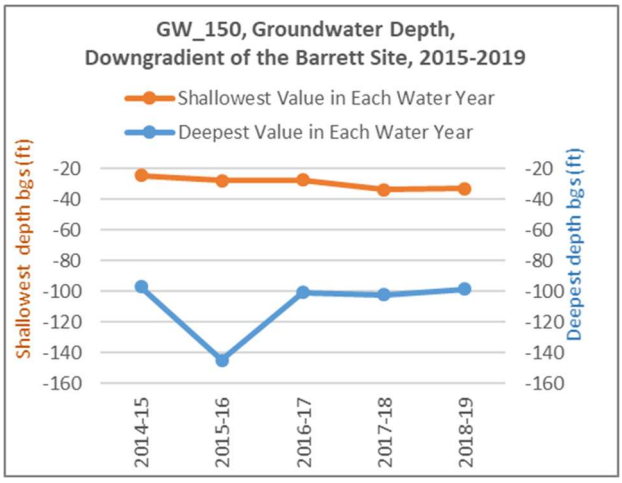
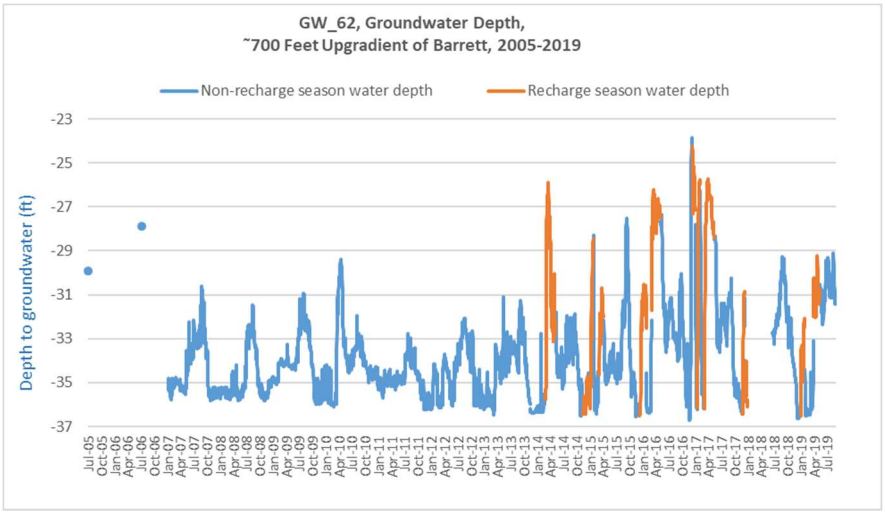
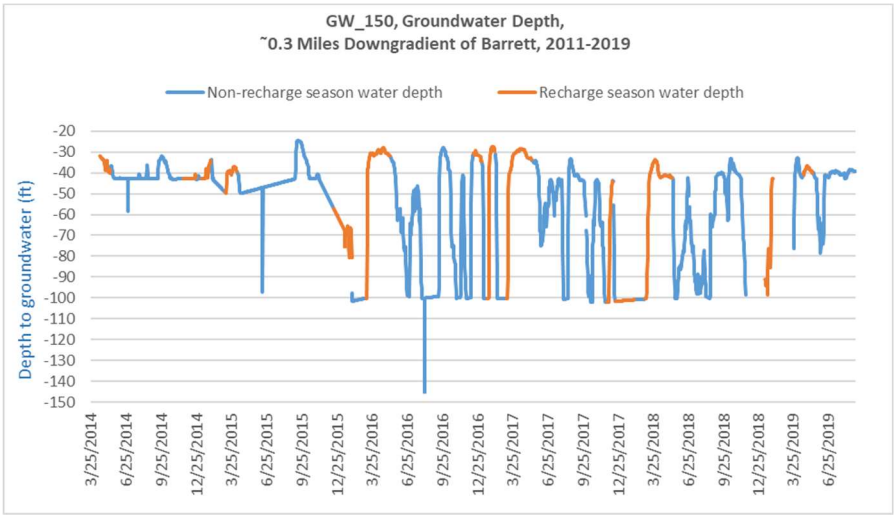


Figure 16. Shallowest and deepest groundwater levels, GW_62 and GW_150.





Note: It is not possible to place the transducer (data recorder) far enough down GW_150 to capture the maximum depth values; the deepest value shown in August 2016 was obtained manually.

Figure 17. Hydrographs for monitoring wells GW_62 and GW_150.

CHUCKHOLE SITE

The Chuckhole site operated for 43 days, recharging 25 ac-ft at an average of 0.3 cfs.

Three monitoring wells are in the vicinity of the site: GW_169 upgradient, GW_62 downgradient, and GW_23 cross-gradient (Figure 18). As discussed above, GW_62 is influenced by recharge from the Barrett site. The battery at GW_169 died during the brief spring recharge season so no values were obtained during recharge (Figure 19). At cross-gradient GW_23, the quarterly readings during WY2019 did not occur within the brief 6-week recharge season (Figure 20).

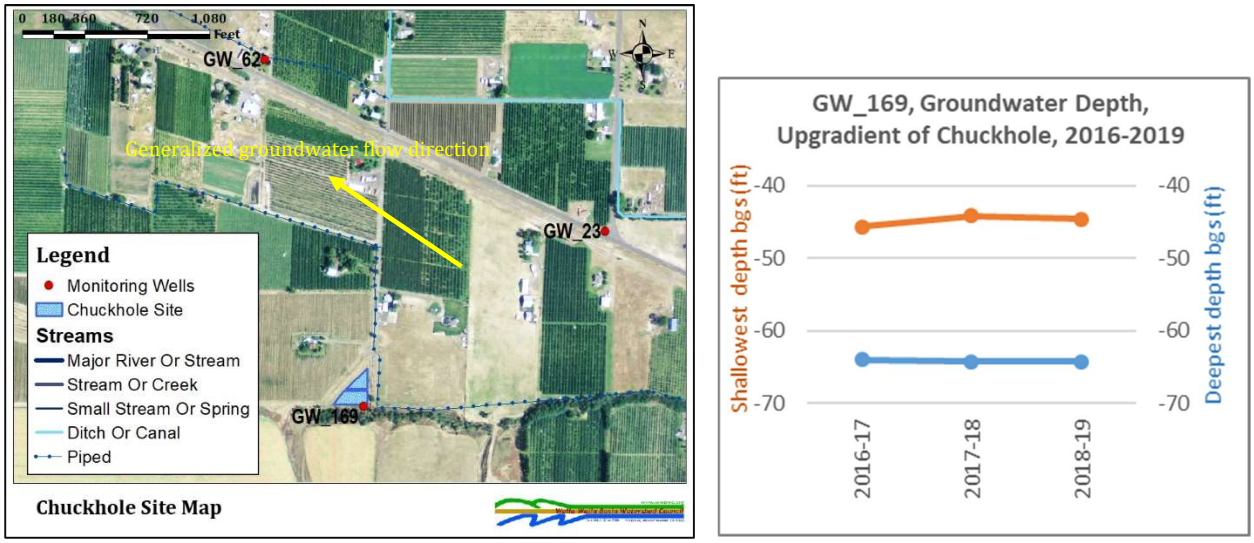


Figure 18. Chuckhole monitoring well locations (left) and shallowest and deepest groundwater levels at GW_169 (right).

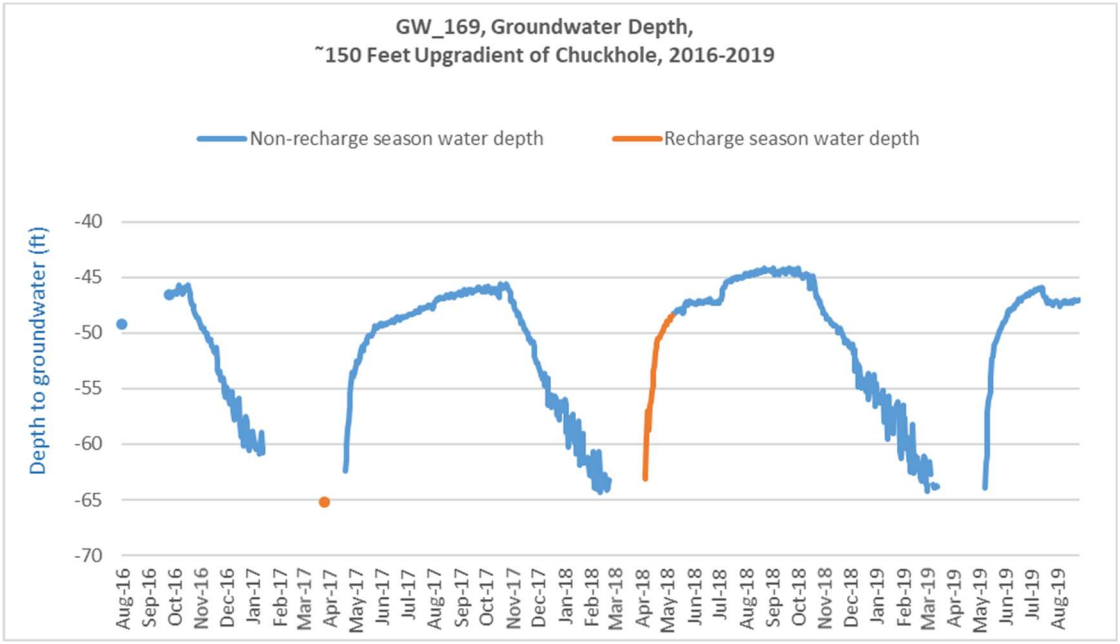


Figure 19. Hydrograph for monitoring well GW_169.

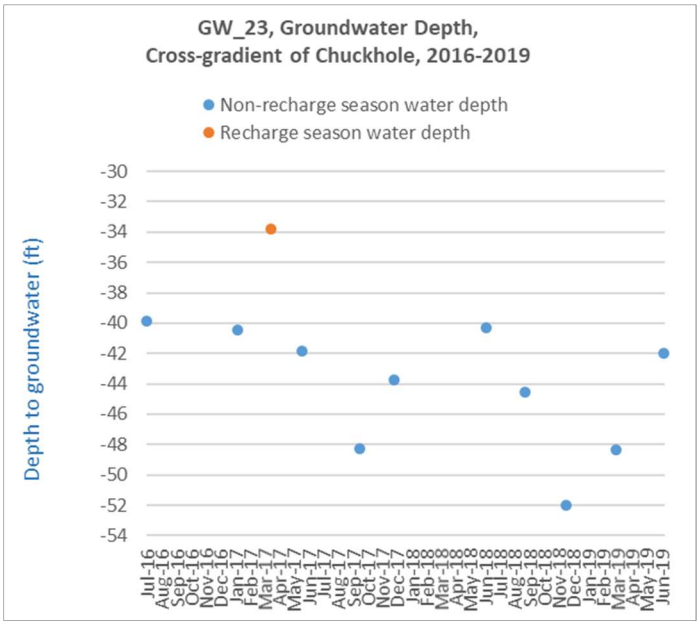
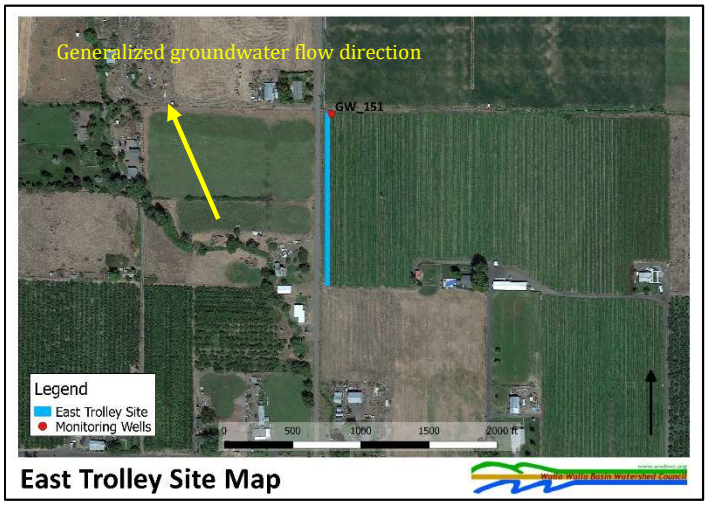


Figure 20. Hydrograph for monitoring well GW_23.

EAST TROLLEY SITE

The East Trolley site operated for 85 days, recharging 45 ac-ft at an average rate of 0.3 cfs. In December 2019 it was discovered two of the infiltration lines were plugged with debris at their inlet valves. The valves were cleared and a screen was added to in the inflow pipe to prevent reoccurrence.

GW_151 is at the distal end of the infiltration gallery (Figure 21). The magnitude and timing of the changes in groundwater levels suggest multiple influences on the seasonal water table (Figure 22).



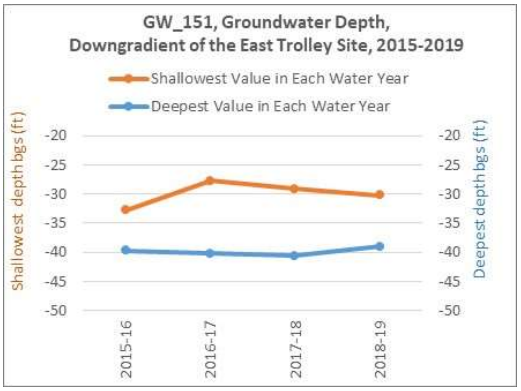


Figure 21. East Trolley monitoring well location, left, and shallowest and deepest groundwater levels, right.

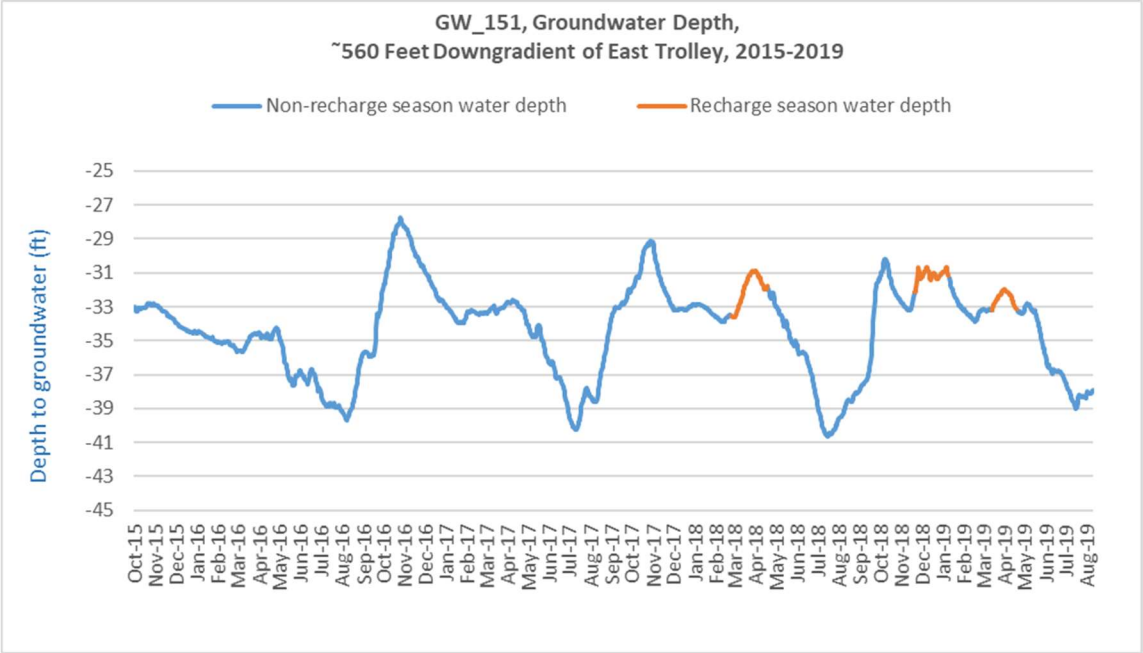


Figure 22. Hydrograph for monitoring well GW_151.

FRUITVALE SITE

The Fruitvale site operated for 68 days, recharging 51 ac-ft at an average rate of 0.3 cfs.

This site is located between the inner and middle zone of springs described by Newcomb (1965). The landowner has described that springs used to surface near this site. Groundwater monitoring well GW_33 and GW_171 are downgradient of the site (Figure 23). In both wells, the deepest groundwater levels are becoming shallower (Figure 24), suggesting longer-term increases in aquifer storage volumes (not just seasonal peaks), which is consistent with increased spring yield observed at other springs monitored by WWBWC (see WWBWC, 2019, for details on increased spring performance). Seasonal changes in groundwater levels at both monitoring locations are influenced by more than just recharge operations (Figure 25).

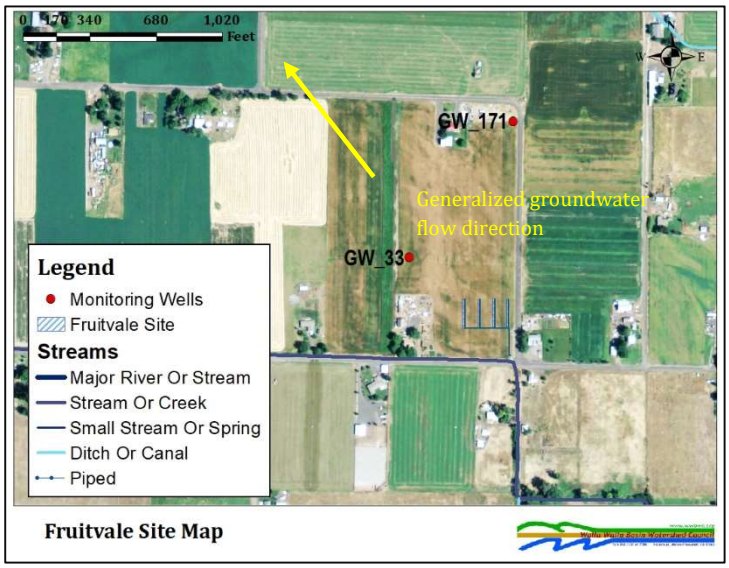


Figure 23. Fruitvale monitoring well locations.

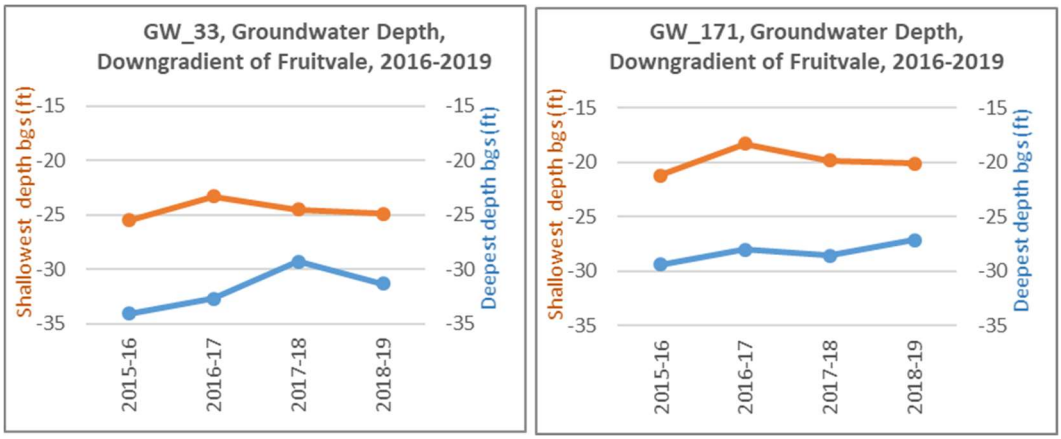


Figure 24. Shallowest and deepest groundwater levels, by year, GW_33 and GW_171.

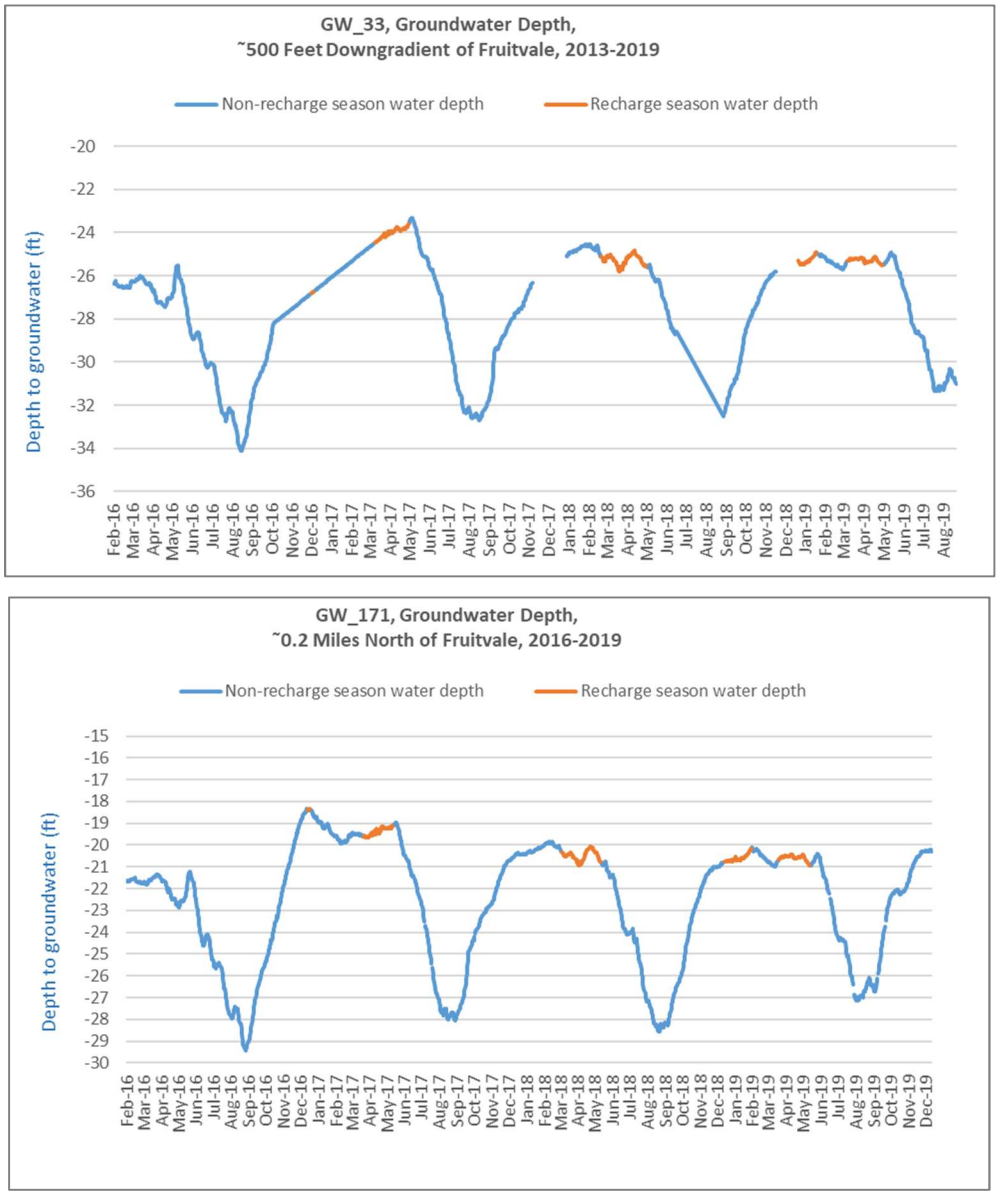


Figure 25. Hydrographs for monitoring wells GW_33 and GW_171.

GALLAGHER SITE

The construction of the Gallagher site was not completed until near the end of the WY2019 recharge season. During the 20 days of operation, the site recharged 16 ac-ft at an average rate of 0.4 cfs.

GW_36 is cross-gradient of the site (Figure 26). None of the quarterly measurements occurred during the 20 days the Gallager site operated (Figure 27).

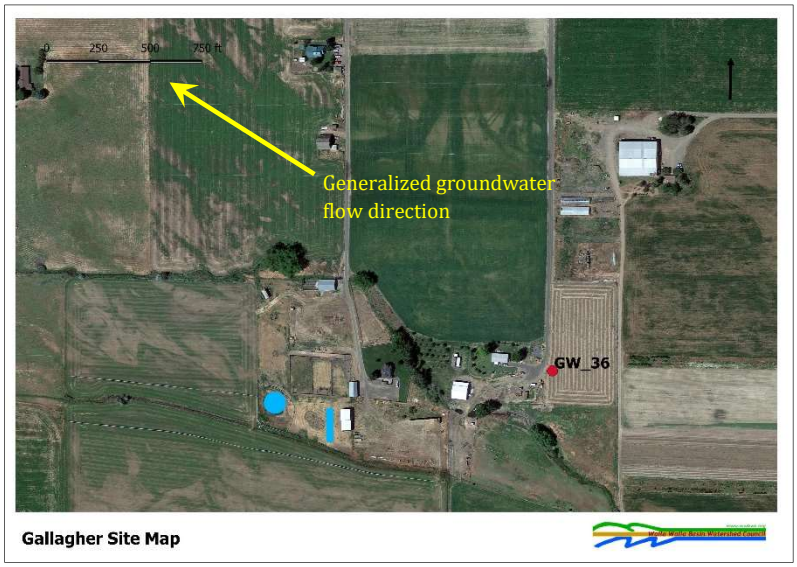


Figure 26. Gallagher monitoring well location

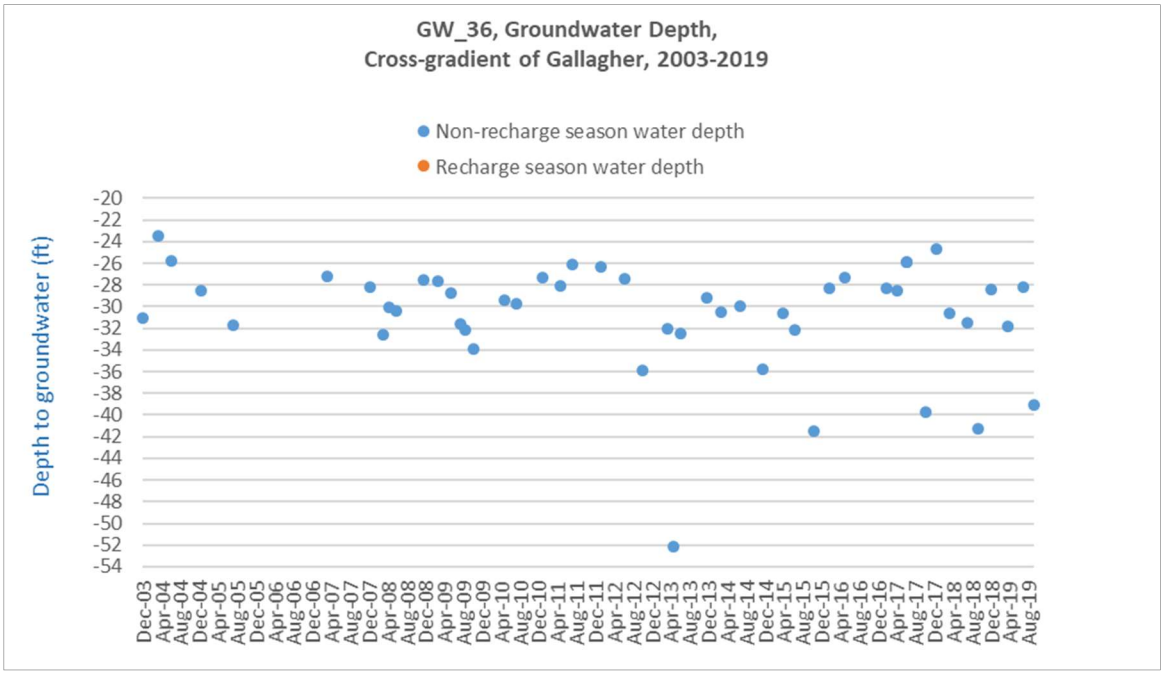


Figure 27. Hydrograph for monitoring well GW_036.

JOHNSON SITE

The Johnson site operated for 89 days, recharging 2,794 ac-ft at an average rate of 16 cfs. The ten spreading basins received 2,414 ac-ft and three active infiltration galleries received 379 ac-ft.

Six monitoring wells are on or near the site (Figure 28). Groundwater levels under the Johnson site (GW_45, GW_46, and GW_47) are roughly 15-20 ft closer to the ground surface than at the upgradient well (GW_40). The shallowest groundwater levels in downgradient GW_118 are similar to levels under the Johnson site during the recharge season. Minimum or maximum groundwater levels have become shallower over time in five of the six monitoring wells to varying degrees in past years (Figures 29-33).

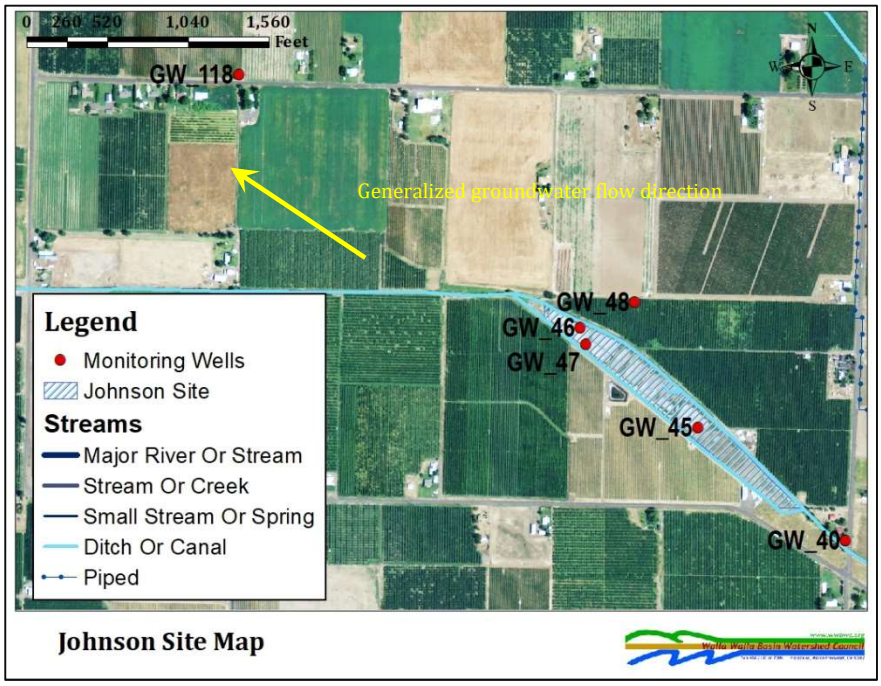


Figure 28. Johnson monitoring well locations.

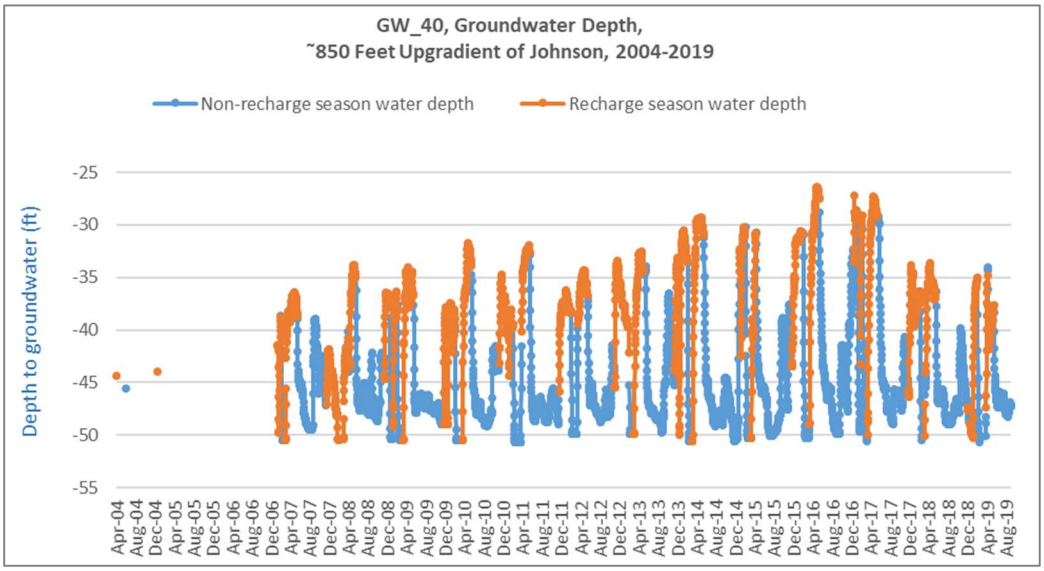
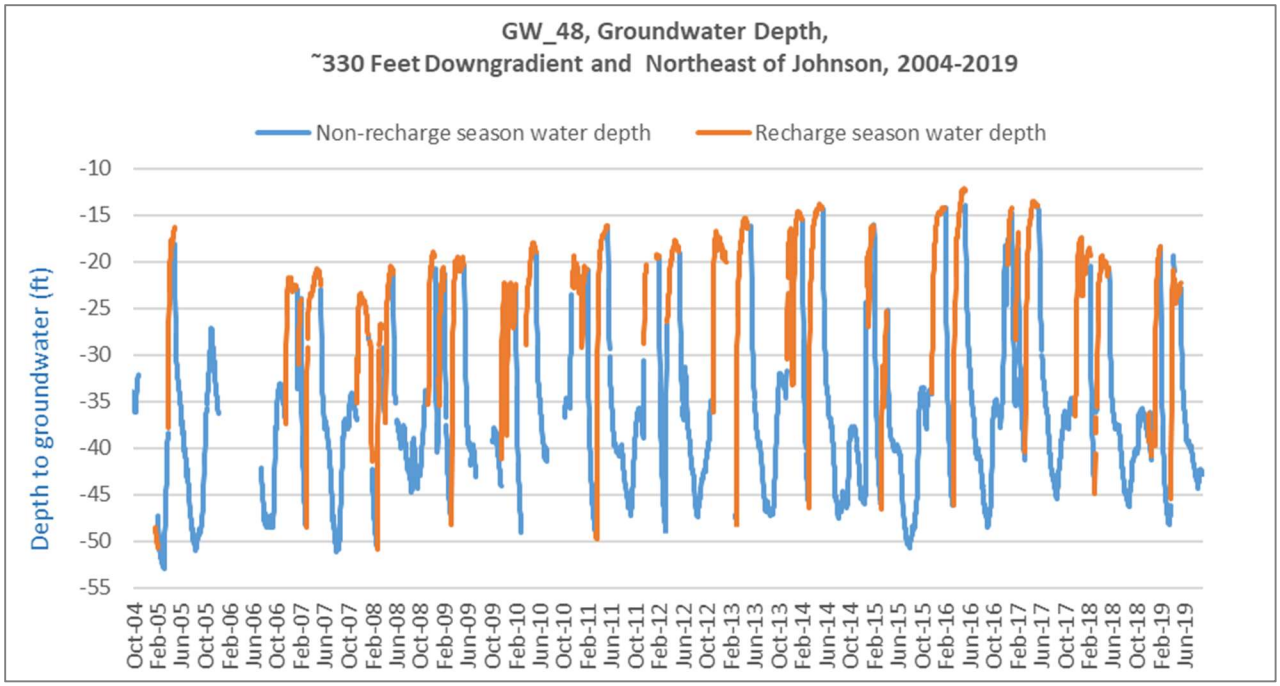


Figure 29. Hydrograph for monitoring well GW_40.

Figure 30. Hydrographs for monitoring wells GW_45, GW_47, and GW_46.



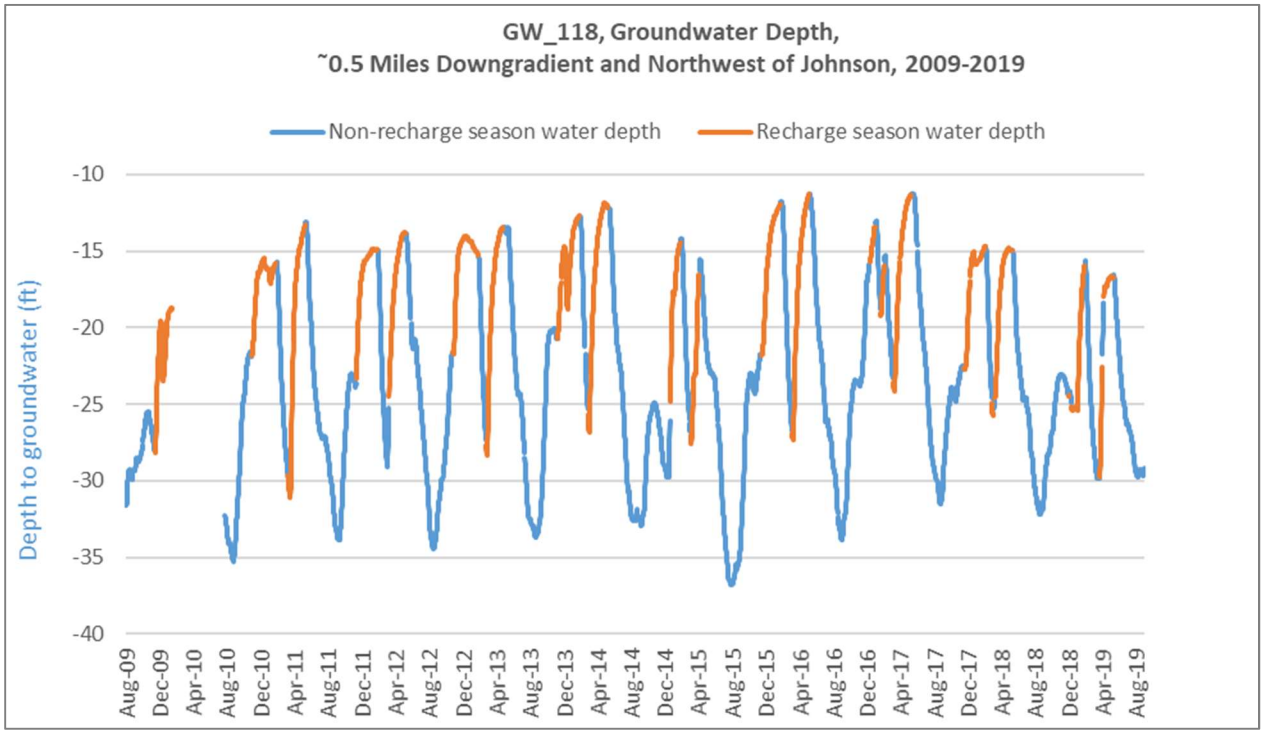


Figure 31. Hydrographs for monitoring wells GW_048 and GW_118.

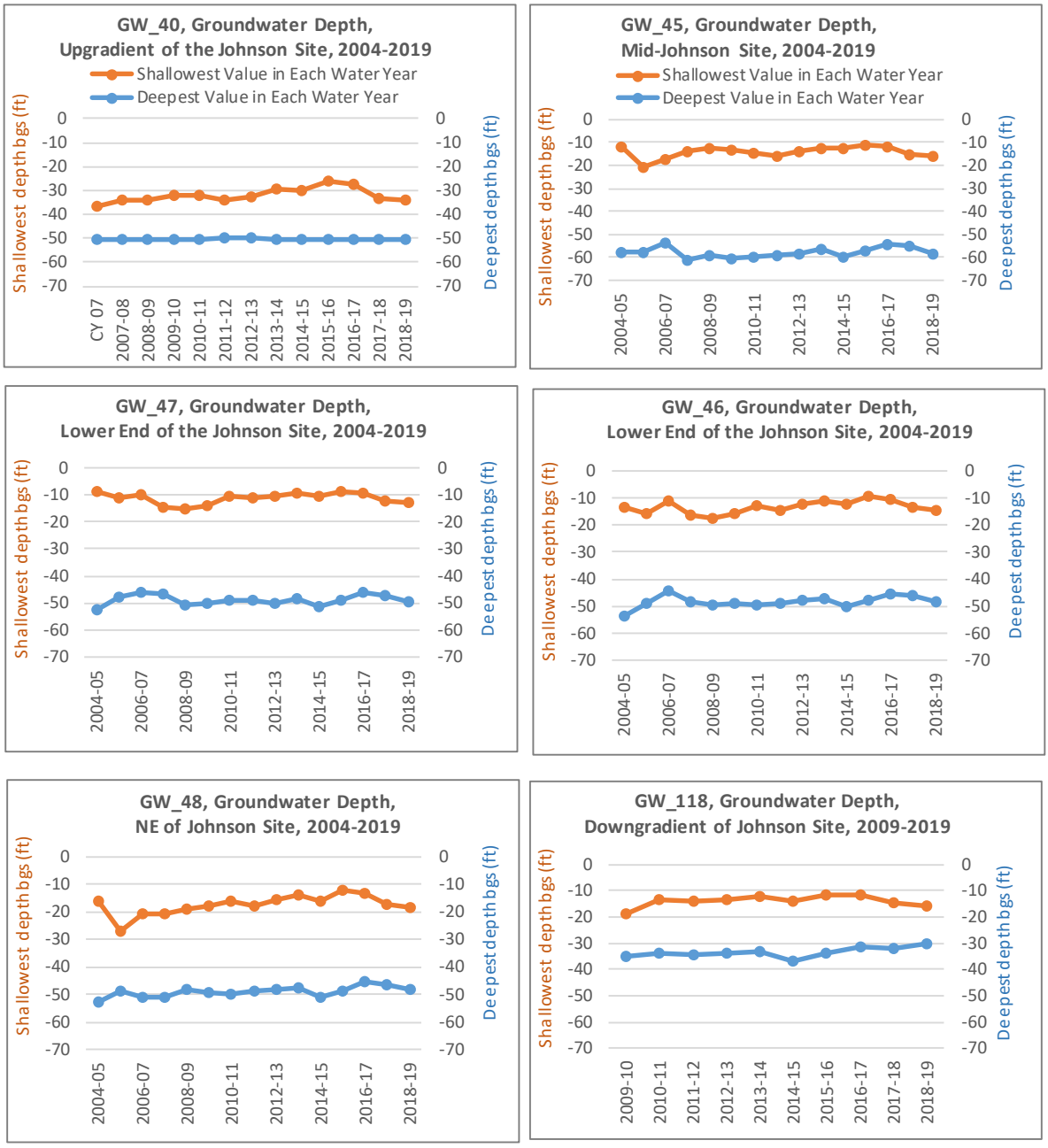


Figure 32. Shallowest and deepest groundwater levels, by year, GW_40, GW_45, GW_47, GW_46, GW_48, and GW_118

LeFore Site

The LeFore Site only operated for two days, recharging 3 ac-ft, due to the landowner passing away. The new landowner intends to conduct recharge in the future. The site is approximately 0.35 miles east of the Walla Walla River, the only recharge site located east of the river.

GW_152 is downgradient and GW_160 is crossgradient of the site (Figure 33). In GW_152, the response to operations in WY2018 is in sharp contrast to the years during which recharge did not occur (Figure 34 and Figure 35). The response is less pronounced at GW_160.

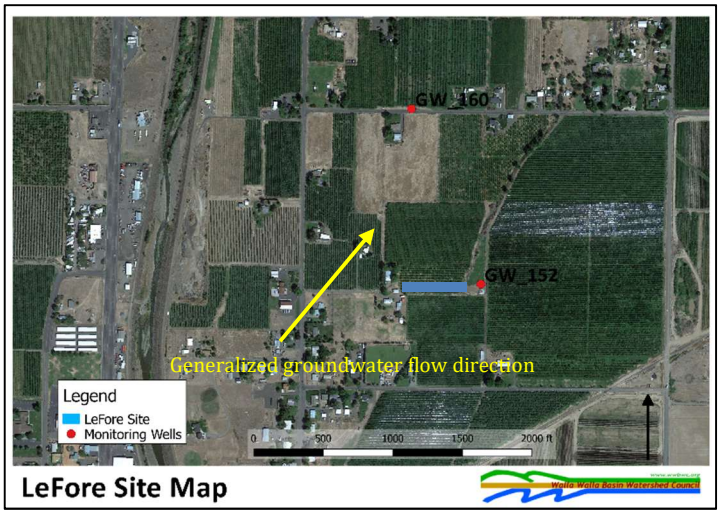


Figure 33. LeFore monitoring well locations.

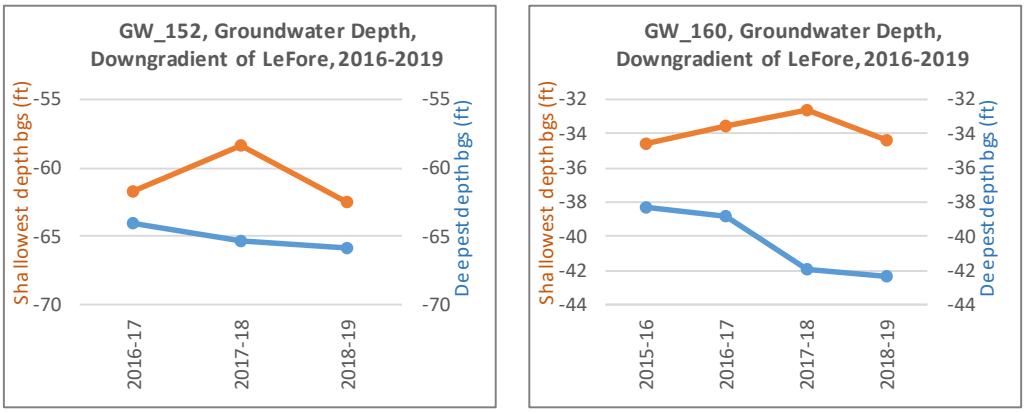
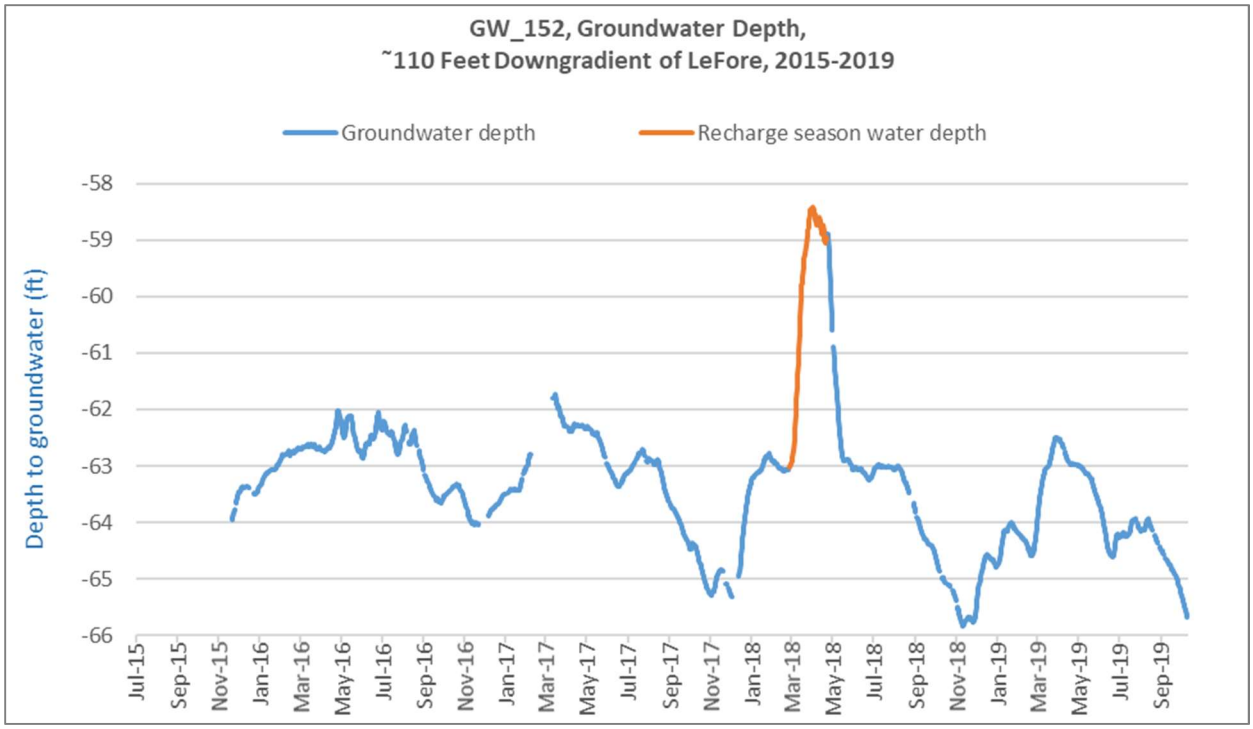


Figure 34. Shallowest and deepest groundwater levels, GW_152 and GW_160.



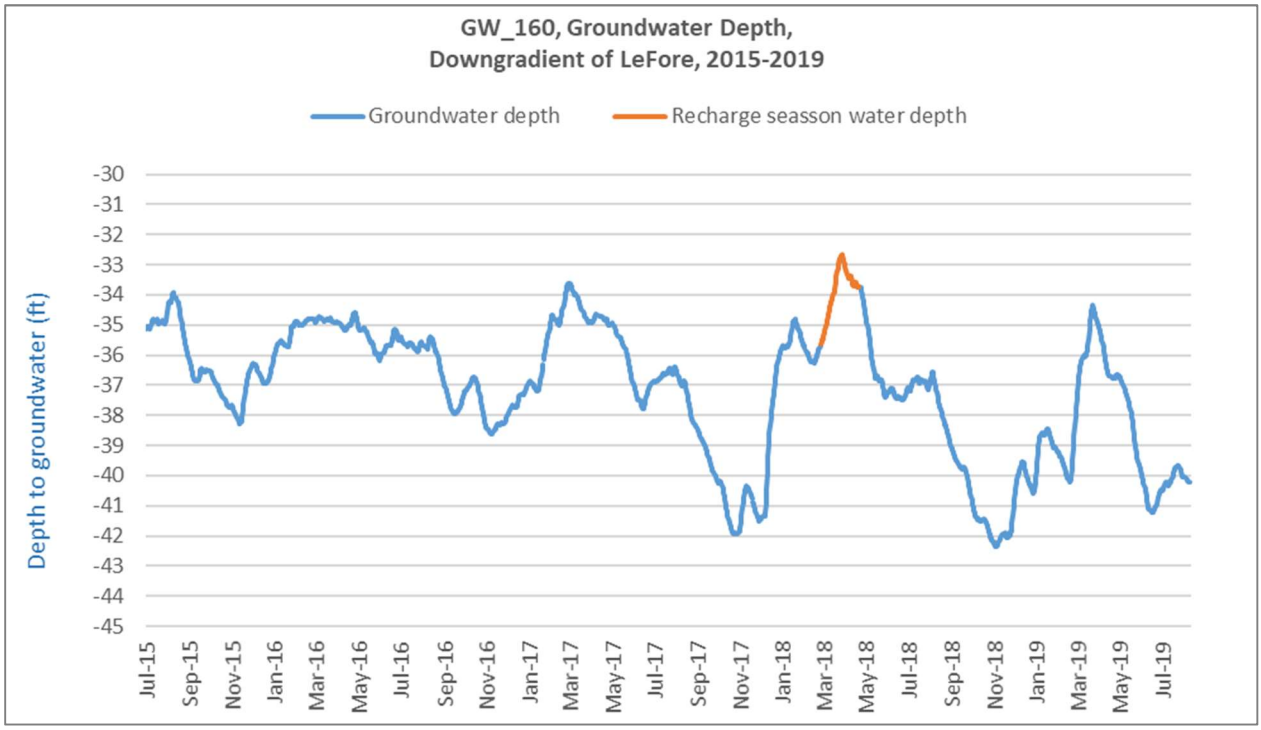


Figure 35. Hydrographs for monitoring wells GW_152 and GW_160.

LOCUST ROAD SITE

The Locust Road Site operated for 43 days, recharging 56 ac-ft at an average rate of 0.7 cfs.

GW_14 and GW_116 are approximately 0.4 miles upgradient and 0.8 miles downgradient of the site (Figure 36). The yearly shallowest and deepest values (Figure 37) largely represent conditions before recharge began in the spring of 2018. Changes in groundwater levels solely due to recharge were not apparent in either well (Figure 38). Given the proximity of GW_14 to the river, fluctuations at GW_14 are most likely dominantly influenced by changing flows in the Walla Walla River.

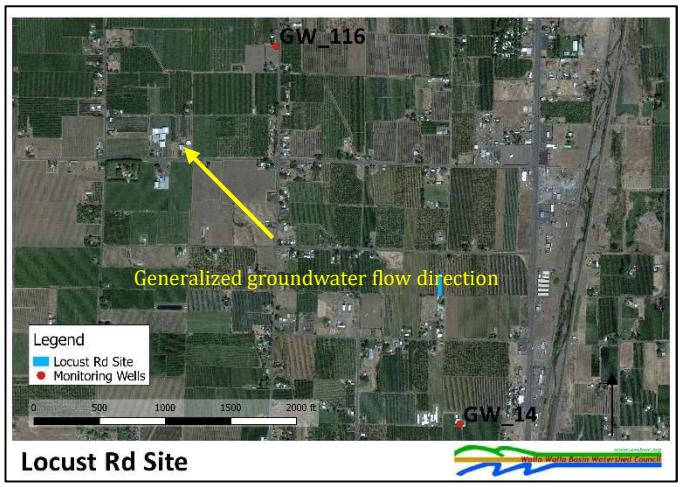


Figure 36. Locust Road monitoring well locations.

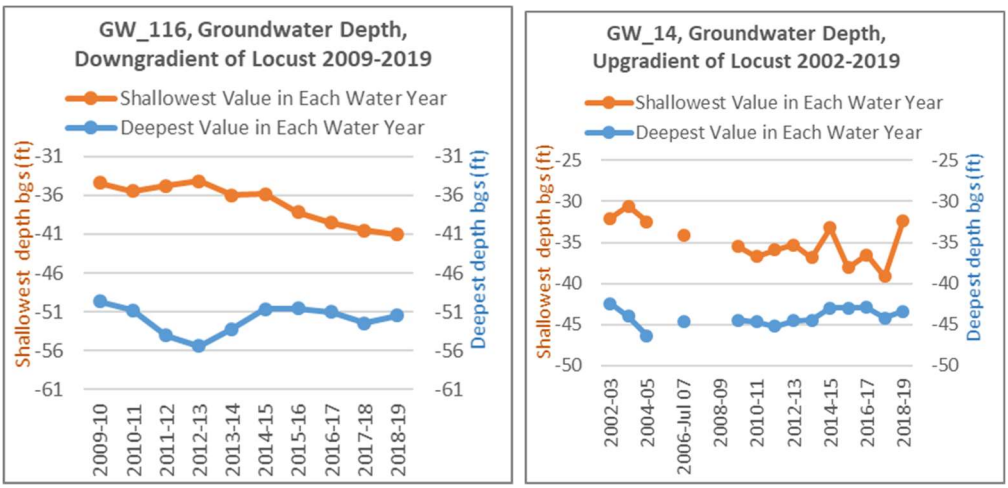


Figure 37. Shallowest and deepest groundwater levels, by year, GW_116 and GW_14.

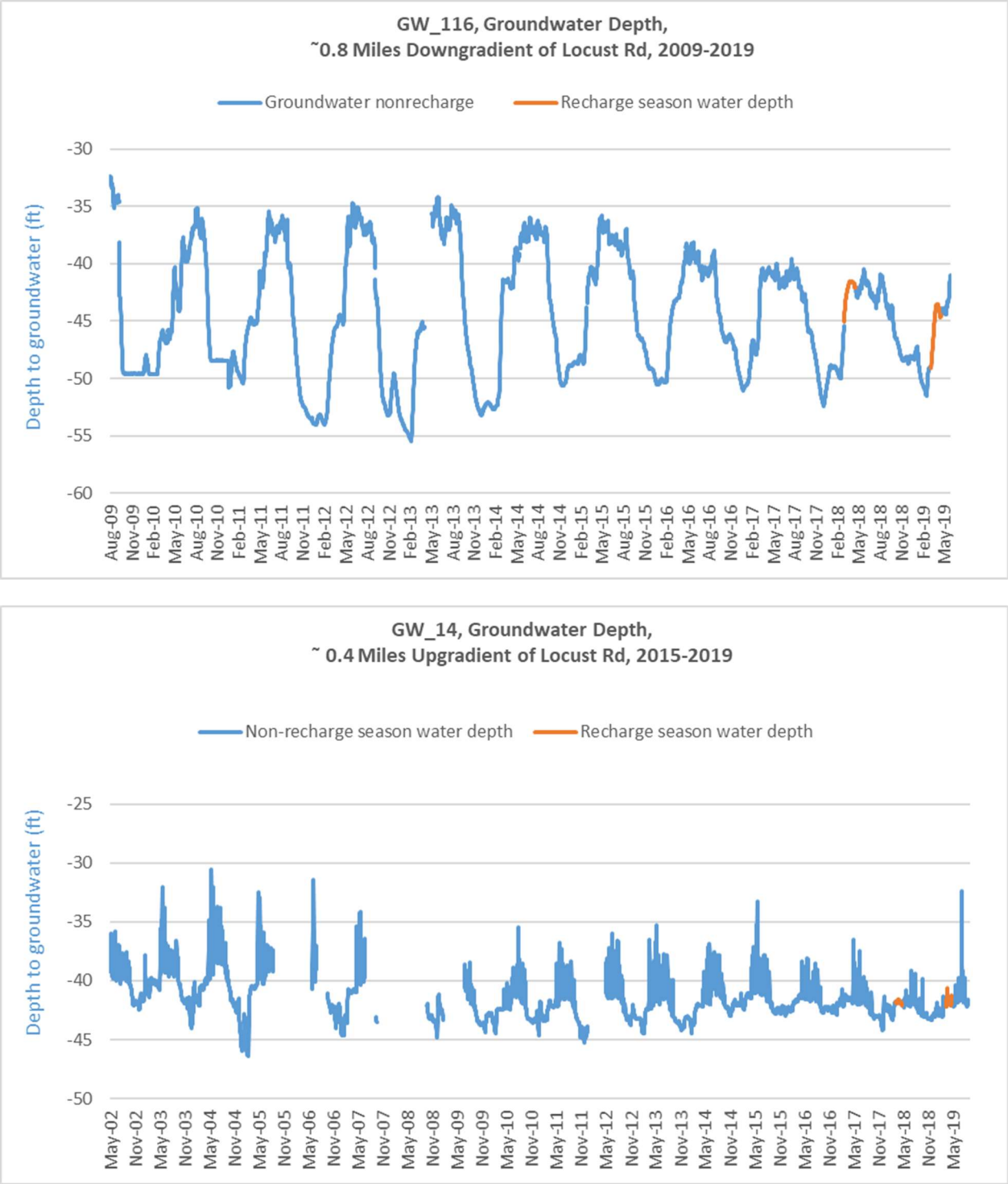


Figure 38. Hydrographs for monitoring wells GW_14 and GW_116.

MUD CREEK SITE

The Mud Creek site operated for 88 days, recharging 43 ac-ft at an average rate of 0.3 cfs.

Two monitoring wells, GW_170[3] and GW_117, both upgradient, are near the site (Figure 39). The roughly 40-foot difference in groundwater levels between the two wells illustrate the highly variable conditions in the alluvial aquifer (Figure 40). At nearby GW_170, groundwater levels increased during the recharge season but additional years of data will be needed to discern if and how much of the increase was due to recharge operations as opposed to other factors influencing seasonal changes (Figure 41).

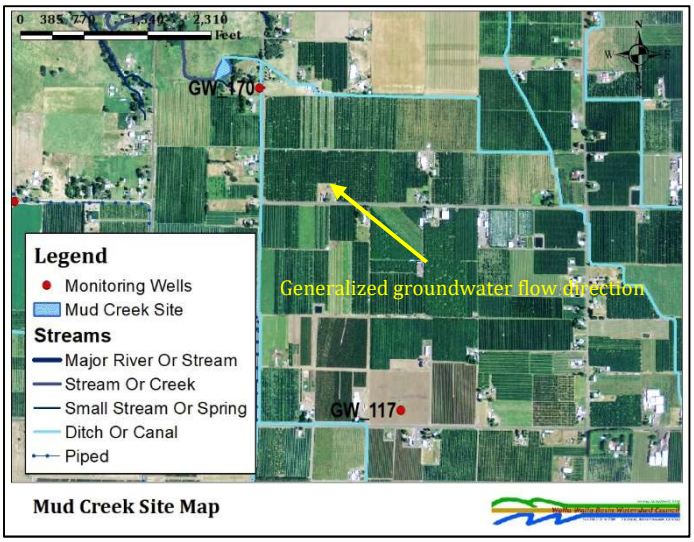
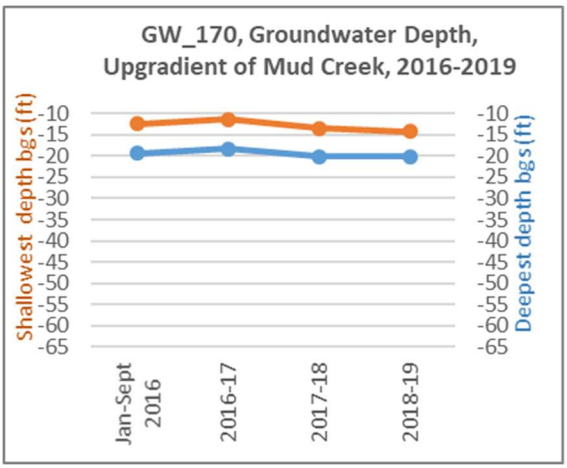


Figure 39. Mud Creek monitoring well locations.



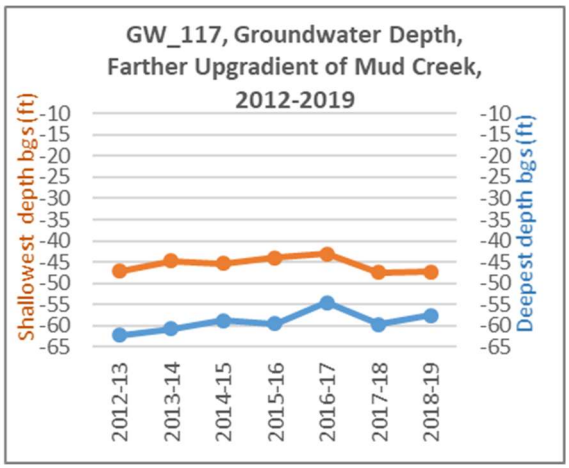
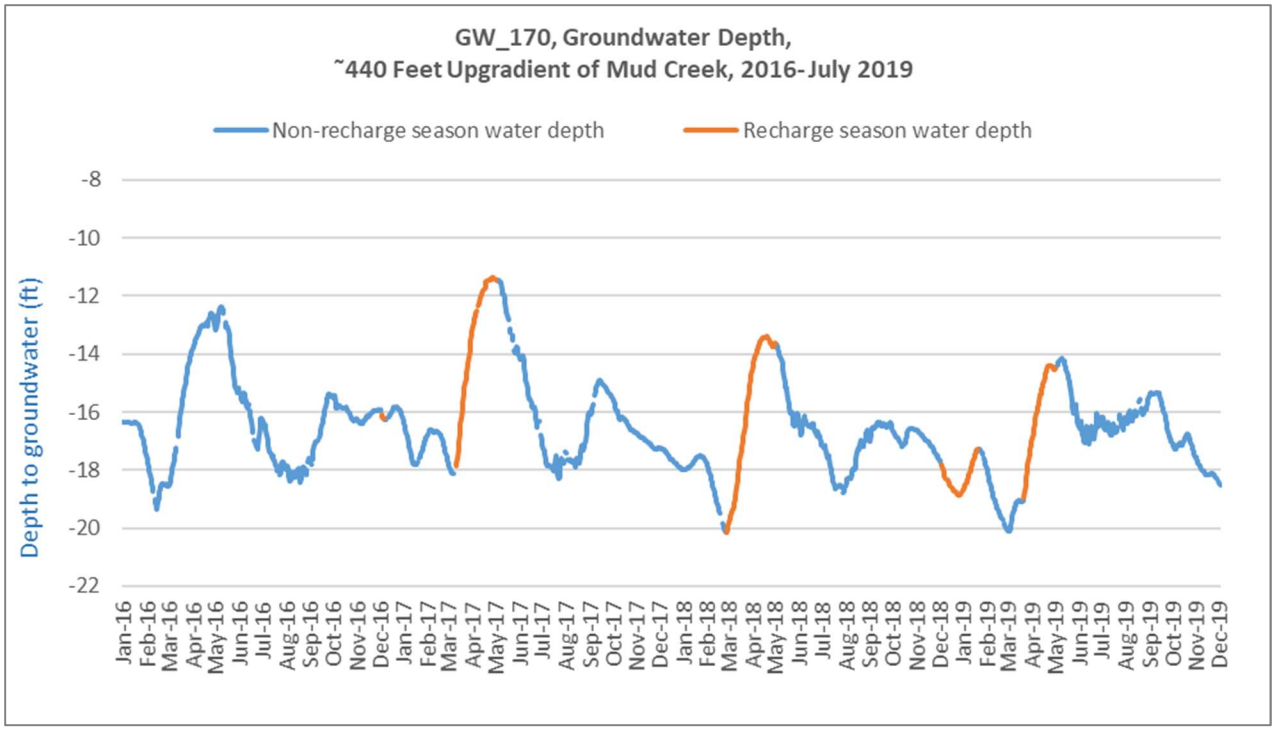


Figure 40. Shallowest and deepest groundwater levels, GW_170 and GW_117.

[3] The Mud Creek site map shows a north-south ditch adjacent to GW_170 but it is actually a pipeline that flows into an east-west ditch located approximately 70 feet south of GW_170.



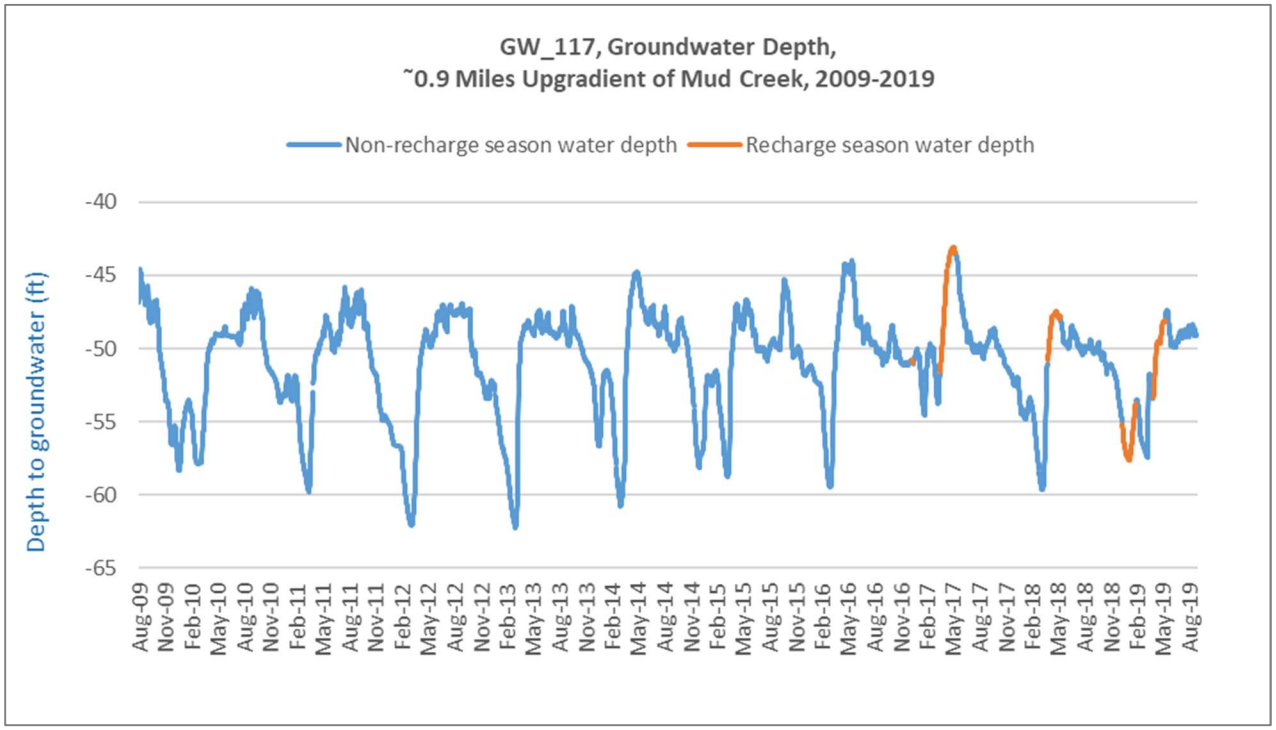


Figure 41. Hydrographs for monitoring wells GW_170 and GW_117.

NW Umapine Site

The NW Umapine site operated for 29 days, recharging 111 ac-ft at an average rate of 1.9 cfs.

Five monitoring wells are in the area of the site (Figure 42). GW_66 is discussed under the Ringer Road site and GW_036 is reported under the Gallagher site because they are closer to those sites. Yearly minimum and maximum groundwater levels at GW_34, GW_144, and GW_119 appear relatively stable (Figure 43). Because of gaps in the dataset for GW_144 during WY2014 and WY2015, yearly maximum and minimums are displayed only for years after WY2015. The yearly shallowest groundwater levels at upgradient GW_119 appear similar in the years before and after recharge began in WY2014 (Figure 43 and Figure 44).

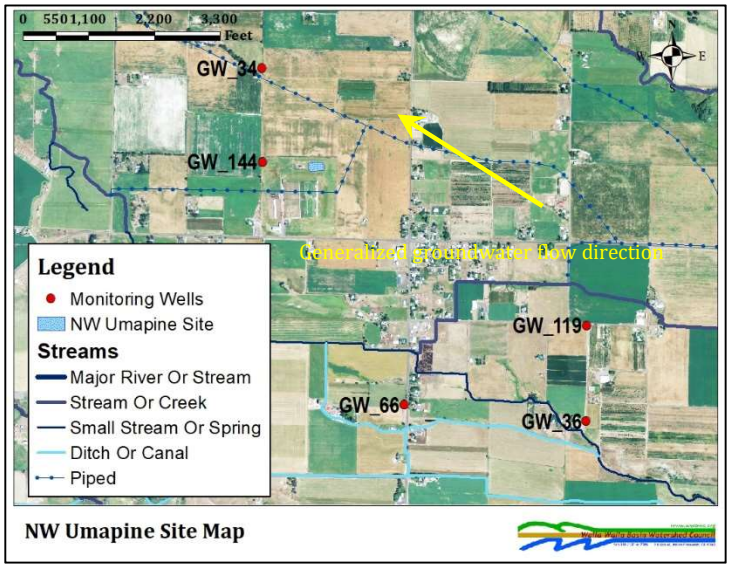


Figure 42. NW Umapine monitoring well locations.

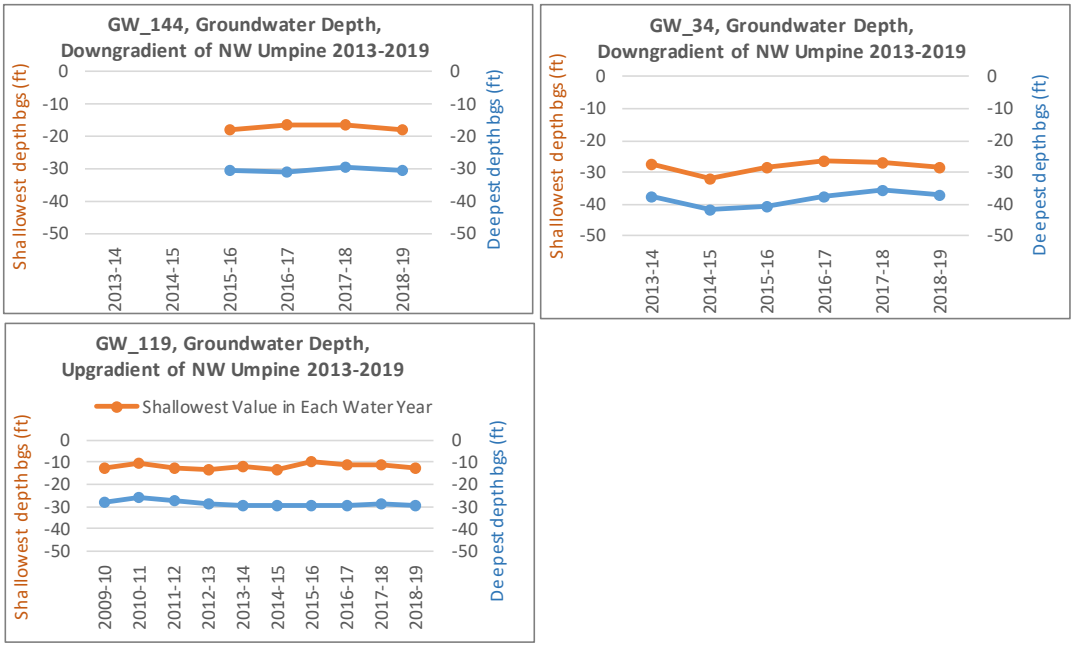
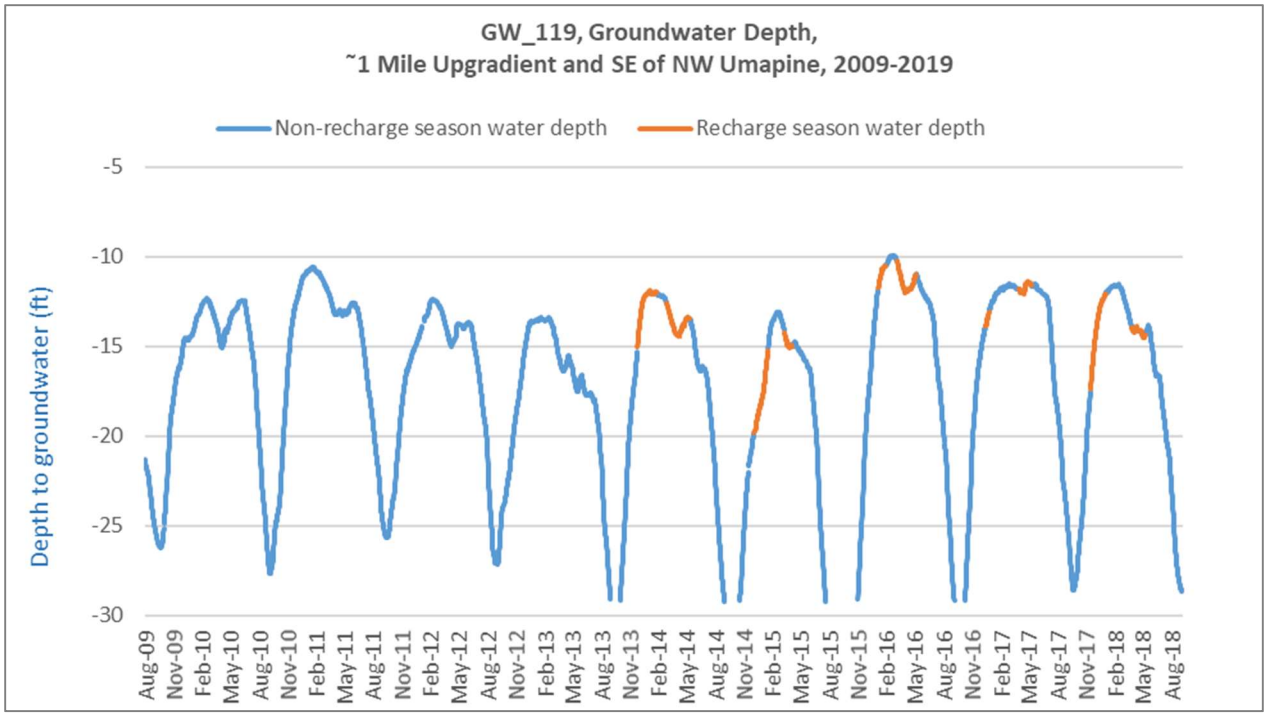


Figure 43. Shallowest and deepest groundwater levels, by year, GW144, GW_34, and GW_119.



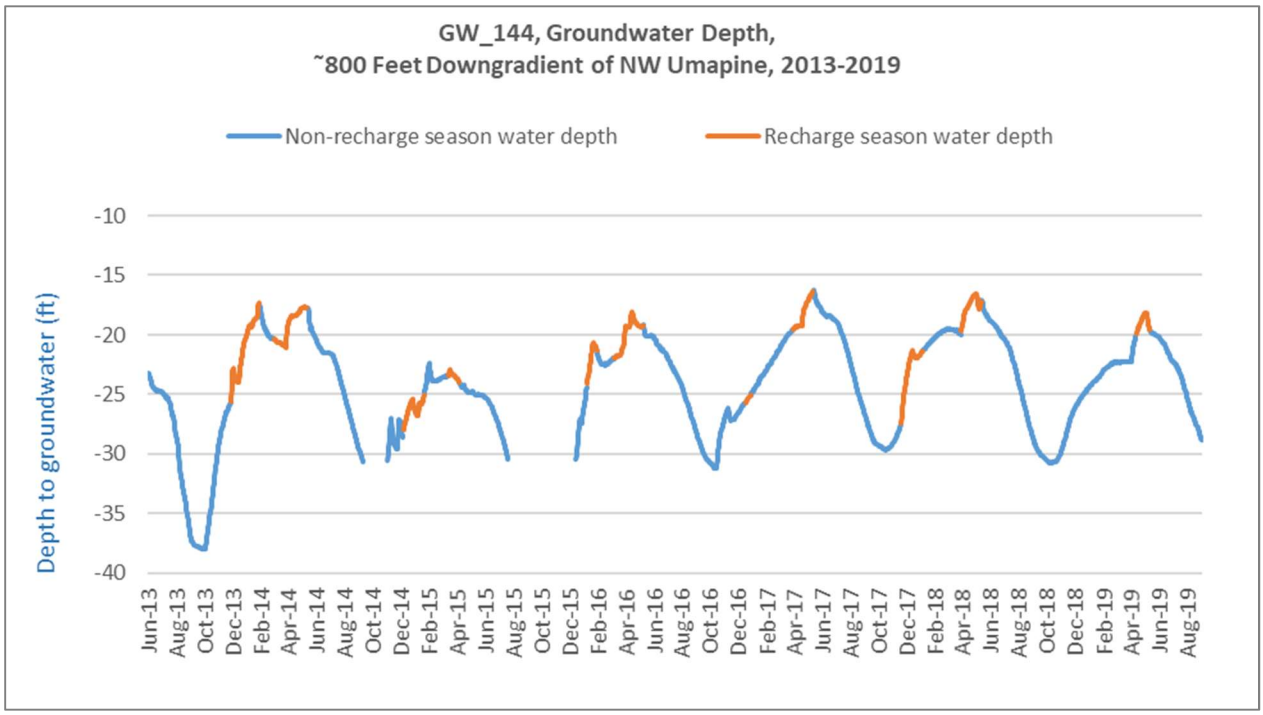


Figure 44. Hydrographs for monitoring wells GW_119 and GW_144.

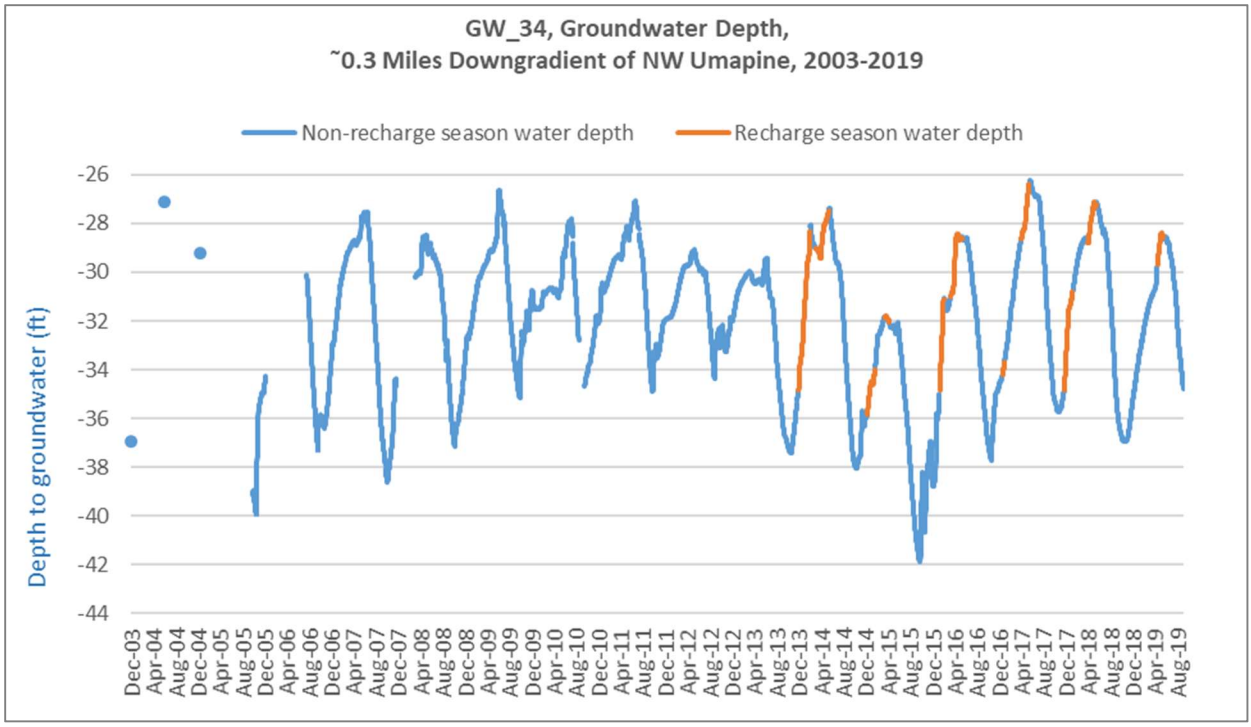


Figure 45. Hydrograph for monitoring well GW_34.

RINGER SITE

The Ringer Road site operated for 90 days, recharging 111 ac-ft of water at an average rate of 0.6 cfs during its first year of operation.

GW_66 is cross-gradient of the site (Figure 46). Additional years of data are needed to assess the influence of this site, if any, on the cross-gradient well (Figure 47).

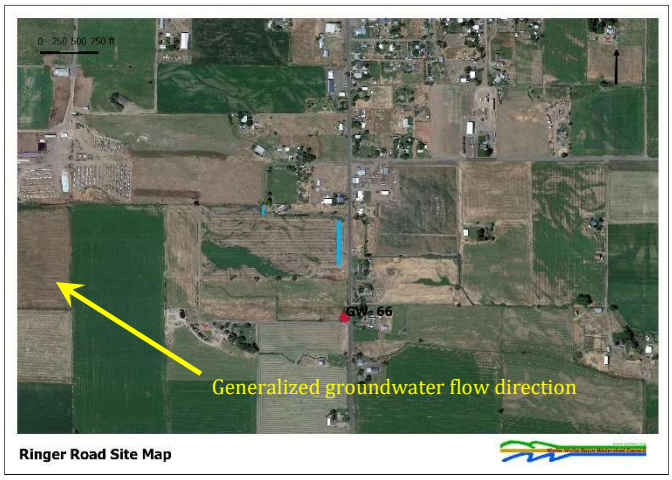


Figure 46. Ringer Road monitoring well location

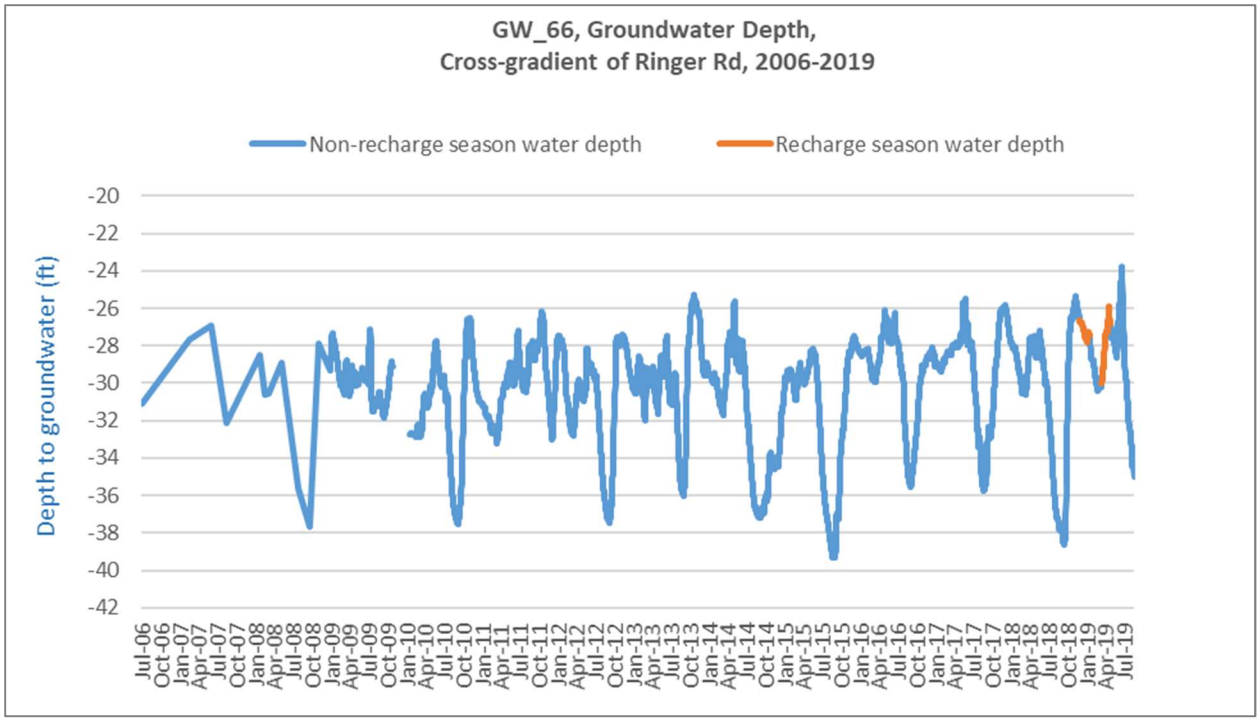


Figure 47. Hydrograph for monitoring well GW_66.

TRIANGLE ROAD SITE

The Triangle Road site operated for 90 days, recharging 72 ac-ft of water at an average rate of 0.4 cfs.

Four monitoring wells are in the vicinity of the site: upgradient GW_117 (discussed under the Trumbull site), cross-gradient GW_143, and downgradient GW_170 (discussed under the Mud Creek site) and GW_171 (discussed under the Fruitvale site) (Figure 48[4]). Based on the small volume recharged and distances to three of the wells, the seasonal changes are unlikely in response to recharge operations. At GW-143 increased groundwater levels coincide with the duration of recharge but a similar seasonal pattern was present even before recharge began (Figure 49). No trends were observed.

[4] GW_171, one of the four monitoring wells associated with the Triangle Road site, is not shown in Figure 48 because it is 1.6 miles northwest of the site; the location of GW_171 can be seen in Figure 10.

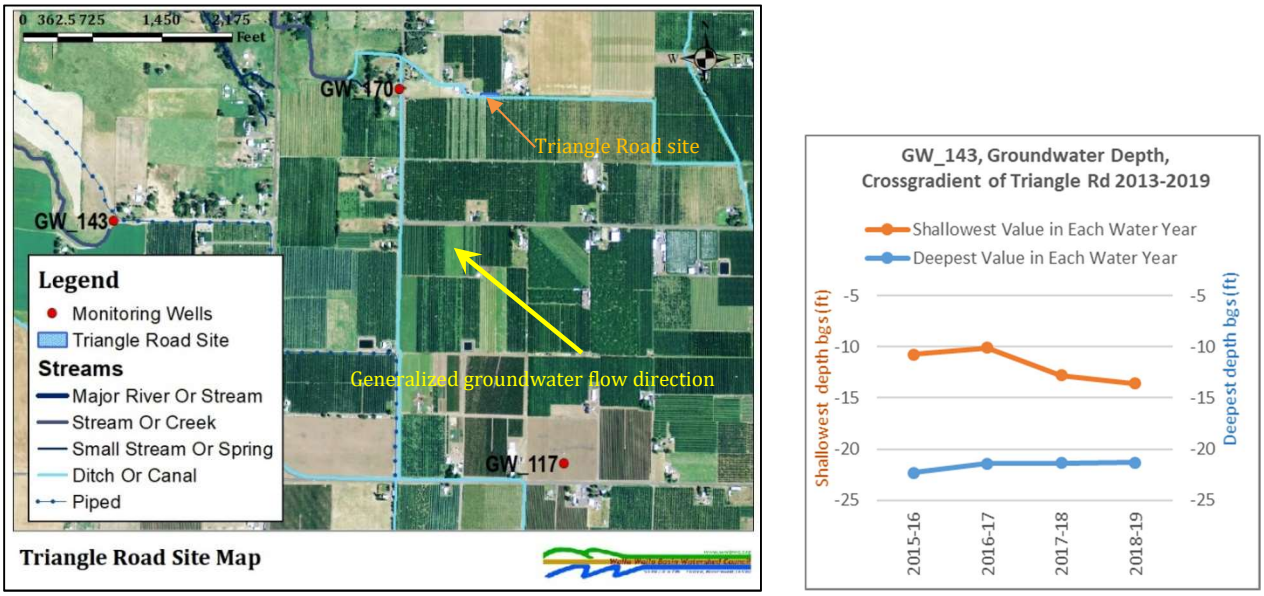


Figure 48. Triangle Road monitoring well locations (GW_171 not shown).

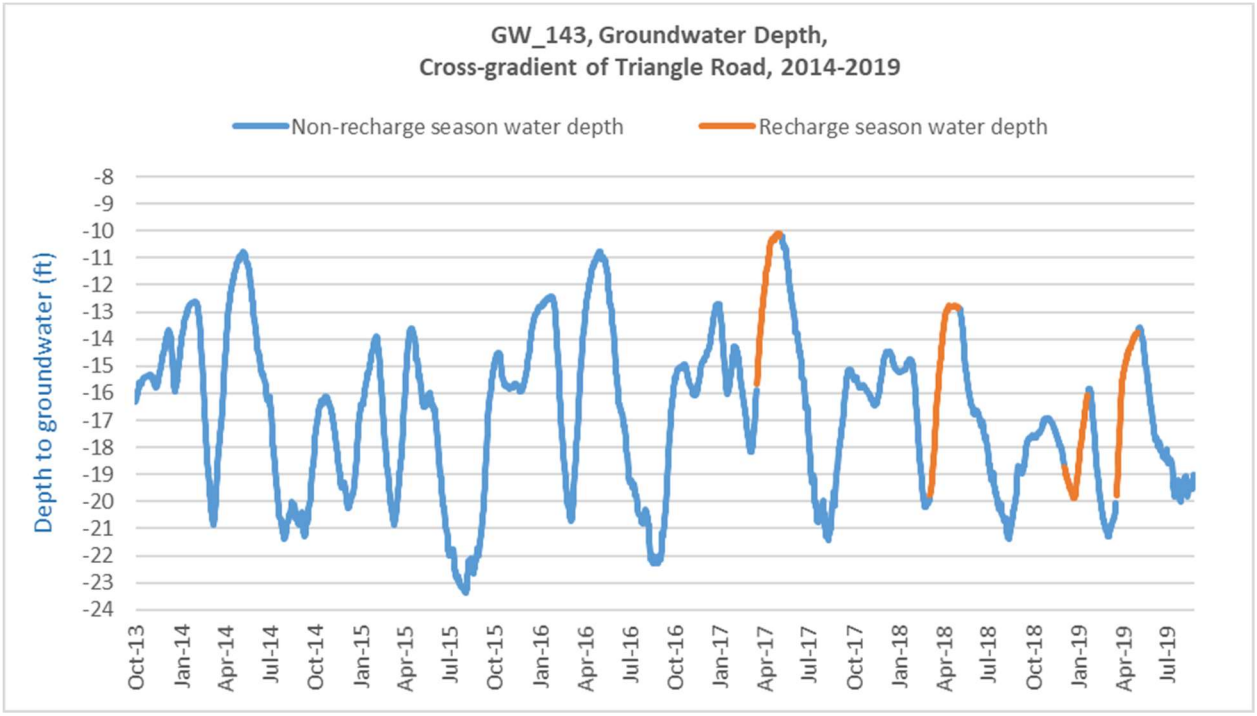
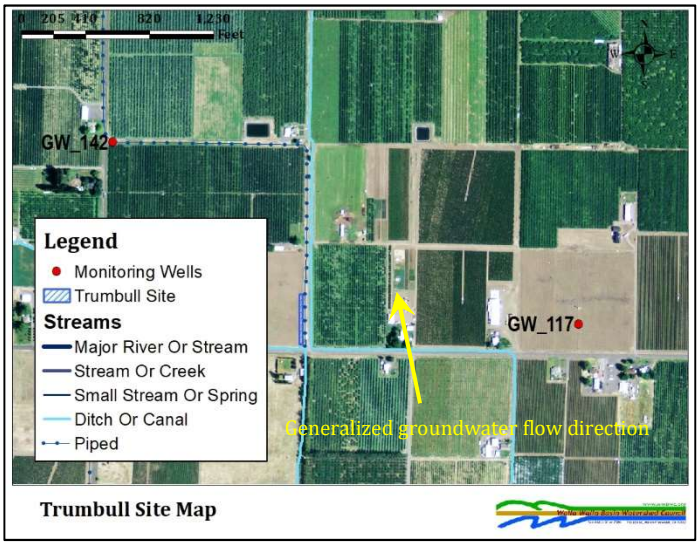


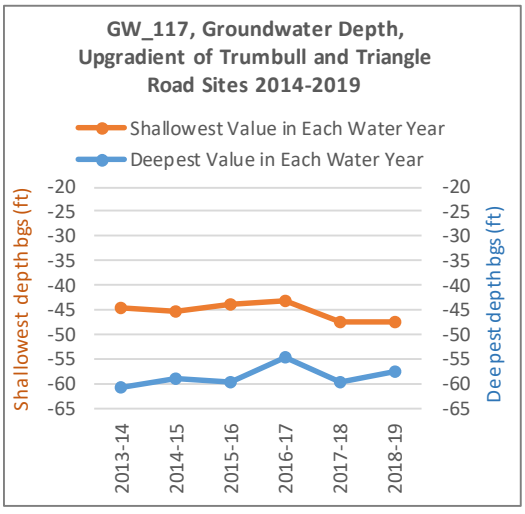
Figure 49. Hydrograph for monitoring well GW_143.

TRUMBULL SITE

The Trumbull site operated for 43 days, recharging 45 ac-ft at an average rate of 0.5 cfs.

GW_117 is upgradient and GW_142 is downgradient of the site. The two wells are approximately 0.6 miles apart. Downgradient of the site, groundwater levels are significantly higher than upgradient of the site (Figure 50). The site began operations in 2013 when monitoring began, so it is unknown if the difference in groundwater levels was present before recharge. The seasonal variability in GW-142 does not consistently coincide with recharge operations (Figure 51).





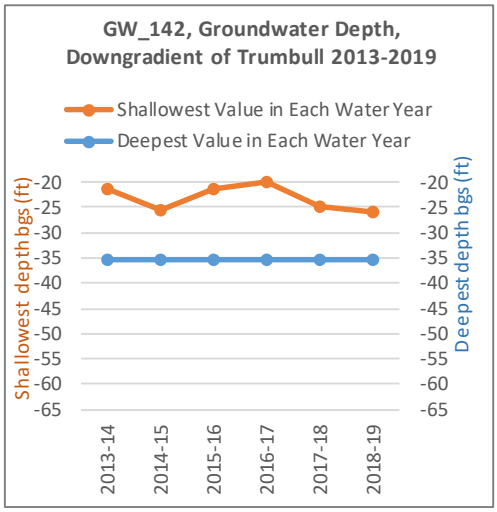
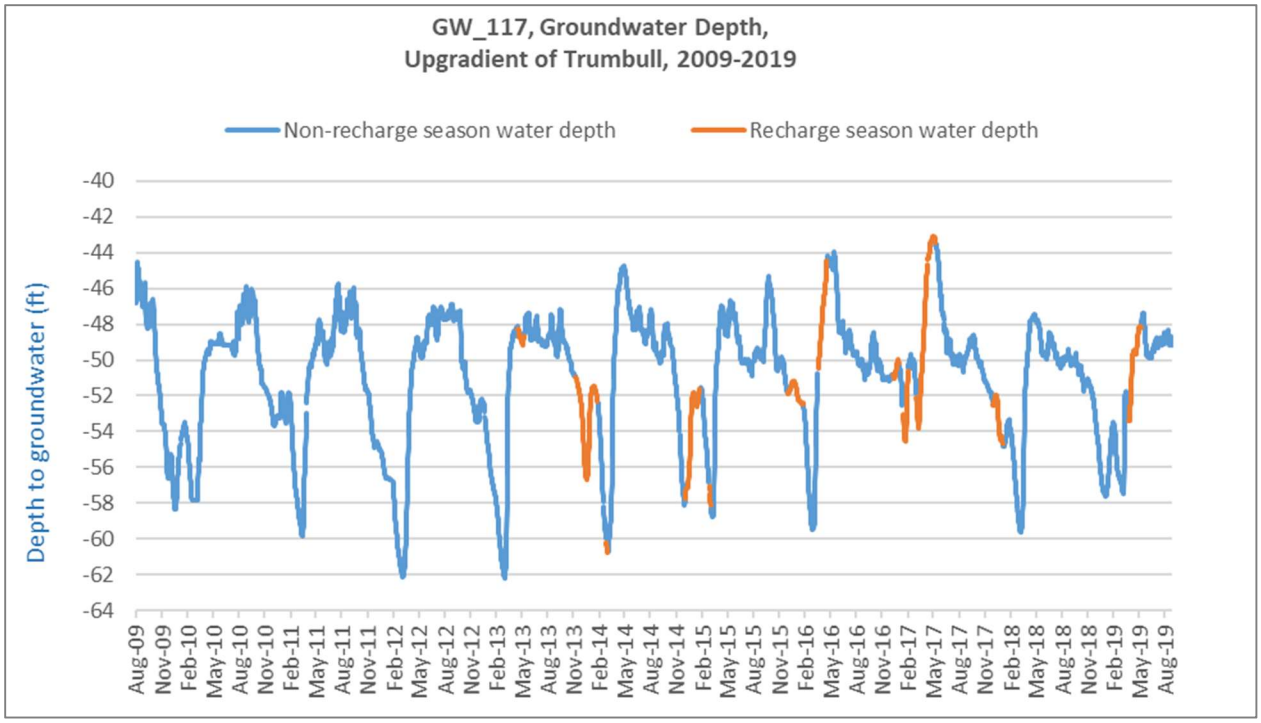


Figure 50. Trumbull monitoring well locations (above) and shallowest and deepest groundwater levels, by year, in GW_117 and GW_142 (below).



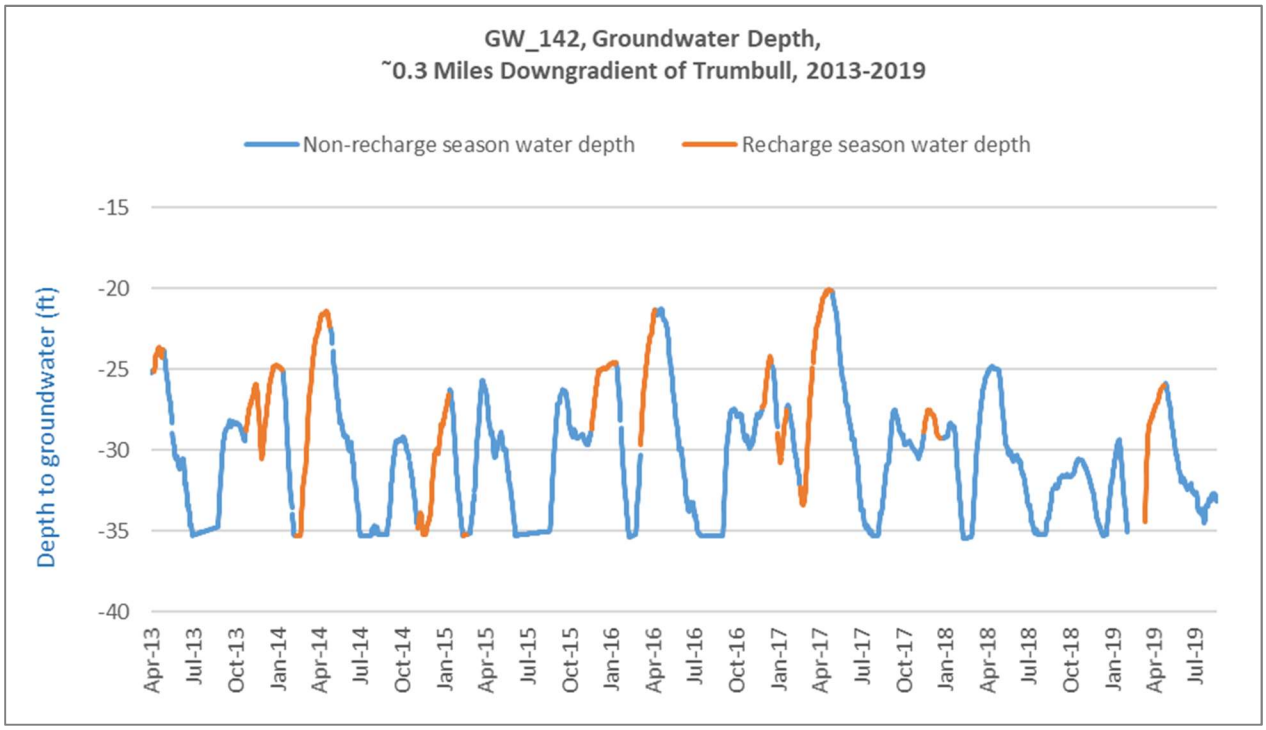


Figure 51. Hydrographs for monitoring wells GW_117 and GW_142.

WATER QUALITY

Samples were collected once before and once after the recharge season. Grab samples of source water at five locations and groundwater at 12 locations were collected on 10/30/2018-11/1/2018 and 5/22/2019-5/23/2019 (Figure 52). The five source water locations were as follows: Source Water #1(Zerba Weir), Source Water #2 (Duff Weir, S-418), Source Water #3 (Huffman-Richartz Split), Source Water #4 (Fruitvale, S-318), and Source Water #5 (Eastside). The twelve groundwater wells were as follows: GW_046, GW_117, GW_119, GW_141, GW_142, GW_144, GW_151, GW_152, GW_160, GW_169, GW_170, and GW_171. See Appendix B for laboratory reports.

To evaluate water quality conditions, groundwater concentrations are compared to source water concentrations before and after the recharge season (Figure 53 through Figure 55 and Table 7 through Table 9). Table 10 lists the source water sites relevant for each groundwater sampling site.

The data indicate no degradation is occurring. Often, the groundwater constituent concentrations are lower after recharge ends than before recharge begins. Out of 132 reported values, constituent concentrations in groundwater were lower (improved) after the recharge season in 63% of the values. Constituent concentrations in the source water were lower (better) than in the receiving groundwater in 61% of the pre-recharge and 92% of the post-recharge values. When post-recharge concentrations were higher than pre-recharge concentrations, with three exceptions the source water had lower concentrations than the groundwater and thus was not the cause of the increase in groundwater concentrations. The three exceptions were all for iron at three different wells with exactly the same results: 0.03 mg/L pre-recharge and 0.04 mg/L post-recharge in the groundwater, and 0.05 mg/L pre- and post-recharge in the source water. The method detection limit for iron using the Unibest method is 0.05 mg/L (Table 6), so the reported values of 0.03 and 0.04 mg/L have high uncertainties.

Table 6. Analyte list, analytical methods, and method reporting limits for WY 2018.

Inorganic Analyte	Analytical Method	Method Detection Limit (mg/L)	Analytical Method	Lab Reporting Limit (mg/L)
Ammonia-N (mg/L)	Eco-Tracker (Unibest)	1.2	SM 4500	0.05
Calcium (mg/L)	Eco-Tracker (Unibest)	0.31		
Copper (mg/L)	Eco-Tracker (Unibest)	0.01	EPA 200.8	0.001
Iron (mg/L)	Eco-Tracker (Unibest)	0.05		
Magnesium (mg/L)	Eco-Tracker (Unibest)	0.27		
Manganese (mg/L)	Eco-Tracker (Unibest)	0.01		
Nitrate-N(mg/L)	Eco-Tracker (Unibest)	0.09	EPA 300.0	0.1
Phosphorus (mg/L)	Eco-Tracker (Unibest)	0.02		
Potassium (mg/L)	Eco-Tracker (Unibest)	0.18		
Sodium (mg/L)	Eco-Tracker (Unibest)	0.17		
Sulfur (mg/L)	Eco-Tracker (Unibest)	0.02		
Zinc (mg/L)	Eco-Tracker (Unibest)	0.01	EPA 200.8	0.001

Synthetic Organic Constituents	Analytical Method*	Quantitation Limit (µg/L)
Azinphos-methyl	8321B	0.12
Chlorpyrifos	8270D	0.06
Diuron	8321B	0.06
Malathion	8270D	0.06

*The lab used methods with a lower quantitation limit than the methods specified in the monitoring plan.

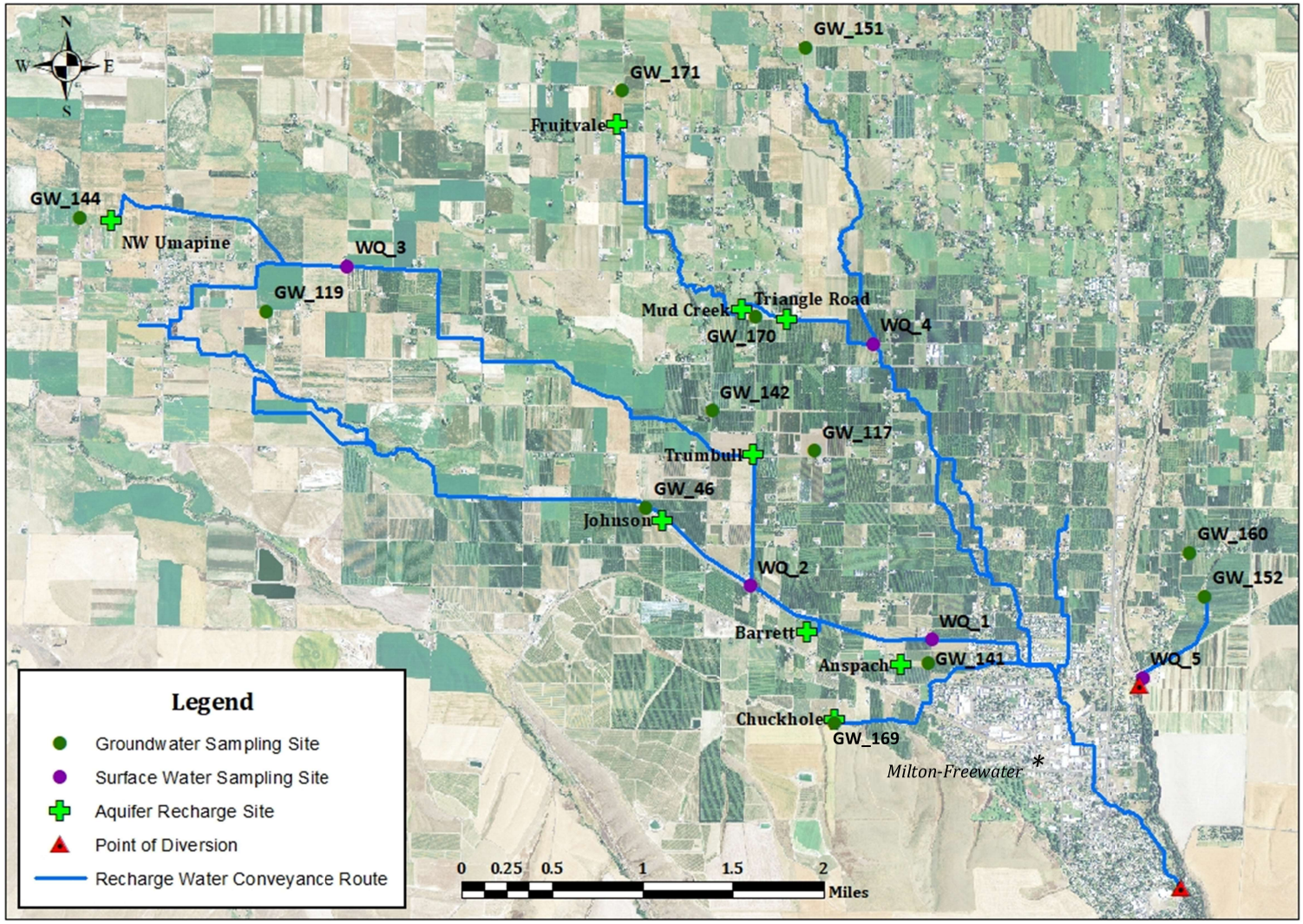


Figure 52. Water quality sampling locations for the managed aquifer recharge program in WY2019.

Figure 53. Water quality data, GW_046, GW_117, GW_119, and GW_141.

Figure 54. Water quality data, GW_142, GW_144, GW_151, and GW_152.

Figure 55. Water quality data, GW_160, GW_169, GW_170, and GW_171.

Table 7. Water quality data, Unibest methodology, GW_046, GW_117, GW_119, and GW_141.

Site	Constituent	Groundwater (mg/L)		Source water (mg/L)	
		Pre-recharge	Post-recharge	Pre-recharge	Post-recharge
GW_046	Ca	3.96	3.2	4.2	3.09
GW_046	K	2.23	1.77	1.74	1.24
GW_046	Mg	1.57	1.3	1.41	1.14
GW_046	Na	2.34	2	2.24	1.72
GW_046	NO3	0	0	0	0
GW_046	S	9.9	4.65	9.71	5.02
GW_046	Cu	0	0	0	0
GW_046	Fe	0.03	0.04	0.05	0.05
GW_046	Mn	0	0	0	0
GW_046	P	0.04	0.06	0.04	0.04
GW_046	Zn	0	0	0	0
GW_117	Ca	8.07	18.76	4.2	3.09
GW_117	K	3.09	5.19	1.74	1.24
GW_117	Mg	3.1	7.12	1.41	1.14
GW_117	Na	3.95	6.41	2.24	1.72
GW_117	NO3	0.74	8.06	0	0
GW_117	S	9.33	8.96	9.71	5.02
GW_117	Cu	0	0	0	0
GW_117	Fe	0.03	0.04	0.05	0.05
GW_117	Mn	0	0	0	0
GW_117	P	0.05	0.07	0.04	0.04
GW_117	Zn	0	0	0	0
GW_119	Ca	20.91	29.45	4.2	3.09
GW_119	K	6.42	7.09	1.74	1.24
GW_119	Mg	8.34	12.2	1.41	1.14
GW_119	Na	13.78	15.09	2.24	1.72
GW_119	NO3	3.08	11.79	0	0
GW_119	S	13.05	12.01	9.71	5.02
GW_119	Cu	0	0	0	0
GW_119	Fe	0.1	0.06	0.05	0.05
GW_119	Mn	0	0	0	0
GW_119	P	0.1	0.11	0.04	0.04
GW_119	Zn	0	0	0	0
GW_141	Ca	6.24	7.06	4.38	3.14
GW_141	K	2.86	2.82	1.86	1.32
GW_141	Mg	2.48	2.75	1.48	1.21
GW_141	Na	3.96	3.97	2.3	1.76
GW_141	NO3	0.17	1.63	0	0
GW_141	S	9.94	6.43	8.91	5.17
GW_141	Cu	0	0	0	0
GW_141	Fe	0.04	0.04	0.05	0.05
GW_141	Mn	0	0	0	0
GW_141	P	0.05	0.06	0.03	0.05
GW_141	Zn	0	0	0	0

Table 8. Water quality data, Unibest methodology, GW_142, GW_144, GW_151, GW_152.

Site	Constituent	Groundwater (mg/L)		Source water (mg/L)	
		Pre-recharge	Post-recharge	Pre-recharge	Post-recharge
GW_142	Ca	8.25	6.39	4.2	3.09
GW_142	K	2.91	2.19	1.74	1.24
GW_142	Mg	2.96	2.29	1.41	1.14
GW_142	Na	3.63	2.55	2.24	1.72
GW_142	NO3	0.93	0	0	0
GW_142	S	10.54	5.81	9.71	5.02
GW_142	Cu	0	0	0	0
GW_142	Fe	0.05	0.04	0.05	0.05
GW_142	Mn	0	0	0	0
GW_142	P	0.06	0.07	0.04	0.06
GW_142	Zn	0	0	0	0
GW_144	Ca	21.9	38.84	3.97	3
GW_144	K	6.85	9.53	1.74	1.24
GW_144	Mg	8.27	15.38	1.43	1.16
GW_144	Na	14.66	24.79	2.4	1.78
GW_144	NO3	7.26	16.19	0	0
GW_144	S	13.42	11.8	9.69	4.94
GW_144	Cu	0	0	0	0
GW_144	Fe	0.04	0.04	0.05	0.07
GW_144	Mn	0	0	0	0
GW_144	P	0.09	0.12	0.04	0.05
GW_144	Zn	0	0	0	0
GW_151	Ca	14.82	13.88	4.07	2.91
GW_151	K	4.27	3.72	1.67	1.27
GW_151	Mg	5.37	5.24	1.41	1.14
GW_151	Na	5.54	4.79	2.3	1.76
GW_151	NO3	5.03	4.42	0	0
GW_151	S	12.49	8.62	9.68	5.42
GW_151	Cu	0	0	0	0
GW_151	Fe	0.05	0.05	0.05	0.05
GW_151	Mn	0	0	0	0
GW_151	P	0.06	0.06	0.04	0.05
GW_151	Zn	0	0	0	0
GW_152	Ca	13.55	18.36	3.69	3.31
GW_152	K	3.4	3.76	1.95	1.41
GW_152	Mg	5.27	7.1	1.4	1.29
GW_152	Na	7.25	8.42	2.35	2.07
GW_152	NO3	1.49	3.2	0	0
GW_152	S	11.36	7.36	9.8	5.19
GW_152	Cu	0	0	0	0
GW_152	Fe	0.03	0.15	0.04	0.04
GW_152	Mn	0	0	0	0
GW_152	P	0.04	0.08	0.04	0.05
GW_152	Zn	0	0	0	0

Table 9. Water quality data, Unibest methodology, GW_160, GW_169, GW_170, GW_171.

Site	Constituent	Groundwater (mg/L)		Source water (mg/L)	
		Pre-recharge	Post-recharge	Pre-recharge	Post-recharge
GW_160	Ca	5.18	8.8	3.69	3.31
GW_160	K	2.49	2.83	1.95	1.41
GW_160	Mg	1.97	3.2	1.4	1.29
GW_160	Na	2.67	3.32	2.35	2.07
GW_160	NO3	0	3.39	0	0
GW_160	S	10.4	6.03	9.8	5.19
GW_160	Cu	0	0	0	0
GW_160	Fe	0.04	0.04	0.04	0.05
GW_160	Mn	0	0	0	0
GW_160	P	0.06	0.05	0.04	0.05
GW_160	Zn	0	0	0	0
GW_169	Ca	8.56	8.13	4.38	3.14
GW_169	K	2.63	2.46	1.86	1.32
GW_169	Mg	3.22	3.03	1.48	1.21
GW_169	Na	5.05	4.39	2.3	1.76
GW_169	NO3	0.35	0.12	0	0
GW_169	S	10.47	5.57	8.91	5.17
GW_169	Cu	0	0	0	0
GW_169	Fe	0.03	0.04	0.05	0.05
GW_169	Mn	0	0	0	0
GW_169	P	0.06	0.05	0.03	0.05
GW_169	Zn	0	0	0	0
GW_170	Ca	9.7	10.61	4.07	2.91
GW_170	K	3.16	3.11	1.67	1.27
GW_170	Mg	3.49	4	1.41	1.13
GW_170	Na	4.66	4.51	2.3	1.76
GW_170	NO3	1.03	2.15	0	0
GW_170	S	11.56	9.11	9.68	5.42
GW_170	Cu	0	0	0	0
GW_170	Fe	0.04	0.03	0.05	0.05
GW_170	Mn	0	0	0	0
GW_170	P	0.06	0.05	0.04	0.05
GW_170	Zn	0	0	0	0
GW_171	Ca	15.85	21.06	4.07	2.91
GW_171	K	4.38	4.98	1.67	1.27
GW_171	Mg	6.1	8.41	1.41	1.13
GW_171	Na	6.03	6.81	2.3	1.76
GW_171	NO3	2.19	4.69	0	0
GW_171	S	11.72	7.78	9.68	5.42
GW_171	Cu	0	0	0	0
GW_171	Fe	0.1	0.04	0.05	0.05
GW_171	Mn	0	0	0	0
GW_171	P	0.06	0.08	0.04	0.05
GW_171	Zn	0	0	0	0

Table 10. Relevant source water site for each groundwater site.

GW site	Relevant source water sampling site
GW_141	WQ_1
GW_046	WQ_2
GW_142	WQ_2
GW_117	WQ_2
GW_119	WQ_2
GW_144	WQ_3
GW_170	WQ_4
GW_171	WQ_4
GW_151	WQ_4
GW_152	WQ_5
GW_160	WQ_5
GW_169	WQ_1

For constituents with regulatory standards analyzed with the Unibest methodology, no copper, manganese or zinc was detected in any sample, ammonia was detected in the source water, and the drinking water standard for nitrate was exceeded post-recharge at GW_119 and GW_144. The Unibest ammonia data are not discussed in this report because the resin capsule used in the Unibest method contains ammonia, biasing the sample results high (see WY2018 for more detailed discussion). WWBWC will propose a new approach to monitoring in the upcoming limited license application. The Oregon Department of Environmental Quality's (ODEQ) guidance levels of 1.0 mg/L for copper, 0.3 mg/L for iron, 0.05 mg/L for manganese, and 5.0 mg/L for zinc were met at all sites.

Split samples were sent to a conventional lab to analyze constituents with regulatory standards (Table 11 and Table 12). Ammonia was not detected in any sample. Copper and zinc were detected but below regulatory criteria. Zinc concentrations were less than the state surface water criteria of 0.043 mg/L for chronic exposure and 0.042 mg/L for acute exposure, assuming a hardness of 30 mg/L. Copper was detected using method EPA 200.8 at 0.00162 mg/L in one source water sample at the Huffman-Richartz split (WQ_3) but below state criteria. The ODEQ water quality criteria for copper are calculated on a site-specific basis using the Biotic Ligand Model. The model outputs based on WWBWC input data were 0.01221 mg/L for the acute criterion (CMC) and 0.00758 mg/L for the chronic criterion (CCC)[5].

[5] Data for temperature and pH were from the May 2018 sampling event at the Source Water #3 location. The other model inputs were obtained from other sources. The following data were obtained from 4/23/2013 at S-417 (Zerba Weir): dissolved organic carbon 1.7 mg C/L (based on total organic carbon of 2.05 and standard conversion factor of 0.83), calcium 5.1 mg/L, magnesium 2.1 mg/L, sodium 2.9 mg/L, potassium 1.7 mg/L, sulfate 0.9 mg/L, and alkalinity 30 mg/L CaCO3. The input value of 0.82 mg/L for chloride was based on ODEQ guidance and the value of 0.001 for sulfide was based on the minimum value allowed in the model.

Table 11. Surface water quality data, conventional methods

Monitoring Site	Ammonia	Copper		Zinc	
	Pre and Post	Pre	Post	Pre	Post
WQ_1	ND	ND		0.00501	
WQ_2	ND	ND		0.00517	
WQ_3	ND	0.00162	0.00209	0.00738	0.00535
WQ_4	ND	ND	0.00181	0.00712	0.0108
WQ_5	ND	ND	ND	0.00546	0.00598

ND = not detected

Using conventional lab analyses, the drinking water standard of 10 mg/L was exceeded in groundwater post-recharge at GW_119; however, no nitrate was detected in any source water sample, so the recharge water infiltrating into groundwater was not the source of the nitrates in the groundwater. In ODEQ's 2016 characterization of the quality of groundwater in the Milton-Freewater and Umapine areas, no sample exceeded the drinking water standard for nitrate (ODEQ, unpublished data).

Table 12. Groundwater constituent concentrations, conventional methods.

Well	NH3-N		Cu		NO3-N		Zn	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
GW_046	ND	ND	ND	ND	ND	0.216	0.00511	0.00873
GW_117	ND	ND	ND	ND	2	8.48	0.00371	0.00838
GW_119	ND	ND	0.00127	ND	5.59	11.4	0.00528	0.00624
GW_141	ND	ND	0.00107	0.0014	0.806	1.85	0.00467	0.00824
GW_141_DUP	--	ND	--	ND	--	1.87	--	0.00952
GW_142	ND	ND	ND	ND	1.9	1.55	0.00439	0.0084
GW_144	ND	ND	0.00193	0.0041	7.99	14	0.00583	0.00647
GW_151	ND	ND	ND	ND	6.7	6.21	0.00432	0.00467
GW_151_DUP	ND	--	0.0036	--	6.09	--	0.00659	--
GW_152	ND	ND	ND	0.136	2.45	2.8	0.00456	0.136
GW_160	ND	ND	ND	ND	1.2	3.78	0.00484	0.0069
GW_169	ND	ND	ND	0.0124	1.06	0.533	0.00492	0.0558
GW_170	ND	ND	ND	ND	1.55	2.56	0.00606	0.0053
GW_171	ND	ND	0.00539	0.00118	3.99	5.66	0.00539	0.00665

The groundwater samples collected at wells GW_144 and GW_171 on May 22, 2019 were also analyzed for the approved targeted list of herbicides and pesticides (azinphos-methyl, chlorpyrifos, diuron, and malathion) using analytical methods EPA 8141B and EPA 8321B. There were no detections of any of the four constituents in either sample. Analytical laboratory reports are included in Appendix B.

An interesting pattern in the field parameters, also observed in WY2018, was that the specific conductance values of 71 and 78 uS/cm at GW_046, at the Johnson site, are unusually low for groundwater and similar to the source water values of 63 and 75 uS/cm (Table 13) -- another likely indication of the influence of the large volumes of surface water introduced to the site over the years.

Table 13. Field parameter results.

	Temperature (°C)		Specific conductance (uS/cm)		Dissolved oxygen (mg/L)		pH (std units)	
Site	Pre	Post	Pre	Post	Pre	Post	Pre	Post
WQ_1	8.5	8.8	75.1	62.6	11.17	10.55	8.36	7.98
WQ_2	8.5	9.5	75.2	62.5	11.21	10.69	7.78	7.88
WQ_3	10.3	10.8	75.6	65.2	10.73	10.78	7.9	7.9
WQ_4	10.3	13.8	74	58.8	10.69	9.98	7.97	8.73
WQ_5	10.1	9.4	74	62.4	10.99	10.83	8.29	9.29
GW_046	12.8	13.6	78.4	71.1	8.41	8.58	7.14	7.29
GW_117	13.8	15.3	149.5	275.2	7.07	7.01	6.61	6.49
GW_119	13.8	13.4	331.3	460.3	7.96	8.75	6.98	7.03
GW_141	12.5	13.9	118.6	145.8	8.05	8.45	6.96	6.78
GW_142	13.2	11.4	139.7	111.5	8.15	9.17	6.64	6.57
GW_144	12.8	14.2	335.5	534	6.68	6.84	6.86	6.81
GW_151	13.8	12.4	214.4	231.5	7.78	7.59	6.69	6.67
GW_152	12.6	12.6	221.7	243.4	7.38	7.47	6.97	5.63
GW_160	11.7	12.4	97.5	144.2	6.53	7.17	6.81	6.79
GW_169	14.1	15.2	150.4	141.6	9.62	8.5	7.26	7.5
GW_170	14.5	14	156.2	197.9	7.02	7.75	6.74	6.82
GW_171	13.5	13.8	254.3	326.8	7.09	7.43	6.89	6.8

QUALITY CONTROL

For the synthetic organic compounds, surrogate recoveries were 98% for the GW_144 sample and 99% for the GW_171 sample (see Appendix B for the lab report). In the lab quality control samples, the target analytes were not detected in the method blank and all percent recoveries of the blank spike were within expected ranges. The lab did not identify any quality control issues associated with analysis of these samples.

For the samples analyzed using conventional methods at Anatek: the temperature of the samples upon receipt by the lab was 2.9 °C for the Oct. 31, 2018 shipment and 5.1 °C for the shipment on Nov. 1, 2018. In the spring sampling event, the temperature of the samples was 5.1 °C for the May 22, 2019 shipment and 3.3 °C for the May 23, 2019 shipment. Two of the shipments exceeded the 4 °C preservation threshold for nitrate and ammonia, despite increasing the amount of ice in the cooler for the May sampling event. Samples were received within the holding time. Lab control data for spikes and duplicates were within acceptable ranges, except for the NH3-N quality control analyses; the NH3-N quality control samples had high percent recoveries. Because ammonia was

not detected in any of the field samples from WWBWC, this exceedance of the lab's acceptable range was not considered significant by WWBWC. No detections were found in the lab blank.

One field replicate was obtained at GW_151 during the pre-recharge sampling event and at GW_141 during the post-recharge event to quantify precision of the inorganic data (Table 21). The results indicate the data have sufficiently low uncertainty for their intended end use.

Table 14. Relative percent differences of replicate sample.

Analyte	GW_151			GW_141		
	Sample	Replicate	Relative percent difference	Sample	Replicate	Relative percent difference
Ammonia	ND	ND	n/a	ND	ND	
Copper	ND	ND	n/a	0.0014	ND	
Nitrate-N	6.7	6.09	2.4	1.85	1.87	
Zinc	0.00432	0.00659	10.4	0.00824	0.00952	3.6%

Discussion of Results

During the WY 2019 recharge season, 6,321 ac-ft (2.1 billion gallons) of water was recharged to the alluvial aquifer near Milton-Freewater through recharge basins, infiltration galleries, and seepage from canals and ditches delivering the water to the engineered structures. Groundwater levels in wells closest to the sites typically showed the strongest response. Seasonal patterns in groundwater levels at most of the monitoring sites reflect multiple factors influencing their change over time such as seepage from stream channels and the irrigation delivery network, deep percolation past the rooting zone, spring discharge, and upwelling into stream channels.

As in previous recharge seasons, groundwater and surface water quality data collected during aquifer recharge activities do not indicate that aquifer recharge activities are degrading groundwater quality. The quality of source water delivered to the aquifer recharge sites continues to be of better quality than the receiving groundwater. No exceedances of surface water quality criteria were found when using conventional lab analyses.

The Walla Walla basin's aquifer recharge program continues to use nature-based infrastructure to simulate the floodplain function of recharge to the aquifer that was lost due to channelization of the distributary system. With continued aquifer recharge activities and increases in the total annual volume of water recharged, continued increases in alluvial aquifer water levels are anticipated, which should lead to further increases in spring flow (WWBWC 2019) and enhance already influential upwelling of groundwater into stream channels.

Aquifer Recharge Program in WY 2020

The existing limited license expires on December 31, 2020. WWBWC is in the process of applying for a new limited license. Continued operation of the program will depend on obtaining the limited license.

REFERENCES

Bower, B., and Lindsey, K., 2010, *Aquifer Recharge as a Water Management Tool: Hudson Bay Recharge Testing Site Report (2004-9)*. Walla Walla Basin Watershed Council and GSI, prepared for Hudson Bay District Improvement Company.

Gryczkowski, L., 2015, *Surface Water and Groundwater Interactions in the Walla Walla River, Northeast Oregon, USA: A Multi-Method Field-Based Approach*, doctoral dissertation, Oregon State University, Corvallis, Oregon.

GSI Water Solutions, 2007, *Geologic Setting of the Miocene (?) to Recent Suprabasalt Sediments of the Walla Walla Basin, Southeastern Washington and Northeastern Oregon*. Prepared for the Walla Walla Basin Watershed Council and the Washington State Department of Ecology.

Newcomb, R.C., 1965, *Geology and ground-water resources of the Walla Walla River Basin, Washington and Oregon.* Washington Department of Conservation, Division of Water Resources. Water Supply Bulletin 21, 151 p, 3 plates.

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WWBWC, 2017, *Surface Water Monitoring in the Walla Walla Basin, 2017 Water Year*, September 2017.

WWBWC, 2019, *Oregon Walla Walla Basin Aquifer Recharge Report*, *Water Year 2018*.

APPENDIX A – LIMITED LICENSE LL-1621

Oregon Water Resources Department

Final Order
Limited License Application LL-1621
Walla Walla Basin Watershed Council and
Hudson Bay District Improvement
Company

Appeal Rights

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Requested Water Use

On June 13, 2016, the Water Resources Department received completed limited license request 1621 from Walla Walla Basin Watershed Council and Hudson Bay District Improvement Company for the use of up to 70 cubic feet per second from the Walla Walla River. The points of diversion are located in the NE 1/4 NW 1/4, Section l, Township 5 North, Range 35 East W.M. and in the SW 1/4, NE 1/4, Section 12, Township 5 North, Range 35 East, W.M., for the purpose of artificial groundwater recharge testing, for the period of March l, 2015 through December 3 1, 2020.

Authorities

The Department may approve a limited license pursuant to its authority under ORS 537.143, 537.144 and OAR 690-340-0030.

ORS 537.143(2) authorizes the Director to revoke the right to use water under a limited license if it causes injury to any other water right or a minimum perennial streamflow.

A limited license will not be issued for more than five consecutive years for the same use, as directed by ORS 537.143(8).

Findings of Fact

l. The forms, fees and map have been submitted, as required by OAR 690-340-0030(1).

2. The Department provided public notice of the application, on December 22, 2015 as required by OAR 690-340-0030(2).

3. This limited license request is limited to an area within a single drainage basin as required by OAR 690-340-0030(3).

4. The Department has determined that there is water available for the requested use.

5. The Department has determined that the proposed source has not been withdrawn from further appropriation.

6. Because this use is from surface water and has the potential to impact fish, the Department finds that fish screening is required to protect the public interest.

7. Because the use requested is longer than 120 days and because the use is in an area that has sensitive, threatened or endangered fish species, the use is subject to the Department's rules under OAR 690-33. These rules aid the Department in determining whether a proposed use will impair or be detrimental to the public interest with regard to sensitive, threatened, or endangered fish species.

8. The Department has determined that the use is not subject to its rules under OAR 690-350. However, artificial groundwater recharge testing must be done in a manner that provides a test with results and supplemental information for the user's artificial groundwater recharge permit application. Consistent with this intent, the Department has added conditions pertaining to testing, monitoring, reporting and coordination with Oregon Department of Environmental Quality (ODEQ), Oregon Department of Fish and Wildlife (ODFW) and this Department.

9. The Department has received comments related to the possible issuance of the limited license from ODEQ requesting changes to the proposed monitoring plan. The water quality monitoring plan was revised and approved by ODEQ on February 25, 2016. The Department has received comments from ODFW in support of this issuance and recommending conditions related to instream water rights and bypass flows. The Department's Groundwater Section determined the testing and water quantity monitoring plan submitted as an addendum to the application on June 13, 2016 is sufficient for artificial groundwater recharge testing. The authorization of Limited License 1621 is conditioned to satisfactorily address issues raised in those comments.

10. Pursuant to OAR 690-340-0030(4)(5), conditions have been added with regard to notice and water-use measurement.

Conclusions of Law

The proposed water use will not impair or be detrimental to the public interest pursuant to OAR 690-340-0030(2), as limited in the order below.

Order

Therefore, pursuant to ORS 537.143, ORS 537.144, and OAR 690-340-0030, application for Limited License 1621 is approved as conditioned below.

1. The period and rate of use for Limited License 1621 shall be from October 17, 2016 through December 3 1, 2020 for the use of 70 cubic feet per second from the Walla Walla River, for the purpose of artificial groundwater recharge testing. The season of use is limited to November 1 through May 15.

2. The licensee shall give notice to the Watermaster in the district where use is to occur not less than 15 days or more than 60 days in advance of using the water under this limited license. The notice shall include the location of the diversion, and the volume of water to be diverted and the intended use and place of use.

3. When water is diverted under this limited license, the use is limited to times when the following minimum streamflows are met in the Tum A Lum reach of the Walla Walla River, between the Little Walla Walla River diversion and Nursery Bridge Dam and flowing past Nursery Bridge Dam: November — 64 cfs, December and January 95 cfs, February to May 15 — 150 cfs. Nursery Bridge Dam is located just downstream of Nursery Bridge and is downstream of the Little Walla Wall diversion. The District 5 Watermaster, based on gage and/or flow measurements, shall make the determination that the above described streamflows are flowing past Nursery Bridge Dam. Diversion under this limited license shall cease when said streamflows are unmet.

4. The Licensee shall follow the operation, water quality and water level monitoring plans described in the document entitled "Surface water and Groundwater Monitoring and Reporting Plan for Limited License Application LL1621" and dated May 3 1, 2016. This plan may be modified after review and approval of changes by the Department.

5. The licensee shall comply with all ODEQ water quality requirements. If monitoring data or other information result in identification of potential water quality concerns, ODEQ may seek modifications to the monitoring and test plan and/or require a permit of its own to address the water quality concerns prior to resumption of artificial groundwater recharge testing.

6. Before water use may begin under this license, the licensee shall install a totalizing flow meter at each point of diversion and at the entry point to each recharge test site. The totalizing flow meters must be installed and maintained in good working order. In addition the licensee shall maintain a record of all water use, including the total number of hours of diversion, the total volume diverted, and the categories of beneficial use to which the water is applied. During the period of the limited license, the record of use shall be available for review by the Department upon request, and shall be submitted to the Department annually and to Watermaster upon request. This record shall include the amount of water diverted from the Walla Walla River, and the amount delivered to each recharge area.

7. The Director may revoke the right to use water for any reason described in ORS 537.143 (2), and OAR 690-340-0030(6). Such revocation may be prompted by field regulatory activities or by any other reason.

8. Use of water under a limited license shall not have priority over any water right exercised according to a permit or certificate, and shall be subordinate to all other authorized uses that rely upon the same source.

9. The licensee shall install, maintain and operate fish screening and by-pass devices as required by the Oregon Department of Fish and Wildlife to prevent fish from entering the proposed diversion. See copy of enclosed fish screening criteria for information.

10. In supporting this license, ODFW retains the prerogative to pursue a future instream water right for the Walla Walla River. A permanent water right for the requested location may fall under the requirements of Division 33 rules, which limit water usage during the period from April 15-September 30.

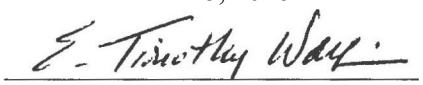
11. The licensee is required to provide a written annual report by February 15th of each year. This report will detail recharge testing and any subsequent recovery under a secondary limited license from the preceding water year. Reporting shall include, but is not limited to, the results of testing efforts that relate to water quality, water quantity, and operations. Water level data shall be submitted in a Department-specified digital format. The licensee shall consult with ODEQ and OWRD to identify additional specific reporting elements. The first report is due in February 2014. The annual report shall be sealed and signed by a professional(s) registered or allowed, under Oregon law, to practice geology.

12. Failure to meet the conditions of the license to the satisfaction of the Department will lead to a cancellation of the limited license, in which case it would no longer be in force.

13. The licensee shall conduct recharge testing as proposed in the application and later amended by the licensee, and as otherwise conditioned herein.

NOTE: This water-use authorization is temporary. Applicants are advised that issuance of this final order does not guarantee that any permit for the authorized use will be issued in the future; any investments should be made with that in mind.

Issued October *18*, 2016



E. Timothy Wallin, Water Rights Program Manager, for
Thomas M. Byler, Director
Water Resources Department

Enclosures - limited license

cc: Greg Silbernagel, District 5 Watermaster
Bill Duke, ODFW
Phil Richerson, ODEQ
File

If you need further assistance, please contact the Water Rights Section at the address, phone number, or fax number below. When contacting the Department, be sure to reference your limited license number for better service.

Remember, the use of water under the terms of this limited license is not a secure source of water. Water use can be revoked at any time. Such revocation may be prompted by field regulatory activities or many other reasons.

Water Rights Section
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem OR 97301-1271
Phone: (503) 986-081 7 Fax: (503) 986-0901

FISH SCREENING CRITERIA FOR WATER DIVERSIONS

This summary describes ODFW fish screening criteria for all fish species.

Screen material openings for ditch (gravity) and pump screens must provide a minimum of 27% open area:

Perforated plate: Openings shall not exceed 3/32 or 0.0938 inches (2.38 mm).

Mesh/Woven wire screen: Square openings shall not exceed 3/32 or 0.0938 inches (2.38 mm) in the narrow direction, e.g., 3/32 inch x 3/32 inch open mesh.

Profile bar screen/Wedge wire: Openings shall not exceed 0.0689 inches (1.75 mm) in the narrow direction.

Screen area must be large enough to prevent fish impact. Wetted screen area depends on the water now rate and the approach velocity.

Approach velocity: The water velocity perpendicular to and approximately three inches in front of the screen face.
Sweeping velocity: The water velocity parallel to the screen face.
Bypass system: Any pipe, flume, open channel or other means of conveyance that transports fish back to the body of water from which the fish were diverted.
Active pump screen: Self cleaning screen that has a proven cleaning system.
Passive pump screen: Screen that has no cleaning system other than periodic manual cleaning.

Screen approach velocity for ditch and active pump screens shall not exceed 0.4 fps (feet per second) or 0.12 mps (meters per second). The wetted screen area in square feet is calculated by dividing the maximum water flow rate in cubic feet per second (1 cfs— 449 gpm) by 0.4 fps.

Screen sweeping velocity for ditch screens shall exceed the approach velocity. Screens greater than 4 feet in length must be angled at 45 degrees or less to flow. An adequate bypass system must be provided for ditch screens to safely and rapidly collect and transport fish back to the stream.

Screen approach velocity for passive pump screens shall not exceed 0.2 fps or 0.06 mps. The wetted screen area in square feet is calculated by dividing the maximum water flow rate by 0.2 fps. pump rate should be less than 1 cfs.

For further information please contact:

Bernie Kepshire
Oregon Department of Fish and Wildlife
71 1 8 NE Vandenberg Avenue
Corvallis, OR 97330-9446
(541)757-4186 055
bernard.m.kepshire@state.or.us

APPENDIX B – WATER QUALITY DATA

Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181031053
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUAFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181031053-001	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-117	**Sampling Time**	6:58 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/6/2018 5:52:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	2.00	mg/L	0.1	10/31/2018 10:43:00 PM	ANG	EPA 300.0	
Zinc	0.00371	mg/L	0.001	11/6/2018 5:52:00 PM	HSW	EPA 200.8	

Sample Number	181031053-002	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-46	**Sampling Time**	7:32 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/6/2018 5:55:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	ND	mg/L	0.1	10/31/2018 11:04:00 PM	ANG	EPA 300.0	
Zinc	0.00511	mg/L	0.001	11/6/2018 5:55:00 PM	HSW	EPA 200.8	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181031053
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUAFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181031053-003	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	WQ-2	**Sampling Time**	8:07 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/6/2018 5:58:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	ND	mg/L	0.1	10/31/2018 11:26:00 PM	ANG	EPA 300.0	
Zinc	0.00517	mg/L	0.001	11/6/2018 5:58:00 PM	HSW	EPA 200.8	

Sample Number	181031053-004	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	WQ-1	**Sampling Time**	8:30 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/6/2018 6:17:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	ND	mg/L	0.1	10/31/2018 11:47:00 PM	ANG	EPA 300.0	
Zinc	0.00501	mg/L	0.001	11/6/2018 6:17:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181031053
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUAFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181031053-005	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-141	**Sampling Time**	8:33 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	0.00107	mg/L	0.001	11/12/2018 7:53:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	0.806	mg/L	0.1	11/1/2018 12:09:00 AM	ANG	EPA 300.0	
Zinc	0.00467	mg/L	0.001	11/12/2018 7:53:00 PM	HSW	EPA 200.8	

Sample Number	181031053-006	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-169	**Sampling Time**	11:20 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 8:13:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	1.06	mg/L	0.1	11/1/2018 12:30:00 AM	ANG	EPA 300.0	
Zinc	0.00492	mg/L	0.001	11/12/2018 8:13:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181031053
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUAFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181031053-007	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-160	**Sampling Time**	12:30 PM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 8:17:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	1.20	mg/L	0.1	11/1/2018 1:35:00 AM	ANG	EPA 300.0	
Zinc	0.00484	mg/L	0.001	11/12/2018 8:17:00 PM	HSW	EPA 200.8	

Sample Number	181031053-008	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	GW-152	**Sampling Time**	1:18 PM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 8:21:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	2.45	mg/L	0.1	11/1/2018 1:57:00 AM	ANG	EPA 300.0	
Zinc	0.00456	mg/L	0.001	11/12/2018 8:21:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181031053
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUAFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181031053-009	**Sampling Date**	10/30/2018	**Date/Time Received**	10/31/2018 10:38 AM
Client Sample ID	WQ-5	**Sampling Time**	1:33 PM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/2/2018 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 8:25:00 PM	HSW	EPA 200.8	
NO3/N+NO2/N	ND	mg/L	0.1	11/1/2018 2:18:00 AM	ANG	EPA 300.0	
Zinc	0.00546	mg/L	0.001	11/12/2018 8:25:00 PM	HSW	EPA 200.8	

Authorized Signature

Todd Taruscio, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn: MARIE COBB

Batch #: 181031053
Project Name: MANAGED AQUAFER RECHARGE

Analytical Results Report
Quality Control Data

Lab Control Sample

Parameter	LCS Result	Units	LCS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
Zinc	0.0475	mg/L	0.05	95.0	85-115	11/6/2018	11/8/2018
Copper	0.0493	mg/L	0.05	98.6	85-115	11/6/2018	11/8/2018
NH3-N	1.00	mg/L	1	100.0	80-120	11/2/2018	11/5/2018
NO3/N+NO2/N	7.91	mg/L	8	98.9	90-110	10/31/2018	10/31/2018

Matrix Spike

Sample Number	Parameter	Sample Result	MS Result	Units	MS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
181030021-007A	Zinc	0.0164	0.231	mg/L	0.25	85.8	70-130	11/6/2018	11/8/2018
181107005-001A	Zinc	0.00266	0.0480	mg/L	0.05	90.7	70-130	11/12/2018	11/12/2018
181031038-001A	NO3/N+NO2/N	ND	79.3	mg/L	80	99.1	80-120	10/31/2018	10/31/2018
181107005-001A	Copper	ND	0.0473	mg/L	0.05	94.6	70-130	11/12/2018	11/12/2018
181030021-007A	Copper	ND	0.231	mg/L	0.25	92.4	70-130	11/6/2018	11/8/2018
181024062-001	NH3-N	2.10	7.19	mg/L	1	509.0	80-120	11/2/2018	11/5/2018

Matrix Spike Duplicate

Parameter	MSD Result	Units	MSD Spike	%Rec	%RPD	AR %RPD	Prep Date	Analysis Date
Zinc	0.240	mg/L	0.25	89.4	3.8	0-20	11/6/2018	11/8/2018
Zinc	0.0490	mg/L	0.05	92.7	2.1	0-20	11/12/2018	11/12/2018
NO3/N+NO2/N	81.3	mg/L	80	101.6	2.5	0-25	10/31/2018	10/31/2018
Copper	0.0480	mg/L	0.05	96.0	1.5	0-20	11/12/2018	11/12/2018
Copper	0.243	mg/L	0.25	97.2	5.1	0-20	11/6/2018	11/8/2018
NH3-N	7.45	mg/L	1	535.0	3.6	0-20	11/2/2018	11/5/2018

Method Blank

Parameter	Result	Units	PQL	Prep Date	Analysis Date
Copper	ND	mg/L	0.001	11/6/2018	11/8/2018
NH3-N	ND	mg/L	0.05	11/2/2018	11/5/2018
NO3/N+NO2/N	ND	mg/L	0.1	10/31/2018	10/31/2018
Zinc	ND	mg/L	0.001	11/6/2018	11/8/2018

AR Acceptable Range
ND Not Detected
PQL Practical Quantitation Limit
RPD Relative Percentage Difference

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

Wednesday, December 05, 2018 Page 1 of 1

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Login Report

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181031053
Order Date: 10/31/2018

Contact Name: MARIE COBB

Project Name: MANAGED AQUAFER RECHARGE

Comment:

Sample #: 181031053-001 **Customer Sample #:** GW-117

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 6:58 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-002 **Customer Sample #:** GW-46

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 7:32 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-003 **Customer Sample #:** WQ-2

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 8:07 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181031053
Order Date: 10/31/2018

Contact Name: MARIE COBB
Project Name: MANAGED AQUAFER RECHARGE
Comment:

NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-004 **Customer Sample #:** WQ-1

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 8:30 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-005 **Customer Sample #:** GW-141

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 8:33 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-006 **Customer Sample #:** GW-169

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 11:20 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181031053
Order Date: 10/31/2018

Contact Name: MARIE COBB

Project Name: MANAGED AQUAFER RECHARGE

Comment:

Sample #: 181031053-007 **Customer Sample #:** GW-160

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 12:30 PM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-008 **Customer Sample #:** GW-152

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 1:18 PM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Sample #: 181031053-009 **Customer Sample #:** WQ-5

Recv'd: ☑ **Matrix:** Water **Collector:** **Date Collected:** 10/30/2018
Quantity: 3 **Date Received:** 10/31/2018 10:38:00 AM **Time Collected:** 1:33 PM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/12/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***
NITRATE+ NITRITE AS N	M	EPA 300.0	11/12/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/12/2018	***Normal (~10 Days)***

Customer Name:	WALLA WALLA BASIN WATERSHED COUNCIL			**Order ID:**	181031053
	810 S. MAIN RD			**Order Date:**	10/31/2018
	MILTON-FREEWATER	OR	97862		
Contact Name:	MARIE COBB			**Project Name:**	MANAGED AQUAFER RECHARGE
Comment:					

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	2.9
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes
Total number of containers?	27

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181102026
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUIFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181102026-001	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018	10:27 AM
Client Sample ID	GW-144	**Sampling Time**	7:04 AM			
Matrix	Water					
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	0.00193	mg/L	0.001	11/12/2018 7:17:00 PM	HSW	EPA 200.8	
NO3/N	7.99	mg/L	1	11/2/2018 7:42:00 PM	ANG	EPA 300.0	
Zinc	0.00583	mg/L	0.001	11/12/2018 7:17:00 PM	HSW	EPA 200.8	

Sample Number	181102026-002	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018	10:27 AM
Client Sample ID	GW-119	**Sampling Time**	8:15 AM			
Matrix	Water					
Comments						

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	0.00127	mg/L	0.001	11/12/2018 7:21:00 PM	HSW	EPA 200.8	
NO3/N	5.59	mg/L	0.1	11/2/2018 8:04:00 PM	ANG	EPA 300.0	
Zinc	0.00528	mg/L	0.001	11/12/2018 7:21:00 PM	HSW	EPA 200.8	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181102026
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUIFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181102026-003	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	WQ-3	**Sampling Time**	8:30 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	0.00162	mg/L	0.001	11/12/2018 7:25:00 PM	HSW	EPA 200.8	
NO3/N	ND	mg/L	0.1	11/2/2018 8:25:00 PM	ANG	EPA 300.0	
Zinc	0.00738	mg/L	0.001	11/12/2018 7:25:00 PM	HSW	EPA 200.8	

Sample Number	181102026-004	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	GW-142	**Sampling Time**	9:01 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 7:29:00 PM	HSW	EPA 200.8	
NO3/N	1.90	mg/L	0.1	11/2/2018 9:30:00 PM	ANG	EPA 300.0	
Zinc	0.00439	mg/L	0.001	11/12/2018 7:29:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181102026
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUIFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181102026-005	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	WQ-4	**Sampling Time**	9:17 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 7:33:00 PM	HSW	EPA 200.8	
NO3/N	ND	mg/L	0.1	11/2/2018 9:51:00 PM	ANG	EPA 300.0	
Zinc	0.00712	mg/L	0.001	11/12/2018 7:33:00 PM	HSW	EPA 200.8	

Sample Number	181102026-006	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	GW-170	**Sampling Time**	9:52 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 7:37:00 PM	HSW	EPA 200.8	
NO3/N	1.55	mg/L	0.1	11/2/2018 10:13:00 PM	ANG	EPA 300.0	
Zinc	0.00606	mg/L	0.001	11/12/2018 7:37:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181102026
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUIFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181102026-007	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	GW-151	**Sampling Time**	11:40 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	11/12/2018 7:41:00 PM	HSW	EPA 200.8	
NO3/N	6.70	mg/L	0.1	11/2/2018 10:34:00 PM	ANG	EPA 300.0	
Zinc	0.00432	mg/L	0.001	11/12/2018 7:41:00 PM	HSW	EPA 200.8	

Sample Number	181102026-008	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	GW-151 DUP.	**Sampling Time**	11:45 AM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	0.00360	mg/L	0.001	11/12/2018 7:45:00 PM	HSW	EPA 200.8	Q3
NO3/N	6.09	mg/L	0.1	11/2/2018 10:56:00 PM	ANG	EPA 300.0	
Zinc	0.00659	mg/L	0.001	11/12/2018 7:45:00 PM	HSW	EPA 200.8	Q3

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	181102026
Address:	810 S. MAIN RD MILTON-FREEWATER, OR 97862	**Project Name:**	MANAGED AQUIFER RECHARGE
Attn:	MARIE COBB		

Analytical Results Report

Sample Number	181102026-009	**Sampling Date**	11/1/2018	**Date/Time Received**	11/2/2018 10:27 AM
Client Sample ID	GW-171	**Sampling Time**	1:46 PM		
Matrix	Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	11/5/2018 9:00:00 AM	BKP	SM4500NH3G	
Copper	0.00156	mg/L	0.001	11/12/2018 7:49:00 PM	HSW	EPA 200.8	
NO3/N	3.99	mg/L	0.1	11/2/2018 11:17:00 PM	ANG	EPA 300.0	
Zinc	0.00539	mg/L	0.001	11/12/2018 7:49:00 PM	HSW	EPA 200.8	

Authorized Signature

Todd Taruscio, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit
Q3 Sample received with improper chemical preservation

The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn: MARIE COBB

Batch #: 181102026
Project Name: MANAGED AQUIFER RECHARGE

Analytical Results Report

Quality Control Data

Lab Control Sample

Parameter	LCS Result	Units	LCS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
Zinc	0.0478	mg/L	0.05	95.6	85-115	11/12/2018	12/4/2018
Copper	0.0485	mg/L	0.05	97.0	85-115	11/12/2018	12/4/2018
NH3-N	1.01	mg/L	1	101.0	80-120	11/5/2018	11/5/2018
NO3/N	3.99	mg/L	4	99.8	90-110	11/2/2018	11/2/2018

Matrix Spike

Sample Number	Parameter	Sample Result	MS Result	Units	MS Spike	%Rec	AR %Rec	Prep Date	Analysis Date
181108044-002	Zinc	0.0453	0.0823	mg/L	0.05	74.0	70-130	11/12/2018	12/4/2018
181101066 001	NO3/N	17.8	56.8	mg/L	40	97.5	80 120	11/2/2018	11/2/2018
181108044-002	Copper	0.00319	0.0492	mg/L	0.05	92.0	70-130	11/12/2018	12/4/2018
181102026-001	NH3-N	ND	0.932	mg/L	1	93.2	80-120	11/5/2018	11/5/2018

Matrix Spike Duplicate

Parameter	MSD Result	Units	MSD Spike	%Rec	%RPD	AR %RPD	Prep Date	Analysis Date
Zinc	0.0852	mg/L	0.05	79.8	3.5	0-20	11/12/2018	12/4/2018
NO3/N	56.5	mg/L	40	96.8	0.5	0-20	11/2/2018	11/2/2018
Copper	0.0496	mg/L	0.05	92.8	0.8	0-20	11/12/2018	12/4/2018
NH3-N	0.943	mg/L	1	94.3	1.2	0-20	11/5/2018	11/5/2018

Method Blank

Parameter	Result	Units	PQL	Prep Date	Analysis Date
Copper	ND	mg/L	0.001	11/12/2018	12/4/2018
NH3 N	ND	mg/L	0.05	11/5/2018	11/5/2018
NO3/N	ND	mg/L	0.1	11/2/2018	11/2/2018
Zinc	ND	mg/L	0.001	11/12/2018	12/4/2018

AR Acceptable Range
ND Not Detected
PQL Practical Quantitation Limit
RPD Relative Percentage Difference

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Login Report

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181102026
Order Date: 11/2/2018

Contact Name: MARIE COBB

Project Name: MANAGED AQUIFER RECHARGE

Comment:

Sample #: 181102026-001 **Customer Sample #:** GW-144

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 7:04 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-002 **Customer Sample #:** GW-119

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 8:15 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-003 **Customer Sample #:** WQ-3

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 8:30 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181102026
Order Date: 11/2/2018

Contact Name: MARIE COBB
Project Name: MANAGED AQUIFER RECHARGE
Comment:

NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-004 **Customer Sample #:** GW-142

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 9:01 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-005 **Customer Sample #:** WQ-4

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 9:17 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-006 **Customer Sample #:** GW-170

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 9:52 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 181102026
Order Date: 11/2/2018

Contact Name: MARIE COBB

Project Name: MANAGED AQUIFER RECHARGE

Comment:

Sample #: 181102026-007 **Customer Sample #:** GW-151

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 11:40 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-008 **Customer Sample #:** GW-151 DUP.

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 1 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 11:45 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Sample #: 181102026-009 **Customer Sample #:** GW-171

Recv'd: ☑ **Matrix:** Water **Collector:** MARIE COBB **Date Collected:** 11/1/2018
Quantity: 3 **Date Received:** 11/2/2018 10:27:00 AM **Time Collected:** 1:46 PM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	11/14/2018	***Normal (~10 Days)***
COPPER	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	11/14/2018	***Normal (~10 Days)***
ZINC	M	EPA 200.8	11/14/2018	***Normal (~10 Days)***

Customer Name:	WALLA WALLA BASIN WATERSHED COUNCIL			**Order ID:**	181102026
	810 S. MAIN RD			**Order Date:**	11/2/2018
	MILTON-FREEWATER	OR	97862		
Contact Name:	MARIE COBB			**Project Name:**	MANAGED AQUIFER RECHARGE
Comment:					

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	5.1
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes
Total number of containers?	25

181102 026 WWBW Last Due 11/14/2018
1st SAMP 11/1/2018 1st RCVD 11/2/2018
MANAGED AQUIFER RECHARGE

Anatek Labs, Inc.

Chain of Custody Record

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Company Name: Walla Walla Basin Watershed Council
Address: 810 S. Main Street
City: Milton-Freewater State: OR Zip: 97862
Phone: 541-938-2170
Fax:

Project Manager: Marie Cobb
Project Name & #: Managed Aquifer Recharge
Email Address: marie.cobb@wwbwc.org
Purchase Order #: MAR-2018-F
Sampler Name & phone: Marie Cobb

Turn Around Time & Reporting

Please refer to our normal turn around times at: http://www.anateklabs.com/services/guidelines/reporting.asp

X Normal
__Next Day*
__2nd Day*
__Other*____

*All rush order requests must be prior approved

__Phone
__Mail
__Fax
__Email

Provide Sample Description

List Analyses Requested

Note Special Instructions/Comments

Lab ID	Sample Identification	Sampling Date/Time PST	Matrix	# of Containers	Sample Volume	Preservative	Copper	Zinc	ammonia-nitrogen	nitrate-nitrite						
-001	GW-144	11-1-18 0648	water	3			✓	✓	✓	✓						
-002	GW-119	11-1-18 0803	water	3			✓	✓	✓	✓						
-003	WQ-3	11-1-18 0830	water	3			✓	✓	✓	✓						
-004	GW-142	11-1-18 0901	water	3			✓	✓	✓	✓						
-005	WQ-4	11-1-18 0917	water	3			✓	✓	✓	✓						
-006	GW-170	11-1-18 0952	water	3			✓	✓	✓	✓						
-006	GW-151	11-1-18 1140	water	3			✓	✓	✓	✓						
-008	GW-151 Dup.	11-1-18 1145	water	3			✓	✓	✓	✓						
-009	GW-171	11-1-18 1346	water	3			✓	✓	✓	✓						

Sample Temps 0704
Tc Ic 0815

	Printed Name	Signature	Company	Date	Time
Relinquished by	Luke Adams	Luke Adams	WWBWC	11-1-18	1400
Received by	Leighann Cornniff	Leighann Cornniff	Anatek	11/2/18	1027
Relinquished by					
Received by					
Relinquished by					
Received by					

Inspection Checklist

Received Intact?	Y	N
Labels & Chains Agree?	Y	N
Containers Sealed?	Y	N
VOC Head Space?	Y	N

WS
Temperature (°C) 5.1 1.3
Preservative:
Date & Time:
Inspected By:

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Walla Walla, Washington 99362
1-509-525-3370
www.unibestinc.com

Requested by: WWBWC
Point of Contact: Marie Cobb
Email: marie.cobb@WWBWC.org
#REF! Milton Freewater
#REF! OR
Sample Location: Various
Day Soak: 7 Day

Collected by: Marie Cobb
Analized by: Ivan Rosumny Jr
Report Date: 11/12/2018
Sample Date: 10/30-10/31/2018

All results are in ppm in extracted solution.
Samples were extraced with 50ml, 2M HCl.

Bar Code	Sample Location	#	Depth	Total N	NO3-N	NH4-N	Al	B	Ca	Cu	Fe	K	Mg	Mn	Na	P	S	Zn
2080844	6W_160	0	12	4.69	0	4.69	0.45	0.02	5.18	0	0.04	2.49	1.97	0	2.67	0.06	10.4	0
#2080814	6W_152	#0	12	5.55	1.49	4.06	0.42	0.02	13.55	0.00	0.03	3.40	5.27	0.00	7.25	0.04	11.36	0.00
#2080593	WQ-5	#0	12	4.55	0.00	4.55	0.39	0.02	3.69	0.00	0.04	1.95	1.40	0.00	2.35	0.04	9.80	0.00
#2080757	6W_169	#0	12	4.89	0.35	4.54	0.74	0.01	8.56	0.00	0.03	2.63	3.22	0.00	5.05	0.06	10.47	0.00
#2080610	6w_141	#0	12	5.72	0.17	5.55	0.55	0.01	6.24	0.00	0.04	2.86	2.48	0.00	3.96	0.05	9.94	0.00
#2080557	WQ-1	#0	12	3.35	0.00	3.35	0.78	0.05	4.38	0.00	0.05	1.86	1.48	0.00	2.30	0.03	8.91	0.00
#2081495	WQ-2	#0	12	5.17	0.00	5.17	0.58	0.05	4.20	0.00	0.05	1.74	1.41	0.00	2.24	0.04	9.71	0.00
#2080839	6W_46	#0	12	4.20	0.00	4.20	0.37	0.01	3.96	0.00	0.03	2.23	1.57	0.00	2.34	0.04	9.90	0.00
#2080847	6W_117	#0	12	3.97	0.74	3.23	0.49	0.01	8.07	0.00	0.03	3.09	3.10	0.00	3.95	0.05	9.33	0.00

UNIBEST International, LLC does not warrant the accuracy, reliability, or completeness of information contained within this report. Data (ppm) derived from UNIBEST Resin System Analytical Processes present the total amount of available nutrients under conditions where ion movement is non-limiting. Data may not represent actual in-field conditions for every system (based upon sampling methods, sampling depth, regional geologic features, or other environmental factors), but provides the maximum level of available nutrients for the sample. Information presented in this publication is based on data available at the date of issuance, and without independent verification. Readers are solely responsible for assessing the relevance, accuracy, and use of the content. UNIBEST will not responsible for, or held liable for any

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A Division of UNIBEST International

Unibest International LLC
115 West Main Street
Walla Walla, Washington 99362
1-509-525-3370
www.unibestinc.com

Requested by: WWBWC
Point of Contact: Marie Cobb
Email: marie.cobb@WWBWC.org
#REF! Milton Freewater
#REF! OR
Sample Location: Various
Day Soak: 7 Day

Collected by: Marie Cobb
Analized by: Ivan Rosumny Jr
Report Date: 11/12/2018
Sample Date: 11/1-11/2/2018

All results are in ppm in extracted solution.
Samples were extraced with 50ml, 2M HCl.

Bar Code	Sample Location	#	Depth	Total N	NO3-N	NH4-N	Al	B	Ca	Cu	Fe	K	Mg	Mn	Na	P	S	Zn
2080823	GW_119	0	8	8.18	3.08	5.10	0.43	0.02	20.91	0	0.1	6.42	8.34	0	13.78	0.1	13.05	0
#2080819	GW_144	#0	8	12.75	7.26	5.49	0.76	0.05	21.90	0.00	0.04	6.85	8.27	0.00	14.66	0.09	13.42	0.00
#2080830	GW_151	#0	8	10.11	5.03	5.08	0.42	0.01	14.82	0.00	0.05	4.27	5.37	0.00	5.54	0.06	12.49	0.00
#2081535	GW_151 (D)	#0	8	8.89	4.95	3.94	1.17	0.12	16.45	0.00	0.07	3.78	5.55	0.00	5.34	0.06	12.05	0.00
#2080620	GW_171	#0	8	6.09	2.19	3.90	0.36	0.01	15.85	0.00	0.10	4.38	6.10	0.00	6.03	0.06	11.72	0.00
#2081468	WQ_4	#0	8	4.58	0.00	4.58	0.46	0.03	4.07	0.00	0.05	1.67	1.41	0.00	2.30	0.04	9.68	0.00
#2081500	GW_170	#0	8	5.07	1.03	4.04	0.43	0.03	9.70	0.00	0.04	3.16	3.49	0.00	4.66	0.06	11.56	0.00
#2080848	GW_142	#0	8	4.78	0.93	3.85	0.51	0.01	8.25	0.00	0.05	2.91	2.96	0.00	3.63	0.06	10.54	0.00
#2080845	WQ_3	#0	8	3.96	0.00	3.96	0.63	0.01	3.97	0.00	0.05	1.74	1.43	0.00	2.40	0.04	9.69	0.00

UNIBEST International, LLC does not warrant the accuracy, reliability, or completeness of information contained within this report. Data (ppm) derived from UNIBEST Resin System Analytical Processes present the total amount of available nutrients under conditions where ion movement is non-limiting. Data may not represent actual in-field conditions for every system (based upon sampling methods, sampling depth, regional geologic features, or other environmental factors), but provides the maximum level of available nutrients for the sample. Information presented in this publication is based on data available at the date of issuance, and without independent verification. Readers are solely responsible for assessing the relevance, accuracy, and use of the content. UNIBEST will not responsible for, or held liable for any

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Walla Walla Basin Watershed Council
810 S. Main Street
Milton-Freewater, OR 97862

Report Number: P190873
Report Date: June 07, 2019
Client Project ID: [none]

Analytical Report

Client Sample ID: GW.144
Matrix: water

PAL Sample ID: P190873-01
Sample Date: 5/22/19
Received Date: 5/23/19

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Modified EPA 8270D (GC-MS/MS)					
5/29/19	6/1/19	Chlorpyrifos	ND	0.060 ug/L	
5/29/19	6/1/19	Malathion	ND	0.060 ug/L	
Method: Modified EPA 8321B (LC-MS/MS)					
5/29/19	5/31/19	Azinphos-methyl	ND	0.12 ug/L	
5/29/19	5/31/19	DCPMU	ND	0.060 ug/L	
5/29/19	5/31/19	Diuron	ND	0.060 ug/L	

Surrogate Recovery: 98 %
Surrogate Recovery Range: 61-129
(TPP-d15 used as Surrogate)

Client Sample ID: GW.171
Matrix: water

PAL Sample ID: P190873-02
Sample Date: 5/22/19
Received Date: 5/23/19

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Modified EPA 8270D (GC-MS/MS)					
5/29/19	6/1/19	Chlorpyrifos	ND	0.060 ug/L	
5/29/19	6/1/19	Malathion	ND	0.060 ug/L	
Method: Modified EPA 8321B (LC-MS/MS)					
5/29/19	5/31/19	Azinphos-methyl	ND	0.12 ug/L	
5/29/19	5/31/19	DCPMU	ND	0.060 ug/L	
5/29/19	5/31/19	Diuron	ND	0.060 ug/L	

Surrogate Recovery: 99 %
Surrogate Recovery Range: 61-129
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

This analytical report complies with the ISO/IEC 17025:2017 Quality Standard.

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Walla Walla Basin Watershed Council
810 S. Main Street
Milton-Freewater, OR 97862

Report Number: P190873
Report Date: June 07, 2019
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
5/29/19	5/31/19	9052903-BLK1	Azinphos-methyl	Not Detected	< 0.12 ug/L	
5/29/19	6/1/19	9052903-BLK1	Chlorpyrifos	Not Detected	< 0.060 ug/L	
5/29/19	5/31/19	9052903-BLK1	DCPMU	Not Detected	< 0.060 ug/L	
5/29/19	5/31/19	9052903-BLK1	Diuron	Not Detected	< 0.060 ug/L	
5/29/19	6/1/19	9052903-BLK1	Malathion	Not Detected	< 0.060 ug/L	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
5/29/19	5/31/19	9052903-BS1	Azinphos-methyl	97	78-114	
5/29/19	5/31/19	9052903-BSD1	Azinphos-methyl	101	78-114	
5/29/19	6/1/19	9052903-BS1	Chlorpyrifos	110	65-128	
5/29/19	6/1/19	9052903-BSD1	Chlorpyrifos	105	65-128	
5/29/19	5/31/19	9052903-BS1	Diuron	101	67-119	
5/29/19	5/31/19	9052903-BSD1	Diuron	105	67-119	
5/29/19	6/1/19	9052903-BS1	Malathion	124	43-157	
5/29/19	6/1/19	9052903-BSD1	Malathion	113	43-157	

Rick Jordan, Laboratory Manager

This analytical report complies with the ISO/IEC 17025:2017 Quality Standard.

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190523006
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190523006-001 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-117 **Sampling Time** 1:55 PM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	ND	mg/L	0.001	5/29/2019 5:29:00 PM	ETL	EPA 200.8	
NO3/N	8.48	mg/L	0.1	5/23/2019 10:34:00 PM	ANG	EPA 300.0	
Zinc	0.00838	mg/L	0.001	5/29/2019 5:29:00 PM	ETL	EPA 200.8	

Sample Number 190523006-002 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-170 **Sampling Time** 10:47 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	ND	mg/L	0.001	5/29/2019 5:32:00 PM	ETL	EPA 200.8	
NO3/N	2.56	mg/L	0.1	5/23/2019 9:51:00 PM	ANG	EPA 300.0	
Zinc	0.00530	mg/L	0.001	5/29/2019 5:32:00 PM	ETL	EPA 200.8	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190523006
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190523006-003 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-119 **Sampling Time** 10:00 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	ND	mg/L	0.001	5/29/2019 5:51:00 PM	ETL	EPA 200.8	
NO3/N	11.4	mg/L	1	5/23/2019 9:08:00 PM	ANG	EPA 300.0	
Zinc	0.00624	mg/L	0.001	5/29/2019 5:51:00 PM	ETL	EPA 200.8	

Sample Number 190523006-004 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-144 **Sampling Time** 9:15 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	0.00410	mg/L	0.001	5/29/2019 5:53:00 PM	ETL	EPA 200.8	
NO3/N	14.0	mg/L	1	5/23/2019 7:42:00 PM	ANG	EPA 300.0	
Zinc	0.00647	mg/L	0.001	5/29/2019 5:53:00 PM	ETL	EPA 200.8	

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190523006
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190523006-005 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID WQ-3 **Sampling Time** 8:40 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	0.00209	mg/L	0.001	5/29/2019 5:56:00 PM	ETL	EPA 200.8	
NO3/N	0.116	mg/L	0.1	5/23/2019 7:20:00 PM	ANG	EPA 300.0	
Zinc	0.00535	mg/L	0.001	5/29/2019 5:56:00 PM	ETL	EPA 200.8	

Sample Number 190523006-006 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-171 **Sampling Time** 8:12 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	0.00118	mg/L	0.001	5/29/2019 5:59:00 PM	ETL	EPA 200.8	
NO3/N	5.66	mg/L	0.1	5/23/2019 6:59:00 PM	ANG	EPA 300.0	
Zinc	0.00665	mg/L	0.001	5/29/2019 5:59:00 PM	ETL	EPA 200.8	

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190523006
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190523006-007 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID GW-151 **Sampling Time** 7:25 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	ND	mg/L	0.001	5/29/2019 6:02:00 PM	ETL	EPA 200.8	
NO3/N	6.21	mg/L	0.1	5/23/2019 6:38:00 PM	ANG	EPA 300.0	
Zinc	0.00467	mg/L	0.001	5/29/2019 6:02:00 PM	ETL	EPA 200.8	

Sample Number 190523006-008 **Sampling Date** 5/22/2019 **Date/Time Received** 5/23/2019 10:30 AM
Client Sample ID WQ-4 **Sampling Time** 2:11 PM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	0.00181	mg/L	0.001	5/29/2019 6:04:00 PM	ETL	EPA 200.8	
NO3/N	ND	mg/L	0.1	5/23/2019 10:55:00 PM	ANG	EPA 300.0	
Zinc	0.0108	mg/L	0.001	5/29/2019 6:04:00 PM	ETL	EPA 200.8	

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190523006
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190523006-009
Client Sample ID GW-142
Matrix Drinking Water
Comments

Sampling Date 5/22/2019
Sampling Time 1:25 PM

Date/Time Received 5/23/2019 10:30 AM

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/24/2019 11:00:00 AM	MER	SM4500NH3G	
Copper	ND	mg/L	0.001	5/29/2019 6:07:00 PM	ETL	EPA 200.8	
NO3/N	1.55	mg/L	0.1	5/23/2019 10:12:00 PM	ANG	EPA 300.0	
Zinc	0.00840	mg/L	0.001	5/29/2019 6:07:00 PM	ETL	EPA 200.8	

Authorized Signature

Todd Taruscio, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

This report shall not be reproduced except in full, without the written approval of the laboratory.
The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

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Login Report

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190523006
Order Date: 5/23/2019

Contact Name:
Comment:

Project Name: NO3/CU/ZN/NH3

Sample #: 190523006-001 **Customer Sample #:** GW-117

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 1:55 PM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-002 **Customer Sample #:** GW-170

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 10:47 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-003 **Customer Sample #:** GW-119

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 10:00 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190523006
Order Date: 5/23/2019

Contact Name:
Comment:

Project Name: NO3/CU/ZN/NH3

NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-004 **Customer Sample #:** GW-144

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/22/2019
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM **Time Collected:** 9:15 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-005 **Customer Sample #:** WQ-3

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/22/2019
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM **Time Collected:** 8:40 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-006 **Customer Sample #:** GW-171

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/22/2019
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM **Time Collected:** 8:12 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190523006
Order Date: 5/23/2019

Contact Name:

Project Name: NO3/CU/ZN/NH3

Comment:

Sample #: 190523006-007 **Customer Sample #:** GW-151

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 7:25 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-008 **Customer Sample #:** WQ-4

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 2:11 PM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Sample #: 190523006-009 **Customer Sample #:** GW-142

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/23/2019 10:30:00 AM
Comment:

Date Collected: 5/22/2019
Time Collected: 1:25 PM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/5/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/5/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/5/2019	***Normal (~10 Days)***

Customer Name:	WALLA WALLA BASIN WATERSHED COUNCIL			**Order ID:**	190523006
	810 S. MAIN RD			**Order Date:**	5/23/2019
	MILTON-FREEWATER	OR	97862		
Contact Name:				**Project Name:**	NO3/CU/ZN/NH3
Comment:					

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	5.1
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes
Total number of containers?	36

Anatek Labs, Inc.

Sample Receipt and Preservation Form

190523 006 WWBW Last Due 6/5/2019
1st SAMP 5/22/2019 1st RCVD 5/23/2019
NO3/CU/ZN/NH3

Client Name: WWBW Project:

TAT: (Normal) RUSH: _____ days

Samples Received From: FedEx (UPS) USPS Client Courier Other: _____

Custody Seal on Cooler/Box: Yes (No) Custody Seals Intact: Yes No (N/A)

Number of Coolers/Boxes: 1 Type of Ice: (Ice/Ice Packs) (Blue Ice) Dry Ice None

Packing Material: (Bubble Wrap) Bags Foam/Peanuts None Other: air pockets

Cooler Temp As Read (°C): 5.1 Cooler Temp Corrected (°C): 5.1 Thermometer Used: 183

				Comments:
Samples Received Intact?	(Yes)	No	N/A	
Chain of Custody Present?	(Yes)	No	N/A	
Samples Received Within Hold Time?	(Yes)	No	N/A	
Samples Properly Preserved?	(Yes)	No	N/A	
VOC Vials Free of Headspace (<6mm)?	Yes	No	(N/A)	
VOC Trip Blanks Present?	Yes	No	(N/A)	
Labels and Chains Agree?	(Yes)	No	N/A	
Total Number of Sample Bottles Received: 36				

Chain of Custody Fully Completed?	(Yes)	No	N/A	
Correct Containers Received?	(Yes)	No	N/A	
Anatek Bottles Used?	(Yes)	No	Unknown	

Record preservatives (and lot numbers, if known) for containers below:

H_2SO_4 (1905) - NH_3

Notes, comments, etc. (also use this space if contacting the client - record names and date/time)

Received/Inspected By: Melanie Dove Date/Time: 5/23/19 1037

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190524021
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190524021-001 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID WQ-5 **Sampling Time** 9:35 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 4:33:00 PM	HSW	EPA 200.8	
NO3/N	ND	mg/L	0.1	5/24/2019 4:31:00 PM	MER	EPA 300.0	
Zinc	0.00598	mg/L	0.001	6/4/2019 3:43:00 PM	HSW	EPA 200.8	

Sample Number 190524021-002 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID GW-152 **Sampling Time** 10:00 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	0.0440	mg/L	0.01	6/3/2019 1:27:00 PM	HSW	EPA 200.8	
NO3/N	2.80	mg/L	0.1	5/24/2019 9:10:00 PM	MER	EPA 300.0	
Zinc	0.136	mg/L	0.01	6/3/2019 1:27:00 PM	HSW	EPA 200.8	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190524021
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190524021-003 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID GW-46 **Sampling Time** 9:15 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 4:36:00 PM	HSW	EPA 200.8	
NO3/N	0.216	mg/L	0.1	5/24/2019 9:32:00 PM	MER	EPA 300.0	
Zinc	0.00873	mg/L	0.001	6/4/2019 3:46:00 PM	HSW	EPA 200.8	

Sample Number 190524021-004 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID WQ-2 **Sampling Time** 8:47 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 4:39:00 PM	HSW	EPA 200.8	
NO3/N	ND	mg/L	0.1	5/24/2019 9:53:00 PM	MER	EPA 300.0	
Zinc	0.00764	mg/L	0.001	6/4/2019 3:48:00 PM	HSW	EPA 200.8	

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190524021
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190524021-005 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID GW-169 **Sampling Time** 8:30 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	0.0124	mg/L	0.001	6/3/2019 1:44:00 PM	HSW	EPA 200.8	
NO3/N	0.533	mg/L	0.1	5/24/2019 10:15:00 PM	MER	EPA 300.0	
Zinc	0.0558	mg/L	0.001	6/3/2019 1:44:00 PM	HSW	EPA 200.8	

Sample Number 190524021-006 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID WQ-1 **Sampling Time** 7:50 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 5:07:00 PM	HSW	EPA 200.8	
NO3/N	ND	mg/L	0.1	5/24/2019 10:36:00 PM	MER	EPA 300.0	
Zinc	0.00845	mg/L	0.001	6/4/2019 4:07:00 PM	HSW	EPA 200.8	

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Client: WALLA WALLA BASIN WATERSHED COUNCIL
Address: 810 S. MAIN RD
MILTON-FREEWATER, OR 97862
Attn:

Batch #: 190524021
Project Name: NO3/CU/ZN/NH3

Analytical Results Report

Sample Number 190524021-007 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID GW-141 DUPLICATE **Sampling Time** 7:37 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 5:10:00 PM	HSW	EPA 200.8	
NO3/N	1.87	mg/L	0.1	5/24/2019 10:58:00 PM	MER	EPA 300.0	
Zinc	0.00952	mg/L	0.001	6/4/2019 4:10:00 PM	HSW	EPA 200.8	

Sample Number 190524021-008 **Sampling Date** 5/23/2019 **Date/Time Received** 5/24/2019 10:29 AM
Client Sample ID GW-141 **Sampling Time** 7:37 AM
Matrix Drinking Water
Comments

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	0.00140	mg/L	0.001	5/31/2019 5:17:00 PM	HSW	EPA 200.8	
NO3/N	1.85	mg/L	0.1	5/24/2019 11:19:00 PM	MER	EPA 300.0	
Zinc	0.00824	mg/L	0.001	6/4/2019 4:18:00 PM	HSW	EPA 200.8	

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Client:	WALLA WALLA BASIN WATERSHED COUNCIL	**Batch #:**	190524021
Address:	810 S. MAIN RD	**Project Name:**	NO3/CU/ZN/NH3
	MILTON-FREEWATER, OR 97862		
Attn:			

Analytical Results Report

Sample Number	190524021-009	**Sampling Date**	5/23/2019	**Date/Time Received**	5/24/2019 10:29 AM
Client Sample ID	GW-160	**Sampling Time**	10:40 AM		
Matrix	Drinking Water				
Comments					

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
NH3-N	ND	mg/L	0.05	5/30/2019 11:00:00 AM	BKP	SM4500NH3G	
Copper	ND	mg/L	0.001	5/31/2019 5:20:00 PM	HSW	EPA 200.8	
NO3/N	3.78	mg/L	0.1	5/24/2019 11:41:00 PM	MER	EPA 300.0	
Zinc	0.00690	mg/L	0.001	6/4/2019 4:21:00 PM	HSW	EPA 200.8	

Authorized Signature

Todd Taruscio, Lab Manager

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013;NV:ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

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Login Report

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190524021
Order Date: 5/24/2019

Contact Name:

Project Name: NO3/CU/ZN/NH3

Comment:

Sample #: 190524021-001 **Customer Sample #:** WQ-5

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM
Comment:

Date Collected: 5/23/2019
Time Collected: 9:35 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-002 **Customer Sample #:** GW-152

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM
Comment:

Date Collected: 5/23/2019
Time Collected: 10:00 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-003 **Customer Sample #:** GW-46

Recv'd: ☑ **Matrix:** Drinking Water **Collector:**
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM
Comment:

Date Collected: 5/23/2019
Time Collected: 9:15 AM

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190524021
Order Date: 5/24/2019

Contact Name:

Project Name: NO3/CU/ZN/NH3

Comment:

NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-004 **Customer Sample #:** WQ-2

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 8:47 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-005 **Customer Sample #:** GW-169

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 8:30 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-006 **Customer Sample #:** WQ-1

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 7:50 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Customer Name: WALLA WALLA BASIN WATERSHED COUNCIL
810 S. MAIN RD
MILTON-FREEWATER OR 97862

Order ID: 190524021
Order Date: 5/24/2019

Contact Name:

Project Name: NO3/CU/ZN/NH3

Comment:

Sample #: 190524021-007 **Customer Sample #:** GW-141 DUPLICATE

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 7:37 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-008 **Customer Sample #:** GW-141

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 7:37 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Sample #: 190524021-009 **Customer Sample #:** GW-160

Recv'd: ☑ **Matrix:** Drinking Water **Collector:** **Date Collected:** 5/23/2019
Quantity: 4 **Date Received:** 5/24/2019 10:29:00 AM **Time Collected:** 10:40 AM
Comment:

Test	Lab	Method	Due Date	Priority
AMMONIA-NITROGEN	M	SM4500NH3G	6/6/2019	***Normal (~10 Days)***
COPPER	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***
NITRATE/N	M	EPA 300.0	6/6/2019	***Normal (~10 Days)***
ZINC	M	EPA 200.8	6/6/2019	***Normal (~10 Days)***

Customer Name:	WALLA WALLA BASIN WATERSHED COUNCIL	**Order ID:**	190524021
	810 S. MAIN RD	**Order Date:**	5/24/2019
	MILTON-FREEWATER OR 97862		
Contact Name:		**Project Name:**	NO3/CU/ZN/NH3
Comment:			

SAMPLE CONDITION RECORD

Samples received in a cooler?	Yes
Samples received intact?	Yes
What is the temperature of the sample(s)? (°C)	3.3
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all sample bottles properly preserved?	Yes
Are VOC samples free of headspace?	N/A
Is there a trip blank to accompany VOC samples?	N/A
Labels and chain agree?	Yes
Total number of containers?	36

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Sample Receipt and Preservation Form

190524 021 WWBW Last Due 6/6/2019
1st SAMP 5/23/2019 1st RCVD 5/24/2019
NO3/CU/ZN/NH3

Client Name: WWBW Project:

TAT: (Normal) RUSH: _____ days

Samples Received From: FedEx (UPS) USPS Client Courier Other: _____

Custody Seal on Cooler/Box: Yes (No) Custody Seals Intact: Yes No (N/A)

Number of Coolers/Boxes: 1 Type of Ice: (Ice/Ice Packs) Blue Ice Dry Ice None

Packing Material: Bubble Wrap Bags (Foam Peanuts) None Other: _____

Cooler Temp As Read (°C): 3.3 Cooler Temp Corrected (°C): 3.3 Thermometer Used: IR3

				Comments:
Samples Received Intact?	(Yes)	No	N/A	
Chain of Custody Present?	(Yes)	No	N/A	
Samples Received Within Hold Time?	(Yes)	No	N/A	
Samples Properly Preserved?	(Yes)	No	N/A	
VOC Vials Free of Headspace (<6mm)?	Yes	No	(N/A)	
VOC Trip Blanks Present?	Yes	No	(N/A)	
Labels and Chains Agree?	(Yes)	No	N/A	
Total Number of Sample Bottles Received: 36				

Chain of Custody Fully Completed?	(Yes)	No	N/A	
Correct Containers Received?	(Yes)	No	N/A	
Anatek Bottles Used?	(Yes)	No	Unknown	

Record preservatives (and lot numbers, if known) for containers below:

H_2SO_4 (1905) - NH_3

Notes, comments, etc. (also use this space if contacting the client - record names and date/time)

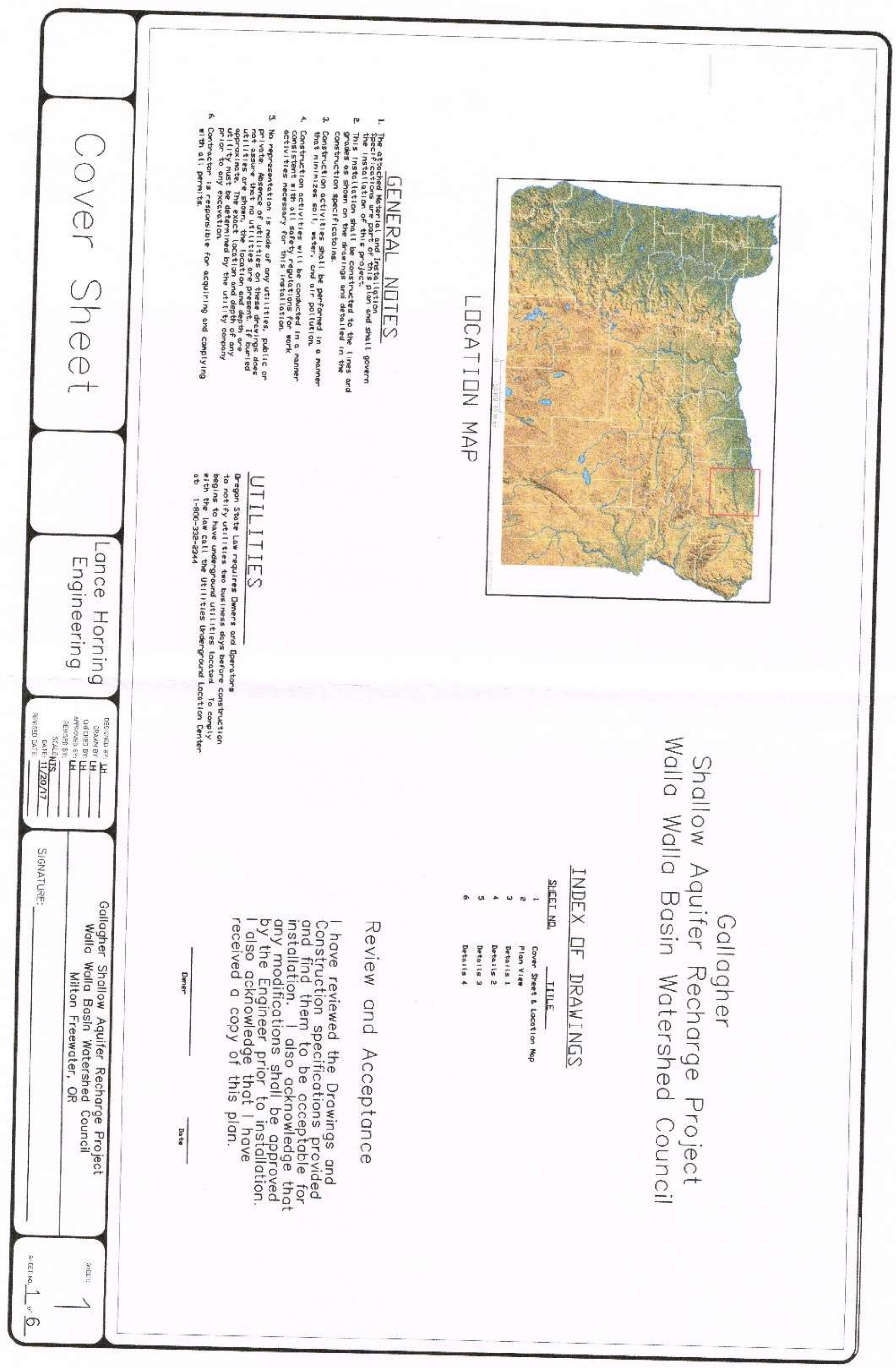
Received/Inspected By: Melanie Clare Date/Time: 5/24/19 1035

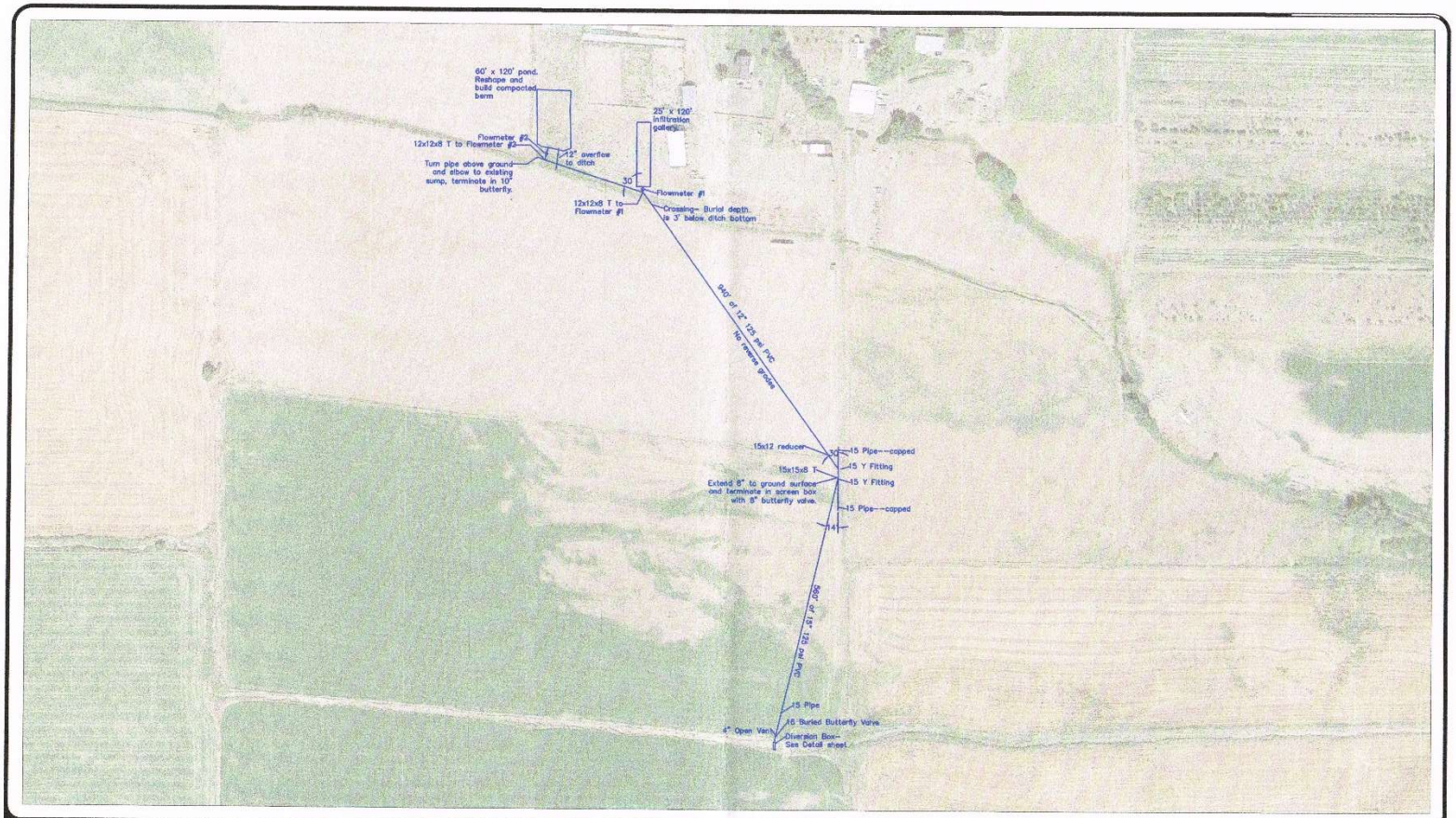
Form F19.00 - Eff 8 Feb 2019

Page 1 of 1

APPENDIX C - ENGINEERING DESIGNS

Gallagher Site





Plan View

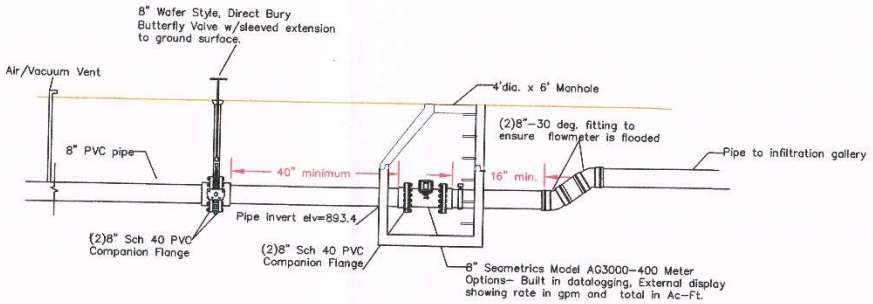
Lance Horning Engineering

DESIGNED BY: LH
DRAWN BY: LH
CHECKED BY: LH
APPROVED BY: LH
REVISED BY:
SCALE: NTS
DATE: 11/20/17
REVISED DATE:

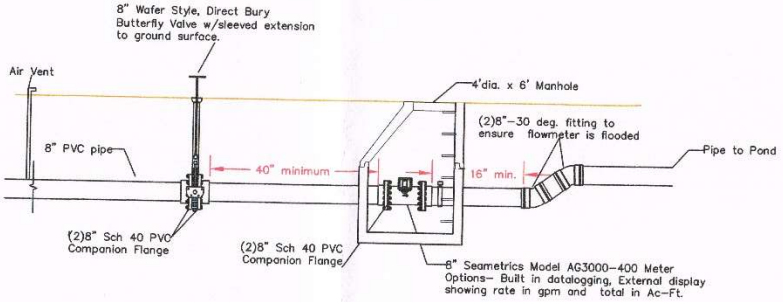
Gallagher Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE:

SHEET: 2
SHEET NO. 2 OF 6



Flowmeter #1



Flowmeter #2

Details 1

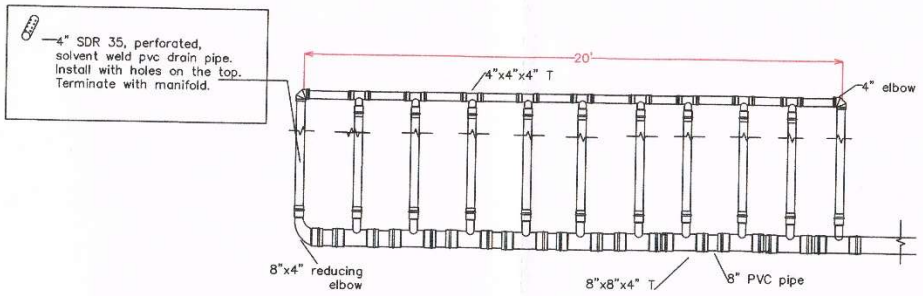
Lance Horning Engineering

DESIGNED BY: J.H.
DRAWN BY: J.H.
CHECKED BY: J.H.
APPROVED BY: J.H.
REVISED BY:
SCALE: NTS
DATE: 11/20/17
REVISED DATE:

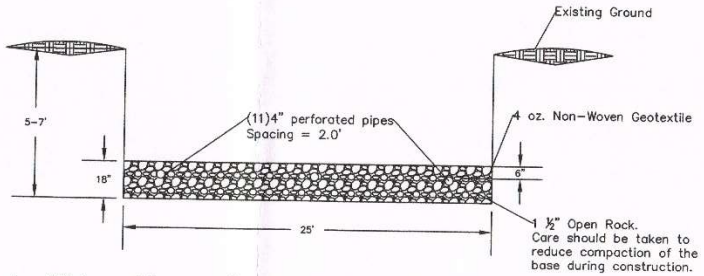
Gallagher Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE:

SHEET: 3
SHEET NO. 3 OF 6



Infiltration Gallery Manifold



Infiltration Gallery– Section View

Details 2

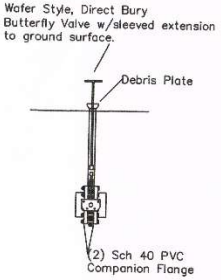
Lance Horning Engineering

DESIGNED BY: LH
DRAWN BY: LH
CHECKED BY: LH
APPROVED BY: LH
REVISED BY:
SCALE: NTS
DATE: 11/20/17
REVISED DATE:

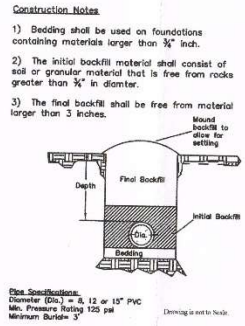
Gallagher Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE:

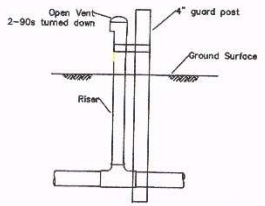
SHEET: 4
SHEET NO. 4 OF 6



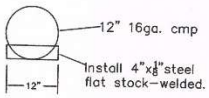
Butterfly Valve



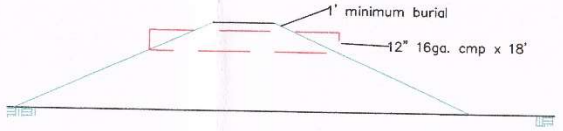
Trench Detail



Air Vent



Overflow Culvert with Weir



Overflow- Section View

Details 3

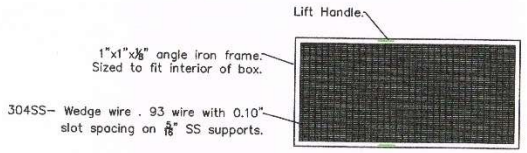
Lance Horning Engineering

DESIGNED BY: LH
DRAWN BY: LH
CHECKED BY: LH
APPROVED BY: LH
REVISED BY:
SCALE: NTS
DATE: 11/20/17
REVISED DATE:

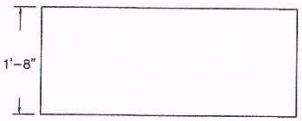
Gallagher Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE:

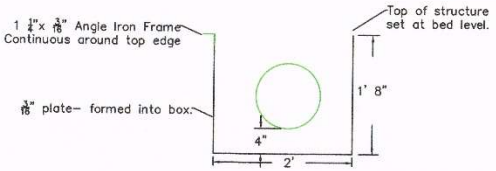
SHEET: 5
SHEET NO. 5 OF 6



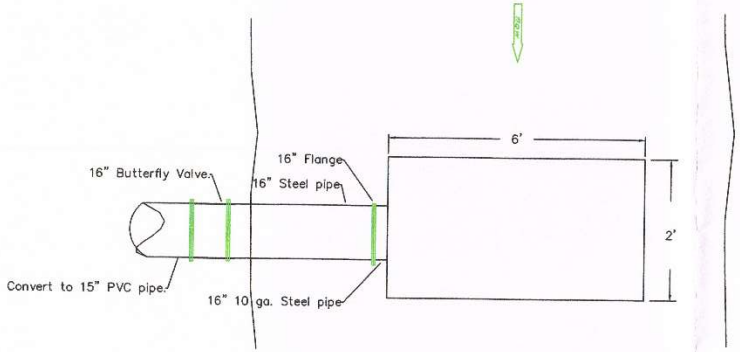
Screen



Intake Box– Section



Intake Box– Section



Intake Box– Plan

Notes

Intake Box shall be cleaned and painted with 2 coats of paint.

Diversion Box

Lance Horning Engineering

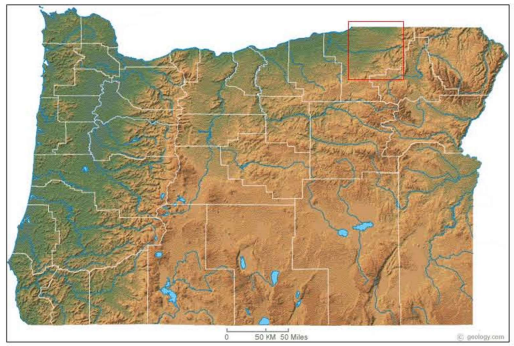
DESIGNED BY: LH
DRAWN BY: LH
CHECKED BY: LH
APPROVED BY: LH
REVISED BY:
SCALE: NTS
DATE: 11/20/17
REVISED DATE:

Gallagher Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE: _____

SHEET: 6
SHEET NO. 6 OF 6

Ringer Road Site



LOCATION MAP

Ringer Road
Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council

INDEX OF DRAWINGS

SHEET NO.	TITLE
1	Cover Sheet & Location Map
2	Plan View
3	Flowmeter Vault
4	Infiltration Gallery & Manifold
5	Control Structure
6	Details

GENERAL NOTES

1. The attached Material and Installation Specifications are part of this plan and shall govern the installation of this project.
2. This installation shall be constructed to the lines and grades as shown on the drawings and detailed in the construction specificatoins.
3. Construction activities shall be performed in a manner that minimizes soil, water, and air pollution.
4. Construction activities will be conducted in a manner consistent with all safety regulations for work activities necessary for this installation.
5. No representation is made of any utilities, public or private. Absence of utilities on these drawings does not assure that no utilities are present. If buried utilities are shown, the location and depth are approximate. The exact location and depth of any utility must be determined by the utility company prior to any excavation.
6. Contractor is responsible for acquiring and complying with all permits.

UTILITIES

Oregon State Law requires Owners and Operators to notify utilities two business days before construction begins to have underground utilities located. To comply with the law call the Utilities Underground Location Center at: 1-800-332-2344

Review and Acceptance

I have reviewed the Drawings and Construction specifications provided and find them to be acceptable for installation. I also acknowledge that any modifications shall be approved by the Engineer prior to installation. I also acknowledge that I have received a copy of this plan.

Owner _____ Date _____

Cover Sheet
--For Construction--

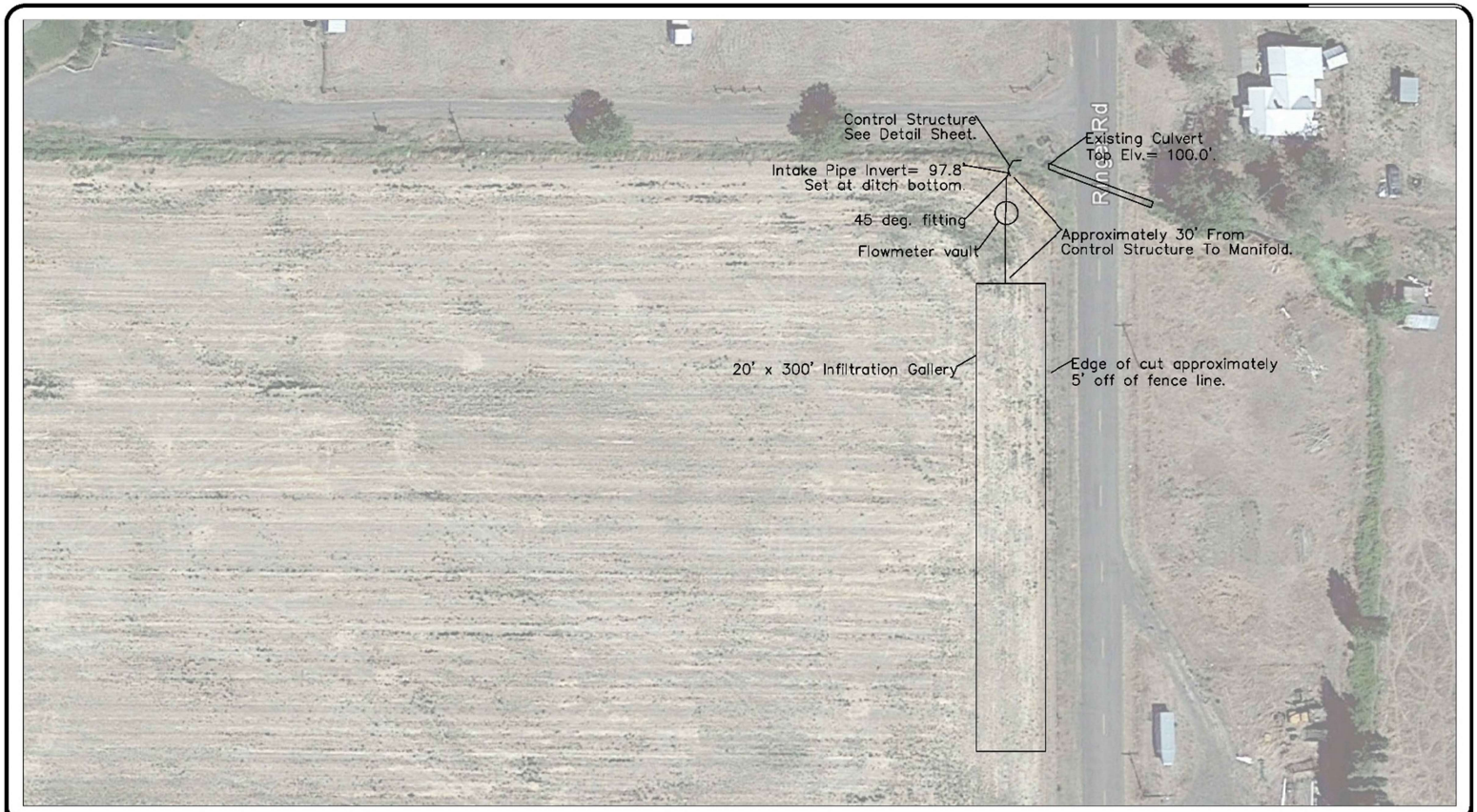
Lance Horning
Engineering
Corvallis, OR 97333

DESIGNED BY: LH
DRAWN BY:
CHECKED BY:
APPROVED BY:
REVISED BY:
SCALE:
DATE: 9/03/18
REVISED DATE: 9/14/18

Ringer Road Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE: _____

SHEET: 1
SHEET NO. 1 OF 6



Plan View

--For Construction--

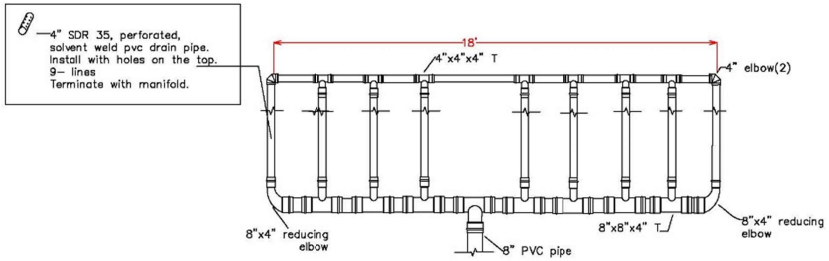
Lance Horning
Engineering
Corvallis, OR 97333

DESIGNED BY: LH
DRAWN BY:
CHECKED BY:
APPROVED BY:
REVISED BY:
SCALE:
DATE: 9/03/18
REVISED DATE: 9/14/18

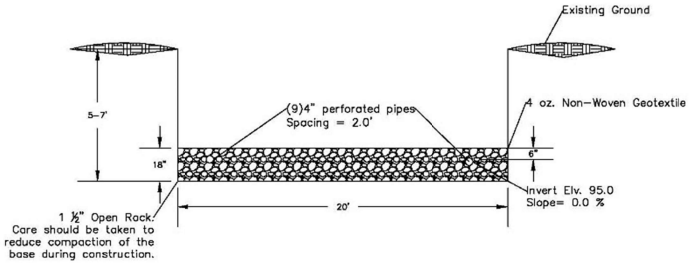
Ringer Road Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE: _____

SHEET 2
SHEET NO. 2 OF 6

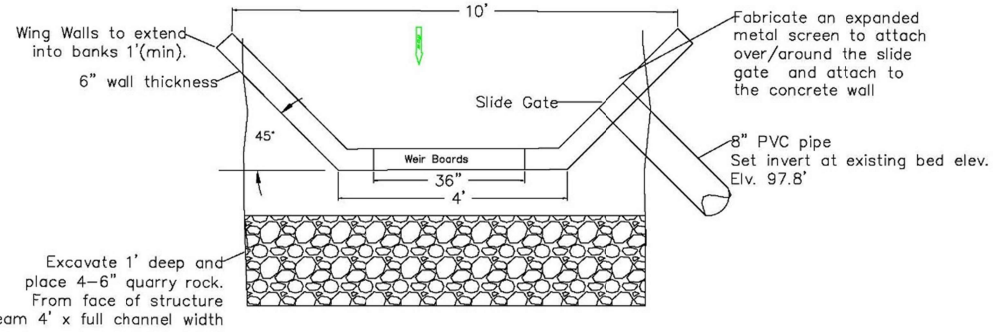


Recharge Manifold



Recharge Area– Trench

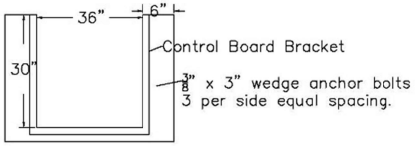
Gallery & Manifold ––For Construction––		Lance Horning Engineering Corvallis, OR 97333	DESIGNED BY: LH DRAWN BY: CHECKED BY: APPROVED BY: REVISED BY: SCALE: DATE: 9/03/18 REVISED DATE: 9/14/18	Ringer Road Shallow Aquifer Recharge Project Walla Walla Basin Watershed Council Milton Freewater, OR SIGNATURE:	SHEET: 4 SHEET NO. 4 OF 6



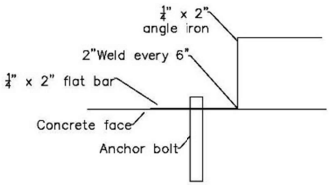
Notes–
#4 Rebar 12" OCBW in wall.
2– #4 Rebar continuous in footing.
2" clearance to all surfaces.

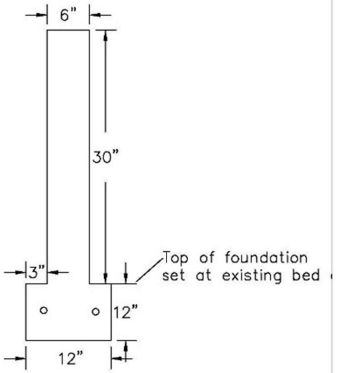
All exposed metal to be painted with 2 coats of enamel paint.

Control Structure– Plan View



Control Board Section

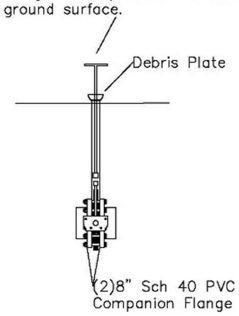




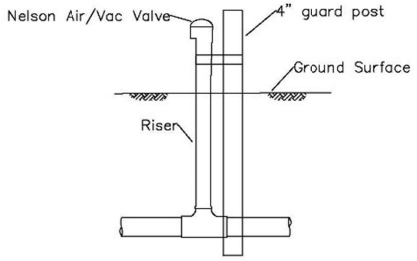
Section View

Control Structure --For Construction--	Lance Horning Engineering Corvallis, OR 97333	DESIGNED BY: LH DRAWN BY: CHECKED BY: APPROVED BY: REVISED BY: SCALE: DATE: 9/03/18 REVISED DATE: 9/14/18	Ringer Road Shallow Aquifer Recharge Project Walla Walla Basin Watershed Council Milton Freewater, OR SIGNATURE:	SHEET: 5 SHEET NO. 5 OF 6

8" Wafer Style, Direct Bury
Butterfly Valve w/sleeved extension
to ground surface.



Butterfly Valve



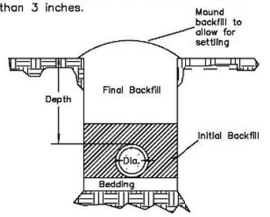
Air Vent

Construction Notes

1) Bedding shall be used on foundations containing materials larger than ¾" inch.

2) The initial backfill material shall consist of soil or granular material that is free from rocks greater than ¾" in diamter.

3) The final backfill shall be free from material larger than 3 inches.



Pipe Specifications:
Diameter (Dia.) = 8" PVC
Min. Pressure Rating 80 psi
Minimum Burial= 3'

Drawing is not to Scale.

Trench Detail

Details
--For Construction--

Lance Horning
Engineering
Corvallis, OR 97333

DESIGNED BY: LH
DRAWN BY:
CHECKED BY:
APPROVED BY:
REVISED BY:
SCALE:
DATE: 9/03/18
REVISED DATE: 9/14/18

Ringer Road Shallow Aquifer Recharge Project
Walla Walla Basin Watershed Council
Milton Freewater, OR

SIGNATURE: _____

SHEET: 6
SHEET NO. 6 OF 6