Recent Water Use In The Methow River Valley: An Estimate

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EXECUTIVE SUMMARY

Recent Water Use in The Methow Valley: An Estimate , is a five part report that estimates the amount of single domestic and stock watering uses from ground and surface waters since 1977. The report addresses the topic areas as noted below:

Part I - The relationship between ground water and surface water, and the impact single domestic wells may have on basin surface waters.

Part II - Estimates of the number of single domestic wells drilled in the basin between RAW, December 29, 1976 and July 10, 1990.

Part III - Estimates of the total amount of water pumped by single domestic water users developed since 1977.

Part IV- The relationship of total high and low single domestic water use, and stock water use estimates to the 2 cubic feet per second (cfs) reservations.

Part V - Information on current water allocations under "Priority IV" of the Basin Management Plan for public water supply, irrigation, and other uses. General information on potential future water use on undeveloped parcels and platted lots is also presented.

The report briefly examines the geologic history of the basin and discusses its role in assessing the hydraulic continuity between ground and surface waters. Estimates of single domestic well construction, single domestic water use, and water used for stock watering purposes provide ranges of water use that are compared against the 2 cfs limit for each of the seven management reaches identified in the Methow River Basin Management Program. The report uses a high single domestic use estimate of 5,000 gallons per day (gpd), and low single domestic use estimate of 450 gpd. Actual use should fall somewhere between the two estimates. Total high water use estimates show the 2 cfs limit has been exceeded for one reach, and is being approached for two other reaches. Low water use estimates show that all reaches are below the 2 cfs limitation. This range in findings clearly suggests that more refined estimates of domestic and stock water use volumes and patterns are needed to continue basin water management planning processes.

INTRODUCTION

This report attempts, for the first time, to estimate ground and surface water uses within the Methow River basin developed since the adoption of the Methow River Basin Management Program. The program was adopted on December 28, 1976 to protect senior water rights, establish priorities for future water allocation, set levels for instream flows in the basin, and to set forth management policies and procedures. Allocation of water in the Methow River basin under this program is based on the following priorities for beneficial water use:

Priority I Senior water rights (rights established before 1977);

Priority II Single domestic supply and livestock water;

Priority III Instrearn flows (e.g. water for fisheries, recreation, etc.); and

Priority IV Public water supply, irrigation, and other uses.

Under this scheme, the allocation of water for single domestic and stock watering uses for each of seven stream management units (river reaches) is limited to two cubic feet per second (cfs) of streamflow. The seven river reaches are: 1) Lower Methow River, 2) Middle Methow River, 3) Twisp River, 4) Upper Methow River, 5) Chewack River, 6) Methow River Headwaters, and 7) Early Winters Creek (Figure 1). Within the 2 cfs per reach limit, single domestic and stock water rights are not subject to regulation to protect instream. flow levels. Other subsequent water rights, including single domestic and stock water uses developed in excess of the 2 cfs per reach limit, are subject to regulation.

The program also requires that ground water "which measurably affects" the river or its tributaries be subject to the same conditions and limitations as surface water. This means that the portion of ground water withdrawn for single domestic supplies and stock watering at the expense of streamflow is considered part of the 2 cfs streamflow reservation.

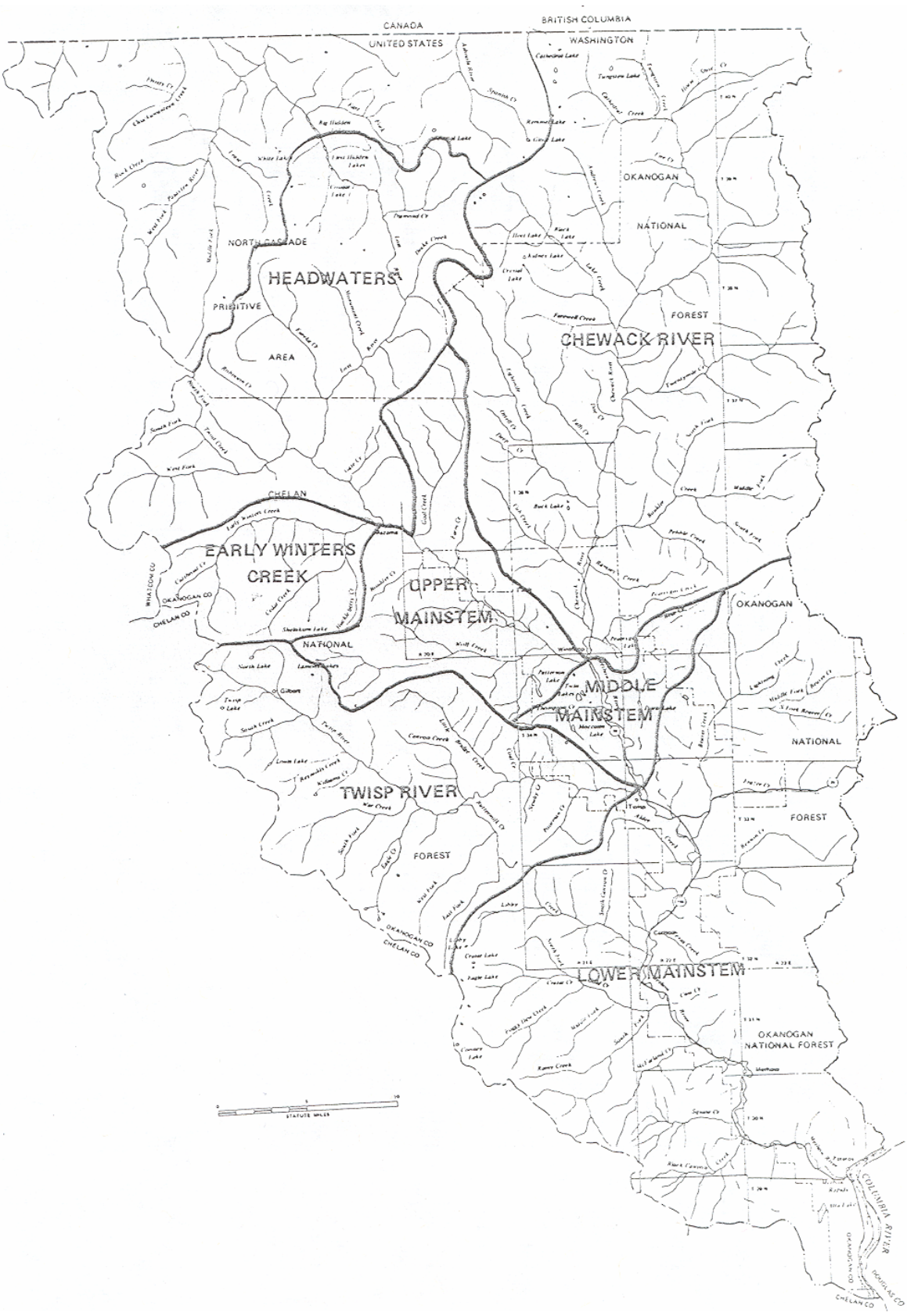

Figure 1. METHOW RIVER BASIN SHOWING STREAM MANAGEMENT UNITS.

This report is presented in five parts:

Part I discusses the relationship between ground water and surface water in the basin. This is important because the allocation of water under the Basin Program is based on surface water flows. The program requires that ground water which measurably affects surface water be subject to the same conditions as the affected surface water. This part discusses the impact single domestic water use from wells may have on the surface waters of the Methow River basin.

Part II estimates the number of single domestic wells drilled and used in the Methow Basin between December 28, 1976 and July 10, 1990. The number of wells was estimated because no comprehensive mechanism for tracking single domestic wells has been developed. This study was developed to estimate only the number of wells and not to document the date of first use, the actual nature of the use, or the actual amount of water used.

Part III estimates the total amount of water pumped by single domestic water users. This estimate is presented as a range of water use between 450 and 5,000 gallons per day (gpd) per household for both in-house and outdoor use. Since actual single domestic water use in the basin has not been measured, previous estimates have been disputed. More precise estimates cannot be made at this time, therefore Ecology has elected to use a range. The lower end of 450 gpd represents typical in-house water consumption with limited outdoor water use. The ground water code specifically exempts "smaller" water uses, those using 5,000 gpd or less for domestic supply or irrigation of one-half acre or less of lawn or non-commercial garden, from the water right permitting process. Thus the legal limit for using ground water without a water right permit is 5,000 gpd. A single rate of consumption, based on the limited data available, could misrepresent actual water use, which probably falls somewhere within the range discussed. (NOTE: Group domestic supplies using up to 5,000 gpd are also exempt from the permit requirement but, under the Basin Program, these uses are subject to regulation to protect instream flows. Also, single domestic uses remain subject to regulatory action in favor of senior rights.)

Part IV combines the range of single domestic water consumption with stock water use to produce an estimate of the total use against the 2 cfs reservation. Livestock watering is primarily surface water use from remote springs. The effect of that use was estimated using Ecology's water right records. Water right permits for stock water issued since 1976 were included whether or not the source was identified as being in direct hydraulic continuity with surface water at the time the permit was issued.

Part V provides information on current water allocations under Priority IV of the Basin Program for public water supply, irrigation, and other uses. All water right permits issued since 1977 in this category are included whether or not they were issued subject to minimum flow protection. This part also provides general information on potential future water use based on numbers of undeveloped parcels and platted lots.

This report is intended to provide background information to Okanogan County, the Yakima Indian Nation, the Colville Confederated Tribes, and other interested parties such as the Methow Basin regional water resources planning group. In the fifteen years that have lapsed since the Methow River Basin Plan was adopted, the Methow Valley has undergone extensive growth and development, especially in single homes. This development raises questions about water availability and existing and potential impacts of that growth on streamflows. Questions have been raised by the county, tribes, local interest groups, and residents on how much of the 2 cfs reservation has been used and how much water remains available. The issue of whether the allocation should remain exclusively for single domestic and stock water use or should be

changed to include public water supply has also been raised. The report is not designed to answer these questions, but it does provide information on the ranges of water use in the valley. Ecology believes the actual water use is within the range expressed in this report. More detailed estimates of actual water consumption should be made as part of the regional planning effort.

This report is not intended to be a document upon which regulatory actions, water right permit decisions, or water availability determinations will be made.

PART I

The connection between ground water and surface water is referred to as hydraulic continuity. Nearly all ground water is hydraulically connected to surface waters at some point in the hydrologic system. This is the case in the Methow River basin.

Geology

The complex geologic history of the Methow basin has influenced the valley's shape. Hard, durable metamorphic rocks in the southern end of the Methow valley confine the Methow River within a deep, narrow gorge. Sedimentary and igneous volcanic rocks in the broad upper valley offer less resistance to the erosional power of the river.

The advance of the Cordilleran Ice Sheet out of British Columbia during the Late Wisconsin glaciation was the most recent event to modify the Methow basin. A south-flowing ice sheet moved up the Pasayten River, over the drainage divide, and down the Methow Valley, removing the deposits from earlier valley glaciers. The mountains separating the Methow from the Okanogan drainage were overtopped all the way to the Columbia River. All but the highest of the basin's northern peaks were covered by the ice, which reached altitudes of over 8,000 feet.

At the end of the latest glacial episode, between 11,000 and 14,000 years ago, the ice sheet melted, depositing immense quantities of glacially eroded and transported sediments. Virtually all of the unconsolidated sediments are the product of glacial deposition, though some reworking of these materials by stream processes has occurred since their original placement.

The glacial-fluvial sediments serve as the basin's principal aquifer. Deposits in the upper portion of the Methow River valley are a mix of boulders, clean sandy gravels, and gravelly sands. Fine grained sediments, including silt and clay, become more abundant to the southeast, near the valley's mouth at Pateros. The glacial-fluvial deposits covering the bedrock range in thickness between a few feet and as much as 1,000 feet.

Ground Water Occurrence

Ground water is recharged by direct infiltration of precipitation or the downward percolation from streams and rivers. In the Methow River valley, where precipitation averages less than 20 inches, most of the ground water recharge occurs as seepage from the Methow River and its tributaries. Recharge is greatest during the spring and early summer when runoff from the melting snowpack is high. The snow that falls on the Methow Valley floor contributes only a small amount of ground water recharge. The water that seeps or runs off the surrounding mountains is much more important.

The ground water, in turn, discharges to down-gradient reaches of the Methow River. The places where an aquifer discharges to surface water or is recharged by surface water are points of hydraulic continuity. Hydraulic continuity between ground and surface water results in a single, continuous system, instead of two or more discrete water regimes.

Pumping from a well in hydraulic continuity with a stream reduces streamflow. The reduction in streamflow is either direct or indirect. Pumping which induces water flowing in the stream to

infiltrate the streambed and flow toward the well is an example of direct continuity. This increases aquifer recharge at the expense of streamflow.

Not all pumped ground water need come directly from the stream for the streamflow to be affected. Pumping may intercept ground water flowing toward a stream, an example of indirect continuity. This is water that would otherwise flow to a stream, either adjacent to the well site or at a location farther downstream.

The effect of surface water diversions on streamflow can be easily determined by comparing the rate of the diversion with the rate of streamflow. Withdrawal of ground water which is in continuity with the same stream will also affect the streamflow, although the effect may be delayed and possibly buffered. The complex nature of ground water flow makes it more difficult to determine, at any given moment, the exact effect of ground water withdrawals on a stream. Under the most obvious circumstances, such as with a well immediately adjacent to a stream, withdrawing ground water would be, in effect, the same as diverting directly from the stream.

Pumping and Hydraulic Continuity

Continuity is usually a matter of degree. The location of a well with respect to surface water, the hydrogeologic properties of the aquifer, and the times the well is pumped all are factors which must be considered. Continuity may vary from 0 to 100 percent. Even a low level of continuity is important since the law does not allow any infringement on senior water rights.

The Methow River has two periods of low streamflow. The lowest flows usually occur in late summer, around September. Some of the heaviest ground water withdrawals in the Methow River basin occur during this period when surface water supplies are lowest. A second low flow period occurs in mid- winter, usually February. During extreme low flow conditions, all surface water is appropriated for various uses, including minimum instrearn flow. Flows may remain critically low for thirty days or more.

Summary

The physical evidence available in the Methow basin indicates that local ground water bodies are hydraulically connected with the Methow River and its tributaries. The degree of connection varies from reach to reach, but is relatively high throughout the valley. In the upper valley, the river is primarily recharging the ground water. A transition occurs in the central valley where ground water generally supports streamflow. This ground water discharge probably continues into the lower valley, although many areas also exist where the river leaks to the aquifer. In the very lowest part of the valley, ground water may directly discharge to the Columbia River rather than the Methow River.

Ground water often surfaces as streamflow and in turn, is returned to the aquifer many times as water moves down the valley. Pumping of ground water from the system either directly or indirectly affects the surface water at some point in the Valley. Very little ground water in the basin discharges to the Columbia River without first having surfaced to the river at some point in its down-valley migration. Because ground water in one river reach often discharges to a lower river reach, pumping from the aquifer may have a greater effect in a downstream reach than it does in the reach in which the well is located.

PART II

Assessing the effect of recent water withdrawals on streamflow, and therefore on the 2 cfs per reach reservation for single domestic and stock water, requires quantification of both surface and ground water uses developed since 1976. Once the net effect of combined surface and ground water withdrawals for those purposes has reached the 2 cfs level, the allocation for that reach will be used up. Any uses beyond that point will be subject to instream flow protection and regulation, and must be treated as Priority IV uses.

This part combines information from several sources to estimate the number of single domestic wells put into use between December 28, 1976, the date of adoption of the Methow River Basin Program, and July 10, 1990. Ecology personnel conducted both office and field investigations to identify wells which were in hydraulic continuity with the Methow River and its tributaries.

Methods

Data for this study were obtained from five primary sources:

1. Well reports on file with the Department of Ecology, which list the date of well construction, location, completed depth, and owner's name,
2. Ecology's Water Rights Information System (WRIS), which provided information on water right applications, permits, and certificates, including owner, location, whether surface or ground water, purpose of use, and quantity,
3. Okanogan County building permits, which provided information on the construction of single family homes and recreational cabins,
4. Tax rolls of the Okanogan County Assessor, which provided information on platted lands and the location of developed and undeveloped parcels (the Okanogan County Department of Public Works provided maps of platted lands which aided in locating building and well sites), and
5. Okanogan County Health Department records of community water systems, which permitted distinction between buildings served by community water supplies and those served by individual wells (community water systems were assumed to provide water to all buildings within their service area unless information indicated otherwise).

Of the above records, only the well reports provide information as to hydraulic continuity. To assist in the determination of hydraulic continuity, wells were located on topographic maps. If the well report indicated the well was completed in glacial sediments or the location of the well was in terrain typically associated with glacial deposits, then hydraulic continuity was assumed.

The collected information was organized by the river reach of the Methow River basin in which it was located. A domestic well established after December 28, 1976 was counted if.- 1) a well report was found for a domestic well and/or a building permit was found for a single family residence, mobile home, or recreational cabin; 2) the well log or building permit was not located within a community water service area (a public water supply), and 3) the well was identified to be in hydraulic continuity with surface water in the reach.

Results

Between 1977 and 1990, Ecology received water well reports for 352 wells drilled in the Methow River basin while at the same time processing 73 applications for ground and surface water rights which included single domestic supplies. These records were compared with the approximately 800 building permits issued by Okanogan County for construction of new single family houses or cabins in the basin and duplicate records were eliminated. Wells which provided multiple domestic water supplies for buildings such as duplexes and condominiums were also eliminated. The preliminary total of 942 exempt single domestic wells developed between December 28, 1976, and July 10, 1990 indicates that wells were often drilled prior to building permits being issued. Of the 942 wells, 882 were identified as being in hydraulic continuity with surface water. **(NOTE: Included in this total are nine water right permits for single domestic surface water supplies developed during the same period. They were included here because they represented such a small percentage of total single domestic uses.)**

RIVER REACH	Recorded Wells	Wells in Community	% Under estimation	Total Wells
Lower Methow	359	329	36	447
Middle Methow	183	173	33	230
Twisp	96	93	18	110
Upper Methow	99	02	4	96
Chewack	162	152	41	214
Headwaters	43	43	15	50
Early Winters	0	0	--	0

Table 1. Estimated total of single domestic wells developed in the Methow River Basin between January 1977 and July 1990, by river reach.

Since the well count was based on a records search, Ecology conducted field verification in representative segments of the reaches. All reaches except Early Winters Creek were investigated. Only areas where the wells were considered to be in hydraulic continuity with surface water were examined. Investigation consisted of locating and identifying buildings and wells on Ecology's inventory. Unlisted buildings and wells constructed since 1977 were added to the inventory.

Field verification revealed that more wells exist than were discovered in the records search. For each reach, the number of wells identified in records was compared with the number of wells observed in the field. The percentage of underestimation was then calculated for each reach. Based on this calculation, Ecology estimates that 1147 single domestic wells were placed in use within the Methow basin during the study period (Table 1).

PART III

No accurate records of the amount of single domestic water use within the Methow River basin exist. To assess the effect of single domestic withdrawals upon the 2 cfs per reach reservations, it is necessary to estimate the extent of such uses. Although actual water use varies depending upon availability and the type of development, some general estimates can be made. The estimates are intended only to provide an indication as to the possible extent of single domestic development. More definitive information should result from the basin planning process.

All surface water uses require water right permits, so quantifying the amount of water legally permitted for diversion per river reach can be easily done. Quantifying ground water uses is more difficult. State law exempts ground water withdrawals of 5,000 gallons per day or less for single domestic use or the irrigation of lawn and non-commercial garden not exceeding one-half acre in area from the water right permitting process. Because of this exemption, Ecology has few records of the number of domestic wells in the Methow basin or the amount of water used from these wells.

Single Domestic Water Use

Studies of metered water use in the western United States indicate in-house single domestic water use, including some irrigation, averages 450 gpd. Ecology issues water right permits for domestic use, also including some limited irrigation, in the same amount. Outdoor water use, especially irrigation, increases the amount of water used. Conservation in both household and irrigation practices can significantly reduce the amount of water used, but the 450 gpd amount appears to reasonably represent average in- house single domestic use, with very limited outdoor use.

The exemption for single domestic supplies has resulted in Ecology's records being incomplete concerning the number of domestic wells in the Methow basin and the amount of water used from those wells. Most single domestic water uses in the Methow River basin were developed under the ground water exemption. Since use of ground water above 5000 gpd without a water right permit is not allowed, that amount can be considered to constitute the upper limit of unpermitted single domestic use. **(NOTE: A right developed under the exemption is not automatic-ally established at 5,000 gpd. A single domestic user has a right to only the amount of water historically put to beneficial use.)**

Number and Types of Single Domestic Water Use in the Methow Valley

No comprehensive information exists about the number of single domestic uses in the basin. Furthermore, the information which is available does not indicate which uses include lawn and garden irrigation. Okanogan County does maintain records of building permits by type of dwelling. The three categories of single domestic development are: 1) single family residences, 2) mobile homes, and 3) recreational cabins (Table 2). However, these permits make no reference to any potential irrigation. Ecology staff concluded, based upon field investigations conducted in 1990, that only dwellings in the recreational cabin category could be considered to be using water solely for in-house purposes.

RIVER REACH	Single Family Residence	Mobile Home	Recreational Cabin	Total	Percentage Recreational Cabin
Lower Methow	137	149	15	301	5.0
Middle Methow	85	81	12	178	6.7
Twisp	137	12	10	65	15.4
Upper Methow	86	5	10	101	9.8
Chewack	67	19	19	88	9.1
Headwaters	35	4	17	56	35.7
Early Winters	0	0	0	0	0.0

Table 2. Building permits issued in the Methow River Basin between December, 1976 and July, 1990, by river reach and category.

Estimating Total Single Domestic Water Use

The problem then becomes estimating the total amount of water used, per reach, for single domestic purposes. Given the paucity of information available, Ecology concluded that the most reasonable approach was to produce low and high estimates using the 450 and 5000 gpd per day limits. Actual use should fall somewhere between the two estimates.

To produce the lower estimate, all single domestic water uses were calculated using the low value of 450 gpd per household as a reasonable average use. Multiplying 450 gpd by the estimated number of single domestic uses (wells) per reach produced an estimate as to the minimum amount of water, in gpd, put to use within each reach.

To produce the upper estimate, the maximum legal limit of 5000 gpd per household was used for both single family residences and mobile homes. Recreational cabin use was again calculated at 450 gpd. To produce the estimates contained in Table 3, the percentages of recreational cabin development from column 6 of Table 2 were multiplied by the total number of single domestic uses (wells) identified in Table 1. Similarly, the percentages of single family homes and mobile homes were multiplied by the total number of single domestic uses (wells) per reach. The sum of the two products represents a likely maximum value for single domestic use per reach.

The results were then used to estimate the effect single domestic use could have on each river reach. Although domestic wells are usually pumped intermittently, an average value over an entire 24-hour period was used. For purposes of determining the potential effect of the total withdrawals upon streamflow for each reach, the amount of water withdrawn in gallons per day is converted to cubic feet per second. A pumping volume of 450 gpd is equivalent to 0.0007 cfs. Similarly, withdrawing the full 5,000 gpd allowed under the ground water exemption at a constant rate over a 24 hour period would equal 0.0077 cfs. The estimates in both gpd and cfs are presented in Table 3.

River Reach	Single Domestic Uses	Low Estimated Water Use[1]		High Estimated Water Use[2]	
		gpd	cfs	gpd	cfs
Lower Methow	447	201,150	0.31	2,133,650	3.30
Middle Methow	230	103,350	0.16	1,072,500	1.66
Twisp	110	49,500	0.08	473,000	0.73
Upper Methow	96	43,200	0.07	436,750	0.68
Chewack	214	96,300	0.15	859,750	1.33
Headwaters	50	22,500	0.03	180,950	0.28
Early Winters	0	0	0.00	0	0.00

1 Based on average water use of 450 gpd for all single domestic uses.
2 Based on average water use of 450 gpd for recreational cabin uses and 5000 gpd for all other single domestic uses

Table 3. Estimated total single domestic use in the Methow River Basin, by river reach.

The lack of better data prevents accurate refinement of the Table 3 estimates. However, the estimates should provide a starting point for more accurate quantification of the single domestic water use developed between December, 1976, and July, 1990. The water resource planning process should provide a means for more accurate determination of the potential impact current development may have on the 2 cfs per reach reservation. The process should also provide indicators of where to concentrate planning and data collection efforts.

Some amount of the in-house portion of domestic water use probably returns to the aquifer via on-site sewage systems. "Me water quantity and quality, timing and location of this return water, however, is currently unknown. The estimate of domestic water use presented in this report does not consider a contribution from this source for return flow. This approach is taken for the following reasons:

- Any water that cannot be re-captured on-site and which leaves the property, is legally available to the next senior user, and cannot be credited to the original user; and,

- Where high contributions from on-site systems are assumed, water quality concerns should also be considered in combination with water quantity issues.

PART IV

The amount of water, by river reach, potentially withdrawn for stock water purposes is summarized in Table 4. Most of the stock water permits in the Methow basin are surface water permits for remote springs located on U.S. Forest Service property. These springs feed stock tanks which are allowed to overflow. The only water lost from the system is that consumed by livestock and by evaporation. These springs are in low continuity because they generally recharge the ground water rather than flowing directly to streams so any impacts are delayed and buffered. For this reason, the impact is estimated by

River Reach	High Continuity [1.3]	Low Continuity [2.3]	Total [3]
Lower Methow	0.32	0.08	0.31
Middle Methow	0.00	0.00	0.00
Twisp	0.02	0.02	0.04
Upper Methow	0.00	0.03	0.03
Chewack	0.03	0.14	0.17
Headwaters	0.00	0.00	0.00
Early Winters	0.00	0.00	0.00

I Sources used were considered to contribute significantly to surface water flow.
3 Sources used were not considered to contribute significantly to surface water flow. 3 In cubic feet per second (cfs).

Table 4. Quantities of stock water from sources in high and low hydraulic continuity, and combined totals used, per river reach.

averaging the annual amount permitted over the entire period of use (10 to 12 months per year). Where the stock water use is directly from a perennial stream, the permitted rate of diversion was used. The average rate for ground water permits issued for stock watering totaled less than 0.001 cfs for all seven reaches. Combining stock water use with the range of single domestic water consumption produces an estimate of the total use against the 2 cfs reservation for each river reach (Table 5).

River Reach	High Range*			Low Range*		
	Domestic	Stock	Total	Domestic	Stock	Total
Lower Methow						
Middle Methow						
Twisp						
Upper Methow						
Chewack						
Headwaters						
Early Winters						

*In cubic fed per second (cfs).

Table 5. Combined totals of the two ranges of estimated single domestic water use and stock water use, per river reach.

PART V

Table 6 is a summary of the amounts of additional water uses that have been developed since 1977 under Priority IV of the Methow River Basin Management Program. These uses include irrigation, multiple domestic supply, fish propagation, recreation, dust control, mining, and industry. Water rights may or may not be required for these various uses, depending upon the type of source and the amount of water used. Historically, permits were not made subject to instream flow protection if hydraulic continuity with regulated surface waters was determined to be low.

River Reach	Surface Water Permits				Ground Water Permits			
	High Continuity[1]		Low Continuity[2]		High Continuity[1]		Low Continuity[2]	
	Number	Amount[3]	Number	Amount[3]	Number	Amount[3]	Number	Amount[3]
Lower Methow	11	5.26	6	0.68	18	7.77	8	2.13
Middle Methow	2	0.24	1	0.02	0	0.00	5	2.03
Twisp	13	7.77	4	2.02	0	0.00	5	0.30
Upper Methow	2	19.10	2	2.00	6	10.79	7	3.55
Chewack	14	14.16	6	0.05	0	0.00	6	3.03
Headwaters	2	0.30	1	0.02	4	2.50	3	0.92
Early Winters	0	0.00	3	0.04	0	0.00	0	0.00

1 Sources used were considered to contribute significantly to surface water flow.
2 Sources used were not considered to contribute significantly to surface water flow.
3 In cubic feet per second (cfs).

Table 6. Surface and Ground Water Permits issued after January 1, 1977 for Priority IV water uses. An interruptible permit is one that is subject to regulation to protect minimum instream flow levels.

To estimate the potential for development which does not require water right permits, the number of undeveloped platted lots and parcels was derived from the Okanogan County Assessor's current tax rolls. The data include a listing of all developed and undeveloped parcels in the basin, including both platted and unplatted property. Platted lands probably have a higher potential for development than do unplatted parcels. For this reason, data are also presented regarding the developed and undeveloped condition of platted parcels.

The Okanogan County tax rolls list 5,737 undeveloped parcels in the basin. These parcels may be developed for many purposes in addition to single family housing. A total of 2,151 parcels have been platted. Likewise, development on platted lots may not be solely for single homes. Table 7 shows the number of platted lots, both developed and undeveloped, and undeveloped parcels in the Methow River basin.

River Reach	Platted Lots		Parcels
	Developed	Undeveloped	Undeveloped
Lower Methow	102	263	2,024
Middle Methow	151	612	1,220
Twisp	16	64	426
Upper Methow	39	233	898
Chewack	77	212	555
Headwaters	65	317	605
Early Winters	0	0	9

Table 7. Summary of platted lots, developed and undeveloped, and undeveloped parcels within the Methow River basin, by River reach. Platted lots are a type of parcel and, therefore, represent a portion of the parcels listed. Based on Okanogan County tax rolls.

CONCLUSIONS

High water use estimates for the seven management reaches in the Methow Valley show that a few key reaches may be approaching or surpassing the 2 cfs reservation limit for single domestic and stock watering uses. For example, using the high single domestic rate of 5,000 gpd (the legal limit), water use in the Lower Methow reach would exceed the 2 cfs limit, while the Middle Methow is shown to be approaching the limit. When the low single domestic rate of 450 gpd is used, total domestic use is estimated to be well below the 2 cfs limit for all of the seven reaches.

When stock water uses are combined with the high single domestic use rate (5,000 gpd), the Chewack reach water use estimations also approach the 2 cfs limit. Total water use estimates that combine stock water use with low single domestic water use rates (450 gpd), show that all use is estimated to remain well below the 2 cfs limit for all reaches.

These water use estimates are intended to provide background information to assist Ecology, Okanogan County, the Yakima Indian Nation, the Colville Confederated Tribes, and other interested parties in better understanding the effects of the development which has taken place in the Methow Valley in the fifteen years following the adoption of the Methow River Basin Water Management Program. The extent of that development has generated considerable concern about water availability and diminished streamflows. This concern will undoubtedly increase given the proposals for additional development in the valley.

To refine the estimates further, more complete information regarding actual water use patterns is required. Methods such as measuring and documenting all current domestic water uses on a case-by-case basis or measuring water use for a representative cross section of the population can provide more accurate data. Hopefully, the information contained in this report will provide a starting point for additional efforts, such as the basin planning process, to develop the information which will permit equitable and effective management of the water resources within the basin.