

Walla Walla Basin Seasonal Seepage Assessments Report

Walla Walla River, Mill Creek, and Touchet River



Walla Walla Basin Watershed Council
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www.wwbwc.org



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Background

The Walla Walla River watershed is a bi-state watershed that originates in Oregon and passes through the state of Washington on route to its confluence with the Columbia River (Figure 1). As in many watersheds in the Western United States, the Walla Walla River basin's water quality and endangered species issues are heavily influenced by the timing, availability, quality, and quantity of water originating from both surface and ground sources. The more obvious issue, seasonal variation in supply (winter-spring = higher flows, summer-fall = lower flows), is well documented in readily available annual hydrographs and continuous flow data. Historically, there's been a lack of understanding of how the Walla Walla River and its tributaries stream discharge vary spatially relative to: water use, groundwater inputs, evaporation, irrigation returns, and tributary inputs. From the near-pristine headwaters of the Walla Walla River, Mill Creek, and Touchet River in the Blue Mountains to near the confluence with the Columbia River (Nine Mile Bridge) variations in environmental conditions help shape the various flow profiles within the watershed.

Walla Walla River

The Walla Walla River originates from mountain springs on the western slope of the Blue Mountains in the southeastern part of watershed. The South Fork Walla Walla River, which is the continuation of the mainstem, and the North Fork Walla Walla River originate at an altitude of about 5,000 feet. Both the North Fork and South Fork Walla Walla Rivers flow westward through narrow canyons, and their gradients decrease from the upper reaches to their confluence. At the town of Milton-Freewater the Walla Walla River flows across its alluvial deposits at a gradient of about 50 feet per mile. Near the city of Walla Walla the river is joined by Yellowhawk Creek, East Little Walla Walla River, and by Mill Creek. The river channel grows deeper, and the gradient decreases to about 25 feet per mile in the lower valley, where three major tributaries Pine Creek, Dry Creek, and the Touchet River discharge into the Walla Walla River. Backwater effects on the Columbia River from McNary Dam extend close to 9 miles upstream (below Pierce's RV Park monitoring site) from the mouth of the Walla Walla River.

Mill Creek

Mill Creek originates in the Blue Mountains to the east of the city of Walla Walla at an approximate altitude of 5,000 feet within a closed municipal watershed. The creek flows through narrow canyons to the Walla Walla Valley. The largest Mill Creek tributary is Blue Creek, which originates in the Blue Mountain Front Range at an approximate altitude of 3,000 feet. The largest diversion on Mill Creek is located at the Mill Creek Dam diversion 3 miles east of the city of Walla Walla. The site is a flood control site in which water can be diverted out of Mill Creek and stored in Bennington Lake during flood events. The stored flood water can be released as regulated flow into Russell Creek which flows into Yellowhawk Creek and out to the confluence with the Walla Walla River. Just downstream of the Mill Creek Dam flow is diverted into Yellowhawk and



Upper South Fork Walla Walla River Springs

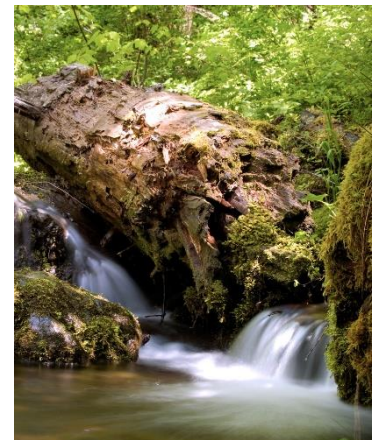


Photo: 2 Upper Mill Creek

Garrison Creeks for use in irrigation, Near Walla Walla, Mill Creek forms several distributary channels which flow across alluvial deposits to the Walla Walla River. The Mill Creek sub-watershed drains approximately 6% of the Walla Walla River Watershed.

Touchet River

The Touchet River is the largest tributary to the Walla Walla River. The Touchet sub-watershed drains approximately 44% of the Walla Walla River Watershed. It originates in the northeastern part of the basin by the combination of several creeks and streams that drain the northern Blue Mountains. The South and North Forks Touchet River originate at altitudes between 4000-5000 feet. The North Fork is considered the upper basin extension of the Touchet River. The North Fork flows to its confluence with South Fork, just above the town of Dayton. The majority of the tributaries that flow into the Touchet River do so above the town of Waitsburg.

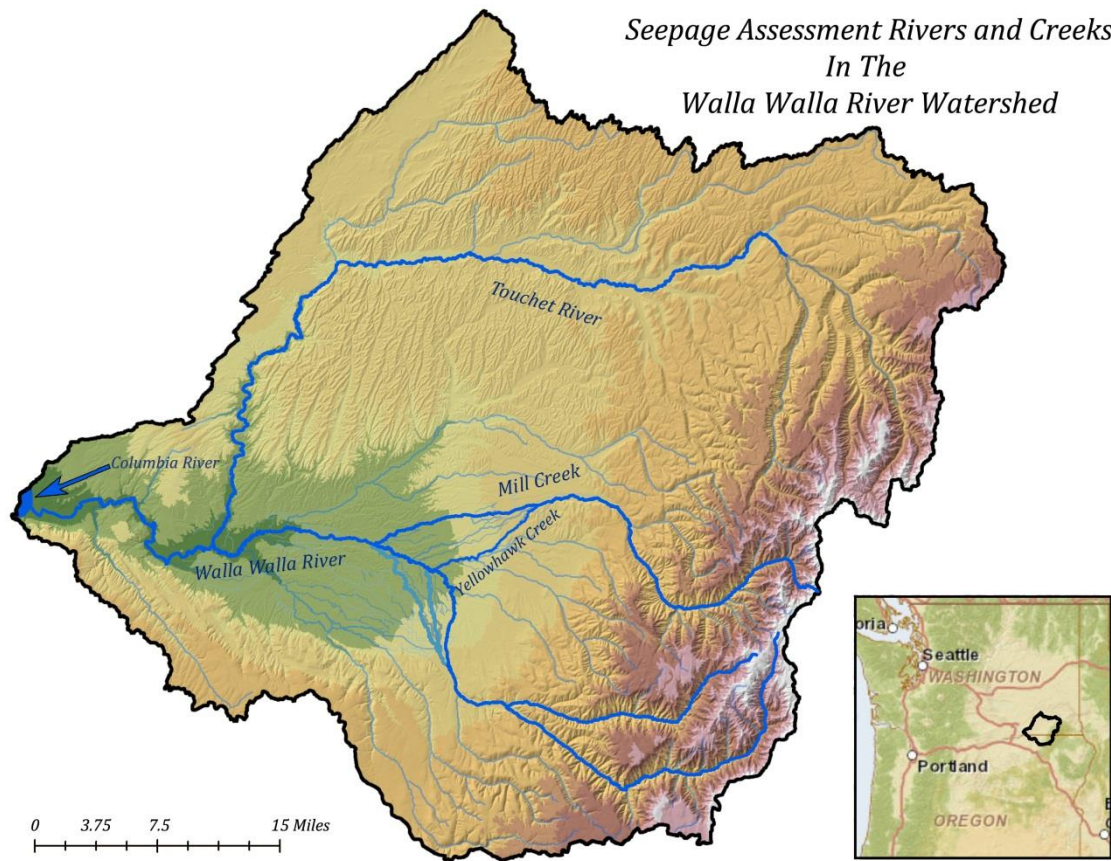


Figure 1: Map of the Walla Walla Watershed showing the Walla Walla River, Touchet River, Mill Creek, and Yellowhawk Creek.

Starting in 2002, WWBWC staff, state and federal agency personnel, and volunteers from Washington and Oregon began conducting seasonal instream flow, diversion inventories, and tributary flow surveys termed “seepage assessments” as a primary first step toward quantifying the spatial variation in water volume for the Walla Walla River. Since 2002 the WWBWC has conducted seasonal seepage assessments on the Walla Walla River. In 2008 seasonal assessments were added on Mill Creek and the Touchet River. Seepage assessments, at first, were conducted in two primary seasons of concern; June, when ESA-listed fish species are moving from the lower to upper watershed to either spawn or rear for the summer months and, August to September, when Clean Water Act water quality issues and low flow volumes are at their most critical levels. This report shares the data collected

from these bi-state cooperative seepage assessments. The focus of the analysis presented in this report is to quantify the channel bed gains and losses for the Walla Walla River, Touchet River, and Mill Creek.

Methodology

Data Collection and Quality

Seepage assessments were typically completed over a 48-hour period with most of the measurements taken during the first 24-hour period. The WWBWC Watershed Monitoring Program Standard Operating Procedures (SOP) outlines the protocols for cross-sectional measurements used by the WWBWC to collect the instream flow data.¹

Data was recorded using a variety of flow methods including hand and spreadsheet calculations. Diversion measurements were made using a variety of methods including: “weir stick” (used in conjunction with a particular weir’s rating table), flow-rate meters on pumps or diversions, estimate of rate of diversion using sprinkler-head-counting method and on the larger diversions continuous flow recorders. Most diversion sites were recorded by direct measurement using weirs, meters and/or flow meters. Tributary inputs were calculated using instream flow measurements or data from the gauge station closest to the confluence of the tributary and the Walla Walla River. At each gauge the average daily flow was used to represent flow for the site.



While not directly relevant to the analysis shared in this report, each field team also collected additional parameters such as (1) channel and riparian photographs, (2) temperature (F), (3) specific conductivity (uS) (4) cross-sectional channel profile (wetted width and depths in feet). This information is available upon request from the Walla Walla Basin Watershed Council. Data collected by all project partners was individually compiled by each of the collection agencies and then organized and analyzed by the WWBWC.

The data for all of the seepage assessments for the Walla Walla River, Touchet River, Mill Creek, and Yellowhawk Creek can be found in *Attachments A and B*. Data sets include site identification or name, the digitized river mile², instream flow, and diversion and tributary quantities. The analysis and discussion sections of this report will review the data and identify areas of net gains and losses and discuss general trends. However the main objective of this report is to present this dataset for use by our numerous project and policy-planning partners to better manage and monitor instream flows in the Walla Walla Watershed.

Spatial Flow Model

To assess the longitudinal profile for each system, a spatially-oriented model was needed. The National Agriculture Imagery Program (NAIP) 2006 imagery for Walla Walla County, Columbia County, and the Umatilla County was used as a base layer to digitize the project streams. The thalweg for each system was digitized using ESRI ArcMap. The digitized linear feature provided the ability to break down each system into “GIS river miles”. The diversions, tributaries, and instream flow measuring sites were located by hand held GPS or by identifying the

¹ The WWBWC, April 2013. *WWBWC Watershed Monitoring Program Standard Operating Procedures Version 1.2*, Walla Walla Basin Watershed Council

² ESRI ArcGIS software was used to determine the river mile through digitizing the streams from the 2006 basin satellite imagery.

location using the NAIP imagery in ArcMap. Water managers from both Oregon and Washington worked with WWBWC staff to locate all diversions, tributaries and instream flow sites.

Reach Analysis

Analysis was conducted using a simple mass-balance approach assessing water balance values on a reach-by-reach basis. Reaches were defined by the closest upstream and downstream instream flow measurement. All water budget calculations were performed from a given instream flow site upriver to the next nearest instream flow site. The equations for net tributary inputs and diversion withdraws are mass balance of all values in a defined reach. The basic equations for water budget analysis were³:

$$(1) \quad \text{Net Channel Gains and Losses } (N_{GL}) = (\sum (T_R) - \sum (D_R)) + (Q_{DN} - Q_{UP})$$

Where: $\sum (T_R)$ = Sum of all Tributary Inputs for given reach

$\sum (D_R)$ = Sum of all Diversion withdraws for a given reach

Q_{DN} = Flow value at reach's downstream site

Q_{UP} = Flow value at reach's upstream site

Units: cubic-feet-per-second/reach

$$(2) \quad \text{Net Rate of Channel Bed Gains and Losses } (N_{GL-R}) = (N_{GL}) / (RM_{DN} - RM_{UP})$$

Where: (N_{GL}) = Net Channel Gains and Losses for a given reach

RM_{DN} = River Mile at downstream flow site

RM_{UP} = River Mile at upstream flow site

Units: cubic-feet-per-second/mile/reach

Analysis Assumptions

To correctly identify possible gaining or losing trends, general assumptions must be made to identify and quantify immeasurable components of the model. The assumptions that were made as the data was analyzed are listed below.

- Instream, diversion, and tributary flow data are representative of actual conditions for a particular season: Spring, summer, and fall datasets used in conjunction provide a reasonable and representative flow profile for the river for the corresponding season of measurement.
- Spatial model data node (e.g. diversion, instream flow, and tributary) locations are +/- 25 meters of where they were originally. This assumption is likely to have remained true for many of the sites through the entire field

³ Bower, R.J. 2005. Walla Walla River Surface Water Budget Assessment: 2002 to 2004. Walla Walla Basin Watershed Council, www.wwbwc.org

seasons of data collected on the Walla Walla River. In Washington, points of diversion (PODs) can be moved short distances without a formal permitting process while in Oregon moving a POD location is not allowed without POD transfer authorization. In Washington, if a particular POD was known to vary by year, a mid-point was chosen on the respective reach to represent that POD. Because reach analysis based on upstream and downstream instream-measurements, this method seemed applicable.

- Total Instream Net Gains (Total N_{GL}) can only be attributed to accretional⁴ sum of the following sources: groundwater, hyporeic⁵ inflow, surface irrigation returns or “tail water,” and any unmeasured springs and tributaries. Due to the inability to quantify these various sources via direct measurement N_{GL} is assumed to be a compilation of these various processes.
- Total Instream Net Losses (Total N_R) can only be attributed to the sum of the following losses: a) direct surface evaporation from sun and wind, b) evapotranspiration through riparian plant transpiration, and c) channel bed infiltration or net loss to the underlying alluvial aquifer system. Due to the inability to quantify these various sources via direct measurement they are assumed to be implicit to the sum of Net Losses. Net Losses is used here as relative to surface water, it is understood that in a highly connective aquifer-surface system, water is not truly “lost” and may show up further down gradient as net gains to the river.
- All surface diversions are accounted for in the diversion inventory⁶. The amount of gains and losses relative to the volume of instream flow measurements were assumed to be equal. Although Carter and Anderson assert that a flow measurement made under ideal conditions can have uncertainty as low as 2.2%, conditions at many of the sites measured for these assessments are not ideal⁷. The WWBWC assumes, for the instream flow measurements in this report that accuracy is within (+/-) 10% of the true flow value. This would mean that a 100 cfs measurement would have a confidence range of +/- 10 cfs while a 10 measurement would be +/- 1 cfs. This crude confidence range assumption helps as we analyze and discuss the qualification of river reaches where net gains and losses are apparent as a trend.

⁴ In science, accretion is a process in which the size of something gradually increases by steady addition of smaller parts

⁵ beneath the bed of a stream, where water percolates through interstices between the rocks

⁶ The Assistant Watermaster for the Milton-Freewater area along with the former watermaster for the Walla Walla Valley, Bill Neve of Water Rights Solutions, assisted in the accounting of all diversions on each assessed river, stream, or creek.

⁷ Carter, R. W., and Anderson, I. E., 1963, Accuracy of current-meter measurements: Am. Soc. Civil Engineers Jour., v. 89, no. HY4, p. 105-115.

2016 Results and Discussion

The Walla Walla River seepage assessments have been conducted over the past 14 years through various conditions and seasons. The WWBWC and its agency partners and volunteers began conducting seepage assessments on the Touchet River and Mill Creek systems in the fall of 2008.

2016 Walla Walla River Seepage Assessment

Data was first tabulated into a spreadsheet model and processed for all seepage assessments utilizing the water budget analysis equations (*Attachments A*). Analysis for each reach is applied from the downstream instream flow measurement on that particular line to the next, upriver instream flow site. Each instream location was assigned a Walla Walla River Reach ID and the application of analysis results can be deduced from the designated “Flow Measurement Location (Reach Locations)” column (*Table 1*). Only field-verified data was used for analysis.

Table 1: MS Excel model data table for the July 29, 2016 Walla Walla River seepage run.

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversion Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	1.03	7.40	-0.78	-8.18	0.00	47.70	Gaining
Byerly Bdg to USGS Touchet Gauge	12.88	3.14	10.18	10.18	0.00	0.00	48.48	Gaining
USGS Touchet Gauge to Lowden Rd Bdg	16.12	1.36	16.46	34.98	-5.27	23.78	38.30	Gaining
Lowden Rd Bdg to McDonald Rd Bdg	28.24	-2.33	-5.07	-6.18	-1.11	0.00	3.33	Losing
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-1.90	-6.77	-32.50	-25.73	0.00	9.50	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	-4.01	-4.31	12.93	-0.12	17.36	42.00	Losing
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	-6.93	-10.24	-9.24	0.00	1.00	29.07	Losing
Last Chance Rd Bdg to Beet Rd Bdg	36.52	0.74	1.34	0.01	-1.80	0.47	38.31	Gaining
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-4.01	-2.07	-6.57	-4.50	0.00	38.30	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	-2.84	-3.91	22.47	0.00	26.38	44.87	Losing
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	-0.84	-0.61	-0.61	0.00	0.00	22.40	Losing
Hwy 125 Bdg to Pepper Bdg	40.94	4.78	4.61	4.61	0.00	0.00	23.01	Gaining
Pepper Bdg to M-10	41.90	0.88	0.92	0.84	-0.28	0.20	18.40	Gaining
M-10 to Mauer Lane (M9a)	42.94	0.50	0.41	0.41	0.00	0.00	17.56	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	1.52	1.01	1.01	0.00	0.00	17.15	Gaining
Tum-A-Lum Bdg (M8) to M7	44.43	-3.14	-1.39	-1.39	0.00	0.00	16.14	Losing
M7 to M5	44.87	-9.66	-10.55	-10.43	0.00	0.12	17.53	Losing
M-5 to Nursery Bdg M-4	45.96	-14.91	-9.85	-9.85	0.00	0.00	27.96	Losing
Nursery Bdg M-4 to M3	46.62	-25.77	-16.57	-20.07	-3.50	0.00	37.81	Losing
M3 to M2	47.26	27.64	12.12	-48.88	-61.00	0.00	57.88	Gaining
M2 to M1a Grove School Bdg	47.70	8.16	7.24	3.74	-3.50	0.00	106.76	Gaining
M1a Grove School Bdg to Couese Creek Rd Bdg	48.59	9.73	10.39	10.39	0.00	0.00	103.02	Gaining
Couese Creek Rd Bdg to Day Road	49.66	-6.71	-6.27	-10.07	-3.80	0.00	92.64	Losing
Day Road to Joe West Bdg	50.59	6.17	6.04	6.04	0.00	0.00	102.71	Gaining
Joe West Bdg to South Fork Bdg	51.57	-0.98	-1.61	-3.10	-8.02	6.53	96.67	Losing
South Fork Bdg to CTUIR Hatchery	53.22	0.89	4.65	-1.10	-5.75	0.00	99.77	Gaining
CTUIR Hatchery to Keating	58.44	2.56	8.72	8.41	-0.31	0.00	100.87	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07							
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	92.46	

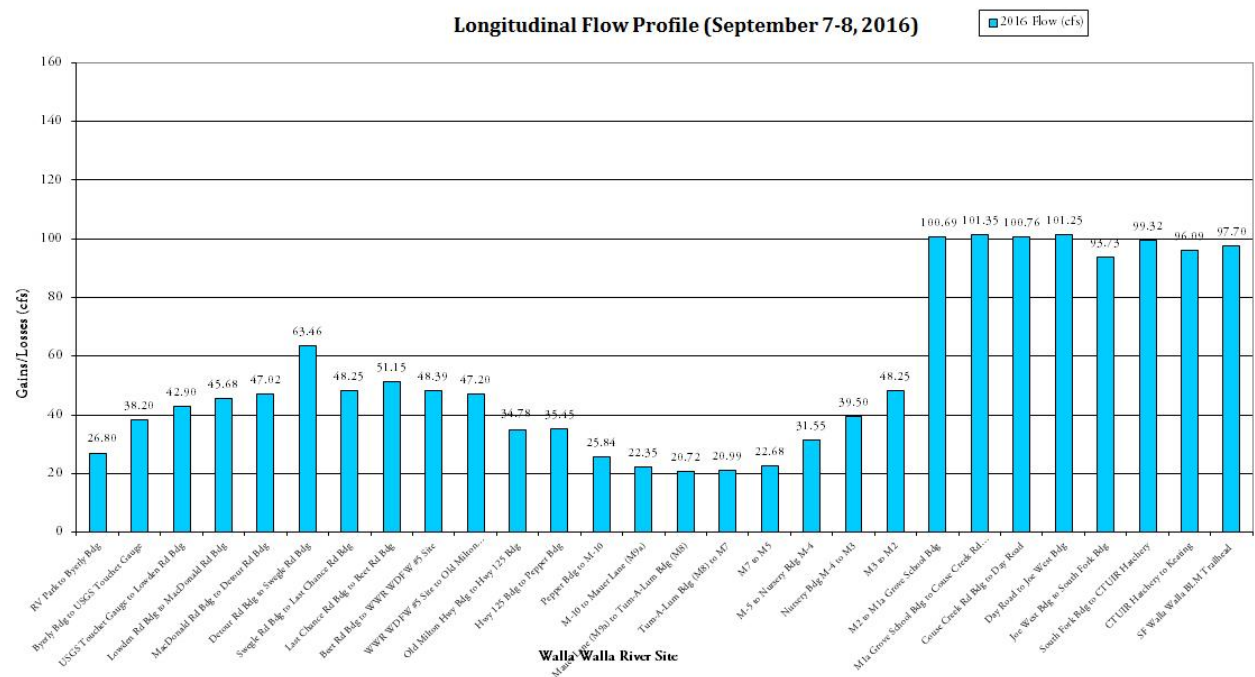
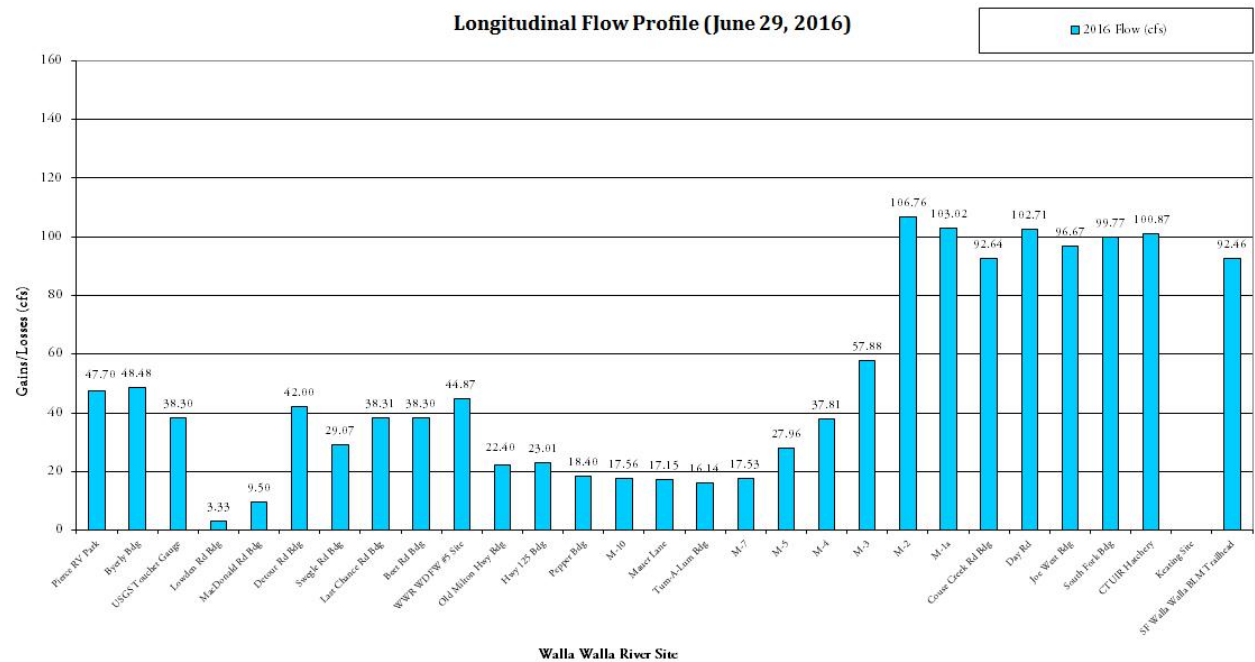


Figure 3 and 4 Walla Walla River Seasonal Flow Profiles 2016

The longitudinal flow profile provides insight of where water is available and/or being used on the Walla Walla River based upon river mile. The most noticeable amount of flow being diverted into the Little Walla Walla River between mile 45 and 50

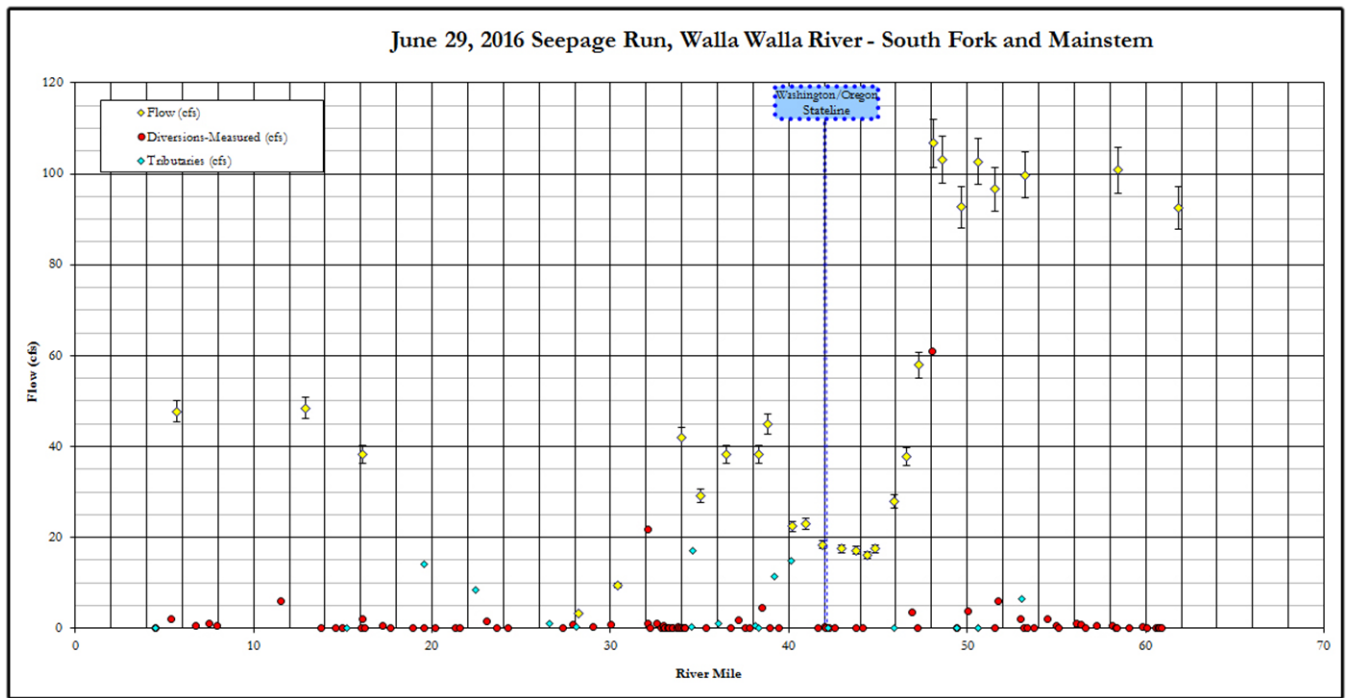


Figure 5: June 29, 2016 Walla Walla River Flow Profile

The results from the 2016 June and September net channel gains and losses (N_{GL}) per reach are documented in figure 6 and figure 7. During the summer of 2016 the Walla Walla River basin experienced normal base flow conditions from the beginning of July through early September. The discharge measurements taken at the McDonald Road Bridge were the lowest recorded discharge values of the June assessment.

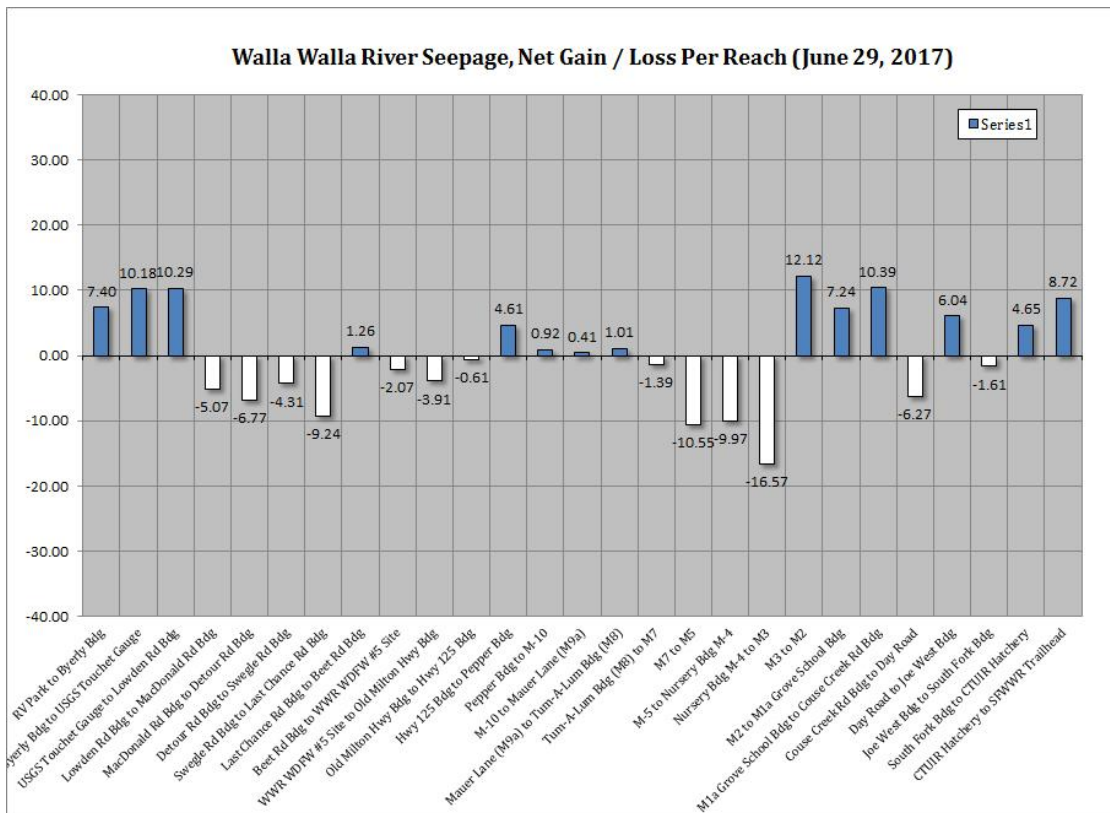


Figure 6: Walla Walla River Net Gain or Loss per Reach, June 29, 2016

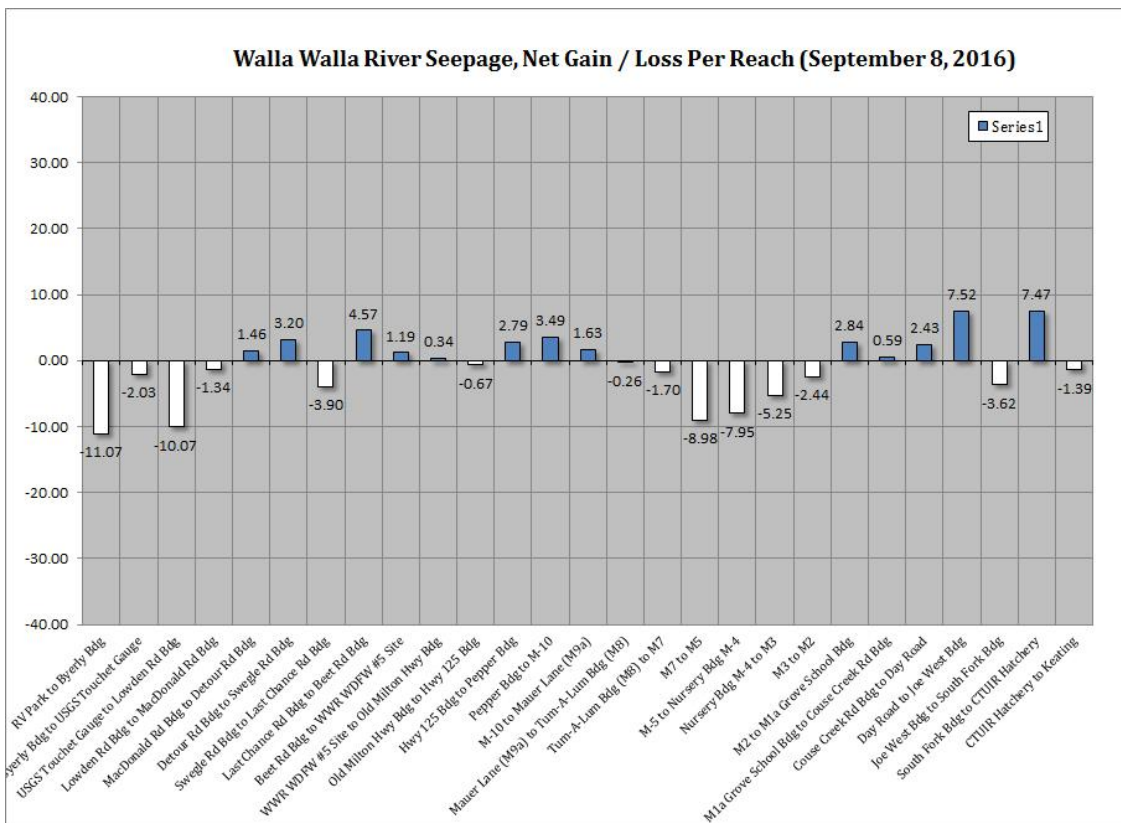


Figure 7: Walla Walla River Net Gain or Loss per Reach, September 8, 2016

Another useful product from this analysis is the net tributary and diversion values associated with each reach of the river. This provides a useful visual tool to assess, relative to instream flow values, the location and magnitude of mainstem flow contributions and identifying the high withdrawal reaches. (Figure 8) Additional Net Reach Analysis graphs for all assessed streams and creeks can be found in Attachment C.

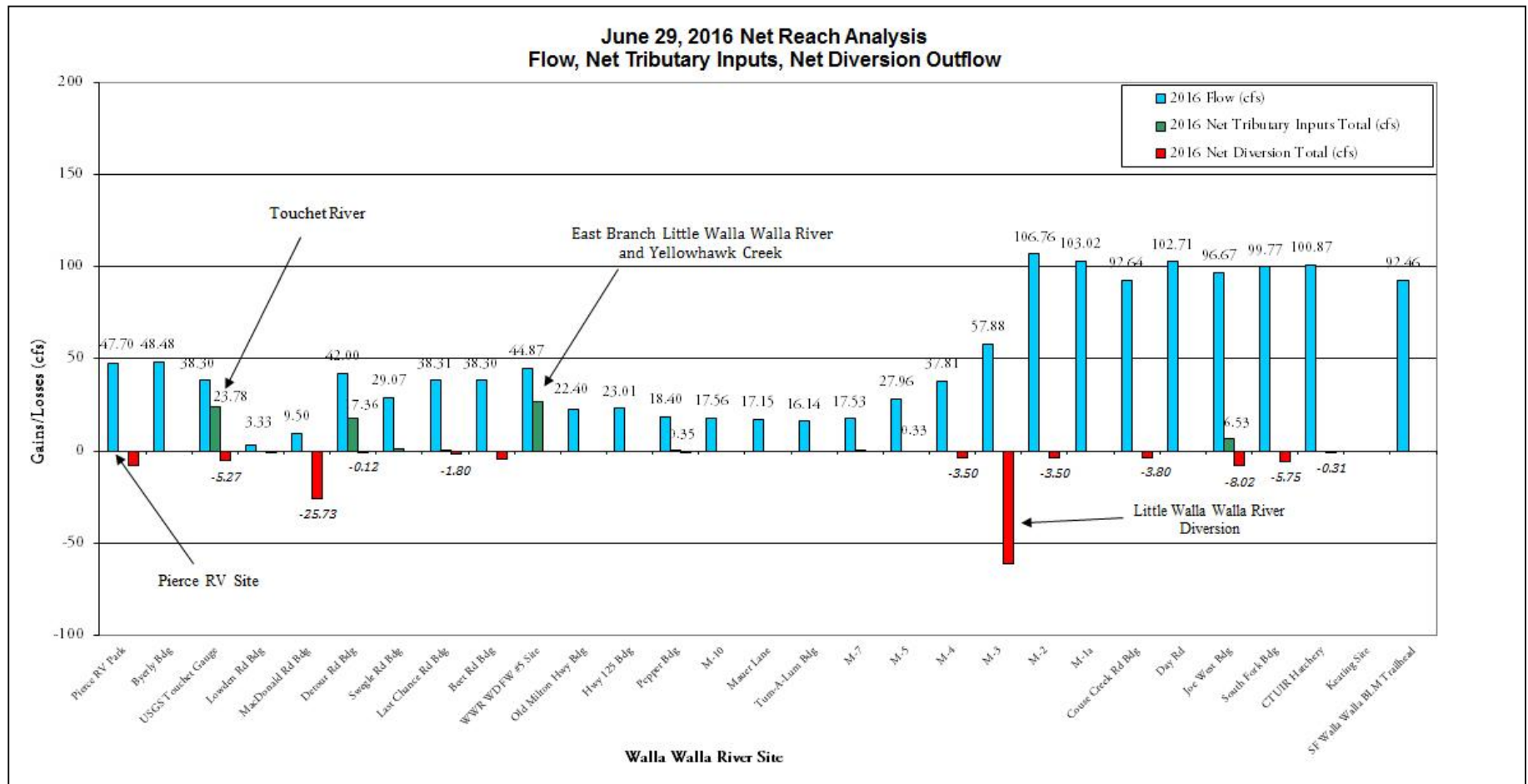


Figure 8: Walla Walla River Net Reach Analysis, June 29, 2016.

Within the Oregon portion of the basin on the Walla Walla River, two upriver sites and the Little Walla Walla River diversion in Milton-Freewater comprise the most visually apparent diversions.

The Little Walla Walla River diversion is in the proximity of where the Walla Walla River historically braided into multiple channels consisting primarily of three main distributaries. (Figure 9) The Tum-A-Lum Branch (now called the mainstem), the East Little Walla Walla River (now named the Crockett Ditch and East Prong of the Little Walla Walla River) and the West Little Walla Walla River (now named the Ford Ditches and West Prong of the Little Walla Walla River).

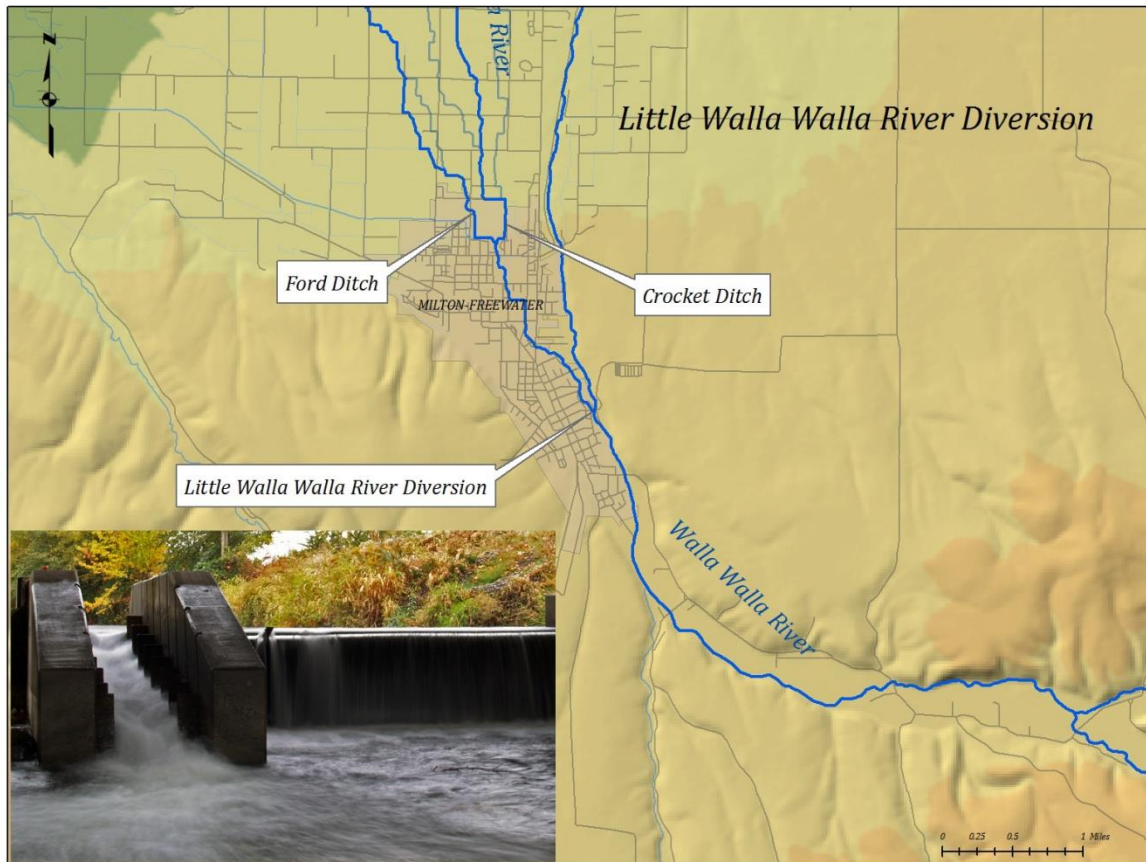


Figure 9: Little Walla Walla Irrigation Diversion at Milton-Freewater

Other distributaries to the west such as Mud, Dry, and Pine Creeks were most likely tied into this distributary system. Many of the historical distributaries west of the mainstem (Tum-A-Lum Branch) were converted into irrigation conveyance systems for hundreds of farms. Because the Little Walla Walla system is currently used mostly for irrigation purposes, it was treated as a diversion for purposes of analysis for the Walla Walla River. It should be noted also that it is generally believed that water lost in this portion of the basin can return to the mainstem Walla Walla River as groundwater and springs (e.g. Big Spring and East Little Walla Walla River flow, and at certain times of year as West Little Walla Walla River flow).

The Walla Walla River after it crosses into Washington State and flows to the Columbia River (Pepper Bridge to the confluence with the Columbia) the major tributary contributions from both the East Branch (Prong)⁸ of the Little Walla Walla River and Yellowhawk Creek help to approximately double or in some years triple the instream flow volumes (Old Milton Highway Bridge, 11.28 cfs, to Walla Walla River (WDFW #5), 22.64 cfs, in July, 2015). The major Washington diversions diverting water out of the Walla Walla River in July appear to be located in the lower section of the river (From the Beet Rd Bridge to MacDonald Road Bridge). Due to the large scale for flow (y-axis) in Figure 8, the smaller point diversions are difficult, if not impossible, to see. A review of the data (*Attachments A-1 through A-22*) does show numerous diversions along most segments of the river.

Water Budget Analysis and Mapping: Channel Bed Gains and Losses

The primary purpose of calculating both the rate and total volumes for net channel gains and losses is to better understand which areas of the river may have groundwater inputs (gains) or channel bed infiltration (losses). This type of information is particularly applicable for the numerous other modeling and research efforts currently underway in the Walla Walla River system⁹. For salmon and bull trout recovery research, the collected data provides spatial reference to potential areas for rearing habitat (groundwater gains provided cool water by volume to gaining reaches while losing reach may indicate thermal or flow barriers). Currently the WWBWC and its partners are studying the relationships between the inflow of groundwater into the Walla Walla River, temperature changes, and fish movements. It also provides valuable information with regard to where ground water from the Little Walla Walla River may reemerge in the Walla Walla River mainstem aside from the more obvious surface tributary sources.

⁸ The source of this tributary water is generally thought to be from springs (primarily from the Big Springs branches and East Prong Little Walla Walla area) located in the Little Walla Walla system that convey ground water returns from the channel bed losses in Oregon's Levee section: Tum-A-Lum Bridge to Grove School Bridge.

Utilizing the simple mass balance equation (*Total Volume of Water Budget = Total Net Gains and Losses + Total Tributary Gains + Total Diversion Losses*) and the total of water exchanged in the designated modeled area from the June 2016 dataset and the 2016 September dataset were further quantified using percent distribution. The percentages of the total volume of water movement in the modeled area relative to distribution are displayed in *figures 10 and 11*. June 2016 results show that Walla Walla River flows from the OWRD gauge on the upper South Fork to Nine Mile Bridge decline from 92.46 cfs to 47.70 cfs. Diversions (60%, 132.87 cfs) comprise of a significant amount of the water budget while the tributary inputs (34%, 75.8 cfs) and the amount of flow lost to the channel bed (6%, 12.3 cfs).

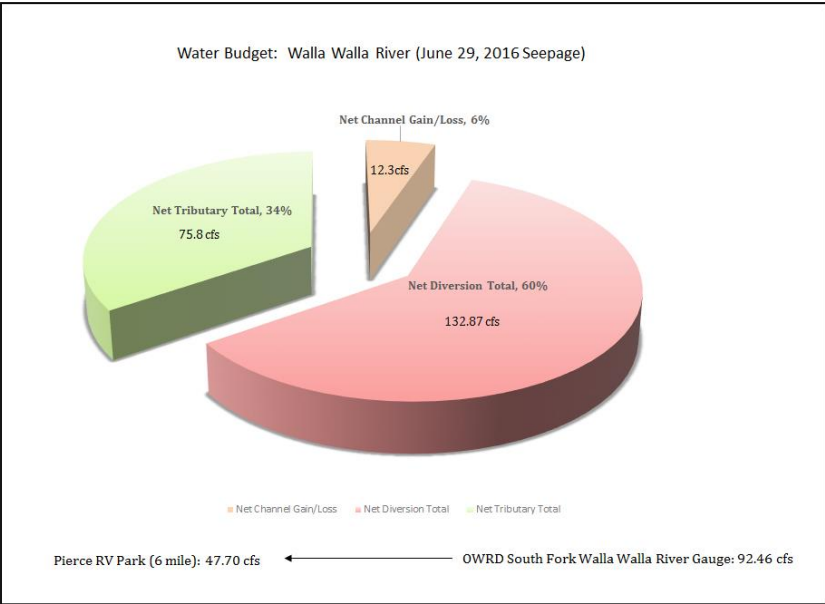


Figure 10: Water Budget June 2016

In September tributary inputs significantly decrease from the June assessment (27%, 46.7 cfs) and instead of a net loss there is a groundwater gains (25%, 32.8 cfs) which combines to make up 59% of the total budget. However, the net diversion total of 54.63 cfs which is 41% percent of the water budget.

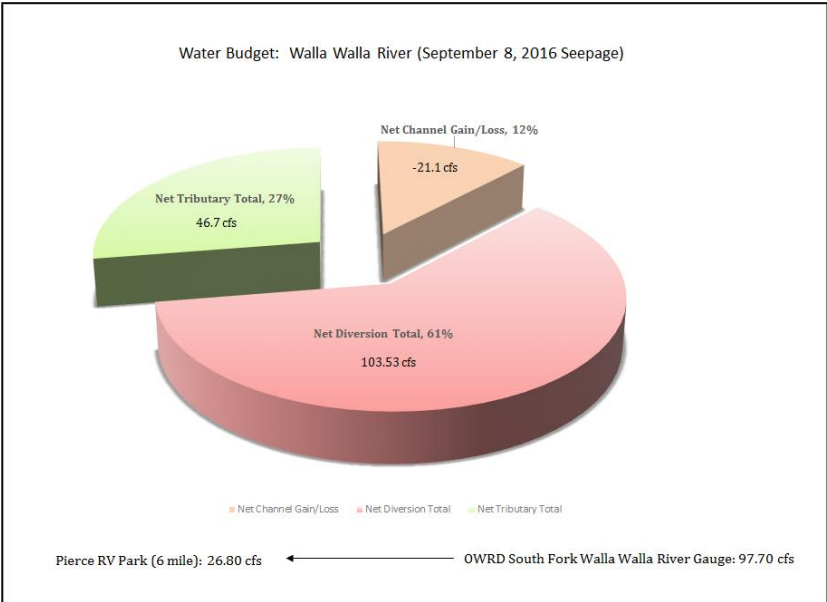


Figure 11: Water Budget Sept. 2016

2016 Mill Creek Seepage Assessment

The seepage assessments on Mill Creek were conducted on June 16 and September 8th of 2016. The WWBWC followed the same procedures discussed in the methodology section. The assessment area begins upstream of the USGS Real-time Gauge Station at the Oregon/Washington Stateline and continues downstream to the confluence with the Walla Walla River (Figure 12). Ten reaches were defined based upon access, proximity to the next reach, and the geomorphology of the system. The thalweg was digitized using ArcMap 10.3 and the digitized layer was transformed into a linear route to break the feature into 25-meter segments. From the 2016 results, Mill Creek has

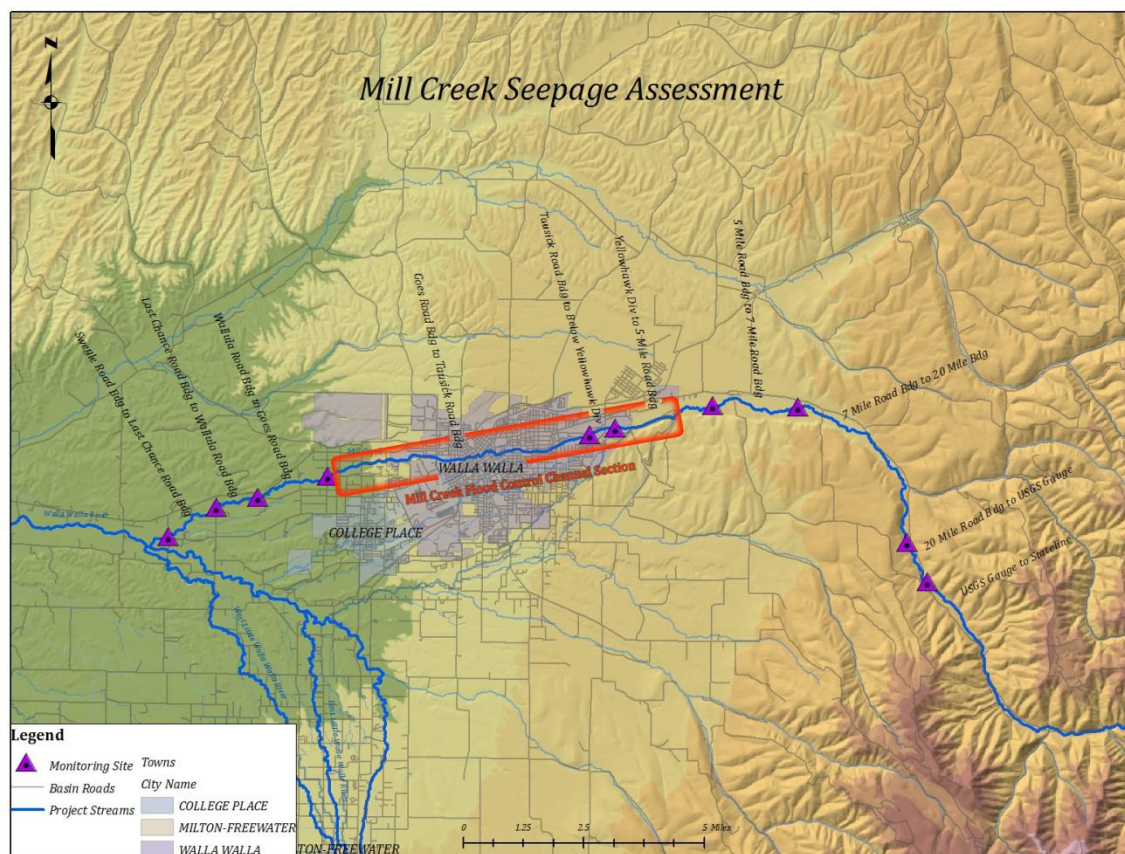


Figure 12: Mill Creek designated project reaches, 2016

a channel bed loss, in early summer, before it enters the concrete section, possibly from the weirs located downstream from the USGS gauge site at the Mill Creek Division which slows the water before it enters into the concrete section. The concrete section continues through the city of Walla Walla then exits back into a natural channel just downstream of Gose Street Bridge. Immediately downstream of the concrete flow control section there is a noticeable channel bed gain from possible return of recharge above the concrete section (Figures 13 and 14).

The gaining and losing reaches for both the June and September on lower Mill Creek were consistent showing little variability while the upper reaches were more variable. There were higher losses in the upper reaches in June compared to the September assessment.

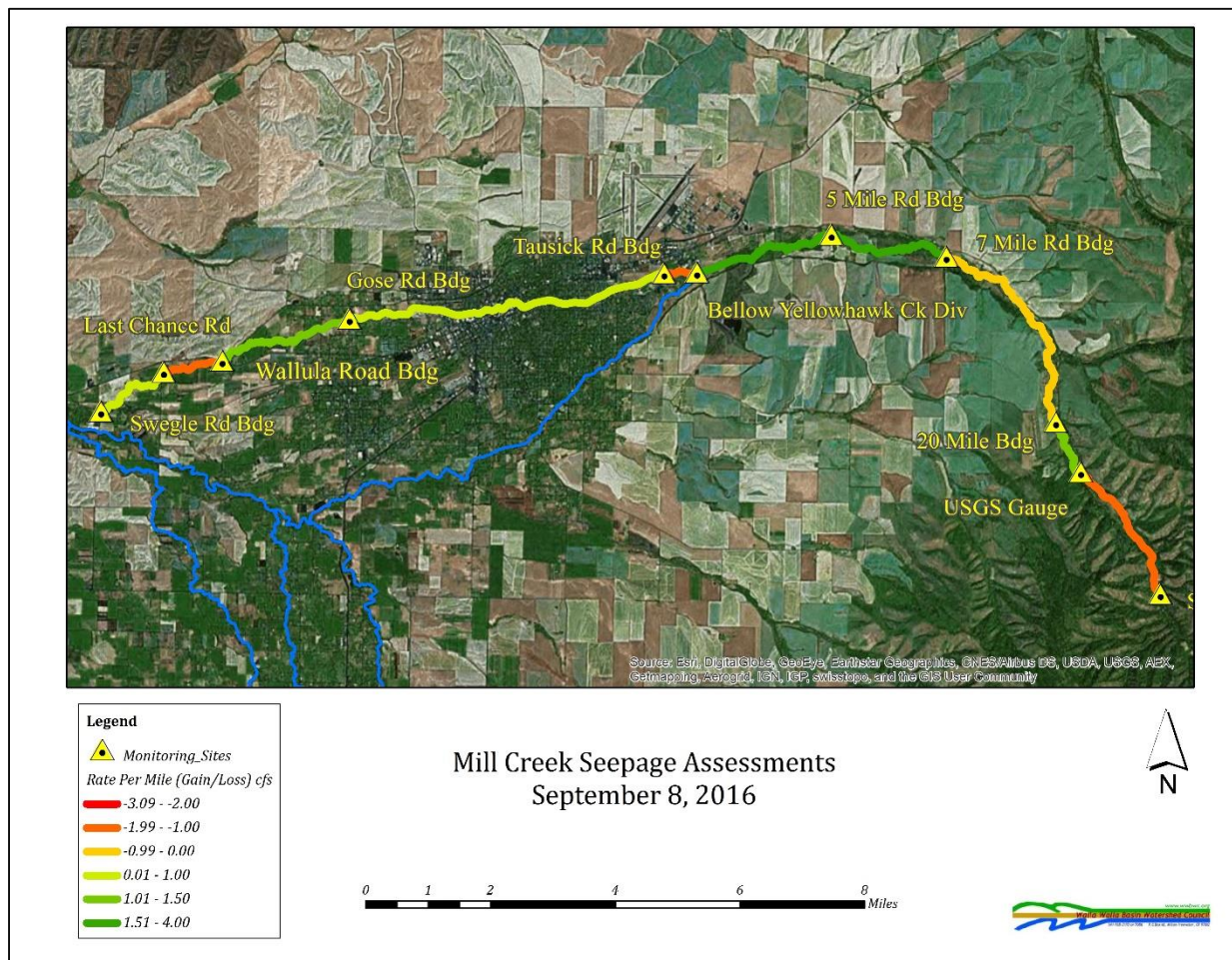


Figure 15: September 8, 2016 Mill Creek Rate Per Mile Gains / Losses per Reach

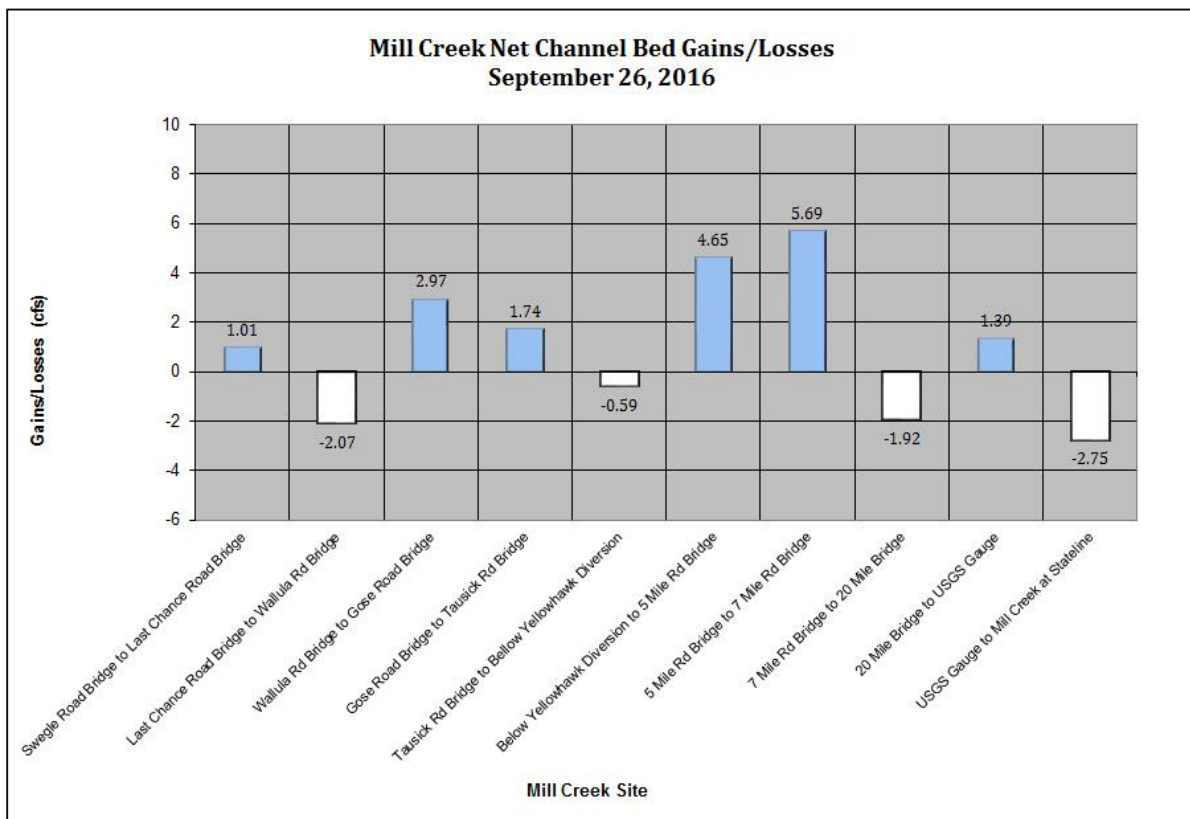


Figure 16: September 8, 2016 Net Gains and Losses per Reach

The datasheets for the two Mill Creek seepage assessments can be found in Attachment B-1.

Utilizing the simple mass balance equation and the total of water exchanged in the designated modeled area from the June 16, 2016 dataset and the September 8, 2016 dataset were further quantified using percent distribution. The percentages of the total volume of water movement in the modeled area relative to distribution are displayed in *figure 17 and figure 18*. June 2016 results show that Mill Creek flows from the Oregon-Washington state line to the confluence with the Walla Walla River decline from 34.33 cfs to 6.33 cfs. Diversions (70%, 35.25 cfs) make up the majority of the water budget while the tributary inputs (20%, 6.2 cfs) and gains from groundwater (10%, 4.4 cfs).

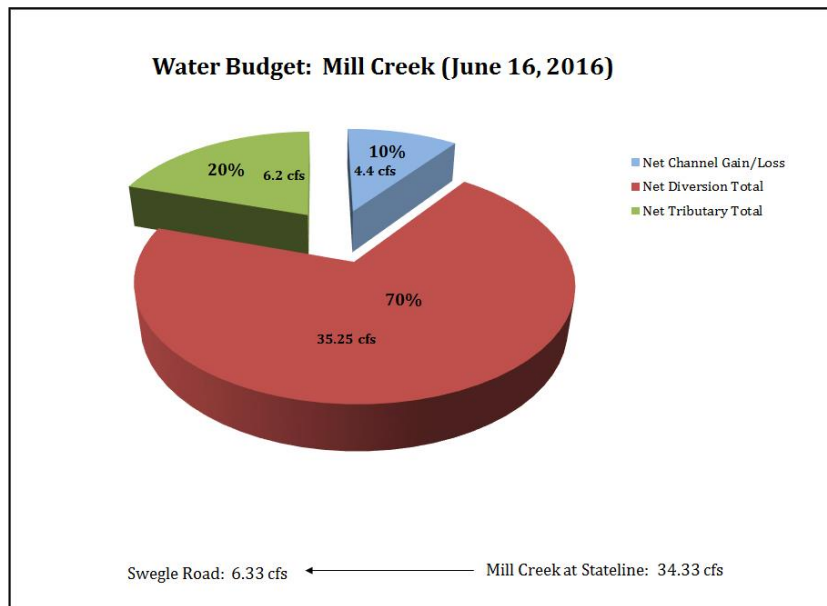


Figure 17: Water Budget June 16, 2016

In September, results show that Mill Creek flows from the Oregon-Washington state line to the confluence with the Walla Walla River decline from 34.29 cfs to 15.98 cfs. Tributary inputs (4%, 6.2 cfs) and gains from groundwater (24%, 4.4 cfs) combine to make up 28% of the total budget while diversions make up the remaining 72% (33.25 cfs).

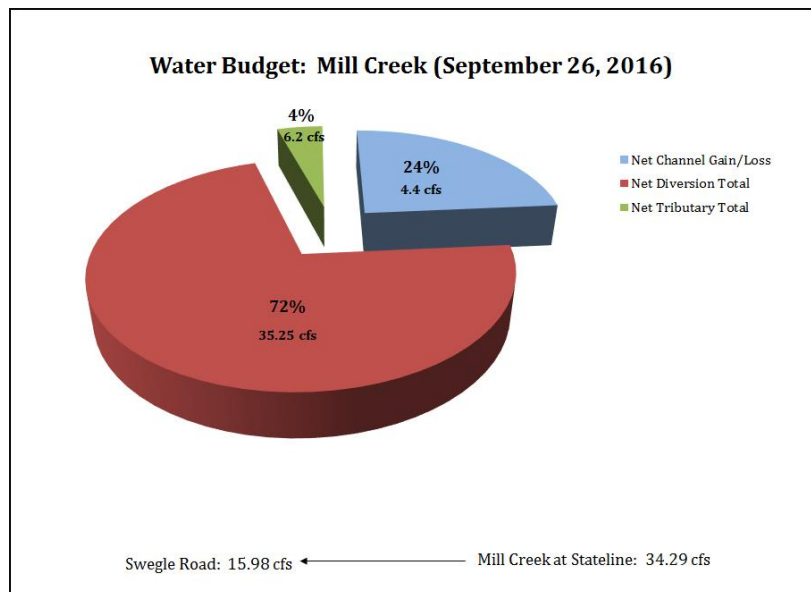


Figure 18: Water Budget September 8, 2016

2016 Touchet River Seepage Assessment

The Touchet River is the largest tributary of the Walla Walla River in southeastern Washington. The river drains an area of approximately 740 square miles and is approximately 66 miles in length from the North and South Fork Touchet River confluence to the Walla Walla River.

The seepage assessments on the Touchet River in 2016 were conducted on June 28th and in September 1st. The WWBWC followed the same procedures discussed in the methodology section. The assessment area begins along the Dayton Levee just downstream of the North and South Forks of the Touchet River downstream to the Walla Walla River close to the town of Touchet. Eleven reaches were defined (Figure 19) based upon access, proximity to the next reach, and the geomorphology of the system. The thalweg was digitized using ArcMap 10.3 then the digitized layer was transformed into a linear route to allow for the ability to break the feature into uniform segments.

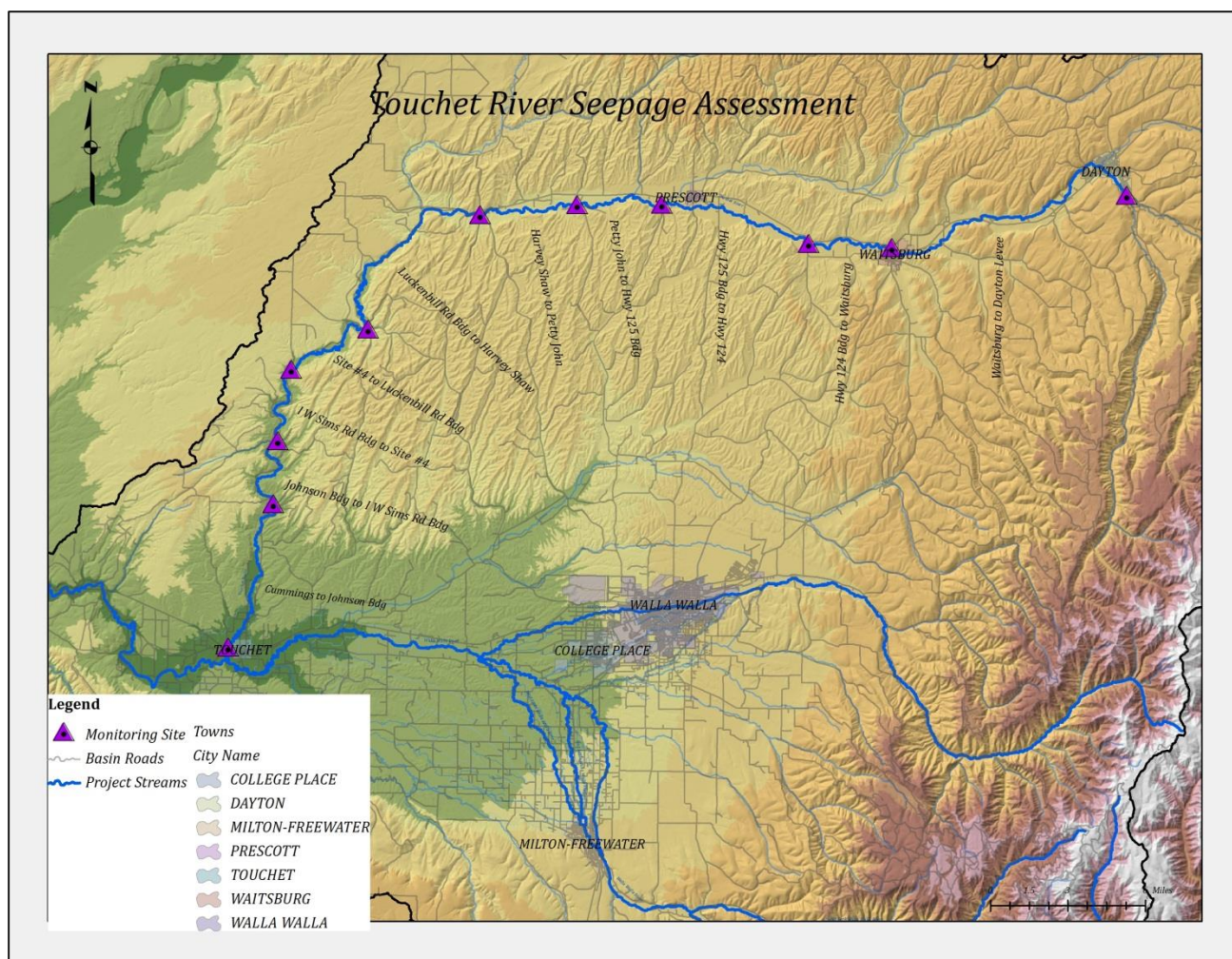


Figure 19: Touchet River Seepage Assessment Sampling Locations and Reaches

The first seepage assessment of 2016 was conducted on June 28th. From the initial 2016 assessment three reaches were defined as gaining while seven reaches were defined as losing. The three gaining reaches were located in the upper, middle, and lower reaches of the Touchet River assessed. (Figures 20 and 21)

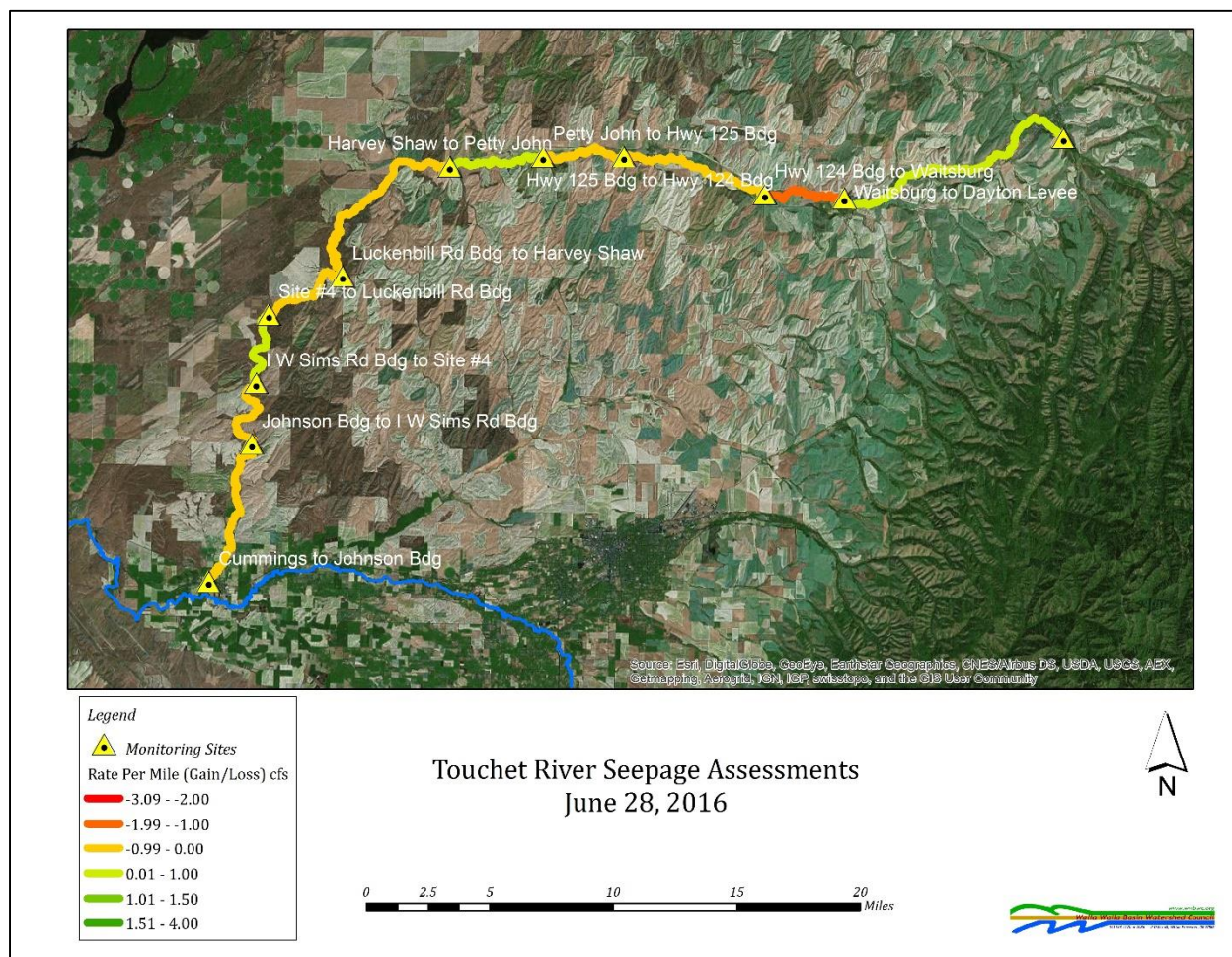


Figure 20: Touchet River Seepage Assessment June 28, 2016 Rate Per Mile (Gains and Losses) per Reach



Touchet River at Hart Road Bridge

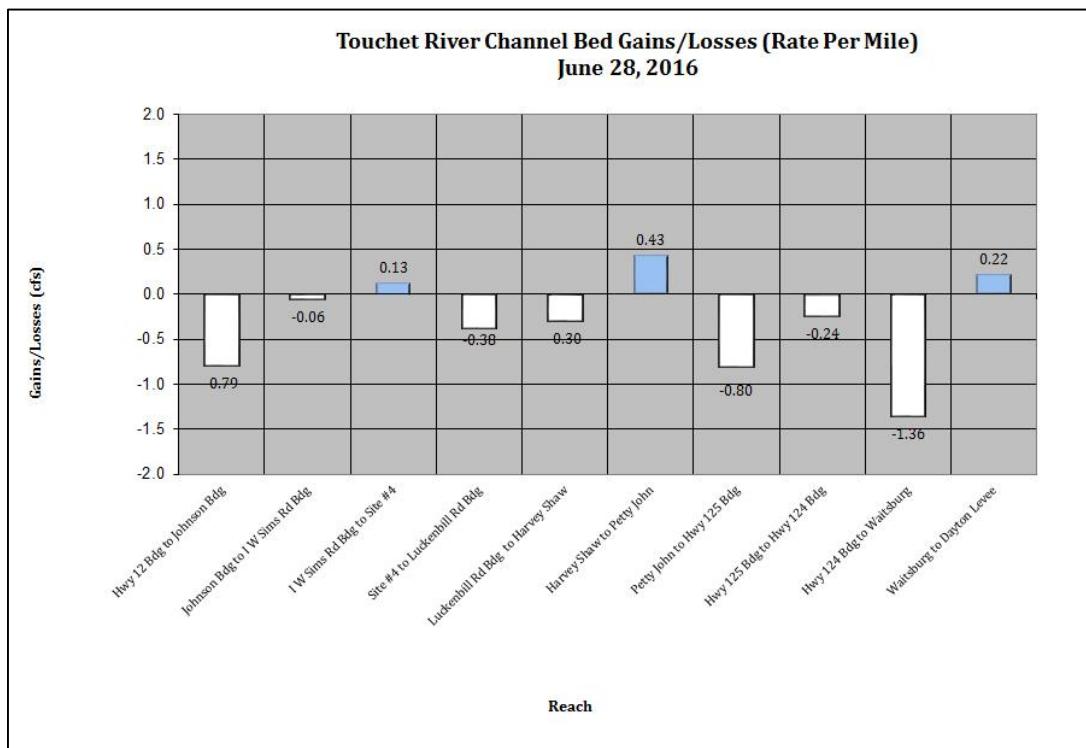


Figure 21 June 28, 2016 Net Gains and Losses per Reach

The second seepage assessment of 2016 on the Touchet River was conducted on September 1st. In the late summer assessment four of the ten reaches were identified as slightly gaining reaches (less than .12 cfs/mile) while six were identified as losing reaches (*Figures 22 and 23*).



Touchet River below the Hwy 125 Bridge

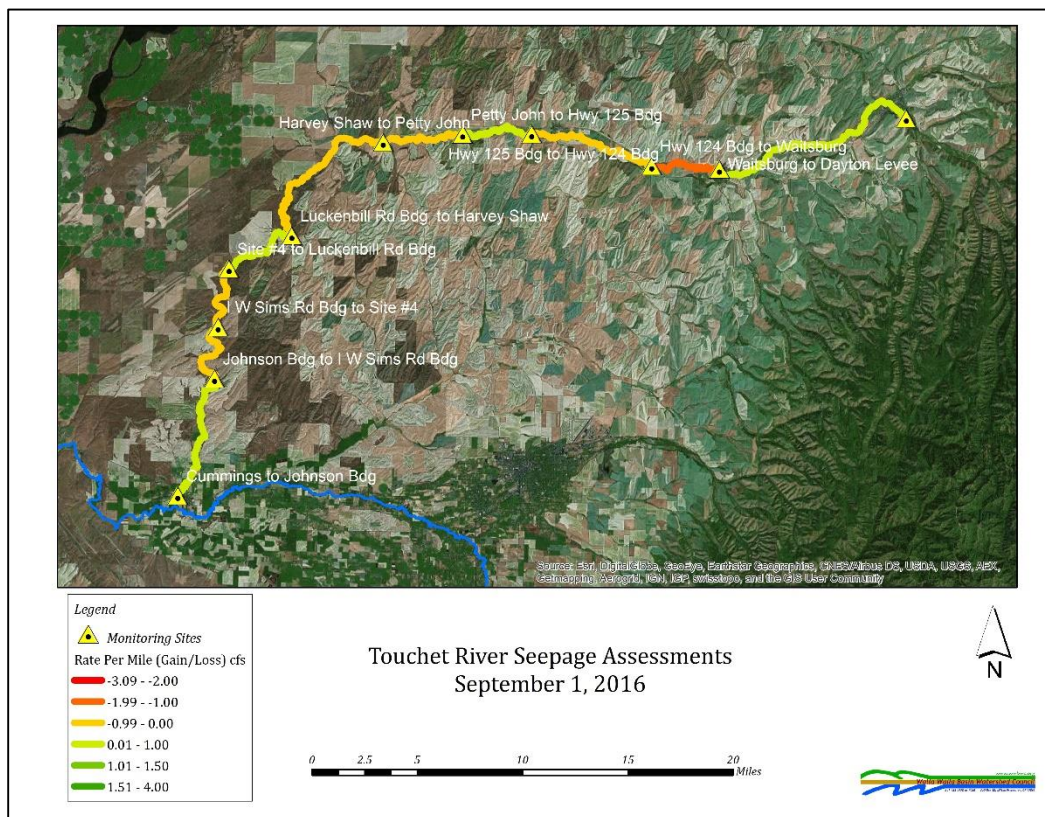


Figure 22: Touchet River Seepage Assessment September 1, 2016 Gains and Losses per Reach

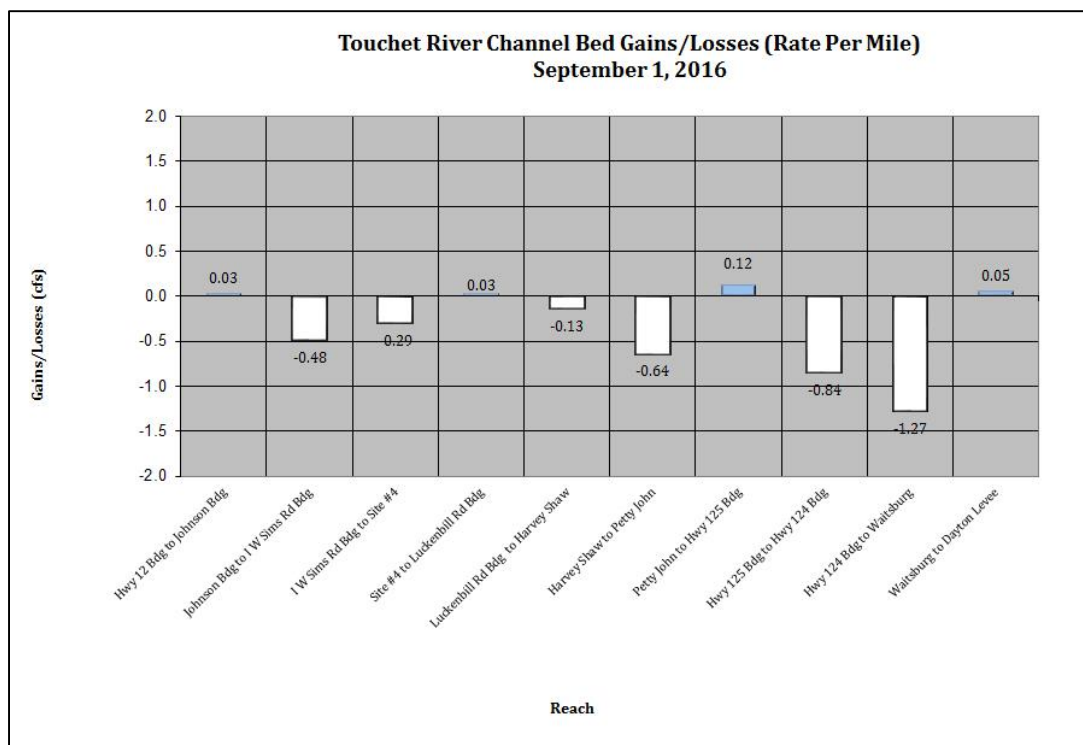


Figure 23: September 1, 2016 Net Gains and Losses per Reach

Utilizing the simple mass balance and the total of water exchanged in the designated modeled area from the June 2016 dataset and the 2016 September dataset were further quantified using percent distribution. The percentages of the total volume of water movement in the modeled area relative to distribution are displayed in figures 24 and 25. June 2016 results show that the Touchet River flows from above Dayton to the confluence with the Walla Walla River decreases from 56.15 cfs to 16.05 cfs. Diversions (56%, 31.32 cfs) take up just over one half

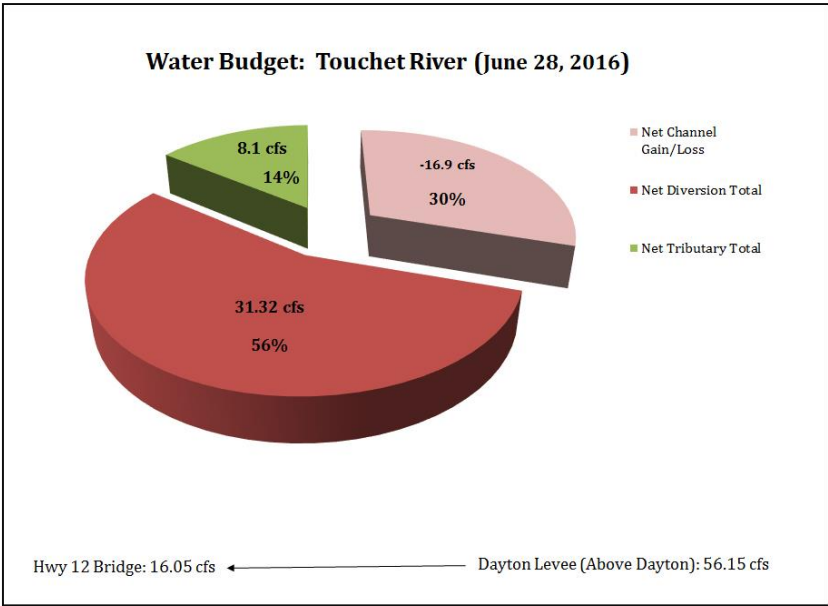


Figure 24: Water Budget June 28, 2016

of the water budget while the tributary inputs (14%, 8.1 cfs) and losses to groundwater (30% 16.9 cfs) total 44% of the total budget.

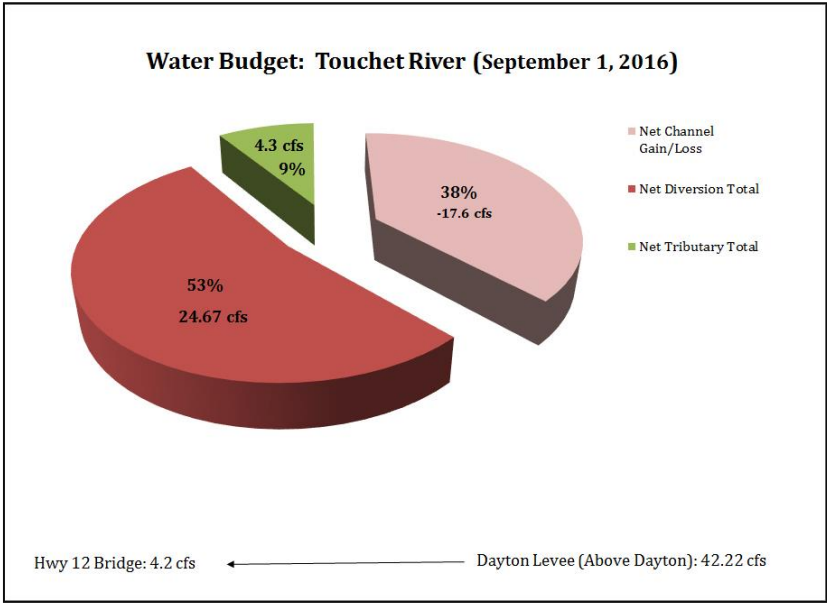


Figure 25: Water Budget Sept. 1, 2016

In September there is a decrease in volume compared to the June assessment. Tributary inputs (9%, 4.3 cfs) and groundwater losses (36%, -15.7 cfs) combine to make up 44% of the total budget while diversions make up the remaining 56% (24.8 cfs). The noticeable difference from the three other systems examined, the Touchet River is consistently a net losing river system in late summer/early fall.

Seepage Assessment Results

The data collected from the assessments conducted on the Walla Walla River, Mill Creek, and the Touchet River from the 2016 and prior years was compiled to produce the final seepage assessment results.

Walla Walla River

Seepage assessments were conducted in the Months of June, July, August, September, October and November. For the purposes of this report the assessments conducted in June were not included.¹⁰ The results below are based on the overall and monthly averages for the assessments.

Flow Measurement Location	Actual River Mile	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Percent Gain/Loss Flow	Average Flow
Pierce's RV Park	8.5	5.68	-0.78	-5.58	-14.7%	42.50
Byerly Road Bridge	12.7	12.88	1.50	6.42	23.9%	47.88
USGS Touchet Gage	15.9	16.12	0.47	4.93	77.8%	43.61
Lowden Rd Bridge	27.6	28.24	0.51	1.11	7.0%	17.43
MacDonald Rd Bridge	29.7	30.41	-0.76	-2.64	-5.3%	20.29
Detour Road	33.3	33.97	-0.08	-0.09	0.3%	44.46
Swegle Road Bridge	34.4	35.04	0.04	0.06	1.5%	35.26
Last Chance Road Bridge	35.8	36.52	0.02	0.03	1.2%	35.14
Beet Road Bridge	37.5	38.32	-2.35	-1.21	-1.5%	36.59
Walla Walla River (WDFW #5 Site)	38.1	38.84	-0.06	-0.09	-3.1%	44.36
Old Milton HWY Bridge	39.5	40.21	0.79	1.34	8.5%	20.51
Peppers Bridge Location	41.1	41.90	1.26	1.31	9.3%	19.19
WWBWC # M-10	42.3	42.94	2.80	2.25	18.0%	16.90
WWBWC # M-9 (Mauer Lane)	43.0	43.76	-1.44	-1.99	-7.2%	15.04
Tumalum Road Bridge (M-8)	43.6	44.43	-1.97	-2.39	-9.2%	15.34
Walla Walla River (M-7)	44.2	44.87	-6.23	-8.89	-34.8%	15.82
Walla Walla River M-5	45.3	45.96	-6.43	-4.77	-14.1%	26.36
Walla Walla River Nursery Bridge (M-4)	45.9	46.62	-14.74	-9.76	-15.7%	30.95
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.7	47.26	-2.16	-2.46	-1.6%	45.93
15th St Bridge (Grove M1)	47.9	48.59	3.73	3.94	4.3%	109.13
Couse Creek Road Bridge	49.0	49.66	-1.54	-1.44	-1.1%	108.34
Day Road	49.9	50.59	3.93	3.84	3.4%	111.80
Joe West Bridge	50.8	51.57	0.57	0.67	1.4%	108.31
South Fork Bridge	52.5	53.22	0.99	5.56	5.4%	106.26
CTUIR Fish Hatchery/Holding Facility	57.6	58.44	0.15	0.50	0.6%	106.57
Private Property (Keating)	59.3	60.07	-1.64	-2.96	-2.4%	106.45
BLM Trailhead	61.1	61.85	x	x	x	111.80

Figure 26: Walla Walla River Seepage Assessment Averages

¹⁰ The June assessments were conducted from June 2002 – 2004 and were mainly focused on the Walla Walla River flowing in Oregon. Also many of the diversions were estimated and not measured.

SF Walla Walla River at Keating to SF Walla Walla River at the BLM Trailhead

This reach is a 1.7 mile¹¹ reach which the upstream end of the reach begins at the BLM Trailhead at the end of the Walla Walla River Road at river mile 61.1¹². This measuring reach is located within a narrow forested canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 111.80 cfs. This reach on average loses 2.4% of its flow to groundwater and has a net loss average of 2.96 cfs.

SF Walla Walla River at the CTUIR Holding/Hatchery Facility to the SF Walla Walla River at Keating

This reach is a 1.63 mile reach which the upstream end of the reach begins at the Keating Site at river mile 59.3. This measuring reach is located within a narrow forested canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 106.45 cfs. This reach on average gains .6% of its flow from groundwater returns and has a net gain average of .5 cfs.

SF Walla Walla River Road Bridge to the SF Walla Walla River at the CTUIR Holding/Hatchery Facility

This reach is a 5.22 mile reach which the upstream end of the reach begins at the CTUIR Holding/Hatchery facility at river mile 57.6. This measuring reach is located within a narrow forested canyon environment to an open canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 106.57 cfs. This reach on average gains 5.4% of its flow from groundwater returns and has a net gain average of 5.56 cfs.



South Fork Walla Walla River at SF Bridge

¹¹ Calculated from the digitized GIS layer used for calculating accurate reach lengths.

¹² River mile distance is in reference to the USGS river mile data.

Walla Walla River at Joe West Bridge to the SF Walla Walla River Road Bridge

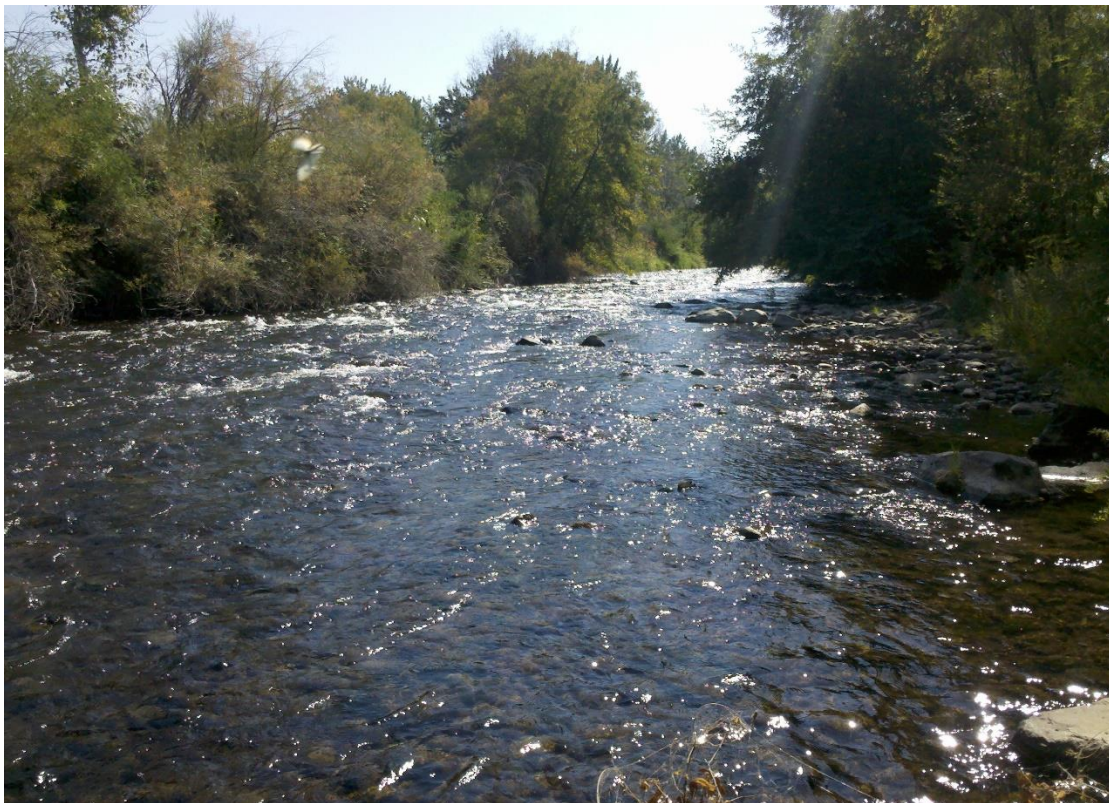
This reach is a 1.65 mile reach which the upstream end of the reach begins at the South Fork Walla Walla River Road Bridge at river mile 52.5. This measuring reach is located within an open canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 106.26 cfs. This reach on average gains 1.4% of its flow from groundwater returns and has a net gain average of .67 cfs.

Walla Walla River at Day Road to the Walla Walla River at the Joe West Bridge

This reach is a .98 mile reach which the upstream end of the reach begins at the Walla Walla River at Joe West Bridge at river mile 50.8. This measuring reach is located within an open canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 108.31 cfs. This reach on average gains 3.4% of its flow from groundwater returns and has a net gain average of 3.84 cfs.

Walla Walla River at the Couse Creek Road Bridge to the Walla Walla River at Day Road

This reach is a .93 mile reach which the upstream end of the reach begins at the Couse Creek Road Bridge at river mile 49.9. This measuring reach is located within an open broad canyon environment. On average the measured flow during the assessments on the upstream side of the reach was 111.80 cfs. This reach on average loses 1.1% of its flow to groundwater and has a net loss average of 1.44 cfs.



Walla Walla River at 15th St. Bridge (Grove M1)

Walla Walla River at the 15th St. Bridge to the Walla Walla River at the Couse Creek Road Bridge

This reach is a 1.07 mile reach which the upstream end of the reach begins at the Walla Walla River at the Couse Creek Road Bridge at river mile 49.0. This measuring reach is located within an open canyon environment in which

the lower end of the reach terminates at the town of Milton-Freewater. This is also the first reach located within the Milton-Freewater flood control levee. On average the measured flow during the assessments on the upstream side of the reach was 108.34 cfs. This reach on average gains 4.3% of its flow from groundwater returns and has a net gain average of 3.94 cfs.

Walla Walla River at M3 to the Walla Walla River at the 15th St. Bridge

This reach is a 1.32 mile reach which the upstream end of the reach begins at the 15th Street Bridge (Grove) at river mile 47.9. This measuring reach is located within the Milton-Freewater flood control levee in the town of Milton-Freewater. On average, the measured flow during the assessments on the upstream side of the reach was 109.13 cfs. A significant amount of flow is diverted in this reach at the Little Walla Walla River Diversion next to the Cemetery Road Bridge. This reach on average loses 1.6% of its flow to groundwater and has a net loss average of 2.46 cfs.

Walla Walla River below Nursery Bridge (M4) to the Walla Walla River at M3

This reach is a .64 mile reach which the upstream end of the reach begins at M3 above Nursery Bridge at river mile 46.7. This measuring reach is located within the Milton-Freewater flood control levee in the town of Milton-Freewater. On average, the measured flow during the assessments on the upstream side of the reach was 45.93 cfs. This reach on average loses 15.7% of its flow to groundwater and has a net loss average of 9.76 cfs.

Walla Walla River at M5 to the Walla Walla River below Nursery Bridge (M4)

This reach is a .66 mile reach which the upstream end of the reach begins at M4 below Nursery Bridge at river mile 45.9. This measuring reach is located within the Milton-Freewater flood control levee northeast of the town of Milton-Freewater. On average, the measured flow during the assessments on the upstream side of the reach was 30.95 cfs. This reach on average loses 14.1% of its flow to groundwater and has a net loss average of 4.77 cfs.

Walla Walla River at M7 to the Walla Walla River at M5

This reach is a 1.09 mile reach which the upstream end of the reach begins at M5 at river mile 45.3. This measuring reach is located within the Milton-Freewater flood control levee northeast of the town of Milton-Freewater. On average, the measured flow during the assessments on the upstream side of the reach was 26.36 cfs. This reach on average loses 38.4% of its flow to groundwater and has a net loss average of 8.89 cfs.

Walla Walla River at the Birch Creek Road Bridge (M8) to the Walla Walla River at M7

This reach is a .44 mile reach which the upstream end of the reach begins at M7 at river mile 44.2. This measuring reach is located within the Milton-Freewater flood control levee northeast of the town of Milton-Freewater. On average, the measured flow during the assessments on the upstream side of the reach was 15.82 cfs. This reach on average loses 9.2% of its flow to groundwater and has a net loss average of 2.39 cfs.



Walla Walla River at the Birch Creek Road Bridge (M8)

Walla Walla River at Mauer Lane (M9) to the Walla Walla River at the Birch Creek Road Bridge (M8)

This reach is a .66 mile reach which the upstream end of the reach begins at the Birch Creek Road Bridge (M8) at river mile 43.6. This measuring reach is located north of the Milton-Freewater flood control. On average, the measured flow during the assessments on the upstream side of the reach was 15.34 cfs. This reach on average loses 7.2 of its flow to groundwater and has a net loss average of 1.99 cfs.

Walla Walla River at M10 to the Walla Walla River at Mauer Lane (M9)

This reach is a .82 mile reach which the upstream end of the reach begins at Mauer Lane (M9) at river mile 43.0. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 15.04 cfs. This reach on average gains 18% of its flow from groundwater returns and has a net gain average of 2.25 cfs.

Walla Walla River at Peppers Bridge to the Walla Walla River at M10

This reach is a 1.04 mile reach which the upstream end of the reach begins at M10 at river mile 42.3. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 16.90 cfs. This reach on average gains 9.3% of its flow from groundwater returns and has a net gain average of 1.31 cfs.

Walla Walla River at Old Milton Highway Bridge to the Walla Walla River at Peppers Bridge

This reach is a 1.69 mile reach which the upstream end of the reach begins at the Walla Walla River at Peppers Bridge at river mile 41.1. This measuring reach is located within an alluvial flood plain and is the last reach located

in Oregon. On average, the measured flow during the assessments on the upstream side of the reach was 19.19 cfs. This reach on average gains 8.5% of its flow from groundwater returns and has a net gain average of 1.34 cfs.

Walla Walla River at WDFW Site #5 to the Walla Walla River at Old Milton Highway Bridge

This reach is a 1.37 mile reach which the upstream end of the reach begins at the Old Milton Highway Road Bridge at river mile 39.5. This measuring reach is located within an alluvial flood plain and is the first reach located in Washington State. On average, the measured flow during the assessments on the upstream side of the reach was 20.51 cfs. This reach on average loses 3.1% of its flow to groundwater and has a net loss average of .09 cfs.

Walla Walla River at the Beet Road Bridge to the Walla Walla River at WDFW Site #5

This reach is a .52 mile reach which the upstream end of the reach begins at the Walla Walla River at WDFW Site #5 at river mile 38.1. This measuring reach is located within an alluvial flood plain. The Gardena Farms Irrigation District Diversion is located within this reach and is one of the largest diversion points on the Walla Walla River. On average, the measured flow during the assessments on the upstream side of the reach was 44.36 cfs. This reach on average loses 1.5% of its flow to groundwater and has a net loss average of 1.21 cfs.

Walla Walla River at the Last Chance Road Bridge to the Walla Walla River at Beet Road Bridge

This reach is a 1.80 mile reach which the upstream end of the reach begins at the Walla Walla River at the Beet Road Bridge at river mile 37.5. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 36.59 cfs. This reach on average gains 1.2% of its flow from groundwater returns and has a net gain average of .03 cfs.



Walla Walla River at Beet Road

Walla Walla River at Swegle Road Bridge to the Walla Walla River at Last Chance Road Bridge

This reach is a 1.48 mile reach which the upstream end of the reach begins at the Walla Walla River at the Last Chance Road Bridge at river mile 35.8. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 35.14 cfs. This reach on average gains 1.5% of its flow from groundwater returns and has a net gain average of .06 cfs.

Walla Walla River at the Detour Road Bridge to the Walla Walla River at the Swegle Road Bridge

This reach is a 1.07 mile reach which the upstream end of the reach begins at the Walla Walla River at the Swegle Road Bridge at river mile 34.4. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 35.26 cfs. This reach on average gains .3% of its flow from groundwater returns, but has a net loss average of .09 cfs.



Walla Walla River at Detour Road Bridge

Walla Walla River at the McDonald Road Bridge to the Walla Walla River at the Detour Road Bridge

This reach is a 3.56 mile reach which the upstream end of the reach begins at the Walla Walla River at the Detour Road Bridge at river mile 33.3. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 44.46 cfs. The last main diversion is located within this reach. In recent years during the months of August and September dry sections of this reach have been documented in previous assessment reports. This reach on average loses 5.3% of its flow to groundwater and has a net loss average of 2.46 cfs.

Walla Walla River at the Lowden Road Bridge to the Walla Walla River at McDonald Road Bridge

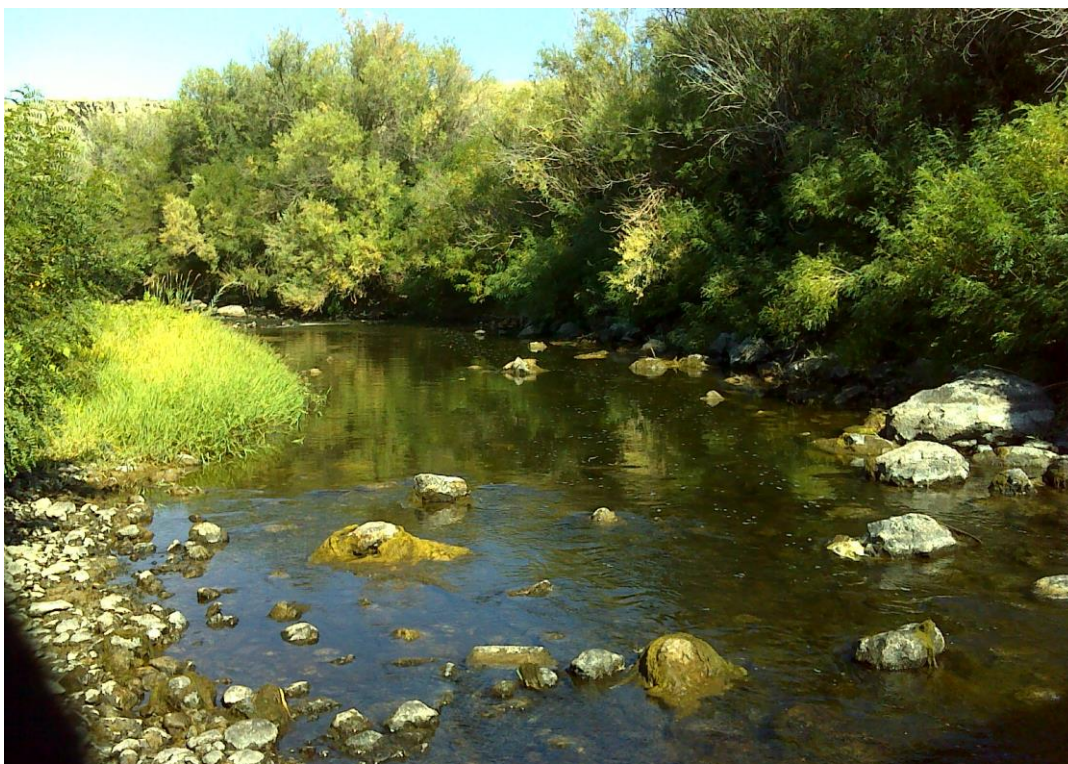
This reach is a 2.17 mile reach which the upstream end of the reach begins at the Walla Walla River at the McDonald Road Bridge at river mile 29.7. This measuring reach is located within an alluvial flood plain. On average, the measured flow during the assessments on the upstream side of the reach was 20.29 cfs. This reach on average gains 7% of its flow from groundwater returns and has a net gain average of 1.11 cfs.

Walla Walla River at the USGS Touchet Gauge to the Walla Walla River at the Lowden Road Bridge

This reach is a 12.11 mile reach which the upstream end of the reach begins at the Walla Walla River at the Lowden Road Bridge at river mile 27.6. This measuring reach is located within an alluvial flood plain. The last main tributary the Touchet River enters the Walla Walla River in this reach. On average, the measured flow during the assessments on the upstream side of the reach was 17.43 cfs. This reach on average gains 77.8% of its flow from groundwater returns and has a net gain average of 4.93 cfs.

Walla Walla River at Byerly Road Bridge to the Walla Walla River at the USGS Touchet Gauge

This reach is a 3.24 mile reach which the upstream end of the reach begins at the Walla Walla River at the USGS Touchet Gauge at river mile 15.9. This measuring reach is located within an alluvial flood plain on the upper end of the reach and a broad basalt canyon on the lower end of the reach. On average, the measured flow during the assessments on the upstream side of the reach was 43.61 cfs. This reach on average gains 23.9% of its flow from groundwater returns and has a net gain average of 6.42cfs.



Walla Walla River at Byerly Road Bridge

Walla Walla River at Pierce's RV Park to the Walla Walla River at Byerly Road Bridge

This reach is a 7.2 mile reach which the upstream end of the reach begins at the Walla Walla River at Byerly Road Bridge at river mile 12.7. This measuring reach is located within a broad basalt canyon. On average the measured flow during the assessments on the upstream side of the reach was 47.88 cfs. In the 2015 July assessment the lower end of the reach was dry. This was the first assessment in which there wasn't measurable flow at the lower end of this reach. The reach on average loses 14.7% of its flow to groundwater and has a net loss average of 5.58 cfs.



Walla Walla River at Pierce's RV Park July 2015

Mill Creek

Seepage assessments were conducted in the Months of June, July, August, September, and October. The results below are based on the overall and monthly averages for the assessments.

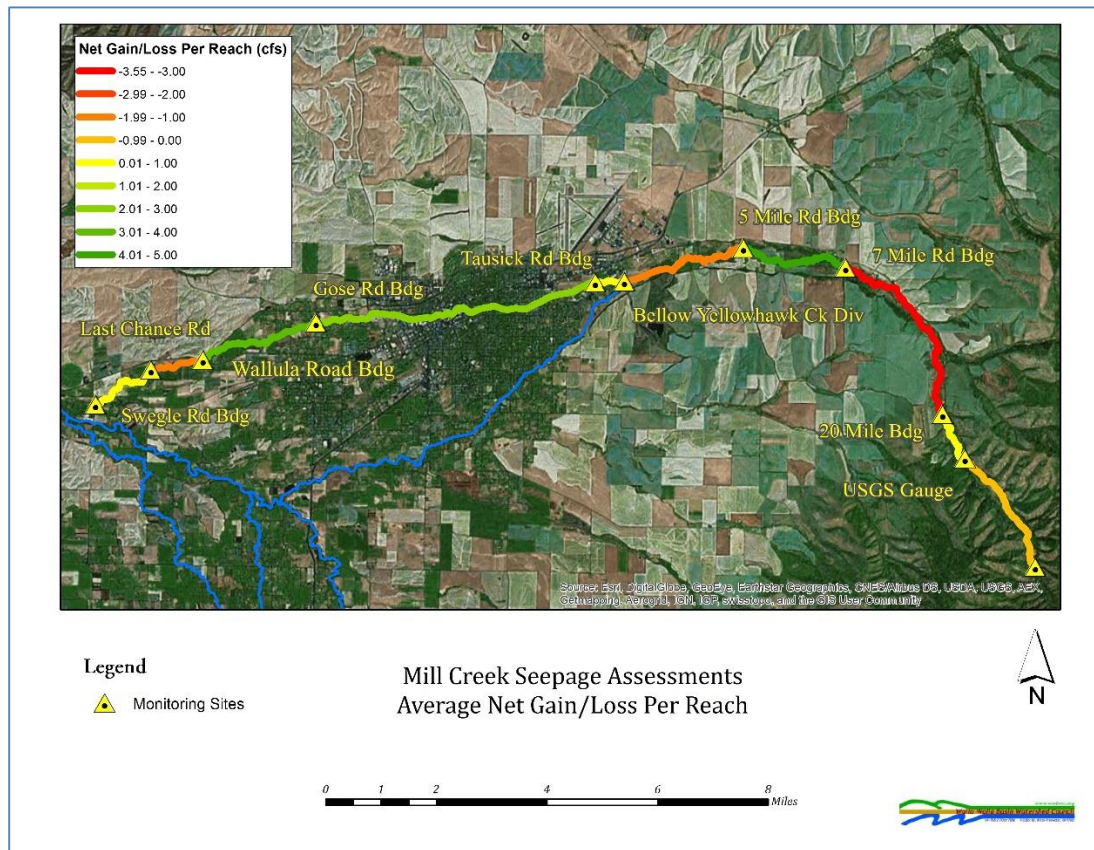


Figure 27: Mill Creek Average Net Gain/Loss

Mill Creek at Stateline to Mill Creek at the USGS Gauge

This reach is a 2.5 mile reach which the upstream end of the reach begins just upstream of the Oregon/Washington State boundary at river mile 23.7. The reach is the uppermost reach assessed during all of the seepage assessments on Mill Creek since 2008. This measuring site on average has the highest flow values recorded and is located in a confined steep canyon environment. Although this reach gains .73% of its flow from groundwater returns on average it actually equates to .01 cfs net loss if you take the average of net gain/loss for the reach.



Mill Creek at Stateline

Average Of All Seepage Assessments	15 Assessments			
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Percent Loss/Gain Flow
Swegle Road Bridge to Last Chance Road Bridge	0.6	0.01	0.01	2.04%
Last Chance Road Bridge to Wallula Rd Bridge	2.0	-1.11	-1.15	-11.90%
Wallula Rd Bridge to Gose Road Bridge	3.1	1.56	3.80	105.94%
Gose Road Bridge to Tausick Rd Bridge	5.5	0.53	2.90	17.74%
Tausick Rd Bridge to Bellow Yellowhawk Diversion	10.9	0.19	0.10	14.40%
Below Yellowhawk Diversion to 5 Mile Rd Bridge	11.5	-0.41	-1.05	-31.52%
5 Mile Rd Bridge to 7 Mile Rd Bridge	14.0	1.85	4.11	1.78%
7 Mile Rd Bridge to 20 Mile Bridge	16.2	-0.90	-3.55	-7.56%
20 Mile Bridge to USGS Gauge	20.2	0.05	0.06	0.70%
USGS Gauge to Mill Creek at Stateline	21.2	0.00	-0.01	0.73%

Figure 28: Mill Creek Seepage Assessment Averages

Mill Creek at the USGS Gauge to Mill Creek at 20 Mile Bridge

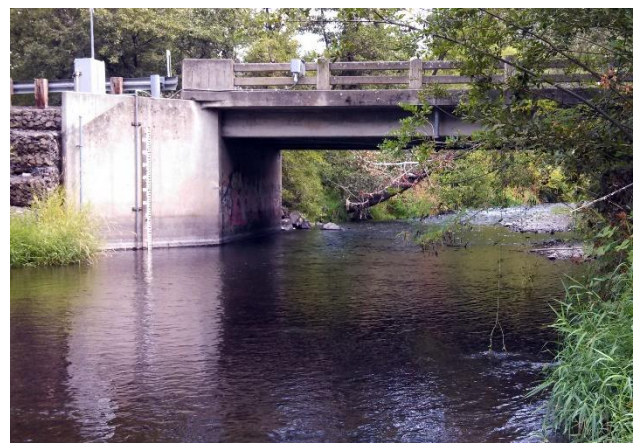
This reach is a 1.0 mile reach which the upstream end of the reach begins at the USGS gauge at river mile 21.2. This measuring site is located within a canyon environment at the upper end of the reach and becomes slightly broader toward the lower end of the reach. On average the measured flow during the assessments on the upstream side of the reach was 36 cfs. This reach on average gains .7% of its flow from groundwater returns, but the net gain/loss for the reach is a net .01 loss. This reach switches from gaining reach to a losing reach for the months of July and October and should be considered an overall neutral reach.

Mill Creek at 20 Mile Bridge to Mill Creek at 7 Mile Road Bridge

This reach is a 3.9 mile reach which the upstream end of the reach begins at the 20 Mile Bridge at river mile 20.2. This measured reach is located in a broad river valley environment. On average the measured flow during the assessments on the upstream side of the reach was 36 cfs. This reach on average loses 7.56% of its flow to groundwater and the average net gain/loss for the reach is 3.55 cfs net loss. This reach was consistently a losing reach throughout the sampling period.

Mill Creek at 7 Mile Road Bridge to Mill Creek at 5 Mile Road Bridge

This reach is a 2.2 mile reach which the upstream end of the reach begins at the 7 Mile Road Bridge at river mile 16.2. This measured reach is located in a broad river valley environment. On average the measured flow during the assessments on the upstream side of the reach was 35.44 cfs. This reach on average gains 1.78 % of its flow from groundwater returns and on average has a net gain of 4.11 cfs. Based on monthly averages this reach was a gaining reach from June-August then switched to a losing reach for the month of September then back to a gaining reach for the one assessment that was conducted in October.



Five Mile Road Bridge

Mill Creek at 5 Mile Road Bridge to Mill Creek just below the Yellowhawk Creek Diversion.

This reach is a 2.5 mile reach which the upstream end of the reach begins at the 5 Mile Road Bridge at river mile 14. This measured reach is located in a broad river valley environment. On average the measured flow during the assessments on the upstream end of the reach was 31.44 cfs. This reach on average loses 31.52% of its flow to groundwater and the average net gain/loss for the reach is 1.05 cfs. There are two main diversions located within the reach, The Mill Creek Dam diversion which diverts water to Bennington Lake and the Yellowhawk Creek Diversion which diverts water for Yellowhawk Creek and Garrison Creek. This reach also is the first reach located in a managed flood control section of Mill Creek. There are concrete weirs located across the channel at regular intervals below the Mill Creek Dam (~40% of the entire reach). Based on monthly averages this reach was a losing reach for the months of June, July, and September while a gaining reach for the months of August and October.



Mill Creek at Five Mile Road Bridge

Mill Creek just below the Yellowhawk Creek Diversion to Mill Creek at Tausick Road Bridge

This reach is a .5 mile reach which the upstream end of the reach begins just below the Yellowhawk Creek Diversion Dam at the USGS gauge site at river mile 11.5. This measured reach is located in a managed flood control river channel with concrete weirs at regular intervals across the entire channel width. On average the measured flow during the assessments on the upstream end of the reach was 9.34 cfs. This reach on average gains 14.4% of its flow from groundwater or a net gain of .10 cfs.

Mill Creek at Tausick Road Bridge to Mill Creek at Gose Road Bridge

This reach is a 5.4 mile reach in which the upstream end of the reach begins at the Tausick Road Bridge at river mile 11. The entire reach is a managed flood control channel in which approximately 45% of the channel is concrete. There are also concrete weirs which extend across the entire channel width. This reach on average gains 17.74% of its flow from groundwater or a net gain of 2.9 cfs some of which can be seen flowing through cracks in

the concrete channel just upstream of the S. Division Street Bridge. Based on the monthly assessment averages this reach was a gaining reach for the months of July, August, and October while a losing reach for the months of June and September.

Mill Creek at Gose Road Bridge to Mill Creek at Wallula Road Bridge

This reach is a 2.4 mile reach in which the upstream end of the reach begins at the Gose Road Bridge just below the managed flood control section of Mill Creek. This reach on average gains 105% of its flow from groundwater or a net gain of 3.8 cfs. Based on the monthly assessment averages this reach was a gaining reach from June – October.

Mill Creek at Wallula Road Bridge to Mill Creek at Last Chance Road Bridge

This reach is a 1.0 mile reach in which the upstream end of the reach begins at the Wallula Road Bridge at river mile 2.0. On average the measured flow during the assessments on the upstream end of the reach was 11.65 cfs. This reach on average loses 11.9% of its flow to groundwater or a net loss of 1.15 cfs. Based on monthly assessment averages this reach was a losing reach from June – October.

Mill Creek at Last Chance Road Bridge to Mill Creek at Swegle Road Bridge

This reach is a 1.5 mile reach in which the upstream end of the reach begins at the Last Chance Road Bridge at mile .6. On average the measured flow during the assessments on the upstream end of the reach was 12.38 cfs. This reach on average gains 2.04% of its flow from groundwater returns or a net gain of .01 cfs. Based on monthly assessment averages this reach was a gaining reach in June, September, and October while a losing reach during the summer months of July and August.

Touchet River

Seepage assessments were conducted in the Months of June, July, August, and September. The results below are based on the overall and monthly averages for the assessments.

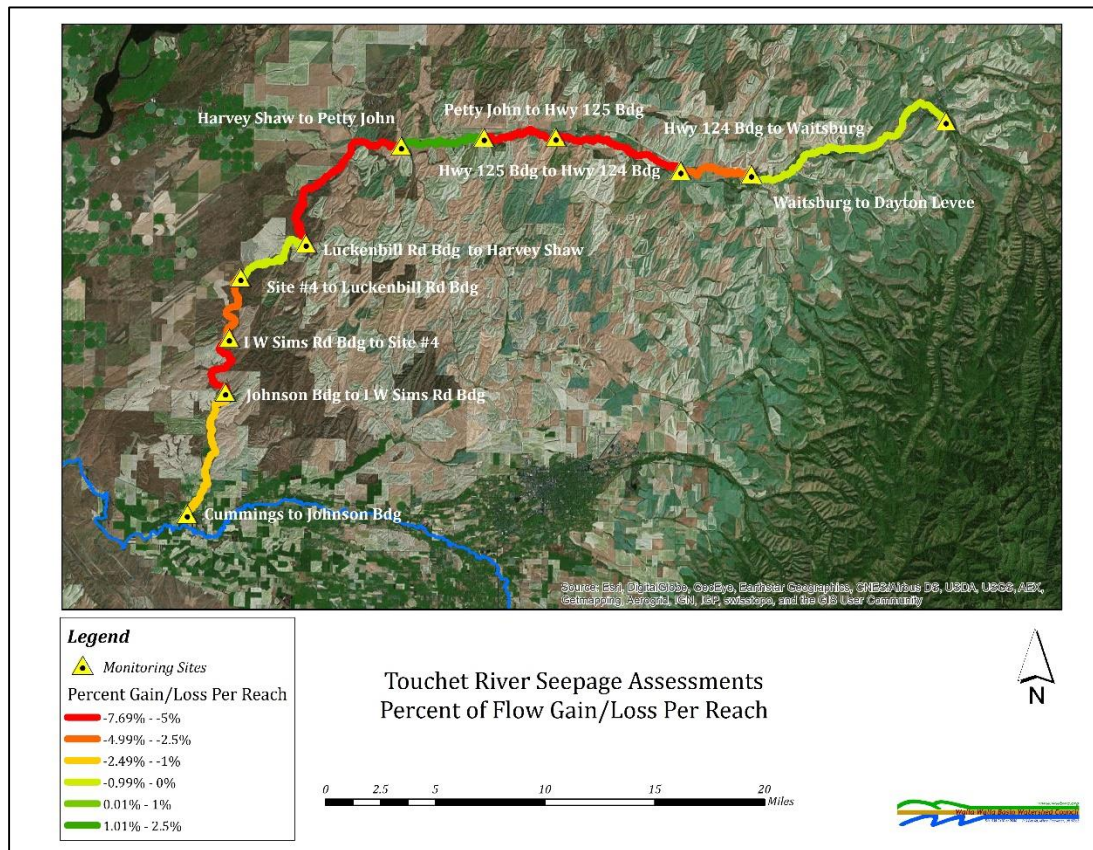


Figure 28: Touchet River Percent Flow Gain/Loss

Average of All Assessments	14 Assessments			
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Average Percent of Flow Gain/Loss
Highway 12 to Johnson Bdg	0.86	-0.42	-0.94	-2.47%
Johnson Bdg to I W Sims Rd Bdg	8.8	-1.54	-1.74	-5.84%
I W Sims Rd Bdg to Site #4	13.18	-0.08	-1.32	-2.51%
Site #4 to Luckenbill Rd Bdg	17.18	0.02	-0.13	-0.25%
Luckenbill Rd Bdg to Harvey Shaw	21.99	-0.89	-2.33	-5.13%
Harvey Shaw to Petty John	32.23	0.59	2.14	2.08%
Petty John to Hwy 125 Bdg	37.2	-1.12	-3.27	-6.96%
Hwy 125 Bdg to Hwy 124 Bdg	41.53	-0.64	-4.15	-7.69%
Hwy 124 Bdg to Waitsburg	48.79	-0.40	-0.99	-4.86%
Waitsburg to Dayton Levee	52.92	0.17	-0.44	-0.13%

Figure 29: Touchet River Seepage Assessment Averages

Touchet River at the Dayton Levee to Touchet River at Waitsburg

This reach is a 12.05 mile reach which the upstream end of the reach begins in the town of Dayton within the Dayton levee section at river mile 64.97. The reach is the uppermost reach assessed during all of the seepage assessments on the Touchet River. This measuring site on average has the highest flow values recorded and is located in a broad canyon environment. On average the measured flow during the assessments on the upstream end of the reach was 64.78 cfs. This reach on average loses .13% of its flow to groundwater or a net loss of .44 cfs. Based on monthly assessment averages this reach was a losing reach from July to August while a gaining reach for June and September.

Touchet River at Waitsburg to Touchet River at the Highway 124 Bridge

This reach is a 4.3 mile reach which the upstream end of the reach begins in the town of Waitsburg within the Bolles Road Bridge at river mile 52.92. On average the measured flow during the assessments on the upstream end of the reach was 61.35 cfs. This reach on average loses 4.86% of its flow to groundwater or a net loss of .99 cfs. Based on monthly assessment averages this reach was a losing reach from August through September while a gaining reach from June through July.

Touchet River at the Highway 124 Bridge to Touchet River at the Highway 125 Bridge

This reach is a 7.26 mile reach which the upstream end of the reach begins at the Highway 124 Bridge at river mile 48.79. On average the measured flow during the assessments on the upstream end of the reach was 61.84 cfs. This reach on average loses 7.69% of its flow to groundwater or a net loss of 4.15 cfs. Based on monthly assessment averages this reach was a losing reach from June – September.

Touchet River at the Highway 125 Bridge to Touchet River at the Petty John Road Bridge

This reach is a 4.33 mile reach which the upstream end of the reach begins at the Highway 125 Bridge at river mile 41.53. On average the measured flow during the assessments on the upstream end of the reach was 56.60 cfs. This reach on average loses 6.96% of its flow to groundwater or a net loss of 3.27 cfs. Based on monthly assessment averages this reach was a losing reach from June – September.

Touchet River at the Petty John Road Bridge to Touchet River at the Harvey Shaw Road Bridge

This reach is a 4.97 mile reach which the upstream end of the reach begins at the Petty John Road Bridge at river mile 37.2. On average the measured flow during the assessments on the upstream end of the reach was 53.34 cfs. This reach on average gains 2.08% of its flow from groundwater or a net gain of 2.14 cfs. Based on monthly assessment averages this reach was a gaining reach from June through July and a losing reach from August through September.

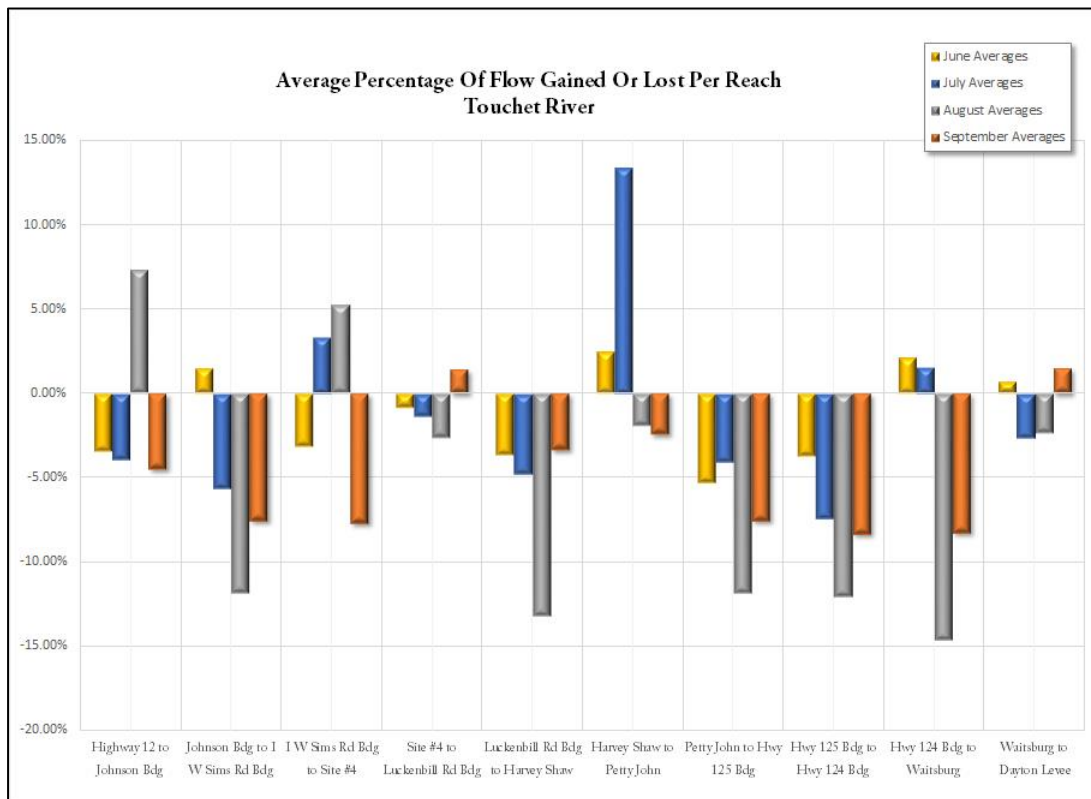


Figure 30: Touchet River Average Percent Flow Gain/Loss Monthly

Touchet River at the Harvey Shaw Road Bridge to Touchet River at the Luckenbill Road Bridge

This reach is a 10.24 mile reach which the upstream end of the reach begins at the Harvey Shaw Road Bridge at river mile 32.23. On average the measured flow during the assessments on the upstream end of the reach was 53.15 cfs. This reach on average loses 5.13% of its flow to groundwater or a net loss of 2.33 cfs. Based on monthly assessment averages this reach was a losing reach from June – September.

Touchet River at the Luckenbill Road Bridge to Touchet River at Site #4

This reach is a 4.81 mile reach which the upstream end of the reach begins at the Luckenbill Road Bridge at river mile 21.99. On average the measured flow during the assessments on the upstream end of the reach was 52.5 cfs. This reach on average loses .25% of its flow to groundwater or a net loss of .13 cfs. Based on monthly assessment averages this reach was a losing reach from June – August while a gaining reach in September.

Touchet River at Site #4 to Touchet River at I W Sims Road Bridge

This reach is a 4 mile reach which the upstream end of the reach begins at Site#4 at river mile 17.18. On average the measured flow during the assessments on the upstream end of the reach was 51.21 cfs. This reach on average loses 2.51% of its flow to groundwater or a net loss of 1.32 cfs. Based on monthly assessment averages this reach was a losing reach in the months of June and September while a gaining reach in the months of July and August.

Touchet River at I W Sims Road Bridge to Touchet River at Johnson Bridge

This reach is a 4.38 mile reach which the upstream end of the reach begins at the I W Sims Road Bridge at river mile 13.18. On average the measured flow during the assessments on the upstream end of the reach was 49.56 cfs. This reach on average loses 5.84% of its flow to groundwater or a net loss of 1.74 cfs. Based on monthly assessment averages this reach was a losing reach from July – September while a gaining reach in the month of June.



Touchet River at IW Sims Road Bridge

Touchet River at Johnson Bridge to Touchet River at Highway 12 Bridge

This reach is a 7.94 mile reach which the upstream end of the reach begins at the Johnson Bridge at river mile 8.8. On average the measured flow during the assessments on the upstream end of the reach was 34.56 cfs. This reach on average loses 2.47% of its flow to groundwater or a net loss of .94 cfs. Based on monthly assessment averages this reach was a losing reach from June – July and the month of September while a gaining reach for the month of August.

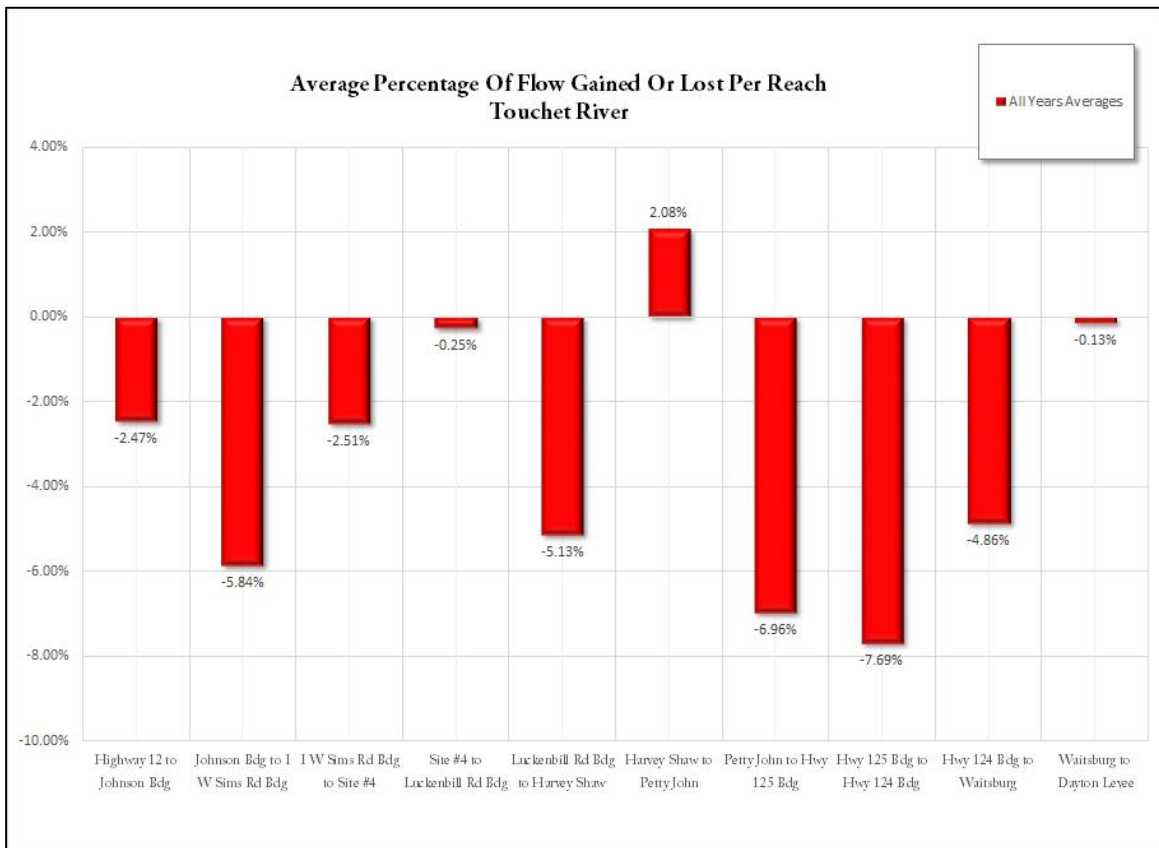


Figure 31: Average Percent Flow Gain/Loss

Summary

The water budget analysis and data sets discussed in this report provide water managers and researchers in the Walla Walla basin a more refined tool by which to look at seasonal and spatial flow distribution in the Walla Walla River, Touchet River, and Mill Creek systems. While these values represent 'snap shots' in time, the information can be coupled with the continuous gauges sites to help piece together the transient nature of each of the flow systems. Rates of net gains and losses provide an estimate of the magnitude of channel bed flux relative to three important irrigation related seasons in the Walla Walla basin.

The analysis tends to support the current theories about where each system shows groundwater gains and losses with several exceptions. Areas such as the Walla Walla River in Oregon at the levee segment that have been shown through other studies to be areas of high loss are confirmed using this data collection and analysis approach.

As the Walla Walla River moves out of the broad to narrow canyon environment above Milton-Freewater into the alluvial gravel rich deposits of the valley floor downstream of Milton-Freewater a significant percentage of flow is lost to channel bed seepage. It is widely believed that the arc of springs located to the west of the Milton-Freewater levee reaches is fed by the high channel bed losses from Nursery Bridge to Birch Creek Road Bridge.

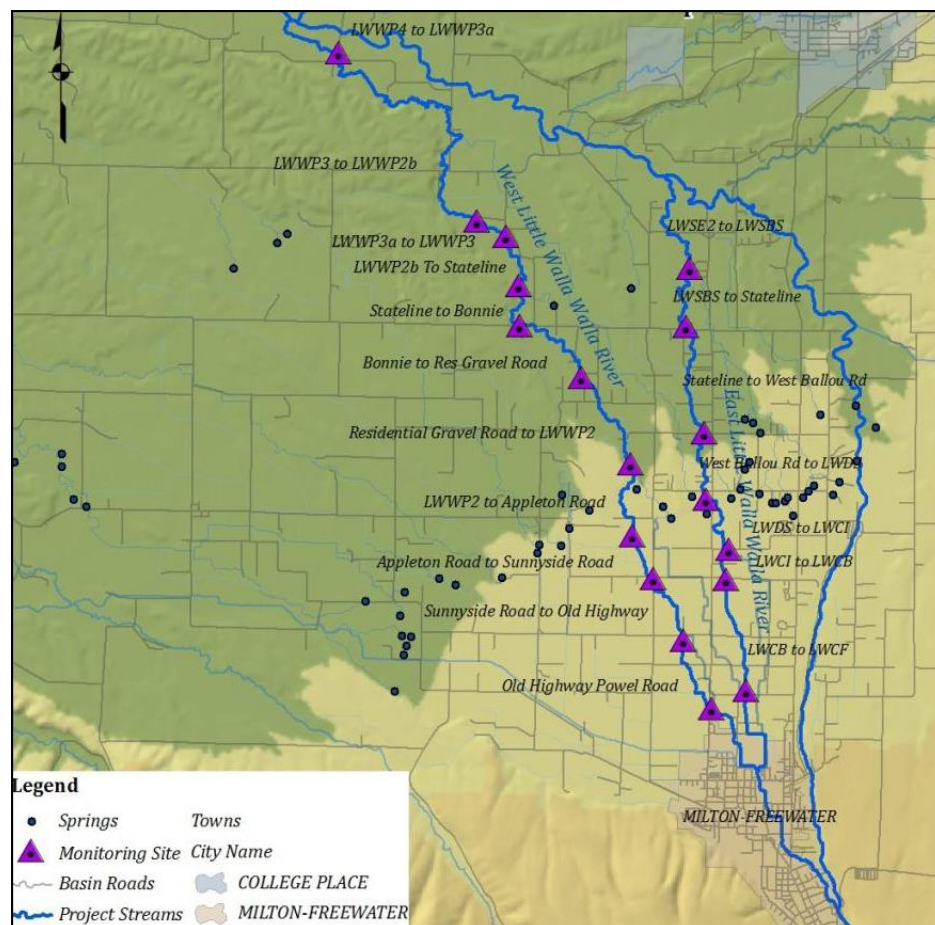


Figure 32: Arc of springs

Water movement through the shallow alluvial aquifer can also be tracked using basin monitoring wells. Water table contours provide an avenue to examine flow direction through the aquifer. By overlaying the seepage results with the water table for the same time period the results show that water leaving the Walla Walla River through the gravel channel moves in a northwesterly direction towards the springs.

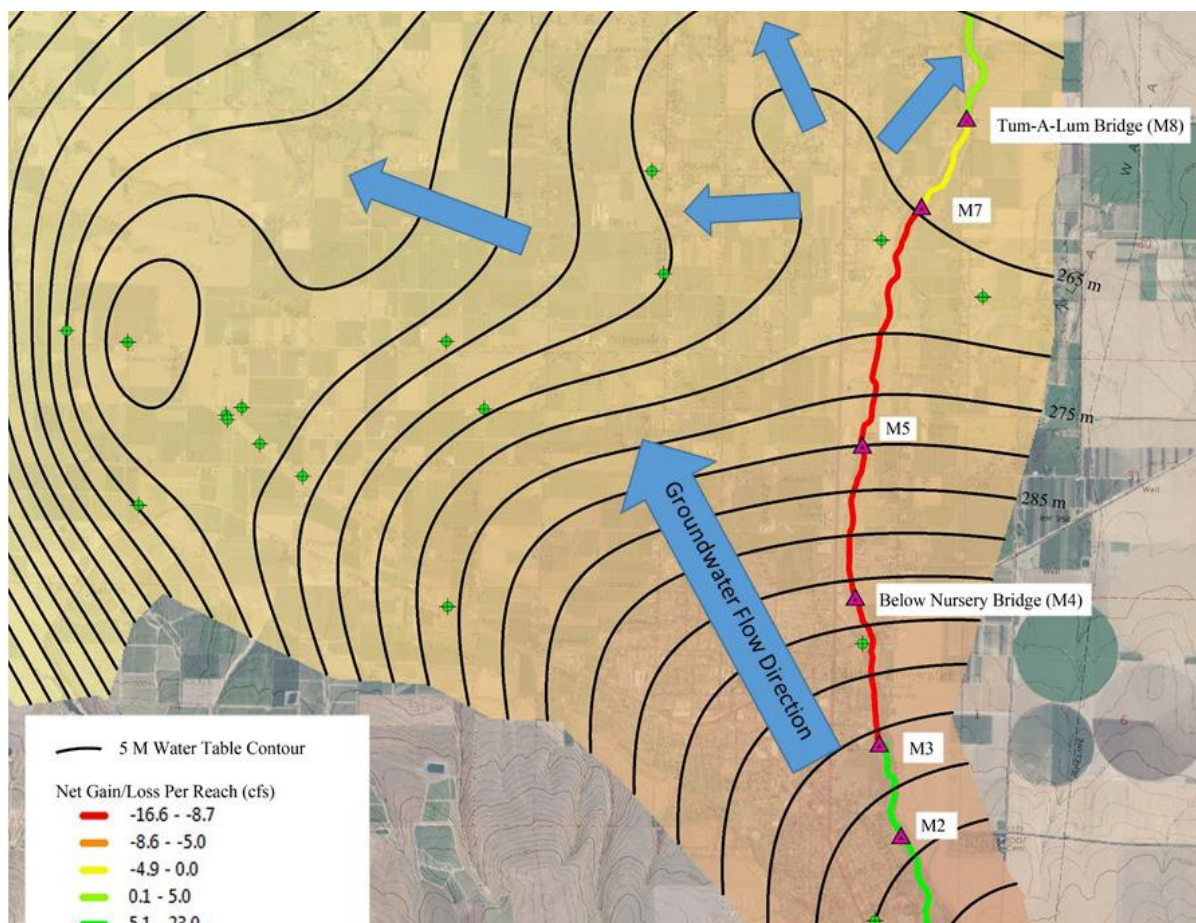


Figure 33: July water table and seepage assessment results

Even though high seepage values are recorded in the levee section of the river, there is a high probability of that same water returning to the system through the springs and back to the Walla Walla River in the East and West Little Walla Walla Rivers. Further studies focused on tracking the high losses in the levee section of the Walla Walla River should occur to fully understand the channel bed losses. By reducing the high losses in the river through the M3 to Birch Creek Road Bridge (M8) reaches a significant amount water would stay on the surface providing additional flow through critical months.

Collaborators

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Attachments

Attachment A

Attachment A-1

June 2002 Seepage Data Set

Flow Measurement Location	Actual River Mile	Rate Per Mile	Net Gain/Loss	Gross Gain/Loss Change (Instream)	Net Diversion Total	Net Trib Total	Flow (cfs)
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	15.85	19.50	19.50	0.00	0.00	118.00
Walla Walla River WWBWC # M-10 (MNWW40.8)	42.30	9.20	6.90	6.90	0.00	0.00	98.50
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	-1.69	-1.00	-1.00	0.00	0.00	91.60
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	0.35	0.20	0.20	0.00	0.00	92.60
Walla Walla River (M-7) (MNWW42.9)	44.21	-31.52	-35.30	-35.30	0.00	0.00	92.40
Walla Walla River M-5b (MNWW44)	45.33	14.83	8.60	15.60	0.00	7.00	127.70
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	-23.29	-18.40	-18.40	0.00	0.00	112.10
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.70	-25.52	-29.60	-147.20	-117.60	0.00	130.50
Grove School Bridge (M-1a) (MNWW46.1)	47.86	18.26	37.80	32.20	-5.60	0.00	277.70
Day Road	49.93	-33.93	-30.20	-30.20	0.00	0.00	245.50
Joe West Bridge (MNWW49.1)	50.82	19.82	32.50	72.20	-2.10	41.80	275.70
South Fork Bridge	52.46	0.21	1.10	-2.90	-4.00	0.00	203.50
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	-12.47	-20.20	-20.20	0.00	0.00	206.40
SF Walla Walla River (SFWW9.0)	59.25	-5.13	-9.40	-9.40	0.00	0.00	226.60
OWRD Gauge Station, SF Walla Walla River	61.08						236.00

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-2

August 2002 Seepage Data Set

Flow Measurement Location	Actual River Mile	Rate Per Mile	Net Gain/Loss	Gross Gain/Loss Change (Instream)	Net Diversion Total	Net Trib Total	Flow (cfs)
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	-0.82	-0.40	-0.10	0.00	0.30	12.40
Oregon/WA stateline (WDFW Gauge station 2001-2)	41.56	1.49	1.10	1.10	0.00	0.00	12.50
Walla Walla River WWBWC # M-10 (MNWW40.8)	42.30	4.53	3.40	3.40	0.00	0.00	11.40
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	-7.46	-4.40	-4.40	0.00	0.00	8.00
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	-1.23	-0.70	-0.70	0.00	0.00	12.40
Walla Walla River (M-7) (MNWW42.9)	44.21	-13.85	-5.40	-5.40	0.00	0.00	13.10
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-21.10	-15.40	-15.40	0.00	0.00	18.50
Walla Walla River M-5b (MNWW44)	45.33	0.00	0.00	7.40	0.00	7.40	33.90
Levy, Willow Lane (M-5a)	45.38	-9.81	-5.20	-5.20	0.00	0.00	26.50
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	-10.51	-8.30	-12.90	-4.60	0.00	31.70
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.70	-3.88	-4.50	-54.30	-49.80	0.00	44.60
Grove School Bridge (M-1a) (MNWW46.1)	47.86	6.51	7.10	2.90	-4.20	0.00	98.90
Couse Creek Road Bridge (MNWW47)	48.95	-3.47	-3.40	-6.80	-3.40	0.00	96.00
Day Road	49.93	2.02	1.80	1.80	0.00	0.00	102.80
Joe West Bridge (MNWW49.1)	50.82	3.96	6.50	4.20	-7.80	5.50	101.00
South Fork Bridge	52.46	1.31	1.80	-3.20	-5.00	0.00	96.80
SF Walla Walla River (SFWW1.7)	53.83	1.74	6.60	-0.90	-7.50	0.00	100.00
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	5.37	8.70	8.70	0.00	0.00	100.90
SF Walla Walla River (SFWW9.0)	59.25	-4.21	-7.70	-7.80	-0.10	0.00	92.20
OWRD Gauge Station, SF Walla Walla River	61.08	x	x	x	x	x	100.00

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-3

June 2003 Seepage Data Set

Flow Measurement Location	Actual River Mile	Rate Per Mile	Net Gain/Loss	Gross Gain/Loss Change (Instream)	Net Diversion Total	Net Trib Total	Flow (cfs)
Oregon/WA stateline (WDFW Gauge station 2001-2)	41.56	7.16	5.30	4.90	-0.40	0.00	11.90
Walla Walla River WWBWC # M-10 (MNWW40.8)	42.30	2.13	1.60	1.60	0.00	0.00	7.00
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	-11.02	-6.50	-6.50	0.00	0.00	5.40
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	3.16	1.80	1.80	0.00	0.00	11.90
Walla Walla River (M-7) (MNWW42.9)	44.21	-17.95	-7.00	-7.00	0.00	0.00	10.10
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-11.51	-8.40	-8.40	0.00	0.00	17.10
Walla Walla River M-5b (MNWW44)	45.33	-14.72	-8.54	-7.90	0.00	0.64	25.50
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	2.28	1.80	-3.40	-5.20	0.00	33.40
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.70	-2.84	-3.30	-80.80	-77.50	0.00	36.80
Grove School Bridge (M-1a) (MNWW46.1)	47.86	8.81	9.60	5.60	-4.00	0.00	117.60
Couse Creek Road Bridge (MNWW47)	48.95	0.20	0.20	-3.10	-3.30	0.00	112.00
Day Road	49.93	3.48	3.10	3.00	-0.10	0.00	115.10
Joe West Bridge (MNWW49.1)	50.82	-8.09	-13.26	-7.00	-4.60	10.86	112.10
South Fork Bridge	52.46	2.96	15.30	6.80	-8.50	0.00	119.10
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	-5.00	-8.10	-8.10	0.00	0.00	112.30
SF Walla Walla River (SFWW9.0)	59.25	5.96	10.90	10.70	-0.20	0.00	120.40
OWRD Gauge Station, SF Walla Walla River	61.08						109.70

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-4

August 2003 Data Set

Flow Measurement Location	Actual River Mile	Rate Per Mile	Net Gain/Loss	Gross Gain/Loss Change (Instream)	Net Diversion Total	Net Trib Total	Flow (cfs)
Highway 12 Bridge (Mouth of Walla Walla River)	0.00						
Nine Mile Bridge	8.54	-1.81	-13.32	-13.32	0.00	0.00	3.64
USGS Touchet Gage	15.91	-2.04	-23.97	-21.24	0.00	2.73	16.96
Lowden Rd Bridge	27.64	13.10	26.59	23.80	-2.79	0.00	38.20
MacDonald Rd Bridge	29.67	-1.71	-6.20	-28.00	-21.80	0.00	14.40
Detour Road	33.29	2.97	3.24	2.24	-1.20	0.20	42.40
Swegle Road Bridge	34.38	-0.46	-0.67	-0.67	0.00	0.00	40.16
Last Chance Road Bridge	35.84	-3.26	-5.47	-7.67	-2.40	0.20	40.83
Beet Road Bridge	37.52	-9.49	-5.60	-5.60	0.00	0.00	42.90
Walla Walla River (WDFW #5 Site)	38.11	0.89	1.20	25.70	-0.80	25.30	48.50
Old Milton HWY Bridge	39.46	2.42	3.90	3.90	0.00	0.00	22.80
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	6.37	3.12	3.20	-0.22	0.30	18.90
Oregon/WA stateline (WDFW Gauge station 2001-2)	41.56	0.95	0.70	0.70	0.00	0.00	15.70
Walla Walla River WWBWC # M-10 (MNWW40.8)	42.30	-1.07	-0.80	-0.90	-0.10	0.00	15.00
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	-1.69	-1.00	-1.00	0.00	0.00	15.90
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	-4.56	-2.60	-2.60	0.00	0.00	16.90
Walla Walla River (M-7) (MNWW42.9)	44.21	-12.82	-5.00	-5.00	0.00	0.00	19.50
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-21.54	-16.80	-14.20	0.00	2.60	24.50
Levy, Willow Lane (M-5a)	45.38	0.94	0.50	0.50	0.00	0.00	38.70
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	-7.09	-5.60	-10.60	-5.00	0.00	38.20
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.70	-3.71	-4.30	-47.80	-43.50	0.00	48.80
Grove School Bridge (M-1a) (MNWW46.1)	47.86	4.22	4.60	-0.70	-5.30	0.00	96.60
Couse Creek Road Bridge (MNWW47)	48.95	6.24	6.12	3.10	-3.02	0.00	97.30
Day Road	49.93	0.56	0.50	0.40	-0.10	0.00	94.20
Joe West Bridge (MNWW49.1)	50.82	3.84	6.30	2.80	-5.40	1.90	93.80
South Fork Bridge	52.46	2.10	2.88	-5.40	-8.28	0.00	91.00
SF Walla Walla River (SFWW1.7)	53.83	2.78	10.56	6.90	-3.66	0.00	103.30
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	2.10	3.40	3.40	0.00	0.00	96.40
SF Walla Walla River (SFWW9.0)	59.25	-7.65	-14.00	-14.00	0.00	0.00	93.00
OWRD Gauge Station, SF Walla Walla River	61.08	-4.08	-24.36	0.00	0.00	24.36	107.00
Walla Walla River 47 feet upstream of Burnt Cabin (Find location)	67.05	-1.55	-1.70	1.80	0.00	3.50	89.50
Walla Walla River 71 feet us Table Creek	68.15	8.37	16.23	27.70	0.00	11.47	87.70
SF Walla Walla River (upstream of Skiphorton)	70.09	2.85	10.52	16.60	0.00	6.08	60.00
Upper South Fork Walla Walla River (Reser Creek)	73.78						43.40

Flow data applies to River flow at Location ID

Rate/Net gain-Loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-5

June 2004 Data Set

Flow Measurement Location	Actual River Mile (GIS)	Rate Per Mile	Net Gain/Loss	Gross Gain/Loss Change (Instream)	Net Diversion Total	Net Trib Total	Flow (cfs)
Highway 12 Bridge (Mouth of Walla Walla River)	0.00	x	x	x	x	x	x
Nine Mile Bridge	8.54	-0.02	-0.08	-0.08	0.00	0.00	184.54
Cummings Bridge	12.71	-16.53	-52.89	-47.97	0.00	4.92	184.62
USGS Touchet Gage	15.91	16.55	75.62	172.20	-3.86	100.44	232.59
Lowden Rd Bridge	27.64	2.33	4.73	1.94	-2.79	0.00	60.39
MacDonald Rd Bridge	29.67	-2.03	-7.36	-32.91	-25.55	0.00	58.45
Detour Road	33.29	2.25	2.45	35.26	0.00	32.82	91.36
Swegle Road Bridge	34.38	2.53	3.70	3.70	0.00	0.00	56.09
Last Chance Road Bridge	35.84	-1.30	-2.96	-40.23	-40.94	3.67	52.39
Walla Walla River (WDFW #5 Site)	38.11	-9.82	-13.26	49.37	0.00	62.63	92.62
Old Milton HWY Bridge	39.46	1.35	2.17	2.17	0.00	0.00	43.24
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	-7.91	-9.73	-7.57	0.00	2.16	41.07
Walla Walla River WWBWC # M-10 (MNWW40.8)	42.30	11.96	16.02	16.02	0.00	0.00	48.64
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	3.70	2.11	2.11	0.00	0.00	32.62
Walla Walla River (M-7) (MNWW42.9)	44.21	0.18	0.07	0.07	0.00	0.00	30.51
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-19.15	-25.09	-23.09	0.00	2.00	30.44
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	0.45	0.88	-158.54	-159.42	0.00	53.53
Grove School Bridge (M-1a) (MNWW46.1)	47.86	35.06	30.15	31.84	-1.87	3.56	212.07
Mainstem u/s Couse Creek	48.72	42.62	8.95	8.95	0.00	0.00	180.23
Couse Creek Road Bridge (MNWW47)	48.95	-17.76	-17.41	-19.64	-2.23	0.00	171.28
Day Road	49.93	27.21	24.22	24.17	-0.05	0.00	190.92
Joe West Bridge (MNWW49.1)	50.82	-10.90	-17.90	4.00	-5.40	27.30	166.75
South Fork Bridge	52.46	-1.70	-8.90	-12.90	-4.00	0.00	162.80
SF Walla Walla River (SFWW9.0)	59.25	8.60	29.70	24.30	-5.50	0.00	175.70
OWRD Gauge Station, SF Walla Walla River	61.08	x	x	x	x	x	151.40

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-6

August 2004 Data Set

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Highway 12 Bridge (Mouth of Walla Walla River)	0.00	x	x	x	x	x	x
Cummings Bridge	12.71	-1.48	-4.74	-6.30	-1.56	0.00	16.70
USGS Touchet Gage	15.91	0.57	2.60	2.52	-1.54	1.46	23.00
Touchet-Gardena Road Bridge	20.48	1.70	12.14	9.01	-3.59	0.46	20.48
Lowden Rd Bridge	27.64	-0.02	-0.05	-8.19	-8.14	0.00	11.47
MacDonald Rd Bridge	29.67	0.96	4.51	-11.08	-17.71	2.12	19.66
Sweeple Road Bridge	34.38	-3.71	-5.42	-5.42	0.00	0.00	30.74
Last Chance Road Bridge	35.84	1.39	2.34	0.79	-2.00	0.45	36.16
Beet Road Bridge	37.52	-2.63	-1.55	-1.55	0.00	0.00	35.37
Walla Walla River (WDFW #5 Site)	38.11	-2.12	-2.86	23.44	-0.29	26.59	36.92
Old Milton HWY Bridge	39.46	1.83	2.96	2.96	0.00	0.00	13.48
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	1.14	1.40	1.50	-0.28	0.38	10.52
Walla Walla River WWBWC # M-10 (MNWW40.8) (Beaver)	42.30	1.92	1.44	1.44	0.00	0.00	9.02
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	0.41	0.24	0.24	0.00	0.00	7.58
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	2.00	1.14	1.14	0.00	0.00	7.34
Walla Walla River (M-7) (MNWW42.9)	44.21	-9.97	-3.89	-3.89	0.00	0.00	6.20
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-15.79	-12.32	-10.32	0.00	2.00	10.09
Levy, Willow Lane (M-5a)	45.38	-1.75	-0.93	-0.93	0.00	0.00	20.41
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	-3.61	-7.07	-77.44	-70.37	0.00	21.34
Grove School Bridge (M-1a) (MNWW46.1)	47.86	8.09	8.82	8.82	0.00	0.00	98.78
Couse Creek Road Bridge (MNWW47)	48.95	-3.29	-3.22	-3.22	0.00	0.00	89.96
Day Road	49.93	-12.24	-10.89	-10.95	-0.06	0.00	93.18
Joe West Bridge (MNWW49.1)	50.82	11.11	18.33	11.57	-6.76	0.00	104.13
South Fork Bridge	52.46	0.49	2.51	-3.90	-6.41	0.00	92.56
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	4.09	6.63	6.63	0.00	0.00	96.46
SF Walla Walla River (SFWW9.0)	59.25	-7.65	-14.00	-14.17	-0.17	0.00	89.83
OWRD Gauge Station, SF Walla Walla River	61.08	x	x	x	x	x	104.00

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-7

2007 August Data Set

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change	2007 Net Diversion Total (cfs)	2004 Net Tributary Inputs Total (cfs)	2004 Flow (cfs)
Nine Mile Bridge	8.50	-0.57	-2.40	-5.58	-3.18	0.00	5.70
Cummings Bridge	12.71	0.32	1.02	-0.70	-1.72	0.00	11.30
USGS Touchet Gage	15.91	0.86	3.94	-0.20	-6.96	2.82	12.00
Lowden Rd Bridge	27.64	1.10	2.24	-6.20	-8.44	0.00	12.20
MacDonald Rd Bridge	29.67	0.70	2.53	-12.20	-14.73	0.00	18.40
Detour Road	33.29	-1.91	-2.08	1.10	0.00	3.18	30.60
Swegle Road Bridge	34.38	0.12	0.18	0.09	-0.09	0.00	29.50
Last Chance Road Bridge	35.84	0.37	0.62	-1.38	-2.00	0.00	29.41
Beet Road Bridge	37.52	3.22	1.90	1.90	0.00	0.00	30.79
Walla Walla River (WDFW #5 Site)	38.11	-2.26	-3.06	14.73	0.00	17.79	28.89
Old Milton HWY Bridge	39.46	0.60	0.97	0.97	0.00	0.00	14.16
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	2.88	3.54	3.54	0.00	0.00	13.19
Walla Walla River WWBWC # M-10 (MNWW40.8) (Beaver)	42.30	1.23	0.92	0.92	0.00	0.00	9.65
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.05	-2.90	-1.71	-2.00	-0.29	0.00	8.73
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	-1.67	-0.96	-0.96	0.00	0.00	10.73
Walla Walla River (M-7) (MNWW42.9)	44.21	-18.44	-7.16	-7.16	0.00	0.00	11.69
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-1.26	-0.92	-0.92	0.00	0.00	18.85
Walla Walla River M-5b (MNWW44)	45.33	-1.63	-0.94	-0.94	0.00	0.00	19.77
Levy, Willow Lane (M-5a)	45.38						
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	-1.56	-1.69	-4.79	-3.10	0.00	20.71
Walla Walla River M-2 (MNWW45.6)	46.99	-4.56	-4.00	-73.00	-69.00	0.00	25.50
Grove School Bridge (M-1a) (MNWW46.1)	47.86	10.41	11.32	11.32	0.00	0.00	98.50
Couse Creek Road Bridge (MNWW47)	48.95	-2.84	-2.78	-5.52	-2.74	0.00	87.18
Day Road	49.93	0.43	0.38	0.34	-0.04	0.00	92.7
Joe West Bridge (MNWW49.1)	50.82	-0.89	-1.46	-3.26	-6.00	4.20	92.36
South Fork Bridge	52.46	0.38	1.95	-4.78	-6.73	0.00	95.62
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	4.59	7.41	7.30	-0.11	0.00	100.4
SF Walla Walla River (SFWW9.0)	59.25	-7.03	-12.89	-12.89	0.00	0.00	93.1
OWRD Gauge Station, SF Walla Walla River	61.08	x	x	x	x	x	105.99

Flow data applies to River flow at Location ID

Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.

Attachment A-8		2007 October Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change	2007 Net Diversion Total (cfs)	2007 Net Tributary Inputs Total (cfs)	2007 Flow (cfs)
Nine Mile Bridge	8.50	-3.04	-12.80	-16.60	-3.80	0.00	54.34
Cummings Bridge	12.71	-2.77	35.14	36.24	-57.40	58.50	70.94
Detour Road	33.29	4.31	4.69	14.09	0.00	9.40	34.70
Swegle Road Bridge	34.38	-0.84	-1.22	-1.31	-0.09	0.00	20.61
Last Chance Road Bridge	35.84	0.80	1.34	0.53	-2.00	1.19	21.92
Beet Road Bridge	37.52	3.35	1.98	-15.31	-17.29	0.00	21.39
Walla Walla River (WDFW #5 Site)	38.11	-1.49	-2.01	20.29	0.00	22.30	36.70
Old Milton HWY Bridge	39.46	-0.64	-1.04	-1.04	0.00	0.00	16.41
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.07	3.22	3.95	3.95	0.00	0.00	17.45
Walla Walla River WWBWC # M-10 (MNWW40.8) (Beaver)	42.30	-1.52	-2.03	-2.03	0.00	0.00	13.50
Tumalum Road Bridge (M-8) (MNWW42.3)	43.64	1.57	0.90	0.90	0.00	0.00	15.53
Walla Walla River (M-7) (MNWW42.9)	44.21	-11.23	-4.36	-4.36	0.00	0.00	14.63
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.60	-1.80	-1.40	-1.40	0.00	0.00	18.99
Levy, Willow Lane (M-5a)	45.38	-11.25	-5.94	-5.94	0.00	0.00	20.39
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.91	0.70	0.76	0.76	0.00	0.00	26.33
Walla Walla River M-2 (MNWW45.6)	46.99	-0.91	-0.80	-87.50	-86.70	0.00	25.57
Grove School Bridge (M-1a) (MNWW46.1)	47.86	13.31	14.47	14.47	0.00	0.00	113.07
Couse Creek Road Bridge (MNWW47)	48.95	-1.80	-1.76	-4.50	-2.74	0.00	98.60
Day Road	49.93	6.15	5.44	5.40	-0.05	0.00	103.10
Joe West Bridge (MNWW49.1)	50.82	0.70	1.15	1.15	0.00	0.00	97.70
South Fork Bridge	52.46	2.28	11.77	9.17	-2.60	0.00	96.55
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.63	-3.76	-6.08	-6.08	0.00	0.00	87.38
SF Walla Walla River (SFWW9.0)	59.25	-7.93	-14.54	-14.54	0.00	0.00	93.46
OWRD Gauge Station, SF Walla Walla River	61.08	x	x	x	x	x	108.00
Flow data applies to River flow at Location ID							
Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.							

Attachment A-9		2008 July Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change	2007 Net Diversion Total (cfs)	2007 Net Tributary Inputs Total (cfs)	2007 Flow (cfs)
Nine Mile Bridge	8.5	-0.2	-0.7	-0.7	0.0	0.0	58.3
Cummings Bridge	12.7	0.7	2.4	4.0	1.7	0.0	59.0
USGS Touchet Gage	15.9	-2.5	-11.3	38.3	-1.1	50.7	55.0
Touchet-Gardena Road Bridge	20.5	0.8	6.0	4.3	-3.3	1.6	16.7
Lowden Rd Bridge	27.6	6.7	13.5	-4.5	-18.1	0.0	12.4
MacDonald Rd Bridge	29.7	-7.2	-26.0	-37.4	-11.3	0.0	16.9
Detour Road	33.3	14.2	15.4	21.4	-0.2	6.2	54.3
Swegle Road Bridge	34.4	-1.2	-1.8	-1.8	0.0	0.0	32.9
Last Chance Road Bridge	35.8	-7.4	-12.5	-14.2	-1.8	0.0	34.7
Beet Road Bridge	37.5	25.2	14.9	14.9	0.0	0.0	48.9
Walla Walla River (WDFW #5 Site)	38.1	-1.0	-1.3	15.4	-1.0	17.6	34.0
Old Milton HWY Bridge	39.5	-3.1	-5.0	-5.0	0.0	0.0	18.7
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.1	-0.1	5.9	5.5	-0.4	0.0	23.6
Walla Walla River WWBWC # M-10 (MNWW40.8) (Beaver)	42.3	3.0	2.2	2.2	0.0	0.0	18.1
Walla Walla River WWBWC # M-9a (Mauer Lane)	43.0	-7.4	-4.4	-4.4	0.0	0.0	15.9
Tumalum Road Bridge (M-8) (MNWW42.3)	43.6	-0.8	-0.5	-0.5	0.0	0.0	20.3
Walla Walla River (M-7) (MNWW42.9)	44.2	-5.6	-2.2	-2.2	0.0	0.0	20.8
Walla Walla River (M-6) Gravel Pit (MNWW43.6)	44.6	-8.2	-6.0	-6.0	0.0	0.0	22.9
Walla Walla River M-5b (MNWW44)	45.3	-184.9	-8.7	-8.7	0.0	0.0	28.9
Levy, Willow Lane (M-5a)	45.4	1.9	1.0	1.0	0.0	0.0	37.6
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	45.9	-10.5	-11.4	-11.4	0.0	0.0	36.6
Walla Walla River M-2 (MNWW45.6)	47.0	9.1	8.0	-78.7	-86.7	0.0	47.9
Grove School Bridge (M-1a) (MNWW46.1)	47.9	-0.2	10.0	10.0	0.0	0.0	126.6
Couse Creek Road Bridge (MNWW47)	49.0	-0.5	-0.5	-3.3	-2.7	0.0	116.6
Day Road	49.9	-5.9	-5.2	-5.3	-0.1	0.0	119.9
Joe West Bridge (MNWW49.1)	50.8	17.9	29.5	35.5	-4.7	10.8	125.1
South Fork Bridge	52.5	0.4	-21.7	-24.3	-2.6	0.0	89.6
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	57.6	-2.6	-4.2	-4.2	0.0	0.0	113.8
SF Walla Walla River (SFWW9.0)	59.3	5.5	10.0	10.0	0.0	0.0	118.0
OWRD Gauge Station, SF Walla Walla River	61.1	x	x	x	x	x	108.0
Flow data applies to River flow at Location ID							
Rate/Net gain-loss/Gross/Net Div and Trib data applies from Location ID to next UPSTREAM site.							

Attachment A-10 2008 November Data Set (Updated 2017)

Flow Measurement Location	Actual River Mile	Walla Walla River Reach ID	Defined Reach Data *	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversio n Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)
Highway 12 Bridge (Mouth of Walla Walla River)	0.0	1	1-2							
Nine Mile Bridge	8.5	2	2-3	5.68	-1.63	-11.73	-15.29	-3.56	0.00	52.04
Cummings Bridge	12.7	3	3-4	12.88	-1.09	-3.54	-10.67	-7.13	0.00	67.33
USGS Touchet Gage	15.9	4	4-5	16.12	-1.29	-5.60	-62.20	-8.90	65.50	78.00
Touchet-Gardena Road Bridge	20.5	5	5-6	20.48	0.28	2.14	4.94	-0.89	3.69	15.80
Lowden Rd Bridge	27.6	6	6-7	28.24	-1.42	-3.08	-11.48	-8.40	0.00	10.86
MacDonald Rd Bridge	29.7	7	7-8	30.41	-1.52	-5.41	-23.86	-18.45	0.00	22.34
Detour Road	33.3	8	8-9	33.97	2.97	3.19	23.69	0.00	20.50	46.20
Swegle Road Bridge	34.4	9	9-10	35.04	2.42	3.58	3.58	0.00	0.00	22.51
Last Chance Road Bridge	35.8	10	10-11	36.52	-0.32	-0.57	-0.57	0.00	0.00	18.93
Beet Road Bridge	37.5	11	11-12	38.32	-5.87	-3.03	-36.63	-33.60	0.00	19.50
Walla Walla River (WDFW #5 Site)	38.1	12	12-13	38.84	0.91	1.25	27.95	0.00	26.70	56.13
Old Milton HWY Bridge	39.5	13	13-14	40.21	1.59	2.68	2.68	0.00	0.00	28.18
Peppers Bridge Location	41.1	14	14-15	41.90	1.27	1.32	1.50	0.00	0.18	25.50
Oregon/WA stateline	41.6	15	15-16							
WWBWC # M-10	42.3	16	16-17	42.94	4.39	3.62	3.62	0.00	0.00	24.00
WWBWC # M-9a	43.0	17	17-18	43.76	-0.72	-0.48	-0.48	0.00	0.00	20.38
Tumalum Road Bridge (M-8)	43.6	18	18-19	44.43	-6.15	-9.43	-9.43	0.00	0.00	20.86
Walla Walla River (M-7)	44.2	19	19-20	44.87						
Walla Walla River (M-6) Gravel Pit	44.6	20	20-21							
Walla Walla River M-5b	45.3	21	21-22	45.96	0.89	0.59	0.59	0.00	0.00	30.29
Levy, Willow Lane (M-5a)	45.4	22	22-23							
Walla Walla River Nursery Bridge (M-4)	45.9	23	23-24	46.62	3.82	7.52	-81.78	-89.30	0.00	29.70
Levy, 0.5 mile us of Nursery Bridge (M-3)	46.7	24	24-25	47.26						
Grove School Bridge (M-1a)	47.9	25	25-26	48.59	13.82	14.74	14.74	0.00	0.00	111.48
Mainstem u/s Couse Creek	48.7	26	26-27							
Couse Creek Road Bridge	49.0	27	27-28	49.66	-5.72	-5.34	-8.56	-3.22	0.00	96.74
Day Road	49.9	28	28-29	50.59	4.99	4.88	2.68	-2.20	0.00	105.30
Joe West Bridge	50.8	29	29-30	51.57	0.18	0.29	0.85	-0.25	0.81	102.62
South Fork Bridge	52.5	30	30-31	53.22	1.67	8.71	4.45	-4.26	0.00	101.77
Private Property (SFWW1.7)	53.8	31	31-32							
CTUIR Fish Hatchery	57.6	32	32-33	58.44	-3.21	-5.25	-5.25	0.00	0.00	97.32
Private Property (SFWW9.0)	59.3	33	33-34	60.07	1.13	2.01	2.01	0.00	0.00	102.57
OWRD Gauge Station,	61.1	34	34-35	61.85	x	x	x	x	x	100.56

Attachment A-11

Walla Walla River Seepage Assessment, July 2011								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	-2.90	-20.91	-21.85	-0.94	0.00	91.86	Losing
Byerly Bdg to USGS Touchet Gauge	12.88	-4.72	-15.29	-15.29	0.00	0.00	113.71	Losing
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	3.77	53.90	119.93	-6.23	72.26	129.00	Gaining
Lowden Rd Bdg	28.24						6.98	Losing
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-0.64	-2.29	-28.23	-25.94	0.00	9.07	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	0.10	0.11	8.24	-0.08	8.21	37.30	Gaining
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	2.80	4.13	4.13	0.00	0.00	29.06	Gaining
Last Chance Rd Bdg to Beet Rd Bdg	36.52	-1.12	-2.02	-2.97	-1.56	0.61	24.93	Losing
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-9.51	-4.91	-36.91	-32.00	0.00	27.90	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	4.58	6.29	45.80	0.00	39.50	64.81	Gaining
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	0.14	0.10	0.10	0.00	0.00	19.01	Gaining
Hwy 125 Bdg to Pepper Bdg	40.94	-0.20	-0.19	-0.19	0.00	0.00	18.91	Losing
Pepper Bdg to M-10	41.90	3.55	3.69	4.40	0.00	0.71	19.10	Gaining
M-10 to Mauer Lane (M9a)	42.94	2.99	2.46	2.46	0.00	0.00	14.70	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	1.67	1.11	1.11	0.00	0.00	12.24	Gaining
Tum-A-Lum Bdg (M8) to M7	44.43	-5.73	-2.53	-2.53	0.00	0.00	11.13	Losing
M7 to M5	44.87	-10.77	-11.77	-11.77	0.00	0.00	13.66	Losing
M-5 to Nursery Bdg M-4	45.96	-7.61	-5.03	-4.61	0.00	0.42	25.43	Losing
Nursery Bdg M-4 to M3	46.62	-18.23	-11.72	-8.15	3.57	0.00	30.04	Losing
M3 to M2	47.26	4.47	1.96	1.96	0.00	0.00	38.19	Gaining
M2 to M1a Grove School Bdg	47.70	4.04	3.58	-112.99	-116.57	0.00	36.23	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	-3.98	-4.24	-3.89	-0.08	0.43	149.22	Losing
Couse Creek Rd Bdg to Day Road	49.66	-0.07	-0.07	-2.44	-2.37	0.00	153.11	Losing
Day Road to Joe West Bdg	50.59	20.91	20.46	20.46	0.00	0.00	155.55	Gaining
Joe West Bdg to South Fork Bdg	51.57	-10.24	-16.87	-10.18	-3.37	10.06	135.09	Losing
South Fork Bdg to CTUIR Hatchery	53.22	1.68	8.75	3.35	-5.40	0.00	145.26	Gaining
CTUIR Hatchery to Keating	58.44	8.39	13.70	13.50	-0.20	0.00	141.91	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07	-10.94	-19.44	-19.60	-0.16	0.00	128.41	Losing
SF Walla Walla BLM Trailhead	61.85	X	X	X	X	X	148.01	

Attachment A-12

Walla Walla River Seepage Assessment, September 2011								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	-0.31	-2.27	-3.22	-0.95	0.00	65.13	Losing
Byerly Bdg to USGS Touchet Gauge	12.88	6.04	19.58	15.35	-4.23	0.00	68.35	Gaining
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	0.21	2.99	4.71	-8.75	10.48	53.00	Gaining
Lowden Rd Bdg	28.24						43.60	Losing
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-0.11	-0.40	-21.22	-20.82	0.00	48.29	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	2.82	3.03	10.80	0.00	7.77	69.51	Gaining
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	0.72	1.07	0.96	-0.11	0.00	58.71	Gaining
Last Chance Rd Bdg to Beet Rd Bdg	36.52	-3.32	-5.99	-8.44	-2.45	0.00	57.75	Losing
Beet Rd Bdg to WWR WDFW #5 Site	38.32	6.75	3.48	3.48	0.00	0.00	66.19	Gaining
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	0.48	0.67	34.52	-0.33	34.19	62.71	Gaining
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	-6.62	-4.77	-4.77	0.00	0.00	28.19	Losing
Hwy 125 Bdg to Pepper Bdg	40.94	5.44	5.25	5.25	0.00	0.00	32.96	Gaining
Pepper Bdg to M-10	41.90	5.15	5.36	5.72	0.00	0.36	27.71	Gaining
M-10 to Mauer Lane (M9a)	42.94	1.21	1.00	1.00	0.00	0.00	21.99	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	-1.18	-0.78	-0.78	0.00	0.00	20.99	Losing
Tum-A-Lum Bdg (M8) to M7	44.43	-2.22	-0.98	-0.98	0.00	0.00	21.77	Losing
M7 to M5	44.87	-9.65	-10.54	-10.54	0.00	0.00	22.75	Losing
M-5 to Nursery Bdg M-4	45.96	-7.01	-4.63	-4.32	0.00	0.31	33.29	Losing
Nursery Bdg M-4 to M3	46.62	-25.00	-16.08	-18.08	-2.01	0.00	37.61	Losing
M3 to M2	47.26	20.92	9.17	-54.83	-64.00	0.00	55.69	Gaining
M2 to M1a Grove School Bdg	47.70	0.98	0.87	0.87	0.00	0.00	110.52	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	-0.64	-0.68	-0.68	0.00	0.00	109.65	Losing
Couse Creek Rd Bdg to Day Road	49.66	-19.26	-17.99	-18.26	-0.69	0.42	110.33	Losing
Day Road to Joe West Bdg	50.59	18.56	18.16	16.96	-1.20	0.00	128.59	Gaining
Joe West Bdg to South Fork Bdg	51.57	-5.57	-9.17	-6.99	-2.68	4.86	111.63	Losing
South Fork Bdg to CTUIR Hatchery	53.22	2.13	11.14	6.64	-4.50	0.00	118.62	Gaining
CTUIR Hatchery to Keating	58.44	-0.56	-0.91	-1.11	-0.20	0.00	111.98	Losing
Keating to SF Walla Walla BLM Trailhead	60.07	1.65	2.93	2.82	-0.11	0.00	113.09	Gaining
SF Walla Walla BLM Trailhead	61.85	X	X	X	X	X	110.27	

Attachment A-13

Walla Walla River Seepage Assessment, July 2012							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)
Nine Mile Bridge	5.7	-1.6	-11.8	-11.8	0.0	0.0	92.1
Cummings Bridge	12.9	9.8	31.9	31.9	0.0	0.0	103.9
USGS Touchet Gage	16.1	-0.2	-2.2	58.4	-2.6	63.2	72.0
Touchet-Gardena Road Bridge							
Lowden Rd Bridge	28.2	1.4	3.1	-3.3	-6.4	0.0	13.6
MacDonald Rd Bridge	30.4	-0.2	-0.8	-20.6	-19.8	0.0	16.9
Detour Road	34.0	-3.3	-3.5	7.4	-0.1	11.0	37.5
Swegle Road Bridge	35.0	0.8	1.2	1.2	0.0	0.0	30.1
Last Chance Road Bridge	36.5	1.3	2.3	1.8	-1.6	1.1	28.9
Beet Road Bridge	38.3	-16.5	-8.5	-33.1	-24.6	0.0	27.1
Walla Walla River (WDFW #5 Site)	38.8	6.0	8.3	40.6	-0.3	32.7	60.2
Old Milton HWY Bridge	40.2	0.2	0.2	0.2	0.0	0.0	19.6
Peppers Bridge Location (WDFW/WDOE Gauge station)	41.9	-2.3	-2.3	-1.8	0.0	0.5	16.4
Walla Walla River W/WBWC # M-10 (MNWW40.8) (Beaver)	42.9	2.6	2.2	2.2	0.0	0.0	18.2
Walla Walla River W/WBWC # M-9a (Mauer Lane)	43.8	-0.3	-0.2	-0.2	0.0	0.0	16.0
Tumalum Road Bridge (M-8) (MNWW42.3)	44.4	2.6	1.2	1.2	0.0	0.0	16.2
Walla Walla River (M-7) (MNWW42.9)	44.9	-8.7	-9.5	-9.5	0.0	0.0	15.0
Walla Walla River (M-6) Gravel Pit (MNWW43.6)							
Levy, Willow Lane (M-5a)	46.0	-7.6	-5.0	-4.9	0.0	0.2	24.5
Walla Walla River Nursery Bridge (M-4) (MNWW44.5)	46.6	-8.2	-5.3	-9.4	-4.1	0.0	29.4
Walla Walla River (M-3) Old Smith Ditch Div.	47.3	5.9	2.6	2.6	0.0	0.0	38.7
Walla Walla River M-2 (MNWW45.6)	47.7	-5.7	-5.0	-94.4	-89.4	0.0	36.1
Grove School Bridge (M-1a) (MNWW46.1)	48.6	12.0	12.8	13.2	-0.1	0.5	130.5
Couse Creek Road Bridge (MNWW47)	49.7	-6.3	-5.9	-9.1	-3.2	0.0	117.3
Day Road	50.6	3.6	3.6	3.6	0.0	0.0	126.4
Joe West Bridge (MNWW49.1)	51.6	-1.7	-2.8	2.1	-3.9	8.9	122.8
South Fork Bridge	53.2	-0.2	-1.2	-7.3	-6.1	0.0	120.7
SF Walla Walla River at CTUIR Fish Hatchery (SFWW7.0)	58.4	1.9	3.1	2.9	-0.2	0.0	128.0
SF Walla Walla River (SFWW9.0)	60.1	0.6	1.1	1.1	0.0	0.0	125.1
OWRD Gauge Station, SF Walla Walla River	61.8	x	x	x	x	x	124.0

Attachment A-14

Walla Walla River Seepage Assessments, September 2012							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)
Nine Mile Bridge	5.7	-1.6	-11.6	-14.9	-3.3	0.0	23.0
Cummings Bridge	12.9	4.2	13.8	7.9	-5.9	0.0	37.9
USGS Touchet Gage	16.1	0.4	5.2	14.7	-3.0	12.5	30.0
Touchet-Gardena Road Bridge							
Lowden Rd Bridge	28.2	-0.3	-0.7	-8.2	-7.5	0.0	15.3
MacDonald Rd Bridge	30.4	1.2	4.2	-24.4	-28.6	0.0	23.5
Detour Road	34.0	-3.8	-4.0	1.1	-0.5	5.6	47.9
Swegle Road Bridge	35.0	-0.8	-1.2	-1.2	0.0	0.0	46.8
Last Chance Road Bridge	36.5	4.7	8.4	6.0	-2.4	0.0	48.0
Beet Road Bridge	38.3	-13.7	-7.1	-7.1	0.0	0.0	42.0
Walla Walla River (WDFW #5 Site)	38.8	0.0	0.0	29.0	0.0	29.0	49.1
Old Milton HWY Bridge	40.2	-1.2	-0.9	-0.9	0.0	0.0	20.1
Peppers Bridge Location (WDFW/WDOE Gage)	41.9	-4.5	-4.7	-4.2	0.0	0.5	17.9
Walla Walla River WWBWC # M-10 (MNWW42.3)	42.9	9.6	7.9	7.9	0.0	0.0	22.1
Walla Walla River WWBWC # M-9a (Materl)	43.8	-1.5	-1.0	-1.0	0.0	0.0	14.2
Tumalum Road Bridge (M-8) (MNWW42.3)	44.4	-2.3	-1.0	-1.0	0.0	0.0	15.2
Walla Walla River (M-7) (MNWW42.9)	44.9	-13.4	-14.6	-14.6	0.0	0.0	16.3
Walla Walla River (M-6) Gravel Pit (MNWW43.6)							
Levy, Willow Lane (M-5a)	46.0	-1.6	-1.1	-0.9	0.0	0.2	30.9
Walla Walla River Nursery Bridge (M-4) (MNWW43.6)	46.6	-8.6	-5.6	-7.8	-2.2	0.0	31.8
Walla Walla River (M-3) Old Smith Ditch Div.	47.3	-0.5	-0.2	-0.2	0.0	0.0	39.6
Walla Walla River M-2 (MNWW45.6)	47.7	9.9	8.7	-65.5	-74.2	0.0	39.8
Grove School Bridge (M-1a) (MNWW46.1)	48.6	3.2	3.4	3.4	0.0	0.0	105.3
Couse Creek Road Bridge (MNWW47)	49.7	2.2	2.1	-1.1	-3.2	0.0	101.9
Day Road	50.6	4.4	4.3	4.3	0.0	0.0	103.0
Joe West Bridge (MNWW49.1)	51.6	-1.2	-2.0	-1.6	-3.5	3.9	98.8
South Fork Bridge	53.2	1.2	6.3	1.8	-4.5	0.0	100.4
SF Walla Walla River at CTUIR Fish Hatchery	58.4	-2.9	-4.7	-4.8	-0.1	0.0	98.6
SF Walla Walla River (SFWW9.0)	60.1	-1.0	-1.9	-2.2	-0.3	0.0	103.4
OWRD Gauge Station, SF Walla Walla River	61.8	x	x	x	x	x	105.6

Attachment A-15

Walla Walla River Seepage Assessment July 16th, 2013

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	-1.89	-13.58	-13.58	0.00	0.00	25.80	Losing
Byerly Bdg to USGS Touchet Gauge	12.88	4.06	13.18	13.18	0.00	0.00	39.38	Gaining
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	0.09	1.08	22.22	-4.21	25.35	26.20	Gaining
Lowden Rd Bdg	28.24	-0.24	-0.52	-0.91	-0.39	0.00	3.98	Losing
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-0.51	-1.80	-27.30	-25.50	0.00	4.89	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	-3.58	-3.85	1.14	-0.09	5.08	32.19	Losing
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	2.66	3.92	3.92	0.00	0.00	31.04	Gaining
Last Chance Rd Bdg to Beet Rd Bdg	36.52	2.43	4.39	2.76	-2.16	0.53	27.12	Gaining
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-13.45	-6.94	-19.64	-12.70	0.00	24.36	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	-0.46	-0.64	21.03	-0.38	22.04	44.00	Losing
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	0.99	0.71	0.71	0.00	0.00	22.98	Gaining
Hwy 125 Bdg to Pepper Bdg	40.94	4.93	4.76	4.11	-0.65	0.00	22.26	Gaining
Pepper Bdg to M-10	41.90	-0.93	-0.97	-0.62	0.00	0.35	18.15	Losing
M-10 to Mauer Lane (M9a)	42.94	3.97	3.27	3.27	0.00	0.00	18.77	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	-1.66	-1.10	-1.10	0.00	0.00	15.50	Losing
Tum-A-Lum Bdg (M8) to M7	44.43	-2.56	-1.13	-1.13	0.00	0.00	16.60	Losing
M7 to M5	44.87	-15.09	-16.48	-16.48	0.00	0.00	17.73	Losing
M-5 to Nursery Bdg M-4	45.96	-9.78	-6.46	-6.13	0.00	0.33	34.21	Losing
Nursery Bdg M-4 to M3	46.62	-7.94	-5.10	-8.87	-3.77	0.00	40.34	Losing
M3 to M2	47.26	-13.48	-5.91	-5.91	0.00	0.00	49.21	Losing
M2 to M1a Grove School Bdg	47.70	0.99	0.88	-73.69	-74.57	0.00	55.12	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	2.73	2.91	2.91	0.00	0.00	128.81	Gaining
Couse Creek Rd Bdg to Day Road	49.66	7.16	6.69	3.86	-2.83	0.00	125.90	Gaining
Day Road to Joe West Bdg	50.59	3.73	3.65	3.65	0.00	0.00	122.04	Gaining
Joe West Bdg to South Fork Bdg	51.57	-0.35	-0.58	3.43	-5.72	9.73	118.39	Losing
South Fork Bdg to CTUIR Hatchery	53.22	2.13	11.12	5.10	-6.02	0.00	114.96	Gaining
CTUIR Hatchery to Keating	58.44	1.65	2.69	2.44	-0.25	0.00	109.86	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07	-6.17	-10.96	-11.24	-0.28	0.00	107.42	Losing
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	118.66	

Attachment A-16

Walla Walla River Seepage Assessment September 17th, 2013

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	0.19	1.35	0.79	-0.56	0.00	48.49	Gaining
Byerly Bdg to USGS Touchet Gauge	12.88	0.37	1.20	1.20	0.00	0.00	47.70	Gaining
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	0.99	11.97	26.42	-6.70	21.16	46.50	Gaining
Lowden Rd Bdg	28.24	1.89	4.11	2.78	-1.33	0.00	20.08	Gaining
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-1.65	-5.87	-32.10	-26.23	0.00	17.30	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	-4.36	-4.68	5.56	-0.60	10.84	49.40	Losing
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	2.00	2.96	2.80	-0.16	0.00	43.84	Gaining
Last Chance Rd Bdg to Beet Rd Bdg	36.52	1.42	2.56	-0.16	-2.72	0.00	41.04	Gaining
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-14.67	-7.57	-7.57	0.00	0.00	41.20	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	-1.00	-1.38	24.42	0.00	25.80	48.77	Losing
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	0.50	0.36	0.36	0.00	0.00	24.35	Gaining
Hwy 125 Bdg to Pepper Bdg	40.94	3.72	3.59	3.59	0.00	0.00	23.99	Gaining
Pepper Bdg to M-10	41.90	-2.68	-2.79	-2.39	0.00	0.40	20.40	Losing
M-10 to Mauer Lane (M9a)	42.94	4.78	3.94	3.94	0.00	0.00	22.79	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	0.18	0.12	0.12	0.00	0.00	18.85	Gaining
Tum-A-Lum Bdg (M8) to M7	44.43	-0.25	-0.11	-0.11	0.00	0.00	18.73	Losing
M7 to M5	44.87	-10.15	-11.09	-11.09	0.00	0.00	18.84	Losing
M-5 to Nursery Bdg M-4	45.96	-8.19	-5.41	-5.10	0.00	0.31	29.93	Losing
Nursery Bdg M-4 to M3	46.62	-10.30	-6.62	-8.07	-1.45	0.00	35.03	Losing
M3 to M2	47.26	-5.09	-2.23	-2.23	0.00	0.00	43.10	Losing
M2 to M1a Grove School Bdg	47.70	0.36	0.32	-67.53	-67.85	0.00	45.33	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	-4.64	-4.95	-4.95	0.00	0.00	112.86	Losing
Couse Creek Rd Bdg to Day Road	49.66	-3.39	-3.17	-4.59	-1.42	0.00	117.81	Losing
Day Road to Joe West Bdg	50.59	9.83	9.62	9.62	0.00	0.00	122.40	Gaining
Joe West Bdg to South Fork Bdg	51.57	-1.32	-2.17	-2.84	-5.68	5.01	112.78	Losing
South Fork Bdg to CTUIR Hatchery	53.22	2.78	14.49	8.23	-6.26	0.00	115.62	Gaining
CTUIR Hatchery to Keating	58.44	1.77	2.89	2.89	0.00	0.00	107.39	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07	1.54	2.74	2.74	0.00	0.00	104.50	Gaining
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	101.76	

Attachment A-17

Walla Walla River Seepage Assessment July 24, 2014

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2014 Net Diversion Total (cfs)	2014 Net Tributary Inputs Total (cfs)	2014 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	0.21	1.49	0.86	-0.62	0.00	28.30	Gaining
Byerly Bdg to USGS Touchet Gauge	12.88	-6.19	-20.07	-20.07	0.00	0.00	27.43	Losing
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	-0.85	-10.35	8.64	-5.44	24.43	47.50	Losing
Lowden Rd Bdg	28.24	3.06	6.65	6.65	0.00	0.00	38.86	Gaining
MacDonald Rd Bdg to Detour Rd Bdg	30.41	2.13	7.60	-21.21	-28.81	0.00	32.21	Gaining
Detour Rd Bdg to Swegle Rd Bdg	33.97	1.53	1.64	10.62	0.00	8.98	53.42	Gaining
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	-1.46	-2.16	-2.16	0.00	0.00	42.80	Losing
Last Chance Rd Bdg to Beet Rd Bdg	36.52	0.33	0.60	-0.08	-0.87	0.20	44.96	Gaining
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-9.86	-5.09	-5.09	0.00	0.00	45.04	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	3.00	4.13	24.91	-0.22	21.00	50.12	Gaining
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	-6.44	-4.64	-4.64	0.00	0.00	25.22	Losing
Hwy 125 Bdg to Pepper Bdg	40.94	5.87	5.66	5.66	0.00	0.00	29.86	Gaining
Pepper Bdg to M-10	41.90	5.04	5.24	5.68	0.00	0.44	24.20	Gaining
M-10 to Mauer Lane (M9a)	42.94	1.31	1.08	1.08	0.00	0.00	18.52	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	0.24	0.16	0.16	0.00	0.00	17.44	Gaining
Tum-A-Lum Bdg (M8) to M7	44.43	-3.43	-1.52	-1.52	0.00	0.00	17.28	Losing
M7 to M5	44.87	-1.79	-1.95	-1.95	0.00	0.00	18.79	Losing
M-5 to Nursery Bdg M-4	45.96	-27.79	-18.36	-18.06	0.00	0.30	20.74	Losing
Nursery Bdg M-4 to M3	46.62	-16.40	-10.55	-13.03	-2.48	0.00	38.80	Losing
M3 to M2	47.26	16.82	7.37	-58.63	-66.00	0.00	51.83	Gaining
M2 to M1a Grove School Bdg	47.70	11.30	10.02	7.54	-2.48	0.00	110.45	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	-4.98	-5.31	-5.31	0.00	0.00	102.92	Losing
Couse Creek Rd Bdg to Day Road	49.66	-3.69	-3.45	-6.28	-2.83	0.00	108.23	Losing
Day Road to Joe West Bdg	50.59	6.09	5.96	5.96	0.00	0.00	114.51	Gaining
Joe West Bdg to South Fork Bdg	51.57	-4.42	-7.28	-1.11	-4.13	10.30	108.54	Losing
South Fork Bdg to CTUIR Hatchery	53.22	0.74	3.86	-4.26	-8.11	0.00	109.65	Gaining
CTUIR Hatchery to Keating	58.44	-0.94	-1.54	-1.98	-0.45	0.00	113.91	Losing
Keating to SF Walla Walla BLM Trailhead	60.07	-1.15	-2.05	-2.05	0.00	0.00	115.89	Losing
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	117.94	

Attachment A-18

Walla Walla River Seepage Assessment September 2, 2014

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2014 Net Diversion Total (cfs)	2014 Net Tributary Inputs Total (cfs)	2014 Flow (cfs)	Gaining/Losing
RV Park	5.68	0.28	2.02	2.02	0.00	0.00	53.41	Gaining
Byerly Rd	12.88	-2.04	-6.61	-6.61	0.00	0.00	51.39	Losing
USGS Gauge	16.12	2.08	25.16	30.41	-7.64	12.89	58.00	Gaining
Lowden Rd Bdg	28.24	-0.04	-0.08	-0.08	0.00	0.00	27.59	Losing
McDonald Rd Bdg	30.41	-0.48	-1.73	-24.43	-22.70	0.00	27.68	Losing
Detour Rd Bdg	33.97	-2.26	-2.43	7.77	0.00	10.20	52.10	Losing
Swegle Rd Bdg	35.04	1.82	2.68	2.55	-0.13	0.00	44.33	Gaining
Last Chance Rd Bdg	36.52	-2.76	-4.99	-6.92	-1.94	0.00	41.78	Losing
Beet Rd Bdg	38.32	3.00	1.55	1.55	0.00	0.00	48.70	Gaining
WWR WDFW #5 Site	38.84	-1.02	-1.40	18.74	0.00	20.14	47.15	Losing
Old Milton Hwy Bdg	40.21	-1.11	-0.80	-0.80	0.00	0.00	28.41	Losing
Hwy 125 Bdg	40.94	2.08	2.01	2.01	0.00	0.00	29.21	Gaining
Pepper Bdg	41.90	1.47	1.53	1.63	0.00	0.10	27.20	Gaining
M-10	42.94	1.23	1.01	1.01	0.00	0.00	25.57	Gaining
Mauer Lane (M9a)	43.76	-7.32	-28.85	-81.63	-52.78	0.00	24.56	Losing
Turn A Turn Bdg (M8) to M7	44.43	0.00	0.00	0.00				Losing
M2 to M1a	44.87	0.00	0.00	0.00				Losing
M-5 to Nursery Bdg M-4	45.98	0.00	0.00	0.00				Losing
Nursery Bdg M-4 to M2	46.62	0.00	0.00	0.00				Losing
M1 to M2	47.19	-2.22	-108.19	-108.19				Losing
M2	47.70	9.92	8.79	7.01	-1.78	0.00	106.19	Gaining
M1 a Grove School Bdg	48.59	-3.11	-3.32	-3.32	0.00	0.00	99.18	Losing
Couse Creek Rd Bdg	49.66	-0.38	-0.35	-3.99	-3.64	0.00	102.50	Losing
Day Road	50.59	3.45	3.37	3.37	0.00	0.00	106.49	Gaining
Joe West Bdg	51.57	1.90	3.13	3.72	-4.98	5.57	103.12	Gaining
South Fork Bdg	53.22	1.51	7.87	1.53	-6.34	0.00	99.40	Gaining
CTUIR Hatchery	58.44	-2.00	-3.26	-3.42	-0.16	0.00	97.88	Losing
Keating	60.07	-0.83	-1.48	-1.48	0.00	0.00	101.30	Losing
SF Walla Walla BLM Trailhead	61.85	X	X	X	X	X	102.78	

Attachment A-19

Walla Walla River Seepage Assessment July 30, 2015

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2015 Net Diversion Total (cfs)	2015 Net Tributary Inputs Total (cfs)	2015 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	-0.88	-6.32	-6.32	0.00	0.00	0.00	Losing
Byerly Bdg to USGS Touchet Gauge	12.88	-0.17	-0.55	-4.05	-3.50	0.00	6.32	Losing
USGS Touchet Gauge to MacDonald Rd Bdg	16.12	0.38	4.58	8.89	-1.00	5.31	10.37	Gaining
Lowden Rd Bdg	28.24	0.14	0.31	0.31	0.00	0.00	1.49	Gaining
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-1.34	-4.78	-26.28	-21.50	0.00	1.18	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	0.84	0.90	3.59	-0.50	3.19	27.46	Gaining
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	0.89	1.32	1.32	0.00	0.00	23.87	Gaining
Last Chance Rd Bdg to Beet Rd Bdg	36.52	-1.49	-2.69	-3.69	-1.00	0.00	22.55	Losing
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-0.77	-0.40	-0.40	0.00	0.00	26.24	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	-2.08	-2.86	15.36	0.00	18.21	26.64	Losing
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	0.14	0.10	0.10	0.00	0.00	11.28	Gaining
Hwy 125 Bdg to Pepper Bdg	40.94	0.74	0.72	0.72	0.00	0.00	11.18	Gaining
Pepper Bdg to M-10	41.90	-1.47	-1.53	-1.53	0.00	0.00	10.46	Losing
M-10 to Mauer Lane (M9a)	42.94	4.22	3.48	3.48	0.00	0.00	11.99	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	-4.18	-2.77	-2.77	0.00	0.00	8.51	Losing
Tum-A-Lum Bdg (M8) to M7	44.43	-0.23	-0.10	-0.10	0.00	0.00	11.28	Losing
M7 to M5	44.87	-13.43	-14.67	-14.55	0.00	0.12	11.38	Losing
M-5 to Nursery Bdg M-4	45.96	-0.54	-0.35	-0.35	0.00	0.00	25.93	Losing
Nursery Bdg M-4 to M3	46.62	-4.08	-2.63	-6.20	-3.57	0.00	26.28	Losing
M3 to M2	47.26	-13.53	-5.93	-60.93	-55.00	0.00	32.48	Losing
M2 to M1a Grove School Bdg	47.70	0.08	0.07	-3.50	-3.57	0.00	93.41	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	1.90	2.03	2.03	0.00	0.00	96.91	Gaining
Couse Creek Rd Bdg to Day Road	49.66	11.27	10.53	7.53	-3.00	0.00	94.88	Gaining
Day Road to Joe West Bdg	50.59	-2.05	-2.01	-2.01	0.00	0.00	87.35	Losing
Joe West Bdg to South Fork Bdg	51.57	2.22	3.66	1.24	-6.72	4.30	89.36	Gaining
South Fork Bdg to CTUIR Hatchery	53.22	2.02	10.54	4.47	-6.07	0.00	88.12	Gaining
CTUIR Hatchery to Keating	58.44	1.21	1.98	1.46	-0.52	0.00	83.65	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07	0.73	1.29	1.29	0.00	0.00	82.19	Gaining
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	80.90	

Attachment A-20

Walla Walla River Seepage Assessment September 21-22, 2015

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2015 Net Diversion Total (cfs)	2015 Net Tributary Inputs Total (cfs)	2015 Flow (cfs)	Gaining/Losing
RV Park	5.68	0.47	3.38	3.38	0.00	0.00	20.50	Gaining
Byerly Rd	12.88	4.05	13.13	5.12	-8.01	0.00	17.12	Gaining
USGS Gauge	16.12	-0.03	-0.41	-1.05	-7.16	6.52	12.00	Losing
Lowden Rd Bdg	28.24	-0.34	-0.73	-1.42	-0.69	0.00	13.05	Losing
McDonald Rd Bdg	30.41	-0.88	-3.13	-26.73	-23.60	0.00	14.47	Losing
Detour Rd Bdg	33.97	-0.35	-0.37	8.33	-0.56	9.26	41.20	Losing
Swegle Rd Bdg	35.04	1.09	1.61	1.61	0.00	0.00	32.87	Gaining
Last Chance Rd Bdg	36.52	-1.18	-2.12	-3.65	-1.53	0.00	31.26	Losing
Beet Rd Bdg	38.32	3.84	1.98	1.98	0.00	0.00	34.91	Gaining
WWR WDFW #5 Site	38.84	-4.01	-5.51	18.84	0.00	24.35	32.93	Losing
Old Milton Hwy Bdg	40.21	-0.12	-0.08	-0.08	0.00	0.00	14.09	Losing
Hwy 125 Bdg	40.94	1.82	1.75	1.42	-0.33	0.00	14.17	Gaining
Pepper Bdg	41.90	-0.36	-0.37	-0.37	0.00	0.00	12.75	Losing
M-10	42.94	3.52	2.90	2.90	0.00	0.00	13.12	Gaining
Mauer Lane (M9a)	43.76	-0.60	-2.36	-2.36	0.00	0.00	10.22	Losing
Tum-A-Lum Bdg (M8)	44.43	0.27	0.12	0.12	0.00	0.00	12.58	Gaining
M7	44.87	-10.70	-11.69	-11.50	0.00	0.19	12.46	Losing
M-5	45.96	-6.74	-4.45	-4.45	0.00	0.00	23.96	Losing
Nursery Bdg M-4	46.62	-12.18	-7.83	-10.91	-3.08	0.00	28.41	Losing
M3	47.26	-2.71	-1.19	-71.19	-70.00	0.00	39.32	Losing
M2	47.70	-1.68	-1.49	-1.49	0.00	0.00	110.51	Losing
M1a Grove School Bdg	48.59	15.61	16.65	16.65	0.00	0.00	112.00	Gaining
Couse Creek Rd Bdg	49.66	1.49	1.39	-1.93	-3.32	0.00	95.35	Gaining
Day Road	50.59	5.20	5.09	5.09	0.00	0.00	97.28	Gaining
Joe West Bdg	51.57	-2.81	-4.63	-4.42	-4.32	4.54	92.19	Losing
South Fork Bdg	53.22	-0.61	-3.16	-8.15	-4.99	0.00	96.61	Losing
CTUIR Hatchery	58.44	1.69	2.77	2.65	-0.12	0.00	104.76	Gaining
Keating	60.07	3.67	6.53	6.53	0.00	0.00	102.11	Gaining
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	95.58	

Attachment A-21 Walla Walla River Seepage Assessment June 29, 2016

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversion Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)	Gaining/Losing
RV Park to Byerly Bdg	5.68	1.03	7.40	-0.78	-8.18	0.00	47.70	Gaining
Byerly Bdg to USGS Touchet Gauge	12.88	3.14	10.18	10.18	0.00	0.00	48.48	Gaining
USGS Touchet Gauge to Lowden Rd Bdg	16.12	1.36	16.46	34.98	-5.27	23.78	38.30	Gaining
Lowden Rd Bdg to McDonald Rd Bdg	28.24	-2.33	-5.07	-6.18	-1.11	0.00	3.33	Losing
MacDonald Rd Bdg to Detour Rd Bdg	30.41	-1.90	-6.77	-32.50	-25.73	0.00	9.50	Losing
Detour Rd Bdg to Swegle Rd Bdg	33.97	-4.01	-4.31	12.93	-0.12	17.36	42.00	Losing
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	-6.93	-10.24	-9.24	0.00	1.00	29.07	Losing
Last Chance Rd Bdg to Beet Rd Bdg	36.52	0.74	1.34	0.01	-1.80	0.47	38.31	Gaining
Beet Rd Bdg to WWR WDFW #5 Site	38.32	-4.01	-2.07	-6.57	-4.50	0.00	38.30	Losing
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	-2.84	-3.91	22.47	0.00	26.38	44.87	Losing
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	-0.84	-0.61	-0.61	0.00	0.00	22.40	Losing
Hwy 125 Bdg to Pepper Bdg	40.94	4.78	4.61	4.61	0.00	0.00	23.01	Gaining
Pepper Bdg to M-10	41.90	0.88	0.92	0.84	-0.28	0.20	18.40	Gaining
M-10 to Mauer Lane (M9a)	42.94	0.50	0.41	0.41	0.00	0.00	17.56	Gaining
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	1.52	1.01	1.01	0.00	0.00	17.15	Gaining
Tum-A-Lum Bdg (M8) to M7	44.43	-3.14	-1.39	-1.39	0.00	0.00	16.14	Losing
M7 to M5	44.87	-9.66	-10.55	-10.43	0.00	0.12	17.53	Losing
M-5 to Nursery Bdg M-4	45.96	-14.91	-9.85	-9.85	0.00	0.00	27.96	Losing
Nursery Bdg M-4 to M3	46.62	-25.77	-16.57	-20.07	-3.50	0.00	37.81	Losing
M3 to M2	47.26	27.64	12.12	-48.88	-61.00	0.00	57.88	Gaining
M2 to M1a Grove School Bdg	47.70	8.16	7.24	3.74	-3.50	0.00	106.76	Gaining
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	9.73	10.39	10.39	0.00	0.00	103.02	Gaining
Couse Creek Rd Bdg to Day Road	49.66	-6.71	-6.27	-10.07	-3.80	0.00	92.64	Losing
Day Road to Joe West Bdg	50.59	6.17	6.04	6.04	0.00	0.00	102.71	Gaining
Joe West Bdg to South Fork Bdg	51.57	-0.98	-1.61	-3.10	-8.02	6.53	96.67	Losing
South Fork Bdg to CTUIR Hatchery	53.22	0.89	4.65	-1.10	-5.75	0.00	99.77	Gaining
CTUIR Hatchery to Keating	58.44	2.56	8.72	8.41	-0.31	0.00	100.87	Gaining
Keating to SF Walla Walla BLM Trailhead	60.07							
SF Walla Walla BLM Trailhead	61.85	x	x	x	x	x	92.46	

Attachment A-22 Walla Walla River Seepage Assessment September 8, 2016

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversion Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)
RV Park to Byerly Bdg	5.68	-1.54	-11.07	-11.40	-0.33	0.00	26.80
Byerly Bdg to USGS Touchet Gauge	12.88	-0.63	-2.03	-4.70	-2.67	0.00	38.20
USGS Touchet Gauge to Lowden Rd Bdg	16.12	-0.83	-10.07	-2.78	-7.93	15.22	42.90
Lowden Rd Bdg to McDonald Rd Bdg	28.24	-0.62	-1.34	-1.34	0.00	0.00	45.68
MacDonald Rd Bdg to Detour Rd Bdg	30.41	0.41	1.46	-16.44	-17.90	0.00	47.02
Detour Rd Bdg to Swegle Rd Bdg	33.97	2.98	3.20	15.22	-1.02	13.04	63.46
Swegle Rd Bdg to Last Chance Rd Bdg	35.04	-2.64	-3.90	-2.90	0.00	1.00	48.25
Last Chance Rd Bdg to Beet Rd Bdg	36.52	2.54	4.57	2.75	-1.82	0.00	51.15
Beet Rd Bdg to WWR WDFW #5 Site	38.32	2.31	1.19	1.19	0.00	0.00	48.39
WWR WDFW #5 Site to Old Milton Hwy Bdg	38.84	0.25	0.34	12.42	0.00	12.09	47.20
Old Milton Hwy Bdg to Hwy 125 Bdg	40.21	-0.93	-0.67	-0.67	0.00	0.00	34.78
Hwy 125 Bdg to Pepper Bdg	40.94	2.89	2.79	2.51	-0.28	0.00	35.45
Pepper Bdg	41.90	X	X	X	X	X	32.94
Flow Measurement Location (Reach Locations)							
Pepper Bdg to M-10	41.90	3.36	3.49	3.49	0.00	0.00	25.84
M-10 to Mauer Lane (M9a)	42.94	1.97	1.63	1.63	0.00	0.00	22.35
Mauer Lane (M9a) to Tum-A-Lum Bdg (M8)	43.76	-0.40	-0.26	-0.26	0.00	0.00	20.72
Tum-A-Lum Bdg (M8) to M7	44.43	-3.84	-1.70	-1.70	0.00	0.00	20.99
M7 to M5	44.87	-8.22	-8.98	-8.87	0.00	0.11	22.68
M-5 to Nursery Bdg M-4	45.96	-12.03	-7.95	-7.95	0.00	0.00	31.55
Nursery Bdg M-4 to M3	46.62	-8.16	-5.25	-8.75	-3.50	0.00	39.50
M3 to M2	47.26	-5.57	-2.44	-52.44	-50.00	0.00	48.25
M2 to M1a Grove School Bdg	47.70	3.20	2.84	-0.66	-3.50	0.00	100.69
M1a Grove School Bdg to Couse Creek Rd Bdg	48.59	0.55	0.59	0.59	0.00	0.00	101.35
Couse Creek Rd Bdg to Day Road	49.66	2.60	2.43	-0.49	-2.92	0.00	100.76
Day Road to Joe West Bdg	50.59	7.69	7.52	7.52	0.00	0.00	101.25
Joe West Bdg to South Fork Bdg	51.57	-2.20	-3.62	-5.58	-7.19	5.22	93.73
South Fork Bdg to CTUIR Hatchery	53.22	1.43	7.47	3.23	-4.24	0.00	99.32
CTUIR Hatchery to SF Walla Walla BLM Trailhead	58.44	-0.41	-1.39	-1.61	-0.22	0.00	96.09
SF Walla Walla BLM Trailhead	61.85	X	X	X	X	X	97.70

Attachment B

Attachment B-1

Mill Creek Seepage Assessments

October, 2008

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2008 Net Diversion Total (cfs)	2008 Net Tributary Inputs Total (cfs)	2008 Flow (cfs)
Swegle Road Bridge	0.5	0.7	1.1	2.3	0.0	1.2	10.5
Last Chance Road Bridge	1.9	-0.4	-0.4	-0.4	0.0	0.0	8.2
Wallula Rd Bridge	2.9	4.7	8.2	7.5	-0.8	0.0	8.6
Goes Bridge	4.7	0.2	1.4	-1.2	-2.6	0.0	1.1
Tausick Rd Bridge	10.6	-5.4	-3.0	-1.5	0.0	1.5	2.3
Below Yellowhawk Diversion	11.1	0.1	0.2	-23.3	-23.4	0.0	3.8
5 Mile Rd Bridge	13.5	1.4	3.0	-1.4	-4.3	0.0	27.1
7 Mile Rd Bridge	15.6	-2.8	-12.6	-11.7	0.0	0.8	28.5
20 Mile Bridge	20.2	7.8	8.2	8.2	0.0	0.0	40.2
USGS Gauge	21.2	-1.7	-2.4	-2.4	0.0	0.0	32.0
Mill Creek At Stateline	22.6	x	x	x	x	x	34.4

July, 2010

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2010 Net Diversion Total (cfs)	2010 Net Tributary Inputs Total (cfs)	2010 Flow (cfs)
Swegle Road Bridge	0.5	-0.2	-0.3	0.7	0.0	1.0	13.9
Last Chance Road Bridge	1.9	-1.2	-1.2	-1.2	0.0	0.0	13.2
Wallula Rd Bridge	2.9	2.7	4.7	4.2	-0.5	0.0	14.4
Goes Bridge	4.7	1.0	5.9	6.0	-0.9	1.0	10.2
Tausick Rd Bridge	10.6	0.8	0.4	0.4	0.0	0.0	4.2
Below Yellowhawk Diversion	11.1	-3.4	-8.0	-32.6	-24.6	0.0	3.8
5 Mile Rd Bridge	13.5	2.5	5.2	-1.7	-6.9	0.0	36.4
7 Mile Rd Bridge	15.6	-0.1	-0.7	0.3	-0.3	1.2	38.1
20 Mile Bridge	20.2	5.0	5.3	5.3	0.0	0.0	37.8
USGS Gauge	21.2	-2.6	-3.7	-4.3	-0.6	0.0	32.5
Mill Creek At Stateline	22.6	x	x	x	x	x	36.8

September, 2011

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)
Swegle Road Bridge	0.5	-0.6	-0.9	0.1	0.0	1.0	5.8
Last Chance Road Bridge	1.9	-1.6	-1.6	-1.6	0.0	0.0	5.7
Wallula Rd Bridge	2.9	2.2	3.8	3.8	-0.1	0.0	7.4
Goes Bridge	4.7	0.8	4.8	0.7	-5.5	0.0	3.6
Tausick Rd Bridge	10.6	-1.3	-0.7	0.9	0.0	1.7	4.3
Below Yellowhawk Diversion	11.1	0.0	0.1	-21.0	-21.1	0.0	3.4
5 Mile Rd Bridge	13.5	-1.9	-4.0	-4.0	0.0	0.0	24.4
7 Mile Rd Bridge	15.6	-0.7	-3.1	-2.3	0.0	0.8	28.3
20 Mile Bridge	20.2	3.4	3.6	3.6	0.0	0.0	30.6
USGS Gauge	21.2	1.2	1.7	1.5	-0.2	0.0	27.0
Mill Creek At Stateline	22.6	x	x	x	x	x	25.5

September, 2012

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)
Swegle Road Bridge	0.6	-0.8	-1.1	-0.5	0.00	0.65	6.4
Last Chance Road Bridge	2.0	-1.5	-1.6	-1.2	0.41	0.00	6.9
Wallula Rd Bridge	3.1	1.9	4.5	4.3	-0.24	0.00	8.1
Gose Bridge	5.5	1.2	6.6	0.6	-6.11	0.05	3.8
Tausick Rd Bridge	10.9	3.1	1.7	1.6	-0.09	0.02	3.2
Below Yellowhawk Diversion	11.5	0.8	2.1	-20.1	-22.20	0.00	1.6
5 Mile Rd Bridge	14.0	1.0	2.3	-2.7	-5.00	0.00	21.7
7 Mile Rd Bridge	16.2	-1.6	-6.4	-5.8	0.00	0.55	24.4
20 Mile Bridge	20.2	0.2	0.2	0.2	0.00	0.00	30.2
USGS Gauge	21.2	0.0	0.0	0.0	0.00	0.00	30.0
Mill Creek At Stateline	23.7	x	x	x	x	x	30.0

September, 2013

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)
Swegle Road Bridge	0.6	0.53	0.8	1.2	0.00	0.45	7.69
Last Chance Road Bridge	2.0	-1.02	-1.1	-1.0	0.05	0.00	6.47
Wallula Rd Bridge	3.1	1.50	3.6	3.5	-0.17	0.00	7.49
Gose Bridge	5.5	-0.71	-3.8	-8.4	-5.11	0.50	4.02
Tausick Rd Bridge	10.9	1.08	0.6	2.5	0.00	1.87	12.46
Below Yellowhawk Diversion	11.5	-2.54	-6.5	-23.7	-17.20	0.00	10.00
5 Mile Rd Bridge	14.0	2.57	5.7	-6.8	-12.53	0.00	33.67
7 Mile Rd Bridge	16.2	-0.24	-1.0	3.8	0.00	4.78	40.49
20 Mile Bridge	20.2	-2.24	-2.3	-2.3	0.00	0.00	36.67
USGS Gauge	21.2	1.00	2.5	2.5	0.00	0.00	39.00
Mill Creek At Stateline	23.7	x	x	x	x	x	36.46

June, 2009

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2009 Net Diversion Total (cfs)	2009 Net Tributary Inputs Total (cfs)	2009 Flow (cfs)
Swegle Road Bridge	0.5	0.2	0.3	2.1	0.0	1.8	16.1
Last Chance Road Bridge	1.9	-0.2	-0.2	-0.2	0.0	0.0	14.0
Wallula Rd Bridge	2.9	1.8	3.2	2.1	-1.1	0.0	14.2
Goes Bridge	4.7	0.1	0.7	-1.4	-2.1	0.0	12.1
Tausick Rd Bridge	10.6	-6.8	-3.8	-1.7	0.0	2.1	13.5
Below Yellowhawk Diversion	11.1	-0.6	-1.5	-33.0	-31.5	0.0	15.2
5 Mile Rd Bridge	13.5	2.0	4.2	-0.9	-5.1	0.0	48.2
7 Mile Rd Bridge	15.6	-1.7	-7.6	-6.1	0.0	1.5	49.1
20 Mile Bridge	20.2	4.6	4.8	4.8	0.0	0.0	55.2
USGS Gauge	21.2	-1.5	-2.1	-2.1	0.0	0.0	50.4
Mill Creek At Stateline	22.6	x	x	x	x	x	52.5

July, 2011

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)
Swegle Road Bridge	0.5	-2.0	-2.8	-1.1	0.0	1.7	18.1
Last Chance Road Bridge	1.9	-0.9	-0.9	-1.0	-0.1	0.0	19.2
Wallula Rd Bridge	2.9	2.4	4.2	3.5	-0.7	0.0	20.2
Goes Bridge	4.7	1.3	7.4	2.2	-5.2	0.0	16.7
Tausick Rd Bridge	10.6	-1.7	-1.0	0.5	0.0	1.5	14.5
Below Yellowhawk Diversion	11.1	-0.4	-1.0	-29.5	-28.5	0.0	14.0
5 Mile Rd Bridge	13.5	2.5	5.2	-2.7	-8.0	0.0	43.5
7 Mile Rd Bridge	15.6	0.4	1.7	3.2	-0.3	1.9	46.3
20 Mile Bridge	20.2	-5.7	-6.0	-6.0	0.0	0.0	43.1
USGS Gauge	21.2	1.6	2.2	2.4	0.2	0.0	49.0
Mill Creek At Stateline	22.6	x	x	x	x	x	46.6

July, 2012

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)
Swegle Road Bridge	0.6	-0.4	-0.5	0.7	0.00	1.2	10.6
Last Chance Road Bridge	2.0	-1.5	-1.6	-1.6	-0.05	0.0	9.9
Wallula Rd Bridge	3.1	2.1	5.1	5.0	-0.16	0.0	11.5
Gose Bridge	5.5	1.0	5.6	0.0	-6.11	0.5	6.6
Tausick Rd Bridge	10.9	1.4	0.8	2.2	0.00	1.4	6.5
Below Yellowhawk Diversion	11.5	-2.9	-7.3	-29.1	-21.80	0.0	4.4
5 Mile Rd Bridge	14.0	0.4	0.8	-4.7	-5.50	0.0	33.4
7 Mile Rd Bridge	16.2	-1.1	-4.5	-3.0	0.00	1.5	38.1
20 Mile Bridge	20.2	0.9	1.0	1.0	0.00	0.0	41.1
USGS Gauge	21.2	-0.7	-1.8	-1.8	0.00	0.0	40.1
Mill Creek At Stateline	23.7	x	x	x	x	x	41.9

June, 2013

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)
Swegle Road Bridge	0.6	1.23	1.8	2.2	0.00	0.45	47.61
Last Chance Road Bridge	2.0	-0.04	0.0	0.0	0.00	0.00	45.37
Wallula Rd Bridge	3.1	0.18	0.4	0.4	0.00	0.00	45.41
Gose Bridge	5.5	1.29	7.0	4.0	-3.01	0.05	44.96
Tausick Rd Bridge	10.9	3.11	1.7	3.9	0.00	2.23	40.92
Below Yellowhawk Diversion	11.5	0.34	0.9	-24.2	-25.06	0.00	37.00
5 Mile Rd Bridge	14.0	6.56	14.6	-7.1	-21.65	0.00	61.20
7 Mile Rd Bridge	16.2	-0.06	-0.2	7.3	0.00	7.56	68.27
20 Mile Bridge	20.2	-2.96	-3.1	-3.1	0.00	0.00	60.93
USGS Gauge	21.2	-0.18	-0.5	-0.5	0.00	0.00	64.00
Mill Creek At Stateline	23.7	x	x	x	x	x	64.46

Mill Creek Seepage Assessments

August, 2014

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2014 Net Diversion Total (cfs)	2014 Net Tributary Inputs Total (cfs)	2014 Flow (cfs)
Swegle Road Bridge	0.6	-0.84	-1.2	-1.1	0.00	0.10	4.71
Last Chance Road Bridge	2.0	-0.32	-0.3	-0.3	0.00	0.00	5.83
Wallula Rd Bridge	3.1	0.98	2.4	2.0	-0.33	0.00	6.17
Gose Bridge	5.5	0.72	3.9	-2.7	-7.11	0.50	4.12
Tausick Rd Bridge	10.9	1.52	0.8	1.8	0.00	0.97	6.83
Below Yellowhawk Diversion	11.5	0.49	1.3	-13.7	-14.96	0.00	5.03
5 Mile Rd Bridge	14.0	1.24	2.8	-7.1	-9.85	0.00	18.74
7 Mile Rd Bridge	16.2	-0.43	-1.7	1.2	0.11	2.73	25.84
20 Mile Bridge	20.2	-1.64	-1.7	-1.5	0.16	0.00	24.68
USGS Gauge	21.2	0.82	2.1	2.1	0.00	0.00	26.22
Mill Creek At Stateline	23.7	x	x	x	x	x	24.12

September, 2014

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2014 Net Diversion Total (cfs)	2014 Net Tributary Inputs Total (cfs)	2014 Flow (cfs)
Swegle Road Bridge	0.6	1.54	2.3	2.4	0.00	0.10	9.78
Last Chance Road Bridge	2.0	-2.53	-2.6	-2.6	0.05	0.00	7.43
Wallula Rd Bridge	3.1	1.03	2.5	2.4	-0.09	0.00	10.01
Gose Bridge	5.5	0.30	1.6	-3.3	-5.41	0.50	7.59
Tausick Rd Bridge	10.9	3.54	1.9	2.6	0.00	0.68	10.87
Below Yellowhawk Diversion	11.5	-0.43	-1.1	-15.7	-14.60	0.00	8.26
5 Mile Rd Bridge	14.0	0.60	1.3	-2.7	-4.00	0.00	23.96
7 Mile Rd Bridge	16.2	-0.42	-1.6	0.8	0.00	2.40	26.63
20 Mile Bridge	20.2	-0.64	-0.7	-0.7	0.00	0.00	25.87
USGS Gauge	21.2	1.69	4.3	4.3	0.00	0.00	26.54
Mill Creek At Stateline	23.7	x	x	x	x	x	22.24

August 5, 2015

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2014 Net Diversion Total (cfs)	2014 Net Tributary Inputs Total (cfs)	2014 Flow (cfs)
Swegle Road Bridge	0.6	-0.58	-0.8	-0.5	0.00	0.35	4.94
Last Chance Road Bridge	2.0	-1.34	-1.4	-1.4	0.04	0.00	5.43
Wallula Rd Bridge	3.1	2.06	5.0	3.1	-1.95	0.00	6.78
Gose Bridge	5.5	0.26	1.4	-5.1	-6.81	0.30	3.72
Tausick Rd Bridge	10.9	2.08	1.1	3.6	0.00	2.50	8.83
Below Yellowhawk Diversion	11.5	0.05	0.1	-15.6	-15.73	0.00	5.20
5 Mile Rd Bridge	14.0	3.34	7.4	-3.7	-11.13	0.00	20.80
7 Mile Rd Bridge	16.2	-0.90	-3.5	-0.1	0.33	3.07	24.51
20 Mile Bridge	20.2	-3.23	-3.4	-3.4	0.00	0.00	24.65
USGS Gauge	21.2	-0.64	-1.6	-1.6	0.00	0.00	28.00
Mill Creek At Stateline	23.7	x	x	x	x	x	29.62

September 29, 2015

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2015 Net Diversion Total (cfs)	2015 Net Tributary Inputs Total (cfs)	2015 Flow (cfs)
Swegle Road Bridge	0.6	0.04	0.1	0.4	0.00	0.30	7.40
Last Chance Road Bridge	2.0	-0.80	-0.8	-0.8	0.03	0.00	7.04
Wallula Rd Bridge	3.1	1.08	2.6	2.2	-0.46	0.00	7.84
Gose Bridge	5.5	0.30	1.7	-2.9	-4.93	0.35	5.68
Tausick Rd Bridge	10.9	2.59	1.4	3.4	0.00	2.00	8.61
Below Yellowhawk Diversion	11.5	0.11	0.3	-17.3	-17.58	0.00	5.20
5 Mile Rd Bridge	14.0	2.24	5.0	-5.6	-10.61	0.00	22.51
7 Mile Rd Bridge	16.2	-0.54	-2.1	0.7	0.00	2.77	28.14
20 Mile Bridge	20.2	-1.45	-1.5	-1.5	0.00	0.00	27.49
USGS Gauge	21.2	-1.28	-3.3	-3.3	0.00	0.00	29.00
Mill Creek At Stateline	23.7	x	x	x	x	x	32.26

September 26, 2016

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversion Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)
Swegle Road Bridge	0.6	0.69	1.0	1.1	0.00	0.05	15.98
Last Chance Road Bridge	2.0	-1.99	-2.1	-2.1	0.00	0.00	14.92
Wallula Rd Bridge	3.1	1.22	3.0	2.7	-0.22	0.00	16.99
Gose Bridge	5.5	0.32	1.7	-1.5	-3.21	0.00	14.24
Tausick Rd Bridge	10.9	-1.08	-0.6	0.4	0.00	1.00	15.71
Below Yellowhawk Diversion	11.5	1.83	4.6	-11.0	-15.69	0.00	15.30
5 Mile Rd Bridge	14.0	2.56	5.7	-5.5	-11.15	0.00	26.34
7 Mile Rd Bridge	16.2	-0.49	-1.9	-1.1	0.00	0.79	31.80
20 Mile Bridge	20.2	1.34	1.4	1.4	0.00	0.00	32.93
USGS Gauge	21.2	-1.08	-2.7	-2.7	0.00	0.00	31.54
Mill Creek At Stateline	23.7	x	x	x	x	x	34.29

June 16, 2016

Flow Measurement Location (Reach Locations)	River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2016 Net Diversion Total (cfs)	2016 Net Tributary Inputs Total (cfs)	2016 Flow (cfs)
Swegle Road Bridge	0.6	0.46	0.7	1.1	0.00	0.40	6.33
Last Chance Road Bridge	2.0	-1.34	-1.4	-1.4	-0.04	0.00	5.26
Wallula Rd Bridge	3.1	1.48	3.6	3.3	-0.35	0.00	6.69
Gose Bridge	5.5	-0.45	-2.5	-5.7	-3.81	0.60	3.43
Tausick Rd Bridge	10.9	0.33	0.2	1.2	0.00	1.00	9.10
Below Yellowhawk Diversion	11.5	0.04	0.1	-21.3	-21.37	0.00	7.92
5 Mile Rd Bridge	14.0	1.13	2.5	-4.0	-6.55	0.00	29.19
7 Mile Rd Bridge	16.2	-2.06	-8.1	-1.1	-0.16	7.13	33.23
20 Mile Bridge	20.2	-4.86	-5.0	-5.0	0.00	0.00	34.35
USGS Gauge	21.2	1.99	5.1	5.1	0.00	0.00	39.40
Mill Creek At Stateline	23.7	x	x	x	x	x	34.33

Attachment B-2

Touchet River Seepage Assessments

Composite Seepage Data Set 2009		June 2009 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
<i>Cummings</i>	0.86	0.14	1.79	-16.21	-18.00	0.00	106.95
<i>Johnson Bridge</i>	8.80	0.42	10.55	10.55	0.00	0.00	123.16
<i>I W Sims Rd Bdg</i>	13.18	-0.31	-12.85	-12.85	0.00	0.00	112.61
<i>Site # 4</i>	17.18	1.38	3.49	1.26	-2.23	0.00	125.46
<i>Luckenbill Rd Bdg</i>	21.99	0.49	6.35	6.35	0.00	0.00	124.20
<i>Hoffman Rd</i>	25.09	-0.60	-11.97	-11.97	0.00	0.00	117.85
<i>Harvey Shaw Rd</i>	32.23	1.06	4.69	4.69	0.00	0.00	129.82
<i>Petty John</i>	37.20	-4.28	-1.01	-1.01	0.00	0.00	125.13
<i>Hwy 125 Bdg</i>	41.53	-0.48	-5.56	-5.69	-0.13	0.00	126.14
<i>Hart Road #5</i>	44.19	-0.62	-7.39	-7.14	-0.91	1.16	131.83
<i>Hwy 124 Bdg</i>	48.79	0.21	19.38	23.08	0.00	3.70	138.97
<i>Waitsburg</i>	52.92	-1.17	-10.27	-8.77	-8.93	10.43	115.89
<i>Dayton Levee</i>	64.97	x	x	x	x	x	124.66

Composite Seepage Data Set 2009		September 2009 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
<i>Cummings</i>	0.86	-0.23	-1.80	-21.86	-20.06	0.00	11.88
<i>Johnson Bridge</i>	8.80	-0.07	-0.31	-0.31	0.00	0.00	33.74
<i>I W Sims Rd Bdg</i>	13.18	-1.36	-5.43	-5.43	0.00	0.00	34.05
<i>Site # 4</i>	17.18	0.97	4.67	4.67	0.00	0.00	39.48
<i>Luckenbill Rd Bdg</i>	21.99	-0.12	-1.25	-1.25	0.00	0.00	34.81
<i>Harvey Shaw Rd</i>	32.23	0.41	2.03	2.03	0.00	0.00	36.06
<i>Petty John</i>	37.20	-0.61	-2.62	-2.62	0.00	0.00	34.03
<i>Hwy 125 Bdg</i>	41.53	-0.38	-2.75	-2.36	0.00	0.39	36.65
<i>Hwy 124 Bdg</i>	48.79	-2.61	-10.79	-10.59	0.00	0.20	39.01
<i>Waitsburg</i>	52.92	0.13	1.53	0.06	-8.00	6.53	49.60
<i>Dayton Levee</i>	64.97	x	x	x	x	x	49.54

Composite Seepage Data Set 2010		July 2010 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	July 2010 Rate Per Mile (cfs)	July 2010 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
<i>Cummings</i>	0.86	1.58	12.56	19.50	-6.94	0.00	53.51
<i>Johnson Bridge</i>	8.80	0.55	2.39	2.39	0.00	0.00	73.01
<i>I W Sims Rd Bdg</i>	13.18	0.07	0.27	1.05	-0.78	0.00	75.40
<i>Site # 4</i>	17.18	-0.90	-4.35	-2.86	-1.49	0.00	76.45
<i>Luckenbill Rd Bdg</i>	21.99	0.35	3.63	3.63	0.00	0.00	73.59
<i>Harvey Shaw Rd</i>	32.23	-2.57	-12.80	-12.80	0.00	0.00	77.22
<i>Petty John</i>	37.20	2.16	9.33	9.33	0.00	0.00	64.42
<i>Hwy 125 Bdg</i>	41.53	1.67	12.10	11.76	0.00	0.34	73.75
<i>Hwy 124 Bdg</i>	48.79	-0.49	-2.04	-3.04	0.00	1.00	85.51
<i>Waitsburg</i>	52.92	-0.04	-0.50	-0.23	-9.22	8.95	82.47
<i>Dayton Levee</i>	64.97	x	x	x	x	x	82.24

Composite Seepage Data Set 2011		July 2011 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	July 2011 Rate Per Mile (cfs)	July 2011 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings	0.86	0.73	5.80	17.58	-11.78	0.00	57.04
Johnson Bridge	8.80	1.42	6.22	6.22	0.00	0.00	74.62
I W Sims Rd Bdg	13.18	-1.39	-5.56	-5.56	0.00	0.00	80.84
Site # 4	17.18	1.26	6.07	6.85	-0.78	0.00	75.28
Luckenbill Rd Bdg	21.99	0.23	2.37	2.37	0.00	0.00	82.13
Harvey Shaw Rd	32.23	-0.72	-3.60	-3.60	0.00	0.00	84.50
Petty John	37.20	0.37	1.58	1.58	0.00	0.00	80.90
Hwy 125 Bdg	41.53	-0.07	-0.53	1.07	-1.86	0.26	82.48
Hwy 124 Bdg	48.79	-0.01	-0.04	-2.24	0.00	2.20	83.55
Waitsburg	52.92	0.56	6.71	6.26	-11.27	11.72	81.31
Dayton Levee	64.97	x	x	x	x	x	87.57
Composite Seepage Data Set 2011		September 2011 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	September 2011 Rate Per Mile (cfs)	September 2011 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings	0.86	-1.20	-9.53	-19.55	-10.02	0.00	7.84
Johnson Bridge	8.80	-0.61	-2.67	-2.67	0.00	0.00	27.39
I W Sims Rd Bridge	13.18	-0.43	-1.72	-2.30	-0.58	0.00	30.06
Site #4	17.18	0.27	1.29	1.29	0.00	0.00	32.36
Luckenbill Rd Bridge	21.99	-0.25	-2.60	-2.60	0.00	0.00	31.07
Harvey Shaw Rd	32.23	0.42	2.07	2.07	0.00	0.00	33.67
Petty John	37.20	-1.76	-7.60	-7.60	0.00	0.00	31.60
Hwy 125 Bdg	41.53	-0.52	-3.79	-4.66	-1.01	0.14	39.20
Hwy 124 Bdg	48.79	0.27	1.11	1.79	-0.07	0.75	43.86
Waitsburg	52.92	0.04	0.54	-7.06	-18.63	11.03	42.07
Dayton Levee	64.97	x	x	x	x	x	49.13
Composite Seepage Data Set 2012		July 2012 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	July 2012 Rate Per Mile (cfs)	July 2012 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	1.42	11.28	6.28	-5.00	0.00	92.61
Johnson Bdg	8.80	-1.28	-5.60	-5.60	0.00	0.00	86.33
I W Sims Rd Bdg	13.18	0.65	2.60	3.18	0.58	0.00	91.93
Site #4	17.18	-0.49	-2.36	-2.36	0.00	0.00	88.75
Luckenbill Rd Bdg	21.99	-0.66	-6.76	-6.76	0.00	0.00	91.11
Harvey Shaw Rd Bdg	32.23	2.69	13.37	13.37	0.00	0.00	97.87
Petty John Rd Bdg	37.20	0.45	1.95	1.95	0.00	0.00	84.50
Hwy 125 Bdg	41.53	-1.10	-7.98	-7.90	-0.06	0.14	82.55
Hwy 124 Bdg	48.79	0.45	1.85	2.53	-0.07	0.75	90.45
Waitsburg Bdg	52.92	-0.06	-0.73	2.06	-10.23	13.02	87.92
Dayton Levee	64.97	x	x	x	x	x	85.86
Composite Seepage Data Set 2012		September 2012 Data Set					
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Sept 2012 Rate Per Mile (cfs)	Sept. 2012 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	0.07	0.54	-11.12	-11.66	0.00	17.57
Johnson Bdg	8.80	-0.63	-2.78	-2.78	0.00	0.00	28.69
I W Sims Rd Bdg	13.18	-0.39	-1.54	-0.96	0.58	0.00	31.47
Site #4	17.18	-0.32	-1.53	-1.53	0.00	0.00	32.43
Luckenbill Rd Bdg	21.99	-0.16	-1.61	-1.61	0.00	0.00	33.96
Harvey Shaw Rd Bdg	32.23	0.62	3.08	3.08	0.00	0.00	35.57
Petty John Rd Bdg	37.20	-0.61	-2.64	-2.64	0.00	0.00	32.49
Hwy 125 Bdg	41.53	-0.51	-3.68	-4.73	-1.19	0.14	35.13
Hwy 124 Bdg	48.79	-0.52	-2.15	-1.47	-0.07	0.75	39.86
Waitsburg Bdg	52.92	-0.07	-0.88	-6.56	-10.96	5.28	41.33
Dayton Levee	64.97	x	x	x	x	x	47.89

Composite Seepage Data Set 2013							
June 2013 Data Set							
Flow Measurement Location (Reach Locations)	Actual River Mile (cfs)	June 2013 Rate Per Mile (cfs)	June 2013 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	0.61	4.85	-10.13	-14.98	0.00	95.40
Johnson Bdg	8.80	-1.08	-4.71	-4.71	0.00	0.00	105.53
I W Sims Rd Bdg	13.18	-0.15	-0.59	-0.59	0.00	0.00	110.24
Site #4	17.18	-0.21	-1.03	-1.03	0.00	0.00	110.83
Luckenbill Rd Bdg	21.99	0.06	0.58	0.58	0.00	0.00	111.86
Harvey Shaw Rd Bdg	32.23	-0.36	-1.80	-1.80	0.00	0.00	111.28
Petty John Rd Bdg	37.20	-2.07	-8.97	-8.97	0.00	0.00	113.08
Hwy 125 Bdg	41.53	0.26	1.87	-0.43	-3.11	0.80	122.05
Hwy 124 Bdg	48.79	0.17	0.70	7.98	-0.28	7.56	122.48
Waitsburg Bdg	52.92	0.52	6.21	2.99	-9.23	6.00	114.50
Dayton Levee	64.97	x	x	x	x	x	111.51
Composite Seepage Data Set 2013							
September 2013 Data Set							
Flow Measurement Location (Reach Locations)	Actual River Mile (cfs)	Sept. 2013 Rate Per Mile (cfs)	Sept. 2013 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	-0.05	-0.38	-14.82	-14.44	0.00	10.31
Johnson Bdg	8.80	-0.25	-1.11	-1.11	0.00	0.00	25.13
I W Sims Rd Bdg	13.18	-0.92	-3.66	-3.66	0.00	0.00	26.24
Site #4	17.18	0.25	1.20	1.20	0.00	0.00	29.90
Luckenbill Rd Bdg	21.99	-0.57	-5.79	-5.79	0.00	0.00	28.70
Harvey Shaw Rd Bdg	32.23	-0.24	-1.20	-1.20	0.00	0.00	34.49
Petty John Rd Bdg	37.20	-0.82	-3.56	-3.56	0.00	0.00	35.69
Hwy 125 Bdg	41.53	-0.56	-4.07	-3.73	-0.46	0.80	39.25
Hwy 124 Bdg	48.79	-0.75	-3.08	-2.95	-0.28	0.41	42.98
Waitsburg Bdg	52.92	-0.08	-0.92	-3.27	-8.93	6.58	45.93
Dayton Levee	64.97	x	x	x	x	x	49.20
Composite Seepage Data Set 2014							
August 2014 Data Set 2014							
Flow Measurement Location (Reach Locations)	Actual River Mile (cfs)	June 2013 Rate Per Mile (cfs)	June 2013 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	0.08	0.67	-18.53	-19.20	0.00	4.10
Johnson Bdg	8.80	-0.19	-0.84	-0.84	0.00	0.00	22.63
I W Sims Rd Bdg	13.18	0.12	0.46	0.46	0.00	0.00	23.47
Site #4	17.18	-0.26	-1.23	-2.17	-0.94	0.00	23.00
Luckenbill Rd Bdg	21.99	0.08	0.81	0.81	0.00	0.00	25.18
Harvey Shaw Rd Bdg	32.23	-0.01	-0.05	-0.05	0.00	0.00	24.37
Petty John Rd Bdg	37.20	-1.16	-5.04	-5.04	0.00	0.00	24.42
Hwy 125 Bdg	41.53	-0.18	-1.34	-4.54	-3.20	0.00	29.46
Hwy 124 Bdg	48.79	-1.07	-4.41	-3.80	0.00	0.61	34.00
Waitsburg Bdg	52.92	-0.03	-0.36	-4.77	-10.82	6.41	37.80
Dayton Levee	64.97	x	x	x	x	x	42.58
Composite Seepage Data Set 2014							
September 2014 Data Set 2014							
Flow Measurement Location (Reach Locations)	Actual River Mile (cfs)	Sept. 2013 Rate Per Mile (cfs)	Sept. 2013 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Cummings Rd Bdg	0.86	-0.06	-0.45	-17.59	-17.14	0.00	4.20
Johnson Bdg	8.80	-1.23	-5.40	-5.40	0.00	0.00	21.79
I W Sims Rd Bdg	13.18	-0.24	-0.95	-0.95	0.00	0.00	27.19
Site #4	17.18	-0.29	-1.41	-2.16	-0.75	0.00	28.14
Luckenbill Rd Bdg	21.99	0.23	2.33	2.33	0.00	0.00	30.30
Harvey Shaw Rd Bdg	32.23	-0.61	-3.05	-3.05	0.00	0.00	27.97
Petty John Rd Bdg	37.20	-1.06	-4.60	-4.60	0.00	0.00	31.02
Hwy 125 Bdg	41.53	-0.04	-0.32	-2.72	-3.20	0.80	35.61
Hwy 124 Bdg	48.79	-0.17	-0.69	-0.77	-0.28	0.20	38.33
Waitsburg Bdg	52.92	0.03	0.31	-6.30	-9.66	3.04	39.10
Dayton Levee	64.97	x	x	x	x	x	45.40

August 4, 2015							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	August 2015 Rate Per Mile (cfs)	August 2015 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Hwy 12 Bdg	0.86	0.15	1.23	-7.90	-9.13	0.00	2.65
Johnson Bdg	8.80	-0.61	-2.66	-2.66	0.00	0.00	10.55
I W Sims Rd Bdg	13.18	0.26	1.04	1.04	0.00	0.00	13.21
Site #4	17.18	-0.01	-0.05	-1.05	-1.00	0.00	12.17
Luckenbill Rd Bdg	21.99	-0.54	-5.58	-5.58	0.00	0.00	13.22
Harvey Shaw Rd Bdg	32.23	-0.14	-0.71	-0.71	0.00	0.00	18.80
Petty John Rd Bdg	37.20	-0.32	-1.37	-1.37	0.00	0.00	19.51
Hwy 125 Bdg	41.53	-0.75	-5.43	-6.10	-0.67	0.00	20.88
Hwy 124 Bdg	48.79	-1.37	-5.65	-5.19	0.00	0.46	26.98
Waitsburg Bdg	52.92	-0.12	-1.46	-5.50	-7.30	3.26	32.17
Dayton Levee	64.97	x	x	x	x	x	37.67
September 30, 2015							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	September 2015 Rate Per Mile (cfs)	September 2015 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Hwy 12 Bdg	0.85	-0.82	-6.50	-23.29	-16.79	0.00	7.40
Johnson Bdg	8.80	-0.13	-0.59	0.75	1.34	0.00	30.69
I W Sims Rd Bdg	13.18	-0.55	-2.21	-2.21	0.00	0.00	29.94
Site #4	17.18	-0.04	-0.18	-0.18	0.00	0.00	32.15
Luckenbill Rd Bdg	21.99	0.06	0.63	0.63	0.00	0.00	32.33
Harvey Shaw Rd Bdg	32.23	-0.35	-1.72	-1.72	0.00	0.00	31.70
Petty John Rd Bdg	37.20	-0.94	-4.08	-4.08	0.00	0.00	33.42
Hwy 125 Bdg	41.53	-0.30	-2.15	-3.48	-1.33	0.00	37.50
Hwy 124 Bdg	48.79	-0.09	-0.36	-0.36	0.00	0.00	40.98
Waitsburg Bdg	52.92	0.12	1.46	-3.11	-8.07	3.50	41.34
Dayton Levee	64.97	x	x	x	x	x	44.45
June 28, 2016							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	August 2015 Rate Per Mile (cfs)	August 2015 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Hwy 12 Bdg	0.86	-0.79	-6.26	-22.43	-16.17	0.00	16.05
Johnson Bdg	8.80	-0.06	-0.25	-0.25	0.00	0.00	38.48
I W Sims Rd Bdg	13.18	0.13	0.50	0.57	0.07	0.00	38.73
Site #4	17.18	-0.38	-1.81	-1.81	0.00	0.00	38.15
Luckenbill Rd Bdg	21.99	-0.30	-3.07	-3.07	0.00	0.00	39.97
Harvey Shaw Rd Bdg	32.23	0.43	2.14	2.14	0.00	0.00	43.04
Petty John Rd Bdg	37.20	-0.80	-3.46	-3.46	0.00	0.00	40.90
Hwy 125 Bdg	41.53	-0.24	-1.74	-4.33	-2.79	0.20	44.37
Hwy 124 Bdg	48.79	-1.36	-5.62	-2.97	0.00	2.65	48.70
Waitsburg Bdg	52.92	0.22	2.66	-4.49	-12.43	5.29	51.66
Dayton Levee	64.97	x	x	x	x	x	56.15
September 1, 2016							
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	August 2015 Rate Per Mile (cfs)	August 2015 Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	Net Diversion Total (cfs)	Net Tributary Inputs Total (cfs)	Measured Instream Flow (cfs)
Hwy 12 Bdg	0.86	0.03	0.23	-15.33	-15.56	0.00	4.20
Johnson Bdg	8.80	-0.48	-2.10	-2.10	0.00	0.00	19.53
I W Sims Rd Bdg	13.18	-0.29	-1.17	-1.17	0.00	0.00	21.63
Site #4	17.18	0.03	0.13	0.13	0.00	0.00	22.80
Luckenbill Rd Bdg	21.99	-0.13	-1.35	-1.35	0.00	0.00	22.68
Harvey Shaw Rd Bdg	32.23	-0.64	-3.17	-3.17	0.00	0.00	24.03
Petty John Rd Bdg	37.20	0.12	0.52	0.52	0.00	0.00	27.20
Hwy 125 Bdg	41.53	-0.84	-6.10	-7.21	-1.11	0.00	26.68
Hwy 124 Bdg	48.79	-1.27	-5.24	-4.04	0.00	1.20	33.89
Waitsburg Bdg	52.92	0.05	0.63	-4.29	-8.00	3.08	37.93
Dayton Levee	64.97	x	x	x	x	x	42.22

Attachment B-3

Yellowhawk Seepage Assessment

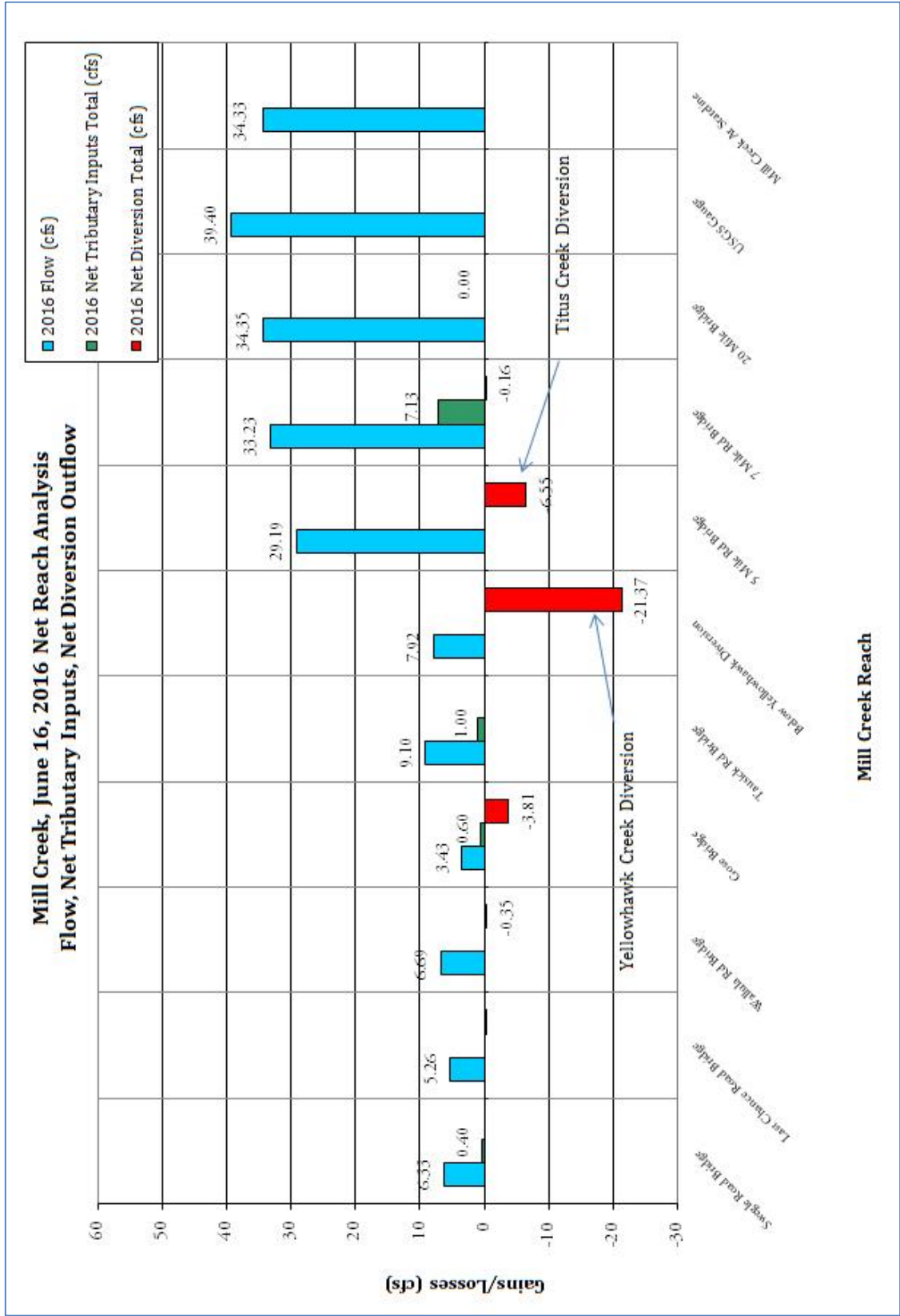
June 2011 Seepage Assessment								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	1.91	1.38	-2.24	-3.62	0.00	27.26	Gaining
Yellowhawk #2 to Yellowhawk #3	0.74	-4.04	-3.85	-12.41	-8.56	0.00	25.02	Losing
Yellowhawk #3 to Yellowhawk #4	1.70	1.37	1.03	5.38	0.00	4.35	12.61	Gaining
Yellowhawk #4 to Yellowhawk #5	2.45	-3.27	-2.01	-2.41	-0.40	0.00	17.99	Losing
Yellowhawk #5 to Yellowhawk #6	3.06	7.67	6.60	6.60	0.00	0.00	15.58	Gaining
Yellowhawk #6 to Yellowhawk #7	3.92	-2.53	-1.94	-1.94	0.00	0.00	22.18	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	3.66	15.31	59.30	-0.50	44.49	20.24	Gaining
Yellowhawk #8 -	8.87	x	x	x	x	x	79.54	Gaining
September 2011 Seepage Assessment								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2011 Net Diversion Total (cfs)	2011 Net Tributary Inputs Total (cfs)	2011 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	1.56	1.13	-0.68	-1.81	0.00	19.04	Gaining
Yellowhawk #2 to Yellowhawk #3	0.74	-4.22	-4.02	-6.69	-2.67	0.00	18.36	Losing
Yellowhawk #3 to Yellowhawk #4	1.70	-0.43	-0.32	3.26	0.00	3.58	11.67	Losing
Yellowhawk #4 to Yellowhawk #5	2.45	1.85	1.14	1.14	0.00	0.00	14.93	Gaining
Yellowhawk #5 to Yellowhawk #6	3.06	-0.17	-0.15	-0.15	0.00	0.00	16.07	Losing
Yellowhawk #6 to Yellowhawk #7	3.92	-1.62	-1.24	-1.24	0.00	0.00	15.92	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	0.72	3.02	0.91	-2.63	0.52	14.68	Gaining
Yellowhawk #8 -	8.87	x	x	x	x	x	15.59	Gaining
June 27, 2012 Yellowhawk Creek Seepage Assessment								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	-1.12	-0.81	-2.02	-1.21	0.00	23.04	Losing
Yellowhawk #2 to Yellowhawk #3	0.74	0.34	0.32	-5.79	-6.11	0.00	21.02	Gaining
Yellowhawk #3 to Yellowhawk #4	1.70	-2.43	-1.83	4.72	0.00	6.55	15.23	Losing
Yellowhawk #4 to Yellowhawk #5	2.45	-1.97	-1.21	-1.81	-0.60	0.00	19.95	Losing
Yellowhawk #5 to Yellowhawk #6	3.06	3.44	2.96	2.96	0.00	0.00	18.14	Gaining
Yellowhawk #6 to Yellowhawk #7	3.92	-0.77	-0.59	-0.59	0.00	0.00	21.10	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	1.39	5.79	18.25	-1.00	13.46	20.51	Gaining
Yellowhawk #8 -	8.87	x	x	x	x	x	38.76	Gaining
September 4, 2012 Yellowhawk Creek Seepage Assessment								
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2012 Net Diversion Total (cfs)	2012 Net Tributary Inputs Total (cfs)	2012 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	0.19	0.14	-2.23	-2.37	0.00	17.87	Gaining
Yellowhawk #2 to Yellowhawk #3	0.74	0.56	0.53	-2.57	-3.10	0.00	15.64	Gaining
Yellowhawk #3 to Yellowhawk #4	1.70	-0.64	-0.48	2.16	0.00	2.64	13.07	Losing
Yellowhawk #4 to Yellowhawk #5	2.45	-1.22	-0.75	-1.35	-0.60	0.00	15.23	Losing
Yellowhawk #5 to Yellowhawk #6	3.06	2.95	2.54	2.54	0.00	0.00	13.88	Gaining
Yellowhawk #6 to Yellowhawk #7	3.92	-1.76	-1.35	-1.35	0.00	0.00	16.42	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	-0.26	-1.10	-0.78	-0.75	1.07	15.07	Losing
Yellowhawk #8 -	8.87	x	x	x	x	x	14.29	

June 27, 2013 Yellowhawk Creek Seepage Assessment

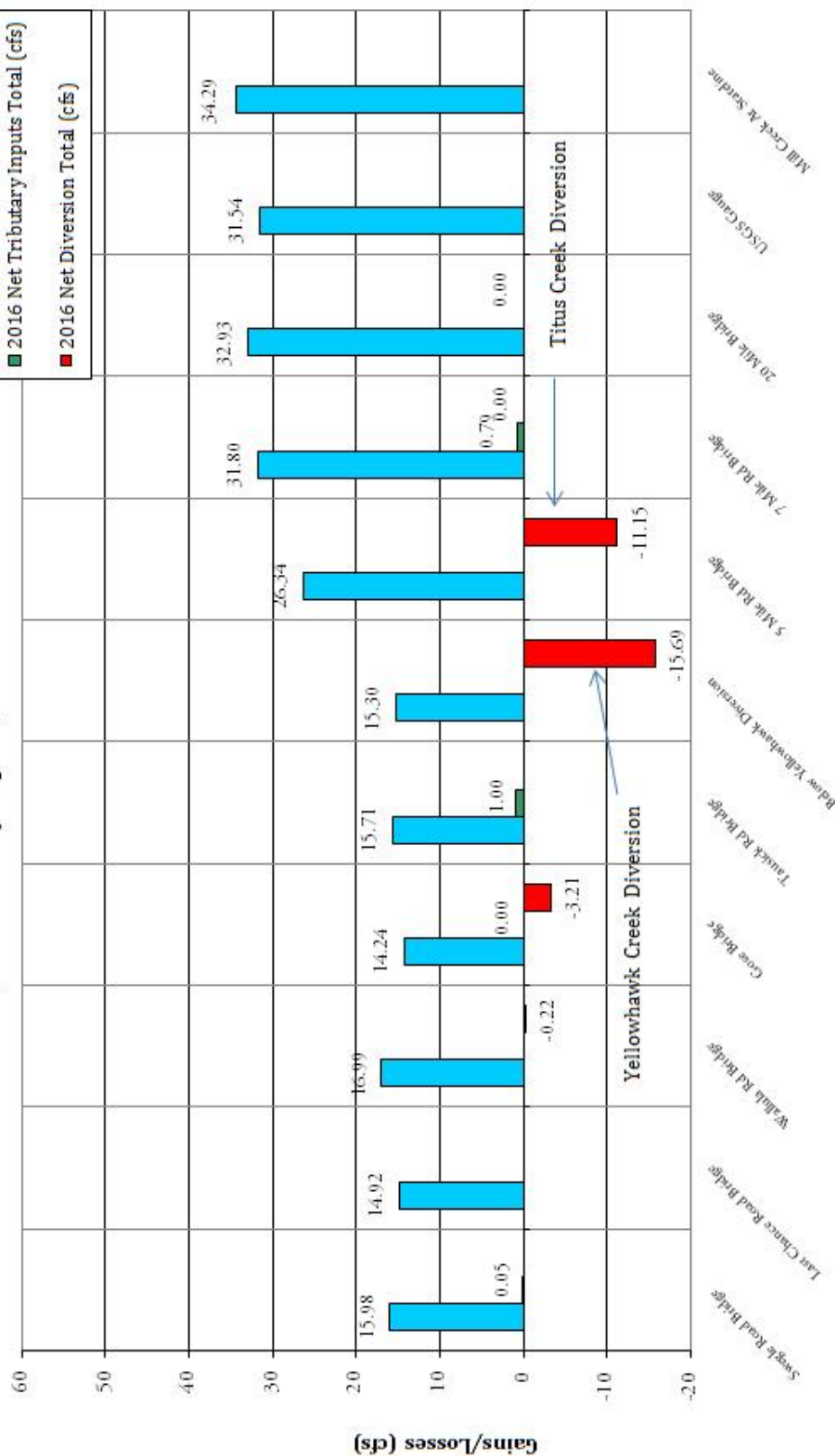
Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	4.18	3.02	0.40	-2.62	0.00	23.15	Gaining
Yellowhawk #2 to Yellowhawk #3	0.74	-1.44	-1.37	-5.07	-3.70	0.00	23.55	Losing
Yellowhawk #3 to Yellowhawk #4	1.70	-1.49	-1.12	0.92	0.00	2.04	18.48	Losing
Yellowhawk #4 to Yellowhawk #5	2.45	-1.59	-0.98	-2.09	-1.11	0.00	19.40	Losing
Yellowhawk #5 to Yellowhawk #6	3.06	1.52	1.31	1.31	0.00	0.00	17.31	Gaining
Yellowhawk #6 to Yellowhawk #7	3.92	-0.03	-0.02	-0.02	0.00	0.00	18.62	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	0.51	2.12	5.02	-0.22	3.12	18.60	Gaining
Yellowhawk #8 -	8.87	x	x	x	x	x	23.62	Gaining

September 4, 2013 Yellowhawk Seepage Assessment

Flow Measurement Location (Reach Locations)	Actual River Mile (GIS)	Rate Per Mile (cfs)	Net Gain/Loss (cfs)	Gross Instream Gain/Loss Change (cfs)	2013 Net Diversion Total (cfs)	2013 Net Tributary Inputs Total (cfs)	2013 Flow (cfs)	Gaining/Losing
Yellowhawk #1 to Yellowhawk #2	0.02	2.28	1.65	-0.56	-2.21	0.00	15.71	Gaining
Yellowhawk #2 to Yellowhawk #3	0.74	0.67	0.64	-2.57	-3.21	0.00	15.15	Gaining
Yellowhawk #3 to Yellowhawk #4	1.70	-1.87	-1.41	0.77	0.00	2.18	12.58	Losing
Yellowhawk #4 to Yellowhawk #5	2.45	-1.04	-0.64	-1.24	-0.60	0.00	13.35	Losing
Yellowhawk #5 to Yellowhawk #6	3.06	6.37	5.48	5.48	0.00	0.00	12.11	Gaining
Yellowhawk #6 to Yellowhawk #7	3.92	-4.92	-3.77	-3.77	0.00	0.00	17.59	Losing
Yellowhawk #7 to Yellowhawk #8	4.69	-0.34	-1.40	-1.64	-0.75	0.51	13.82	Losing
Yellowhawk #8 -	8.87	x	x	x	x	x	12.18	Gaining

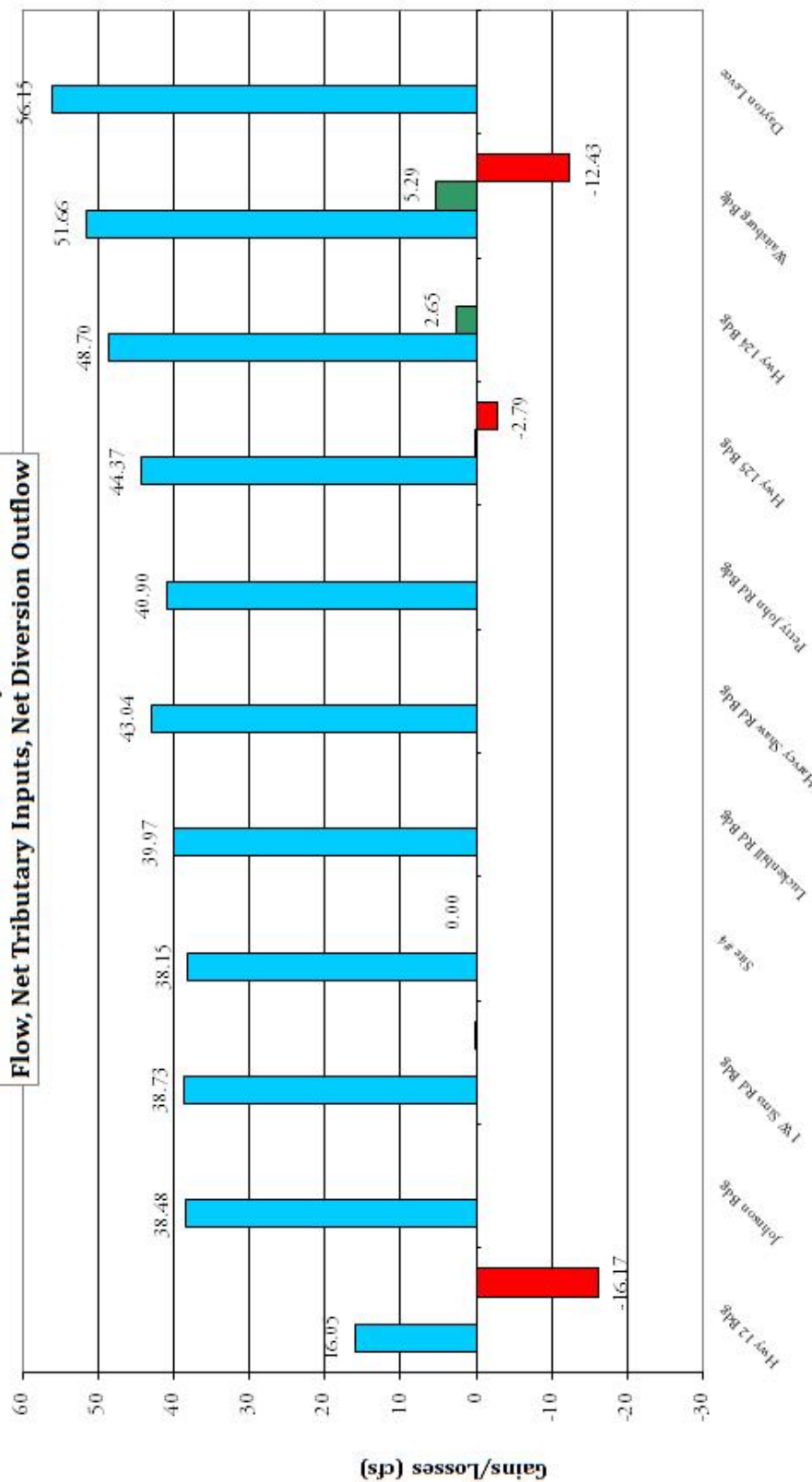


Mill Creek, September 26, 2016 Net Reach Analysis Flow, Net Tributary Inputs, Net Diversion Outflow



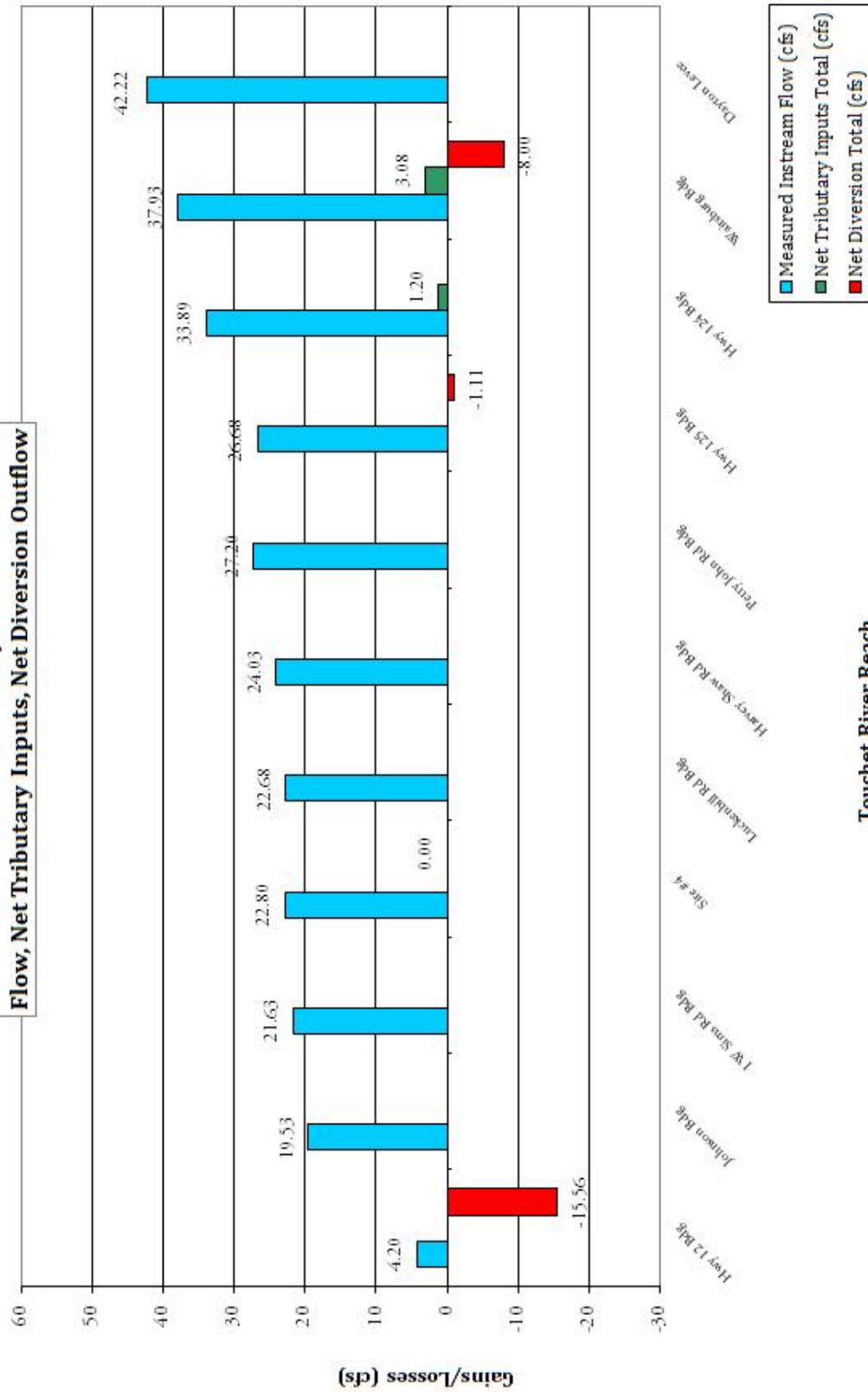
Mill Creek Reach

Touchet River, June 28, 2016
Net Reach Analysis
Flow, Net Tributary Inputs, Net Diversion Outflow



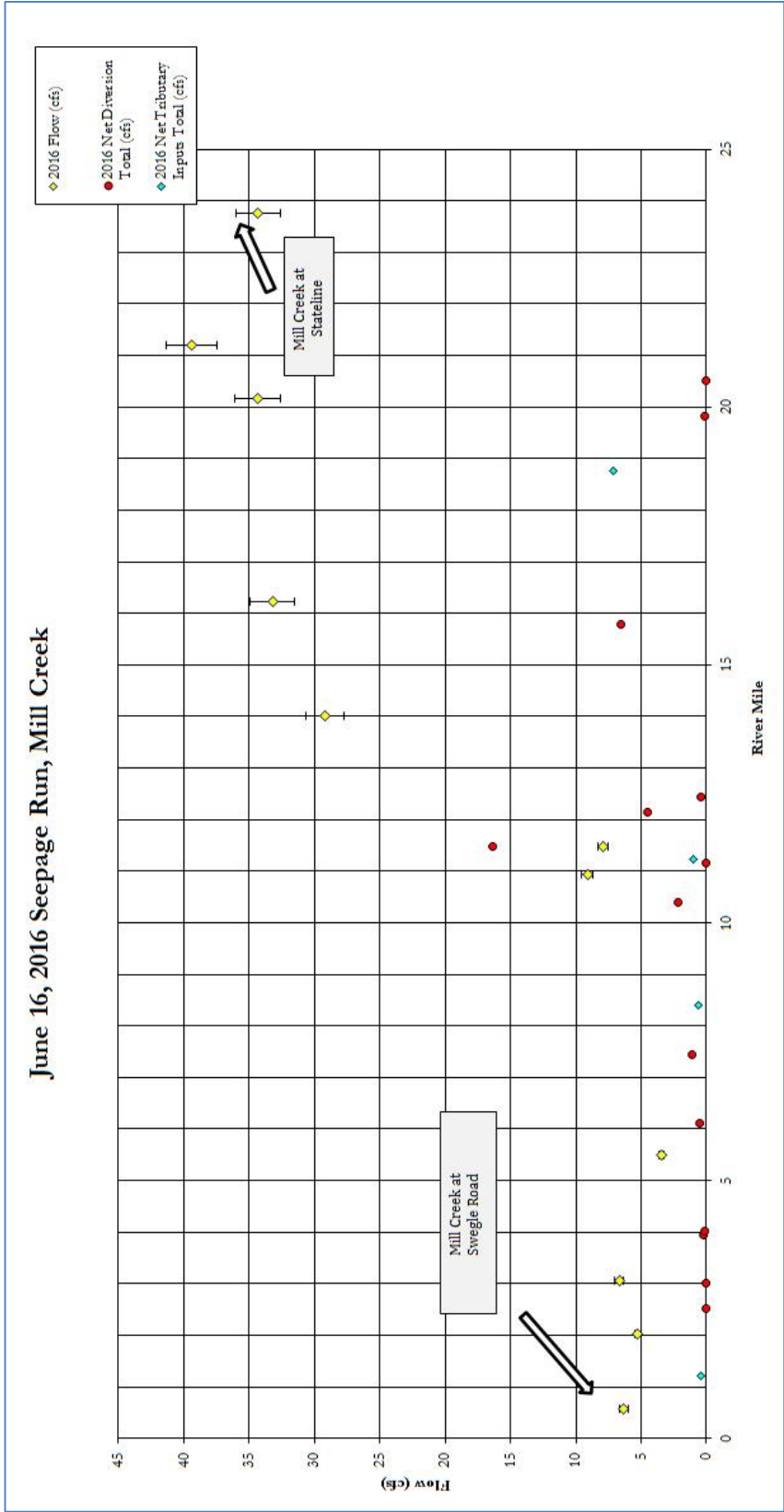
Touchet River Reach

Touchet River, September 1, 2016
Net Reach Analysis
Flow, Net Tributary Inputs, Net Diversion Outflow

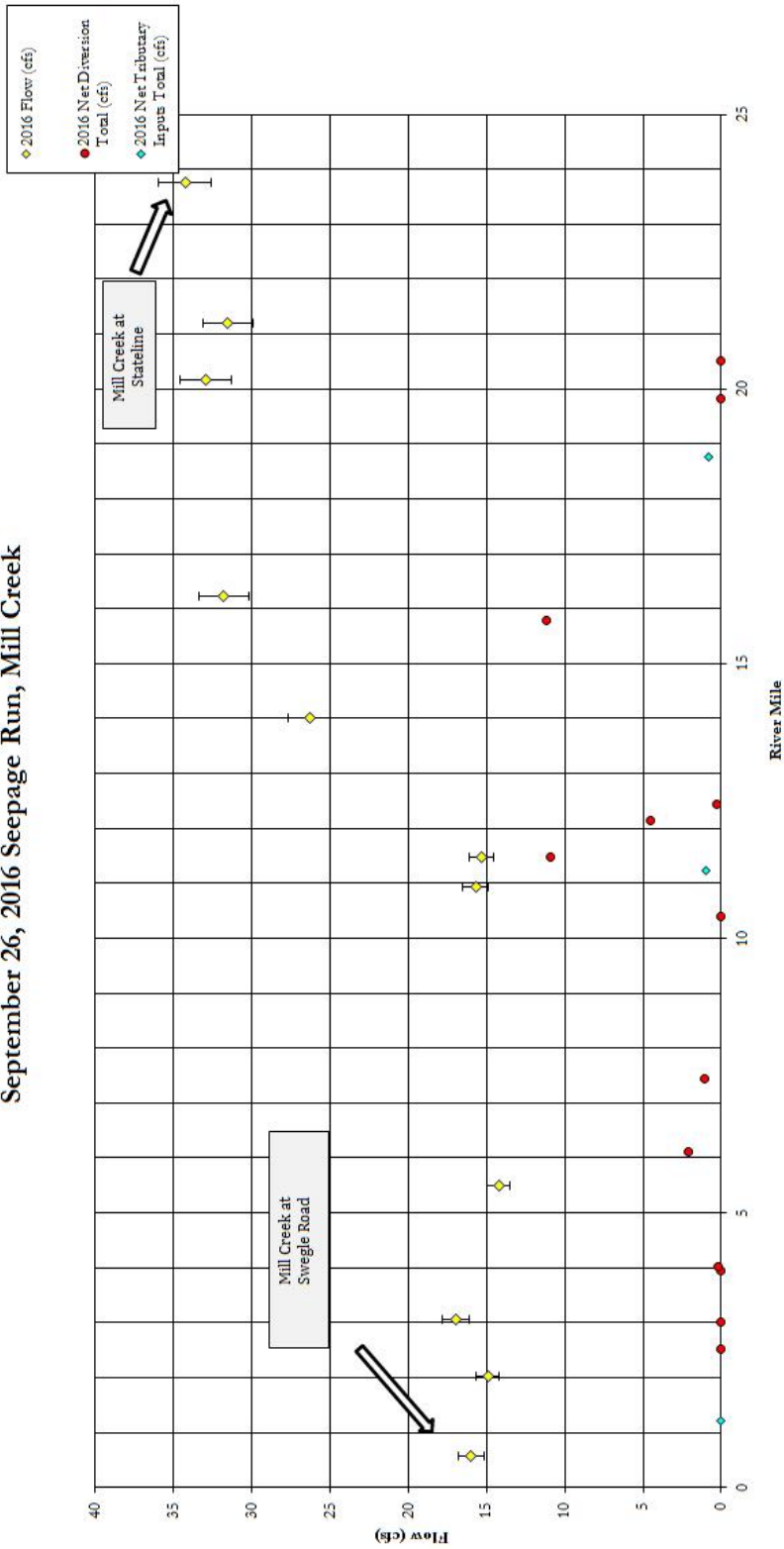


Touchet River Reach

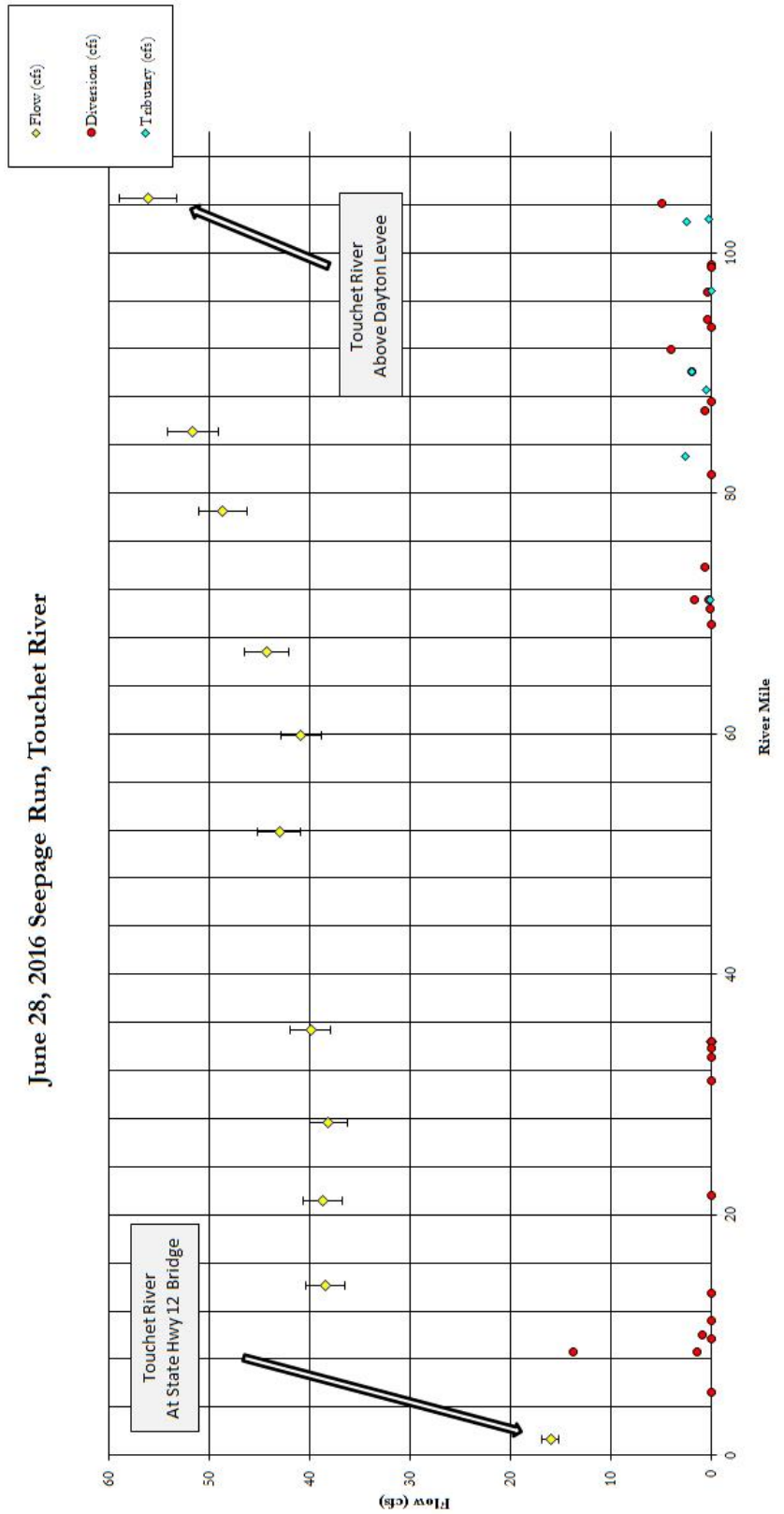
Attachment D



September 26, 2016 Seepage Run, Mill Creek



June 28, 2016 Seepage Run, Touchet River



September 1, 2016 Seepage Run, Touchet River

