Technical Memorandum No. 3
Proposed Flow Enhancement Targets for WRIA 35 Streams

Draft

WRIA 35 – Middle Snake River Basin

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Prepared by

HDR | EES
2805 St. Andrews Loop, Ste. A
Pasco, Washington 99301-6121
(509) 546-2040

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1.0 Introduction and Background

This document is Technical Memorandum No. 3 prepared as part of the Level 2 Instream Flow Assessment for WRIA 35 and documents the preliminary flow enhancement targets for the Tucannon River (Management Points 1 and 3). Target flows are one part of the overall instream flow management strategy being developed for the WRIA 35 watershed management plan. Tech Memo No. 1 describes the overall stream flow management framework and the management points developed for the basin. Tech Memos 2a and 2b present the approach to develop preliminary minimum instream flow (MIF) recommendations and the proposed administrative stream closures, respectively.

The purpose of this tech memo is to develop preliminary flow enhancement targets for the Tucannon River and Asotin River for consideration of the Planning Unit. The reason for selecting these two rivers is discussed further in Section 1.2. The approach presented here may be used for the other management points where flow enhancement targets may be developed.

1.1 Flow Enhancement Targets

Tech Memo No. 1 introduced the concept of flow enhancement targets (or target flows) as an increment of flow (e.g. in cubic feet per second) that can realistically be returned to the stream through operational or structural improvements in irrigation and other municipal and domestic water use and management practices[1]. The development of target flows and their use in managing streamflows are generally voluntary and can be used to: (1) help guide flow enhancement efforts, and (2) provide the means for measuring the progress and effectiveness of flow enhancement actions over time.

They are important in the overall stream flow management strategy because the regulatory controls (minimum instream flows and administrative closures) only protect stream flow by placing restrictions on *new* (or future) water rights. They cannot do anything to improve (increase) existing low flow conditions in streams. However, the Watershed Planning Act requires the planning units to develop management strategies to return flows to the streams to the extent practicable, i.e., to enhance existing flows.

Establishing flow enhancement targets is an iterative process where the enhancement flow can first be estimated based on the available flow enhancement techniques and known hydrologic conditions. Monitoring is then conducted to determine whether the targets are being achieved and whether the targets need to be adjusted. Furthermore, the flow enhancement targets for various locations throughout the Basin should be adjusted annually to account for the type of water year. For a "wet year," flow enhancement targets in certain areas might be adjusted higher

[1] In general, effective streamflow management addresses both high flow and low flow conditions. As such, target flows are generally defined as a "flow regime" that could be achieved in most years by following selected management techniques over a long period of time. The flow regime can be defined by a set of statistics that define both the high and low flows and their frequency of occurrence. For the purpose of this assessment, the focus is on enhancing or increasing flows in the WRIA 35 streams and target flows refer to an increment of flow.

to maximize fish benefits, while in a "dry year" flows might be adjusted to maintain a certain base flow that minimizes negative fish impacts, while perhaps providing for a reduced level of water withdrawal (selective curtailment through a short-term lease between willing lessee/lessor). Negotiating and adopting these flow enhancement targets in the watershed plan can provide an important component to an updated flow management approach for the Basin.

1.2 Selection of Tucannon River and Asotin River

In order to simplify the approach used for target flows, flow enhancement goals are applied only to select management points rather than attempting to develop targets for every management point. The management points are selected based on the following:

- Management point should account for those stream segments where flow enhancement is expected to be most biologically important for fish and where low flows are predominant factors that would improve habitat conditions. For these management points flow has been identified as a limiting factor and is a priority restoration reach.

- Management points should be located in areas downstream of existing, relatively substantial diversions. Some management points simply do not have enough water use activities upstream to provide additional flow despite the management practices.

- Management points should effectively consolidate and account for flow enhancement activities of key streams to simplify the monitoring needs of the management program. By using certain management points, the need for flow monitoring locations can be reduced.

As documented in Tech Memo No. 1 and based on the factors above, management points MP-1 and MP-3 were selected for recommending target flows. Since Pataha Creek is a tributary to the Tucannon River, MP-2 and MP-4 are also evaluated here. The Tucannon River has been identified as a stream where flows are one of the primary habitat limiting factors for salmonids. Although other factors such as temperature and riparian function may be more important, improving flows is still considered a benefit for the overall habitat improvement, especially from the Pataha confluence to the Tumulam Hatchery (Parametrix, 2004a). This section of the Tucannon River was also identified as a priority restoration reach.

Management Points MP-12, MP-13, and MP-14 associated with the Asotin River drainage were also identified as reaches for developing target flows. Within the Asotin River drainage the upper Asotin, North Fork Asotin, Charley Creek, and Lower George Creek were identified as priority for restoration (Parametrix, 2004b).

The approach used here can be applied to other streams as the watershed plan is developed in the basin once the Planning Unit agrees on the approach.

2.0 Management Techniques for Enhancing Flows

The effectiveness of this approach will be dependent on the complementary actions that would be taken to achieve the target flows, including protecting flows throughout the watershed to

achieve the intended benefits downstream of flow enhancement strategies. The advantage to this approach is that: 1) involves existing water right holders in flow management beyond those provisions established in water rights documents, and 2) affords greater flexibility in adjusting the flow management regime to reflect seasonal variations in water conditions.

For the purposes of developing the target flows, it is assumed that flow management practices capable of returning significant flows back to the stream are implemented primarily during the high water demand periods between June and October. Thus, the target flows are assumed to also apply only between this period.

There are several regulatory and incentive-based mechanisms for putting water back into streams to achieve the target flow goals. They include:

- Water rights acquisitions through purchases, leases, donations and other means (including using the State Trust water rights);
- Flow augmentation from water conservation and reuse projects (including on-farm measures such as soil moisture monitoring, drip irrigation, and irrigation scheduling);
- Water releases from existing and new water storage projects (including off-stream storage and shallow aquifer storage and recharge projects);
- Source substitution;
- Enforcement activities against unpermitted uses and excessive water waste; and
- Stream habitat restoration projects (including channel restoration)

The reader is referred to the appendix in Tech Memo No. 1 for a description of these techniques. Table 1 presents the applicability of the techniques to MP-1 through MP-4 and MP12 through MP-14 with respect to enhancing flows on the Tucannon River and the Asotin River, respectively.

Table 1 Applicability of Flow Enhancement Management Techniques to the Tucannon River and Asotin River Drainage Areas							
Management Technique	**MP-1 Tucannon River at Starbuck**	**MP-3 Tucannon River at Marengo**	**MP-2 Pataha Creek at Mouth**	**MP-4 Pataha Creek at Pomeroy**	**MP-12 Asotin Creek at mouth**	**MP-13 George Creek above Asotin Creek**	**MP-14 Asotin Creek below George Creek**
Water rights transfers, lease, etc. (to State Trust)(1)	Medium	Low	Medium	Medium	Low	Low	Low
Water Conservation (on-farm, municipal)(2)	Medium	Low	Medium	Medium	Low	Low	Low
Storage releases(3)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Source substitution(4)	Low	Low	Low	Low	Low	Low	Low
Enforcement against un-permitted use(5)	Low	Low	Low	Low	Low	Low	Low
Restoration projects(6)	TBD	TBD	TBD	TBD	TBD	TBD	TBD

(1) The effectiveness or applicability of water rights transfers and leases is highly dependent on the willingness of private individuals to participate based on available incentives. The ratings are subjective and based primarily on whether there are water rights present above each of the management points.
(2) Water conservation is most effective where there is significant water use and loss through distribution and application of water. There are no irrigation canals in this area and only limited water use occurs above MP-3.
(3) A separate assessment is being conducted to evaluate the feasibility of developing water storage projects to augment flows throughout the watershed.
(4) Source substitution refers to switching from a surface water source or shallow groundwater source to a deeper groundwater source not hydraulically connected to surface water. It is unlikely that existing water users would change sources without a lot of incentive to do so.
(5) Based on the limited amount of irrigation use in the area, it is not expected that much unpermitted use occurs in the basin. However, this would need further assessment.
(6) Restoration projects related to floodplain or wetland restoration would provide additional bank storage and baseflow later in the summer season. A separate assessment is being conducted to evaluate the feasibility of using wetland creation to augment flows throughout the watershed.

3.0 Summary of Water Rights in Tucannon River and Asotin River Drainage

The appendix includes a summary of the water rights associated with each management point in the Tucannon River and Pataha Creek drainage areas. The information collected from the Ecology database record of water rights is not always up-to-date and is not considered an accurate gauge of actual water use (for example rights that have not been used in the last five years may not be removed from the system). However, it does provide a surrogate means to assess the types of use and the relative magnitude of use along the Tucannon and Pataha drainage areas. A summary of the findings from a review of the water rights record is presented in Table 2.

Table 2
Summary of Water Rights Distribution in the Tucannon River Asotin River Drainage Areas

Management Point	Surface Water Rights	Ground Water Rights
Tucannon River		
MP-1	■ Most of the surface water rights are for irrigation use. ■ A total of 19 cfs is available to irrigate ~716 acres.	■ Only supplemental ground water rights are available.
MP-3	■ Most surface water rights are owned by WDFW for fish propagation use (non-consumptive) ■ Minor amount used for irrigation (1 cfs)	■ Most ground water rights are owned by WDFW for fish propagation use ■ Minor quantity for irrigation (0.36 cfs to irrigate 34 acres)
Pataha Creek		
MP-2	■ Majority of surface water rights used for irrigation (6 cfs to irrigate ~300 acres)	■ City of Pomeroy owns a municipal right of 2.78 cfs ■ Remaining ground water rights are primarily for irrigation use (3.25 cfs to irrigate ~240 acres)
MP-4	■ Minor amount of surface water rights used for irrigation (2 cfs to irrigate 71 acres)	■ Most ground water rights are primarily for irrigation (6.9 cfs to irrigate ~500 acres)
Asotin Creek (including Forks and Charley Creek)		
MP-12	■ Small irrigation, domestic and stock watering use	■ Largest groundwater rights are for irrigation (~1 cfs to irrigate 90 acres) ■ Remaining rights are primarily for small domestic and stock watering
MP-14	■ Small rights primarily for stock and wildlife watering ■ Small domestic rights	■ No ground water rights listed in database
George Creek (including Pintner Creek)		
MP-13	■ Small rights primarily for stock and wildlife watering ■ Small domestic rights	■ No ground water rights listed in database

Note: Source of water rights information is the same Ecology database used to document water rights information in the WRIA 35 Level 1 Assessment (HDR-EES, 2004).

With no direct municipal water supply user affecting the Tucannon River (City of Pomeroy uses groundwater as its primary source in the Pataha Creek drainage), the most significant water use is for irrigation. As Table 2, indicates only a limited quantity of land is irrigated above MP-3 (Marengo) on the Tucannon River. A majority of the irrigated lands occur between MP-1 and MP-3, and even in this area the number of acres is on the order of 700 acres. There are significantly more irrigated acres along Pataha Creek (on the order of total 1,100 acres). There are almost equal irrigated acres above and below MP-4. However, above MP-4 most of the irrigation occurs through use of ground water, whereas below MP-4 to the mouth of Pataha Creek, surface and groundwater is used almost equally for irrigation.

4.0 Summary of NRCS Irrigation Savings Study

The Natural Resource Conservation Service (NRCS) conducted an irrigation survey in the Tucannon River watershed in 1995 (NRCS, 1995). Although the study was conducted almost ten year ago, it is considered the most recent and complete inventory of irrigation water use in the basin (Terry Bruegman, personal communication, June 3, 2005). In the NRCS inventory, an estimated 1,941 acres of irrigated land was documented as follows:

- Alfalfa = 835 acres
- Wheat = 596 acres
- Grass Hay = 115 acres
- Pasture = 378 acres
- Fallow = 17 acres

The crop type and acreages were assembled by aerial photo and visual observation from the roadway and no landowner input was collected. However, a more recent informal survey by land owners in the area estimated approximately 2,000 acres of irrigated land along the Tucannon River (Dick Ducharme, personal communication, June 3, 2005). Therefore, the estimate of irrigated acres is considered relatively accurate for the purposes of this discussion.

As part of this study, the NRCS estimated the instantaneous flow expected for irrigation requirements. Using different methods, the estimated values for instantaneous flow for irrigation were as follows:

- Based on brake horsepower from inventoried pumps = 33.7 cfs
- Inventory of crop acreage = 39.7 cfs
- Maximum instantaneous flow = 44.9 cfs

In the latter estimate, NRCS assumed that the entire 1,941 acres were irrigated for alfalfa, which had the highest peak irrigation need of the different crop types (0.36 in/day), and that irrigation efficiency was 65 percent (based on sprinklers). With an improvement in irrigation efficiency of 5 percent, the total estimated peak flow would be reduced by 3.2 cfs. In terms of annual volume, the total savings would be ~460 acre-ft. annually.

As part of this study, the NRCS also estimated actual water use by comparing the total irrigated acreage based on Ecology's water rights database (8,831 acres, including water rights claims) with the estimated irrigated acreage from their survey (1,941 acres). This implies that approximately 22 percent of the area provided by water rights or claims was actually under irrigation at the time. Furthermore, based on a review of water rights at the time, NRCS estimated that the greatest flow improvement that could be expected by turning off all surface diversions was in the range of 34 to 39 cfs during August low flows.

NRCS concluded that there was no reason to assume at the time that the acres under irrigation were poorly managed. The conclusion was that irrigation occurring in the watershed was "supplemental" relative to the irrigation guidelines for the crops in the area, as supported by the fact the size of the pumps did not correspond with full irrigation.

It should be pointed out that the NRCS study included those lands along both Pataha Creek and the Tucannon River. As discussed in Section 3, a significant portion of the irrigated lands would actually be along Pataha Creek, and although reductions in irrigation would benefit Pataha Creek the flow benefits to Tucannon River would in the lower portion of its run. Most of the spawning and rearing occur above Kellogg Creek (above MP-1). The benefits of the additional flow from MP-2 and MP-4 would not affect this area.

5.0 Flow Enhancement for Tucannon River

A relatively significant amount of effort, and perhaps more critically, cooperation from water users in the area is necessary to obtain a comprehensive and current estimate of actual water use and a projection of potential savings. Requirements for metering should make this effort more practical in the future. Because of current difficulties in obtaining actual water use estimates and the lack of interest from water users to document their planned improvements and efficiencies, the approach taken here is to present a range of possible flow enhancement levels based on the information on water rights and the NRCS study described above.

5.1 Issues with Estimating Flow Enhancement Targets

This section discusses the issues implicit in estimating potential flow enhancement or flow savings opportunities. The major source of potential savings or flow enhancement for the Tucannon River is in irrigation savings. The other primary methods to return flows to the stream are through water rights transfers or leases and conservation savings by other users such as municipalities and industries. The primary issues with estimating savings from each option are as follows:

- Irrigation savings
  - Crop rotation and the type of crop planted by a land owner cannot be predicted.
  - The amount of irrigation savings is directly dependent on the type of crop being irrigated, and is a greater factor than the amount of irrigation efficiencies that can be gained from switching irrigation methods.
  - Irrigation practices change depending on climatic conditions and condition of the crop.
- Water right transfers or lease

- Uncertainty associated with participation in the program.
- Potentially market driven.
- Availability of state funding to support temporary instream leases.

- Municipal and commercial/industrial
  - Limited opportunity in the basin.
  - Small communities do not have as much incentive or funding to develop conservation program.
  - Water use is relatively low.

5.2 Flow Enhancement Target Approach

Three different methods are presented below for deriving potential flow enhancement targets. The first two approaches focus only on the irrigation savings in the basin and rely on the NRCS estimates of irrigated acres. The third method considers all the other types of water use and relies on the water rights information. The following discussion explains each method.

The first method is simply the findings from the NRCS study. Using the estimated acreage irrigated (1,941 acres), the crops identified in the inventory, and an improvement in irrigation efficiency from 65% to 70%, the estimated flow returned to the stream was 3.2 cfs. Assuming efficiency improvements of 2% and 10%, the returned flows become 2.0 cfs and 6.0 cfs, respectively. These totals can be distributed among the four management points based on the proportion or irrigated acres within each management point's drainage areas as quantified by the water rights database (see Appendix). Table 3 summarizes the results of this method.

Table 3
Summary of Potential Flow Enhancement Targets
based on NRCS Irrigation Savings Study – Tucannon River

	Percent of Irrigated Lands	2% Efficiency Improvement	5% Efficiency Improvement	10% Efficiency Improvement
Total Savings		2.0 cfs	3.2 cfs	6.0 cfs
MP-1	42%	0.84 cfs	1.3 cfs	2.5 cfs
MP-3	4%	0.08 cfs	0.13 cfs	0.24 cfs
MP-2	26%	0.52cfs	0.83 cfs	1.6 cfs
MP-4	28%	0.56 cfs	0.90 cfs	1.7 cfs

The second method simply assumes that there are approximately 2,000 acres of irrigated land in the Tucannon/Pataha basin. The assumption is made that an average of 3.0 feet per acre is the irrigation requirement for irrigated crops grown in the area (alfalfa, winter wheat, pasture, hay). The annual irrigation total is converted to an average instantaneous rate by assuming a 6 month irrigation season and 65% irrigation efficiency. Irrigation efficiency improvements of 2%, 5%, and 10% were calculated. The results of this method are shown in Table 4. As can be expected the results are similar to the NRCS values.

Table 4 Summary of Potential Flow Enhancement Targets based on Irrigation Average – Tucannon River				
	Percent of Irrigated Lands	**2% Efficiency Improvement**	**5% Efficiency Improvement**	**10% Efficiency Improvement**
Total Savings		1.8 cfs	2.9 cfs	5.4 cfs
MP-1	42%	0.76 cfs	1.2 cfs	2.3 cfs
MP-3	4%	0.07 cfs	0.12 cfs	0.22 cfs
MP-2	26%	0.47cfs	0.75 cfs	1.4 cfs
MP-4	28%	0.50 cfs	0.81 cfs	1.5 cfs

The third method considers the other types of water use besides irrigation and uses water rights information as the basis for calculating the range of flow enhancements. The total instantaneous and annual rights were grouped for each management point into three major groups of consumptive water use types: (1) irrigation, (2) municipal/commercial/industrial, and (3) domestic/stock/other. Any water right that has irrigation as one of its uses was included in the irrigation category. Rather than assuming a range of irrigation efficiency improvements, a percent reduction (1%, 2%, and 5%) of the total water rights was assumed. This range of percent reductions is considered realistic for the quantities of water being used in the area, especially considering that the amount of water actually used is less than the water rights available. For example, with irrigation it is assumed that total irrigation use would be reduced by 1% to 5% of the total water rights available. Similarly, municipal and commercial use could be reduced by 1% to 5% of the available water rights through conservation efforts. Finally, domestic and stock use may be transferred or leased for instream use by the same fraction.

This approach provides a range of target flows for the different categories of use and allows the Planning Unit a means to compare (on a relative basis) the potential source of flow to return to the stream. Another benefit of this approach is that the flow enhancements are divided into surface and ground water sources. A 1 cfs savings from a ground water source would not have the same direct benefit as a 1 cfs savings from a surface water diversion. This approach allows the planning unit to consider the benefits from each. Table 5 summarizes the results of the calculations for the combined effects of the different types of use. Table 6 includes the detailed table showing the flow reductions from each category of water use. As the results show, MP-1 and MP-4 have a majority of the source for returning flows. For each management point the totals are relatively insignificant, but the cumulative flow enhancement for the 5% reduction at MP-1 is on the order of 2.1 cfs. This value is comparable to the values derived from the irrigation-only methods described above. The cumulative flow enhancement is on the order of 1.5 cfs when only the surface water diversions are considered.

Table 5 Summary of Potential Flow Enhancement Targets Based on Water Rights Information – Tucannon River						
	Surface Water			**Ground Water**		
Management Point	**1% Return (cfs)**	**2% Return (cfs)**	**5% Return (cfs)**	**1% Return (cfs)**	**2% Return (cfs)**	***5% Return (cfs)***
MP-1	0.19	0.4	0.95	0	0	0
MP-2	0.1	0.12	0.3	<0.1	0.1	0.3
MP-3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MP-4	<0.1	<0.1	0.1	0.1	0.1	0.4

Table 6
Calculated Flow Enhancement Values Based on Water Rights Method

	Surface Water								Ground Water							
	Water Rights		1 Percent		2 Percent		5 Percent		Water Rights		1 Percent		2 Percent		5 Percent	
	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (gpm)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)
MP-1																
Irrigation	19	1909	0.19	19.1	0.38	38.2	1.0	95.5	0	0	0	0	0	0	0	0
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic/stock/other to instream lease	0	1	0	0.01	0	0.02	0	0.05	0	0	0	0	0	0	0	0
Total			0.19	19.1	0.38	38.2	0.95	95.5			0	0	0	0	0	0
MP-3																
Irrigation	1	285	0.01	2.9	0.02	5.7	0.05	14.3	160	153	0.0036	1.53	0.0071	3.06	0.018	7.7
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic/stock/other to instream lease	0	35	0	0.35	0	0.7	0	1.8	158	18	0.0035	0.18	0.0070	0.36	0.018	0.9
Total			0.01	3.2	0.02	6.4	0.05	16			0.007	1.7	0.01	3.4	0.04	8.6
MP-2																
Irrigation	6	759	0.06	7.6	0.12	15.2	0.3	38.0	1460	972	0.033	9.7	0.065	19.44	0.16	48.6
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	1385	293	0.031	2.9	0.062	5.9	0.15	14.7
Domestic/stock/other to instream lease	0	2	0	0.02	0	0.04	0	0.1	80	31	0.0018	0.31	0.0036	0.62	0.0089	1.6
Total			0.06	7.6	0.12	15.2	0.3	38.1			0.07	13.0	0.1	25.9	0.3	64.8
MP-4																
Irrigation	2	276	0.02	2.8	0.04	5.5	0.1	13.8	2954	1558	0.066	15.6	0.13	31.2	0.33	77.9
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	185	40	0.0041	0.4	0.0082	0.8	0.021	2
Domestic/stock/other to instream lease	0	187	0	1.9	0	3.7	0	9.4	20	2	0.00045	0.02	0.00089	0.04	0.0022	0.1
Total			0.02	4.6	0.04	9.3	0.1	23.2			0.070	16.0	0.1	32.0	0.4	80.0

6.0 Flow Enhancement for Asotin River

A study similar to the NRCS irrigation study was not available for the Asotin River watershed. Therefore only the water rights method used for the Tucannon River system was applied for MP-12, MP-13, and MP-14. There are even fewer water rights listed in the Ecology database upstream of these management points. Therefore the 1%, 2%, and 5% reductions in water use based on water rights yielded very small quantities available to return to the stream at each management point. In fact, as shown in Tables 7 and 8, conservation and leasing/purchase opportunities are very limited in the along the Asotin River, Charley Creek, and George Creeks. There may be additional water usage not accounted for in the water rights database reviewed during preparation of this memo. The Planning Unit may be able to provide additional information to refine this analysis. However, based on the current analysis, it appears that opportunities for flow enhancement on the Asotin River system is limited, if at all practicable.

Table 7
Summary of Potential Flow Enhancement Targets
Based on Water Rights Information – Asotin River

	Surface Water			Ground Water		
Management Point	**1% Return (cfs)**	**2% Return (cfs)**	**5% Return (cfs)**	**1% Return (cfs)**	**2% Return (cfs)**	***5% Return (cfs)***
MP-12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MP-13	<0.1	<0.1	<0.1	0	0	0
MP-14	<0.1	<0.1	<0.1	0	0	0

Table 8
Calculated Flow Enhancement Values Based on Water Rights Method - Asotin River System

	Surface Water								Ground Water							
	Water Rights		1 Percent		2 Percent		5 Percent		Water Rights		1 Percent		2 Percent		5 Percent	
	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (gpm)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)	Instant (cfs)	Annual (ac-ft)
MP-12																
Irrigation	0	59	0	0.6	0	1.2	0.0	3.0	485	361	0.011	3.61	0.022	7.2	0.054	18.1
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic/stock/other to instream lease	0	16	0	0.16	0	0.32	0	0.8	119	146	0.0027	1.46	0.0053	2.9	0.013	7.3
Total			0	0.75	0	1.5	0	3.8			0.013	5.1	0.027	10.1	0.067	25.4
MP-13																
Irrigation	0	0	0	0.0	0	0	0	0.0	0	0	0	0	0	0	0	0
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic/stock/other to instream lease	0	24	0	0.24	0	0.48	0	1.2	0	0	0	0	0	0	0	0
Total			0	0.24	0	0.48	0	1.2			0	0	0	0	0	0
MP-14																
Irrigation	0	0	0	0.0	0	0.0	0	0	0	0	0	0	0	0	0	0
Municipal and Commerical/Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic/stock/other to instream lease	0	22	0	0.2	0	0.4	0	1.1	0	0	0	0	0	0	0	0
Total			0	0.2	0	0.4	0	1.1			0	0	0	0	0	0

7.0 Preliminary Flow Enhancement Targets

Based on the information presented above, preliminary target flows are presented in Table 9. Target flows are presented only for MP-1 and MP-3. The values derived above for MP-2 and MP-4 are used to define the target flow for MP-1 since Pataha Creek discharges to the Tucannon River just above MP-1. The values presented in Table 9 are for discussion purposes only. The methods presented here may be applied to other management points where target flows may be established (e.g. MP-12, MP-13, and MP-14).

Table 9
Preliminary Flow Targets for Tucannon River and Asotin River

Management Point	Management Point Objective	Basis and Flow Enhancement Strategy
1 – Tucannon River below Smith Hollow	▪ **Total of ~ 1 cfs flow enhancement target** ▪ MP-4: ~0.25 cfs reaching MP-2 ▪ MP-2: ~0.25 cfs reaching MP-1 ▪ MP-3: ~0 cfs reaching MP-1 ▪ MP-1: ~0.5 cfs reaching MP-1	▪ Irrigation efficiencies along Tucannon River between MP-1 and MP-3, as well as efficiency improvements on Pataha Creek ▪ Voluntary short-term leases by existing water right holders to leave water in the stream during low flow periods; primarily above MP-4 and MP-1 ▪ City of Pomeroy relies on groundwater as its primary source; therefore, minor conservation savings would not benefit streams significantly from MP-4.
3 – Tucannon River at Marengo	▪ **Maintain flows**	▪ No significant irrigation occurs above MP-3 ▪ Majority of water rights are associated with non-consumptive fish propagation rights ▪ Potential for <0.5 cfs of rights for lease or relinquishment.
12 – Asotin River at mouth	▪ **Maintain flows** ▪ MP-13: ~0 cfs ▪ MP-14: ~0 cfs	▪ Potentially some opportunity for irrigation savings in lower Asotin ▪ Numerous stock water rights that may provide opportunities for return flows. ▪ Potential for <0.5 cfs of rights for lease or relinquishment.

It should be noted that the preliminary target flows presented in Table 9 do not include any off-stream or aquifer storage projects. These types of projects may provide more significant flow enhancement to increase the targets flows shown above. Additional input from the Planning Unit is needed to refine these target flows, especially with respect to the potential for water rights transfers/leases and source substitution. Finally, the assumption here is that a single flow target applies from the period June through October since that is when most of the irrigation savings would occur. Additional refinement may be needed to account for a more robust analysis of seasonal flow targets.

References

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Paramatrix. 2004a. Tucannon Subbasin Plan. Prepared for Asotin County Conservation District and submitted to Northwest Power and Conservation Council.

Paramatrix. 2004b. Asotin Subbasin Plan. Prepared for Asotin County Conservation District and submitted to Northwest Power and Conservation Council.

APPENDIX – WATER RIGHTS INFORMATION

Management Point 1					
Surface Water Use					
		Rate		Duty	Irrigated
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	IR	19	-	1909	716
	DS	0	-	1	-
	FS	0	-	1	-
	Totals	**19**	**0**	**1911**	**716**
Supplemental	IR	1		0	40
	Totals	**1**	**-**	**0**	**40**
Ground Water Use					
Supplemental	IR	-	100	52	13
	IR DS ST	-	1450	485	145
	Totals	**-**	**1550**	**537**	**158**

Management Point 2					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	IR	6	-	703	290.7
	FS	1	-	0	-
	IR ST	0	-	56	15
	DS ST	0	-	2	-
	Totals	**7**	**-**	**761**	**305.7**
Supplemental	IR	1	-	0	40
	Totals	**1**	**-**	**0**	**40**
Ground Water Use					
Primary	IR	-	625	389	101
	MU	-	1250	278	0
	DM	-	30	26	0
	CI	-	135	15	0
	IR DS	-	370	168	48
	IR ST	-	400	375	80
	IR DM	-	45	24	3
	DG RW	-	50	5	0
	IR DS ST	-	20	16	5
	Totals	**-**	**2925**	**1296**	**237**
Supplemental	MU	-	500	746	0
	IR DS ST	-	1450	485	145
	Totals	**-**	**1950**	**1231**	**145**

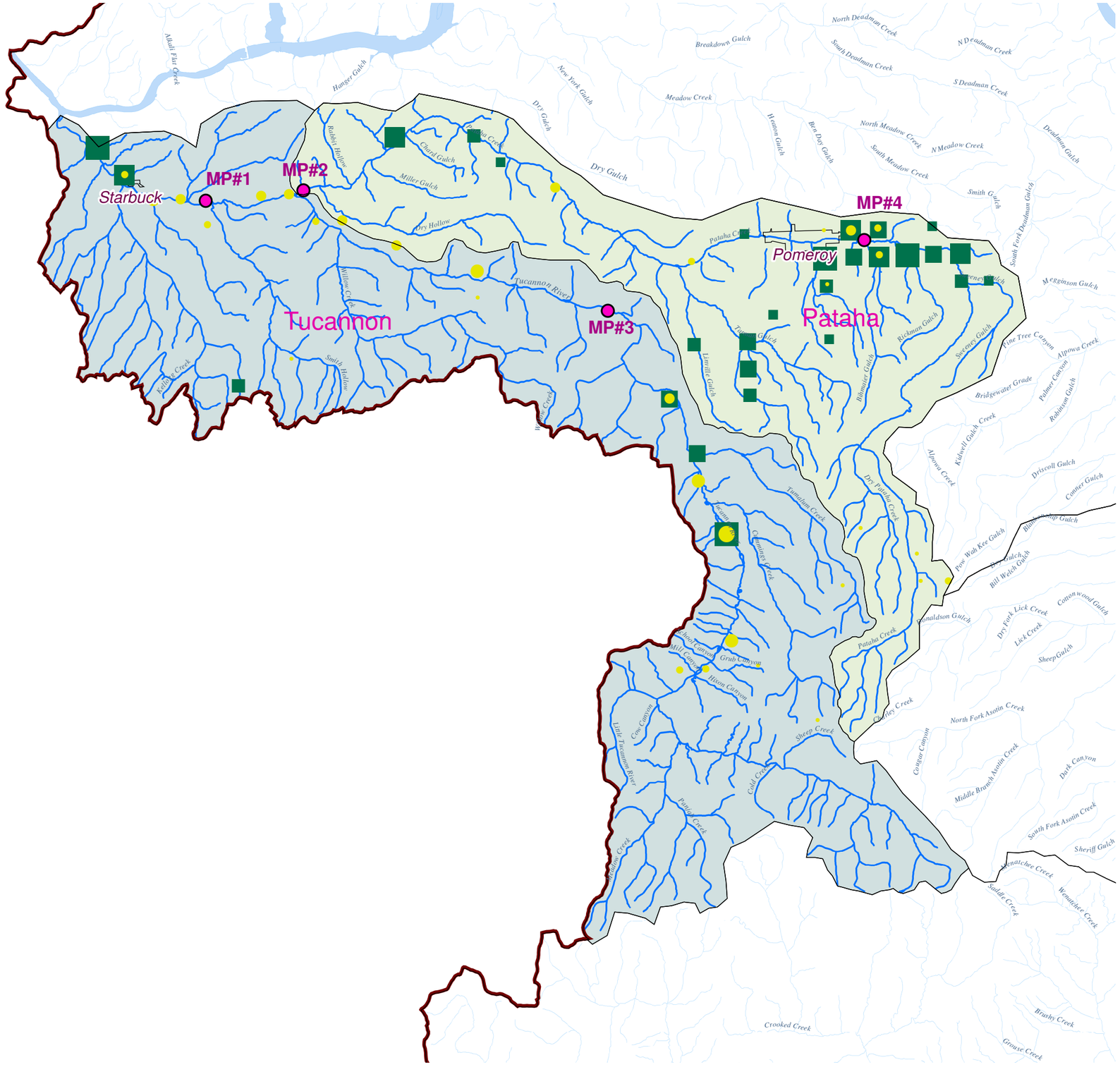
Management Point 3					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	IR	1	-	245	40
	ST	0	-	2	-
	DM	0	-	17	-
	FS	34	-	0	-
	IR DM	0	-	0	3
	IR FR	0	-	40	10
	ST WL	0	-	9	-
	DS ST WL	0	-	9	-
	Totals	**35**	**0**	**322**	**53**
Ground Water Use					
Primary	FS	-	900	1440	0
	IR DS	-	160	153	34
	CI DM	-	158	18	0
	Totals	**-**	**1218**	**1611**	**34**

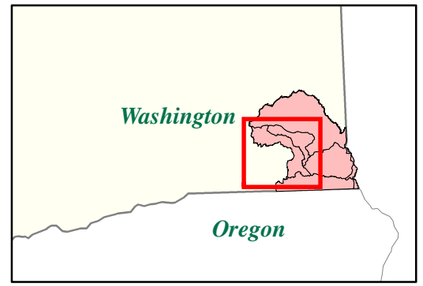
Management Point 4					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	IR	2	-	276	71
	DS	0	-	2	-
	ST	0	-	2	-
	DM	0	-	165	-
	ST WL	0	-	8	-
	DM ST WL	0	-	10	-
	Totals	**2**	**-**	**463**	**71**
Supplemental	DM	1		387	71
	Totals	**1**		**387**	
Ground Water Use					
Primary	IR	-	1609	860	301
	CI	-	185	40	0
	IR DM	-	110	71	14
	IR ST	-	65	13	2
	IR DS	-	915	452	137
	DS FR	-	20	2	0
	IR DS ST	-	255	162	52
	Totals	**-**	**3159**	**1600**	**506**

Management Point 12					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	IR	0	-	54	13
	ST	0	-	2	0
	DS	0	-	1	-
	ST WL	0	-	13	0
	FS RE	0	-	10	-
	IR DS ST	0	-	5	1
	Totals	**0**	**-**	**85**	**14**
Supplemental	IR	1	-	116	25
	Totals	**1**	**-**	**116**	**25**
Ground Water Use					
Primary	IR	-	200	222	60
	DS	-	31	5	0
	DM	-	13	21	0
	IR DS	-	50	15	5
	DG HW	-	75	120	0
	IR DS ST	-	10	5	1
	IR DM FS	-	225	119	25
	Totals	**-**	**604**	**507**	**91**
Supplemental	DM	-	25	21	0
	Totals	**-**	**25**	**21**	**0**

Management Point 13					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	ST WL	0	-	14	-
	DM ST WL	0	-	10	-
	Totals	**0**	**-**	**24**	**-**

Management Point 14					
Surface Water Use					
		Rate		**Duty**	**Irrigated**
Purpose	**Water Use**	**CFS**	**GPM**	**(ac-ft)**	**Acres**
Primary	ST WL	0	-	18	-
	DS ST WL	0	-	4	-
	Totals	**0**	**-**	**22**	**-**





Vicinity Map

Legend

- WRIA 35 Boundary
- Rivers and Streams
- Management Points

Implementation Areas

- Pataha
- Tucannon

Ground Water Rights

- 15.00 - 25.00
- 25.00 - 50.00
- 50.00 - 285.00
- 285.00 - 600.00
- 600.00 - 1500.00

Surface Water Rights

- 0.0044 - 0.0600
- 0.0600 - 0.4000
- 0.4000 - 2.6000
- 2.6000 - 11.1500
- 11.1500 - 22.5000

N

0 2.5 5 10 Miles

EXHIBIT A-1

WRIA 35
Tucanon and Pataha Implementation Areas
Water Rights

June 2005

HDR | ees

Clarkston

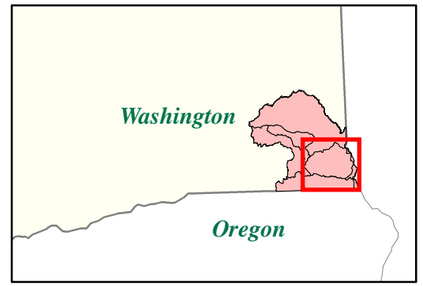
MP#12

Asotin

MP#14

MP#13

Asotin



Vicinity Map

Legend

- WRIA 35 Boundary
- Rivers and Streams
- Drainage Area
- Management Points

Ground Water Rights

- 5.00 - 20.00
- 20.00 - 50.00
- 50.00 - 130.00
- 130.00 - 225.00
- 225.00 - 1409.00

Surface Water Rights

- 0.0044 - 0.0300
- 0.0300 - 0.1000
- 0.1000 - 0.1400
- 0.1400 - 0.2000
- 0.2000 - 0.5000

N

0 2.5 5 Miles

EXHIBIT A-2

WRIA 35
Asotin Implementation Area
Water Rights

June 2005

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