# 2.3 WATER QUANTITY

## 2.3.1 Water Budget

Section 2.1.5 (Hydrology and Geohydrology) presents water budgets for East and West WRIA 18.

## 2.3.2 Water Rights

Ecology (2000) documented the status of ground water and surface water applications, permits, certificates and claims[1] in support of watershed planning for WRIA 18 as a whole. Further analysis was conducted for the watershed plan in 2002, using GIS to allocate water rights to subbasins. For both analyses, information about groundwater and surface water certificates, permits, applications, and claims for both analyses was drawn from Ecology's Water Rights Applications Tracking System (WRATS) database. The Ecology 2000 analysis also used the Water Rights Information System (WRIS) database. Analyses conducted for this report entailed two WRATS polls, conducted in 2000 and again in 2002, with important differences in the results obtained from each poll. Analysis of water rights revealed further inconsistencies in information obtained from the WRATS, and the numbers should be used with caution. The Ecology 2000 analysis is reproduced as Appendix 2-B, and the 2002 analysis done with Clallam County GIS is presented in Appendix 2-C.

Ecology (2000) analyzed water rights for WRIA 18 as a whole, sorting instantaneous (Qi) and annual (Qa) quantities under certificate, permit, application, or claim, differentiating by purpose of use, and totaling them for both groundwater and surface water. Instantaneous and annual quantities (net of supplemental rights[2]) were also sorted by percentage of purpose of use for both groundwater and surface water.[3,4] Multiple purposes of use are often associated with a single water right, and for those records the listed quantity was

[1]Certificates are perfected water rights. (Water rights are perfected when they have been demonstrated to have been put to beneficial use. The amount of water put to beneficial use under a permit is said to be "perfected.") Permits are water rights which have received approval for development of water use, but for which documentation of beneficial use remains to be completed. Once it is shown that water has been put to beneficial use under a permit, a final certificate of water right is issued. With certain exceptions, a water right must be used in order to remain valid. Not all certificated water rights are used, or fully used, resulting in a distinction between "wet" water rights (which continue to confer the legal right to withdraw or divert water), and "paper" rights which actually have been lost, or relinquished, for non-use. This discussion takes account of the full amount of water right certificates and permits that are recorded in the Department of Ecology database, but it is important to bear in mind that not all of these remain valid. Unfortunately, it is not possible to discern the validity of a water right from the fact that it is listed in the Ecology database.

[2]"Supplemental" rights are issued as an administrative tool to provide flexibility within a given project or water system, and are not additive. Water rights issued for "supplemental use" were aggregated by purpose and subtracted from the gross total. Similar limitations exist for water rights with quantities issued for "seasonal" or "emergency" use.

[3]Ecology uses the terms "net" and "gross" in this analysis to differentiate between total water rights and total amount of water that may be withdrawn or diverted. The total, or "gross" number includes water rights that are "supplemental" – that is, may be used in place of another "primary" water right. However, because the supplemental and primary right may not both be used at one time, they are not additive. The "net" number reflects the actual maximum amount of water that may be withdrawn or diverted.

[4]Applications include a requested instantaneous and annual quantity, which was taken at face value for quantity estimations. There were two exceptions; both were surface water applications for domestic municipal use, where the annual quantity was estimated based upon the listed instantaneous withdrawal rate.

divided among and estimated for each purpose (see Appendix 2-B Table 5 for assumptions used by Ecology to allocate quantities to each purpose). Records with missing data, which list a single purpose of use but lack an instantaneous or annual quantity, were similarly estimated by Ecology (2000).

Subbasin analysis conducted in 2002 used township, section, and range descriptors to locate each water right or claim within the GIS. The centroid of the section associated with each record was used to assign each record to a subbasin (however, if the database source information conflicted with this assignment, the record was allocated to the subbasin named as source). Nonconsumptive water rights were not considered in this analysis. Most multi-purpose water rights were already disaggregated in the WRATS database in 2002; where they were not, quantities were estimated for each water right purpose.

Tables 2.3-1 through 2.3-3 summarize quantities for water certificates and permits, applications, and claims[5] by subbasin for WRIA 18. The tables are based on Ecology's 2002 WRATS poll, disaggregated into subbasins using GIS. Table 2.3-1 sums all water rights in WRIA 18; Tables 2.3-2 and 2.3-3 show totals for surface and groundwater rights by subbasin, respectively. Water right totals are further disaggregated by purpose of use in Appendix 2-B. Purposes are grouped in the appendix into municipal and domestic purposes, commercial and industrial purposes, agricultural purposes (including irrigation, stock water and frost protection), and other purposes (including environmental purposes such as fish propagation). Appendix 2-B presents Ecology's 2000 WRATS/WRIS poll results, showing estimated quantities of WRIA 18 water rights for groundwater certificates and permits, groundwater applications, surface water certificates and permits, surface water applications, and combined surface and groundwater claims (Appendix 2-B Tables 1-6). The totals differ markedly between the 2002 and 2000 database polls, for reasons unknown (possible reasons may include differences in the way supplemental and non-consumptive water rights were handled, or in the exclusion of water rights that have been cancelled, relinquished, or withdrawn).

Ecology (2000) identified a total of 2,004 claims (1712 groundwater and 292 surface water) on file for WRIA 18. Instantaneous withdrawal and annual quantities of water claims[6] were estimated according to the use of the water, based on the instantaneous and annual withdrawal standards specified in Ecology standard operating policies and procedures. For claims records associated with multiple purposes of use, the listed uses were evaluated individually. Records without a listed purpose were not estimated, but

[5] Water claims are statements of water use that predate the water code that regulates appropriation of surface or ground water. Claims are filed with Ecology during periods when the claims registry has been open (the claims registry must be opened by the state legislature and has been opened only three times). Amounts stated in claims are subject to general adjudication proceedings, but otherwise are not checked or enforced.

[6] Water claims can be wild cards for watershed planning. Because claims are merely registered and neither checked nor enforced against, the actual historical or present use cannot be known with certainty short of adjudication. Claims are easy to file during the periods when the registry is open. They may represent long-established, accurately reported water use, or they may be spurious or unused, or they may provide claim of right to cover illegal appropriations of water. The claims recorded for WRIA 18 amount to much less than in some watersheds, where claims can run several times the actual water available. As counted in acre-feet per year, annual quantity estimations for groundwater and surface water were nearly identical.

## Table 2.3-1. WRIA 18 Total Water Rights by Subbasin.

| Subbasin | Certificates & Permits | | | | | Claims | | | | | Applications | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated |
| Bagley Creek | 1.71 | 18 | 56.5 | | 102 | 0 | 0 | 0 | | 516 | 0.04 | 0 | 0 | | 2 |
| Bear Creek | 0.21 | 265 | 156.6 | | 14014.3 | 0 | 0 | 0 | | 135 | 0 | 460 | 160 | 218 | 0 |
| Bell Creek | 1.96 | 1308 | 811.74 | 128 | 335.5 | 0.6 | 0 | 100 | | 762 | 0.08 | 80 | 0 | 56 | 10 |
| Canyon Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Cassalery Creek | 7.79 | 856 | 1217.87 | | 685.5 | 0 | 0 | 0 | | 28 | 0.93 | 85 | 0 | 2 | 17 |
| Chicken Coop Creek | 0.26 | 79 | 29.5 | 10 | 13 | 0 | 0 | 0 | | 22 | 0 | 0 | 0 | | 0 |
| Cooper Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dean Creek | 0.09 | 0 | 11 | | 2 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dry Creek | 0.64 | 284 | 220.68 | 1 | 86 | 0 | 0 | 0 | | 132 | 0 | 0 | 0 | | 0 |
| Dungeness Bay inner | 1.63 | 2645 | 1531.4 | | 170 | 0 | 0 | 0 | | 78 | 0.04 | 240 | 0 | 44 | 0 |
| Dungeness Bay outer | 8.72 | 6803.5 | 3630.2 | 6 | 664 | 0 | 0 | 0 | | 145 | 0 | 2000 | 0 | | 0 |
| Dungeness River | 340.66 | 13833 | 8792.55 | 56 | 16867 | 0.2 | 0 | 23.88 | | 274.09 | 200.75 | 210 | 0 | 145 | 13 |
| Elwha River | 153.32 | 48367 | 108541.5 | 52 | 119.8 | 0 | 0 | 0 | | 388 | 6.33 | 3740 | 0 | 129 | 0 |
| Ennis Creek | 0.64 | 214 | 87 | 51 | 6 | 0 | 0 | 0 | | 1 | 0 | 15 | 0 | 2 | 4 |
| Gierin Creek | 6.77 | 6256 | 3506.97 | 35 | 897.32 | 0 | 0 | 0 | | 405 | 0 | 690 | 0 | 20 | 51 |
| Indian Creek | 3.32 | 342 | 132.92 | 18 | 31.5 | 0 | 0 | 0 | | 116 | 25.24 | 0 | 0 | 7 | 0 |
| Jimmycomelately Creek | 0.73 | 56 | 131.2 | | 101.27 | 0 | 0 | 0 | | 10 | 0 | 20 | 0 | | 0 |
| Johnson Creek | 3.76 | 4817 | 356.2 | 430 | 223.75 | 0 | 0 | 0 | | 28 | 0 | 0 | 0 | | 0 |
| Lake Sutherland | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Lees Creek | 0.52 | 470 | 373.8 | | 86.5 | 0 | 10 | 7.05 | | 141.9 | 0.04 | 0 | 0 | | 0 |
| Little River | 20.55 | 10 | 145.14 | 1 | 26.75 | 0 | 0 | 0 | | 0 | 0.2 | 80 | 0 | 80 | 0 |
| Matriotti Creek | 10.19 | 5923.5 | 2176.9 | 420 | 1362.75 | 0.15 | 0 | 20 | | 658 | 0.05 | 702 | 94.8 | 653 | 16 |
| McDonald Creek | 5.25 | 97.5 | 74 | | 374.5 | 0 | 0 | 0 | | 102 | 0 | 100 | 0 | 19 | 0 |
| Meadowbrook Creek | 0 | 10 | 1 | | 0 | 0 | 0 | 0 | | 1 | 0 | 0 | 0 | | 0 |
| Morse Creek | 35.7 | 1560 | 1784.45 | | 318.5 | 3.05 | 0 | 53 | | 109 | 0 | 400 | 0 | 160 | 0 |
| Peabody Creek | 1.02 | 154 | 118.87 | 1 | 39 | 0 | 0 | 0 | | 21 | 0.01 | 0 | 0 | | 0 |
| Port Angeles small tributaries | 0.19 | 30 | 33.1 | | 19 | 0 | 0 | 13 | | 482 | 0 | 0 | 13 | | 0 |
| Sequim Bay small tributaries | 1.8 | 1263.5 | 466.9 | 55 | 131.8 | 0 | 0 | 0 | | 46 | 0 | 0 | 0 | | 0 |
| Siebert Creek | 0.63 | 350 | 151 | | 74.75 | 0.06 | 0 | 0 | | 162 | 0 | 0 | 0 | | 0 |
| Strait small tributaries | 1.65 | 1950 | 724.7 | | 165 | 0 | 60 | 182 | | 286.42 | 0.13 | 565 | 80 | 3 | 160 |
| Tumwater Creek | 20.9 | 175 | 151.5 | 18 | 84 | 0 | 0 | 43800 | | 46 | 0 | 0 | 0 | | 0 |
| Valley Creek | 0.17 | 22 | 14 | | 12.5 | 0 | 0 | 0 | | 7 | 0 | 0 | 0 | | 0 |
| White Creek | 0.09 | 20 | 19.3 | | 2 | 0 | 0 | 0 | | 3 | 0 | 0 | 0 | | 0 |
| Wood Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| **TOTAL** | **630.87** | **98179** | **135448.49** | **1282** | **37015.99** | **4.06** | **70** | **44198.93** | **0** | **5105.41** | **233.84** | **9387** | **347.8** | **1538** | **273** |
| **East WRIA 18** | 392.16 | 44581 | 23101.53 | 1140 | 36019.44 | 1.01 | 0 | 143.88 | 0 | 3372.09 | 201.89 | 4587 | 254.8 | 1157 | 109 |
| **West WRIA 18** | 238.71 | 53598 | 112346.96 | 142 | 996.55 | 3.05 | 70 | 44055.05 | 0 | 1733.32 | 31.95 | 4800 | 93 | 381 | 164 |

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## Table 2.3-2. WRIA 18 Surface Water Rights by Subbasin.

| Subbasin | Certificates & Permits | | | | | Claims | | | | | Applications | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated |
| Bagley Creek | 1.71 | 0 | 45.5 | | 97 | 0 | 0 | 0 | | 67 | 0.04 | 0 | 0 | | 2 |
| Bear Creek | 0.21 | 0 | 34.6 | | 14011.3 | 0 | 0 | 0 | | 95 | 0 | 0 | 0 | | 0 |
| Bell Creek | 1.96 | 0 | 272 | | 274 | 0.6 | 0 | 100 | | 566 | 0.08 | 0 | 0 | | 6 |
| Canyon Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Cassalery Creek | 7.79 | 0 | 1016.67 | | 678 | 0 | 0 | 0 | | 13 | 0.93 | 0 | 0 | | 15 |
| Chicken Coop Creek | 0.26 | 0 | 20.5 | | 11 | 0 | 0 | 0 | | 22 | 0 | 0 | 0 | | 0 |
| Cooper Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dean Creek | 0.09 | 0 | 11 | | 2 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dry Creek | 0.64 | 0 | 141.15 | | 74 | 0 | 0 | 0 | | 34 | 0 | 0 | 0 | | 0 |
| Dungeness Bay inner | 1.63 | 0 | 104.5 | | 69.5 | 0 | 0 | 0 | | 0 | 0.04 | 0 | 0 | | 0 |
| Dungeness Bay outer | 8.72 | 0 | 226 | | 468 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dungeness River | 340.66 | 0 | 32.6 | | 15685 | 0.2 | 0 | 23.88 | | 80.09 | 200.75 | 0 | 0 | | 0 |
| Elwha River | 153.32 | 0 | 65237.05 | 1 | 117.3 | 0 | 0 | 0 | | 314 | 6.33 | 0 | 0 | 4 | 0 |
| Ennis Creek | 0.64 | 0 | 35 | 1 | 5 | 0 | 0 | 0 | | 1 | 0 | 0 | 0 | | 0 |
| Gierin Creek | 6.77 | 0 | 294.67 | | 666 | 0 | 0 | 0 | | 311 | 0 | 0 | 0 | | 0 |
| Indian Creek | 3.32 | 0 | 88.92 | 6 | 31.5 | 0 | 0 | 0 | | 81 | 25.24 | 0 | 0 | 7 | 0 |
| Jimmycomelately Creek | 0.73 | 0 | 108.1 | | 94.27 | 0 | 0 | 0 | | 6 | 0 | 0 | 0 | | 0 |
| Johnson Creek | 3.76 | 0 | 251.25 | | 217.75 | 0 | 0 | 0 | | 9 | 0 | 0 | 0 | | 0 |
| Lake Sutherland | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Lees Creek | 0.52 | 0 | 59 | | 65.5 | 0 | 0 | 0 | | 88 | 0.04 | 0 | 0 | | 0 |
| Little River | 20.55 | 0 | 140.64 | 1 | 23.75 | 0 | 0 | 0 | | 0 | 0.2 | 0 | 0 | 80 | 0 |
| Matriotti Creek | 10.19 | 0 | 271 | | 797.75 | 0.15 | 0 | 20 | | 414 | 0.05 | 0 | 14.8 | | 16 |
| McDonald Creek | 5.25 | 0 | 41 | | 372 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Meadowbrook Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Morse Creek | 35.7 | 0 | 816.75 | | 311.5 | 3.05 | 0 | 53 | | 77 | 0 | 0 | 0 | | 0 |
| Peabody Creek | 1.02 | 0 | 59.87 | 1 | 39 | 0 | 0 | 0 | | 0 | 0.01 | 0 | 0 | | 0 |
| Port Angeles small tributaries | 0.19 | 0 | 30.1 | | 19 | 0 | 0 | 0 | | 462 | 0 | 0 | 0 | | 0 |
| Sequim Bay small tributaries | 1.8 | 0 | 201.55 | | 126.3 | 0 | 0 | 0 | | 23 | 0 | 0 | 0 | | 0 |
| Siebert Creek | 0.63 | 0 | 104.5 | | 43.25 | 0.06 | 0 | 0 | | 14 | 0 | 0 | 0 | | 0 |
| Strait small tributaries | 1.65 | 0 | 286 | | 159 | 0 | 0 | 101 | | 133.71 | 0.13 | 0 | 80 | | 160 |
| Tumwater Creek | 20.9 | 0 | 107.8 | | 75 | 0 | 0 | 43800 | | 30 | 0 | 0 | 0 | | 0 |
| Valley Creek | 0.17 | 0 | 4 | | 8 | 0 | 0 | 0 | | 6 | 0 | 0 | 0 | | 0 |
| White Creek | 0.09 | 0 | 17.8 | | 2 | 0 | 0 | 0 | | 3 | 0 | 0 | 0 | | 0 |
| Wood Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| **TOTAL** | **630.87** | **0** | **70059.52** | **10** | **34543.67** | **4.06** | **0** | **44097.88** | **0** | **2849.8** | **233.84** | **0** | **94.8** | **91** | **199** |
| **East WRIA 18** | 392.16 | 0 | 3035.44 | 0 | 33613.12 | 1.01 | 0 | 143.88 | 0 | 1620.09 | 201.89 | 0 | 14.8 | 0 | 39 |
| **West WRIA 18** | 238.71 | 0 | 67024.08 | 10 | 930.55 | 3.05 | 0 | 43954 | 0 | 1229.71 | 31.95 | 0 | 80 | 91 | 160 |

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## Table 2.3-3. WRIA 18 Groundwater Rights by Subbasin.

| Subbasin | Certificates & Permits | | | | | Claims | | | | | Applications | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated | cfs | gpm | ac-ft | Dom Units | Acres Irrigated |
| Bagley Creek | 0 | 18 | 11 | | 5 | 0 | 0 | 0 | | 449 | 0 | 0 | 0 | | 0 |
| Bear Creek | 0 | 265 | 122 | | 3 | 0 | 0 | 0 | | 40 | 0 | 460 | 160 | 218 | 0 |
| Bell Creek | 0 | 1308 | 539.74 | 128 | 61.5 | 0 | 0 | 0 | | 196 | 0 | 80 | 0 | 56 | 4 |
| Canyon Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Cassalery Creek | 0 | 856 | 201.2 | | 7.5 | 0 | 0 | 0 | | 15 | 0 | 85 | 0 | 2 | 2 |
| Chicken Coop Creek | 0 | 79 | 9 | 10 | 2 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Cooper Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dean Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Dry Creek | 0 | 284 | 79.53 | 1 | 12 | 0 | 0 | 0 | | 98 | 0 | 0 | 0 | | 0 |
| Dungeness Bay inner | 0 | 2645 | 1426.9 | | 100.5 | 0 | 0 | 0 | | 78 | 0 | 240 | 0 | 44 | 0 |
| Dungeness Bay outer | 0 | 6803.5 | 3404.2 | 6 | 196 | 0 | 0 | 0 | | 145 | 0 | 2000 | 0 | | 0 |
| Dungeness River | 0 | 13833 | 8759.95 | 56 | 1182 | 0 | 0 | 0 | | 194 | 0 | 210 | 0 | 145 | 13 |
| Elwha River | 0 | 48367 | 43304.45 | 51 | 2.5 | 0 | 0 | 0 | | 74 | 0 | 3740 | 0 | 125 | 0 |
| Ennis Creek | 0 | 214 | 52 | 50 | 1 | 0 | 0 | 0 | | 0 | 0 | 15 | 0 | 2 | 4 |
| Gierin Creek | 0 | 6256 | 3212.3 | 35 | 231.32 | 0 | 0 | 0 | | 94 | 0 | 690 | 0 | 20 | 51 |
| Indian Creek | 0 | 342 | 44 | 12 | 0 | 0 | 0 | 0 | | 35 | 0 | 0 | 0 | | 0 |
| Jimmycomelately Creek | 0 | 56 | 23.1 | | 7 | 0 | 0 | 0 | | 4 | 0 | 20 | 0 | | 0 |
| Johnson Creek | 0 | 4817 | 104.95 | 430 | 6 | 0 | 0 | 0 | | 19 | 0 | 0 | 0 | | 0 |
| Lake Sutherland | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Lees Creek | 0 | 470 | 314.8 | | 21 | 0 | 10 | 7.05 | | 53.9 | 0 | 0 | 0 | | 0 |
| Little River | 0 | 10 | 4.5 | | 3 | 0 | 0 | 0 | | 0 | 0 | 80 | 0 | | 0 |
| Matriotti Creek | 0 | 5923.5 | 1905.9 | 420 | 565 | 0 | 0 | 0 | | 244 | 0 | 702 | 80 | 653 | 0 |
| McDonald Creek | 0 | 97.5 | 33 | | 2.5 | 0 | 0 | 0 | | 102 | 0 | 100 | 0 | 19 | 0 |
| Meadowbrook Creek | 0 | 10 | 1 | | 0 | 0 | 0 | 0 | | 1 | 0 | 0 | 0 | | 0 |
| Morse Creek | 0 | 1560 | 967.7 | | 7 | 0 | 0 | 0 | | 32 | 0 | 400 | 0 | 160 | 0 |
| Peabody Creek | 0 | 154 | 59 | | 0 | 0 | 0 | 0 | | 21 | 0 | 0 | 0 | | 0 |
| Port Angeles small tributaries | 0 | 30 | 3 | | 0 | 0 | 0 | 13 | | 20 | 0 | 0 | 13 | | 0 |
| Sequim Bay small tributaries | 0 | 1263.5 | 265.35 | 55 | 5.5 | 0 | 0 | 0 | | 23 | 0 | 0 | 0 | | 0 |
| Siebert Creek | 0 | 350 | 46.5 | | 31.5 | 0 | 0 | 0 | | 148 | 0 | 0 | 0 | | 0 |
| Strait small tributaries | 0 | 1950 | 438.7 | | 6 | 0 | 60 | 81 | | 152.71 | 0 | 565 | 0 | 3 | 0 |
| Tumwater Creek | 0 | 175 | 43.7 | 18 | 9 | 0 | 0 | 0 | | 16 | 0 | 0 | 0 | | 0 |
| Valley Creek | 0 | 22 | 10 | | 4.5 | 0 | 0 | 0 | | 1 | 0 | 0 | 0 | | 0 |
| White Creek | 0 | 20 | 1.5 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| Wood Creek | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 |
| **TOTAL** | **0** | **98179** | **65388.97** | **1272** | **2472.32** | **0** | **70** | **101.05** | **0** | **2255.61** | **0** | **9387** | **253** | **1447** | **74** |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **East WRIA 18** | 0 | 44581 | 20066.09 | 1140 | 2406.32 | 0 | 0 | 0 | 0 | 1752 | 0 | 4587 | 240 | 1157 | 70 |
| **West WRIA 18** | 0 | 53598 | 45322.88 | 132 | 66 | 0 | 70 | 101.05 | 0 | 503.61 | 0 | 4800 | 13 | 290 | 4 |

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these accounted for less than 2% of the total number of claims records (21 of 1712 groundwater and 8 of 292 surface water records).

Turning to applications, in 2000 it appeared that the trend in water source, WRIA-wide, was shifting strongly away from surface water and toward groundwater: over twice as much surface water as groundwater was certificated or permitted for use, but more than twice as much groundwater as surface water was requested in new applications. In 2002, ten times as much surface water as groundwater (instantaneous) was requested in new applications. About four times as much surface water as groundwater was certificated in water certificates and permits instantaneous quantities in 2002, but annual quantities were about equal.

### Surface Water

Statewide, Ecology is making many decisions on applications for changes to existing water rights and issuing water right decisions on some pending water right applications, where there are no instream flow or hydraulic continuity issues or where public interest is high or public welfare is at stake. Administrative closures are in place on the Dungeness River, Bagley Creek, McDonald Creek and Siebert Creek (Ecology Surface Water Source Limitation list on file at Southwest Regional Office, per 75.20 RCW). In 1994, the DQ Plan recommended a moratorium on new surface water rights and a search of Ecology's database indicates that no new surface water rights for the Dungeness River, its tributaries, or other East WRIA 18 streams have been issued since 1994.

Ecology (2000) found that rights to divert surface water have steadily increased and now total 1,659 cfs and 70,248 ac-ft/year WRIA-wide. More than twice as much surface water as groundwater is authorized for use under water right certificates and permits.

### Surface Water Permits and Certificates

The 2000 WRATS poll showed a total of 289.4 cfs of surface water certificates and permits granted in East WRIA 18, totaling 33,169 acre-feet per year. Of these, 229.5 cfs (79%) and 32,505 acre-feet (98%) were for agriculture. Environmental water use, primarily for the WDFW fish hatcheries, held 55.6 cfs of surface certificates (19%), for non-consumptive use. The Dungeness River accounted for 207.7 cfs (72% of all surface water certificates and permits). The remaining surface water rights were spread among 27 other creeks and numerous unnamed sources, the largest of which accounted for more than 10.6 cfs (Hurd Creek). Other streams with 5 or more cfs of approved water rights included Cassalery, Canyon, and McDonald creeks.

In 2002 the WRATS poll showed a total of 630.87 cfs in surface water certificates, with 672.11 cfs in East WRIA 18 and 238.71 cfs in West WRIA 18. This includes 340.66 cfs for the Dungeness River (including some tributaries) and 153.32 cfs for the Elwha River (most of which is represented by the 150 cfs industrial water right owned by the City of Port Angeles. Morse Creek shows as 35.7 cfs (compared to 40.868 in the 2000 WRATS poll). Other streams with high instantaneous water rights relative to their flows include Tumwater Creek (20.9 cfs, of which 20 cfs is represented by a commercial/industrial water right owned by a private individual; Little River (20.55 cfs, of which 20 cfs is represented by commercial/industrial water right held by Washington Pulp and Paper Corporation);

Matriotti Creek (10.19 cfs, but just 1.9 cfs in the 2000 WRATS poll); and Cassalery Creek (7.79 cfs, close to the 7.7 cfs identified in the 2000 WRATS poll); and Geirin Creek (6.77 cfs, but just 1.3 cfs in the 2000 WRATS poll).

Annual quantities of permits and certificates totaled 70,060 acre-feet, almost all of it in West WRIA 18 (67,024 ac-ft), and almost all of this is on the Elwha River for storage in the two reservoirs (Glines and Elwha). As it is known that the Dungeness River adjudication allocates 29,250 acre-feet of water, its clear absence from this total means that there is a significant error in the 2002 WRATS poll.

### Surface Water Applications

As of 2000, 28 surface water applications were on file, requesting a total of 233.62 cfs and 4,618 ac-ft/yr. None of the new surface water applications indicate a request for supplemental use.[7] The new surface water applications totaled more than 6% of net and gross existing annual water rights (and 13 to 14% of instantaneous gross and net water rights). As noted, the 1994 DQ Plan recommends that no new surface water rights be issued in the DQ planning area, in order to protect small streams in Clallam County from over-allocation until more is known about the resources and until instream flows are adopted by rule. In 2002, the Ecology database recorded almost the same instantaneous flow in WRIA 18 applications (233.84), but only 94.8 acre-feet.

The largest applications include one for hydropower purposes requesting 200 cfs on the Dungeness River (Hydro Resource Company) and one for a domestic single purpose requesting 25 cfs on Indian Creek (a domestic single use would normally require a very small fraction of a single cfs).

### Surface Water Claims

The Ecology 2000 database showed that in WRIA 18, claims amounted to less than one percent of gross instantaneous, but 7 percent of gross annual surface water rights. Surface water claims totaled 9.08 cfs and 5,273 ac-ft/year.

In 2002, claims recorded in the Ecology database showed less than half the volume as 2000 (4.06 cfs), but included a very large claim by a private individual on Tumwater Creek (43,800 ac-ft/year) which pushed the total of water claims to 44,148 ac-ft.

### Adjudication of Dungeness River & Tributaries

The waters of the Dungeness River mainstem were originally adjudicated in 1924 in Clallam County Superior Court. The Superior Court established 13 classes of users, irrigating a total of 28,988 acres, and awarded a total of 579.56 cfs in flow with priority dates ranging from November 1895 to March 1921. A water duty of 6 acre-feet per acre for the irrigation season was determined by the Report of Referee for the adjudication. The 1924 decree is reviewed in depth in the 1999 PCHB *Final Order* regarding the Trust Water Rights Memorandum of Understanding (MOU) (see discussion of agricultural water use below), which points out that the Court's decree recognized water rights beyond actual

[7]However, although application is made for new water, Ecology may issue water rights as supplemental to existing (primary) water rights.

mean flows in the Dungeness River. Mean flows as calculated by the USGS meet or exceed these adjudicated rights only within July.

The PCHB (1999) and the MOU both recognize only a portion of the rights actually listed in the decree, totaling 25,918 acres and 518.36 cfs. Not included are ten rights to irrigate 3,070 acres totaling 61.2 cfs. Most are small rights, with the exception of the Happy Valley Irrigation District 1916 water right for 2,618 acres and 52.36 cfs. This water right was never perfected, even though it was adjudicated. The adjudication addressed the nine current companies and districts, plus HVID (which did not exist) and several individuals. The Court recognized water rights in its decree for land that irrigators "intended to irrigate" but never actually did irrigate (see discussion below on agricultural use). To the extent that these rights were never exercised (e.g., Happy Valley), they can be presumed to be relinquished or forfeited. Current irrigation occurs through the nine original district and company rights. A tentative determination of the 1998 validity of these tights was made in the Trust Water Agreement MOU.

## Groundwater

### Groundwater Permits and Certificates

According to Ecology's 2000 database poll, the amount of groundwater diverted has increased steadily over time to a total certificated right to withdraw at a rate of 41,089 gpm for WRIA 18 and an annual withdrawal right of 33,190 ac-ft/year. In the 2000 WRATS poll, groundwater permits and certificates total 35,124.5 gpm and 16,690.8 acre-feet/year in East WRIA 18. Potable water accounted for 56% of both the instantaneous and annual ground water rights. Agriculture held 35% of the certificated and permitted instantaneous groundwater quantities, and 29% of the annual quantities. Environmental water purposes (again, the hatcheries) made up 8% of the instantaneous and 15 % of the annual groundwater quantities. Montgomery Water Group (1999) reports that groundwater permits and certificates total 26,354 acre-feet (36.4 cfs) for the area served by the WUA. Since the 1994 DQ Plan, 13 groundwater permits have been issued for new wells and two of these have been certificated. Groundwater permits and certificates issued since 1994 total 3,574.5 gpm and 2049.2 acre-feet, including a large new right for the City of Sequim (2250 gpm and 1850 acre-feet). The 2002 database poll shows total groundwater certificates and permits of 98,179 gpm and 65,389 ac-ft/year.

The 2002 WRATS poll indicates that total WRIA 18 groundwater rights amount to 98,179 gpm and 65,389 ac-ft/year. The largest groundwater rights in East WRIA 18 are held by the Washington Department of Wildlife (in the Dungeness River subbasin), City of Sequim (in Gierin Creek subbasin); Clallam PUD (in the Dungeness, Bell, and Matriotti subbasins); and Sequim Prairie Ditch Company (in the Dungeness subbasin). There are additional large wells (>500 gpm) with water rights in the Matriotti, Gierin, and Johnson creek subbasins.

In West WRIA 18, the 2002 WRATS poll indicates that the largest groundwater rights are on the Elwha River (48,367 gpm). This includes a large 22,500 gpm permit held by the City of Port Angeles for municipal supply (often referred to as a 50 cfs Elwha River right). Other large groundwater rights are held by Clallam PUD (in the Elwha, Morse, and Lees subbasins).

An alluvial sand and gravel groundwater aquifer, which supplies municipal and industrial water for local residents and businesses, underlies the Elwha River valley (see BOR 1995a). Five major purveyors withdraw groundwater from the alluvial aquifer: the City of Port Angeles, the Dry Creek Water Association, the Lower Elwha Klallam Tribe, the Lower Elwha Klallam Tribal Fish Hatchery, and the Elwha Place Homeowners' Association. Washington Department of Health water supply monitoring records indicate that the groundwater is of high quality.

The alluvial aquifer and the river are hydraulically connected (illustrated in Box 1 on the next page), and both surface and groundwater flow north toward the Strait of Juan de Fuca. Groundwater flow through the aquifer increases from the upper to the lower sub-basin. The discharge from the middle to the lower sub-basin is approximately 1 to 2 cubic feet per second (cfs). In the lower sub-basin, the river "loses water" to the aquifer; the USGS estimates that groundwater discharges from the alluvial aquifer to the Strait at a rate of approximately 6 cfs.

Total use by the five major groundwater purveyors in the Elwha River valley is approximately 22.3 cubic feet per second. In the upper sub-basin, the Dry Creek Water Association holds a groundwater right for 0.6 cubic feet per second and average use is approximately 0.33 cubic feet per second (150 gallons per minute). The association wells are located at approximately river mile (RM) 3. Because of their proximity to the river channel, turbidity in the river has increased turbidity in their well water supply.

In the middle sub-basin, the City of Port Angeles holds a groundwater permit for 50 cfs The City's Ranney collector, a large diameter caisson located near the river's edge with laterally radiating perforated collection pipes beneath the riverbed, has the capacity to pump approximately 17 cfs. There is little indication that present river water quality affects the Ranney collector water supply.

In the lower sub-basin, the Lower Elwha Klallam Tribe and the Lower Elwha Tribal Fish Hatchery together withdraw a total from both wells and a shallow infiltration gallery of approximately 10 cfs. The Elwha Place Homeowners' Association holds a groundwater right for 0.4 cfs and uses approximately 0.1 cfs. The Homeowners' Association wells are located in the Elwha floodplain at approximately river mile 1.4, only 1 foot above the 100-year frequency flood level; their water supply does not become turbid when the river does. Other individual groundwater withdrawals amount to less than 0.2 cfs.

### Groundwater Applications

Ecology's 2000 database poll (Appendix 2-B) shows 39 groundwater applications on file, requesting a total withdrawal rate of 7,979 gpm and 10,356 ac-ft/year. New groundwater applications total nearly one-third of existing appropriations on a net annual basis (about 20 percent on a net instantaneous basis). The 2002 database poll (Appendix 2C) shows total applications of 9,387 gpm and 253 ac-ft/year. These include two large applications for 2000 gpm each in the Elwha and Dungeness subbasins by the WDFW for fish production.

### Groundwater Claims

Ecology (2000) found that ground water claims were 37% of the gross instantaneous and 14% of the gross annual ground water rights. Groundwater claims in the 2000 WRATS

## Box 1: Illustration of hydraulic continuity (from USGS)

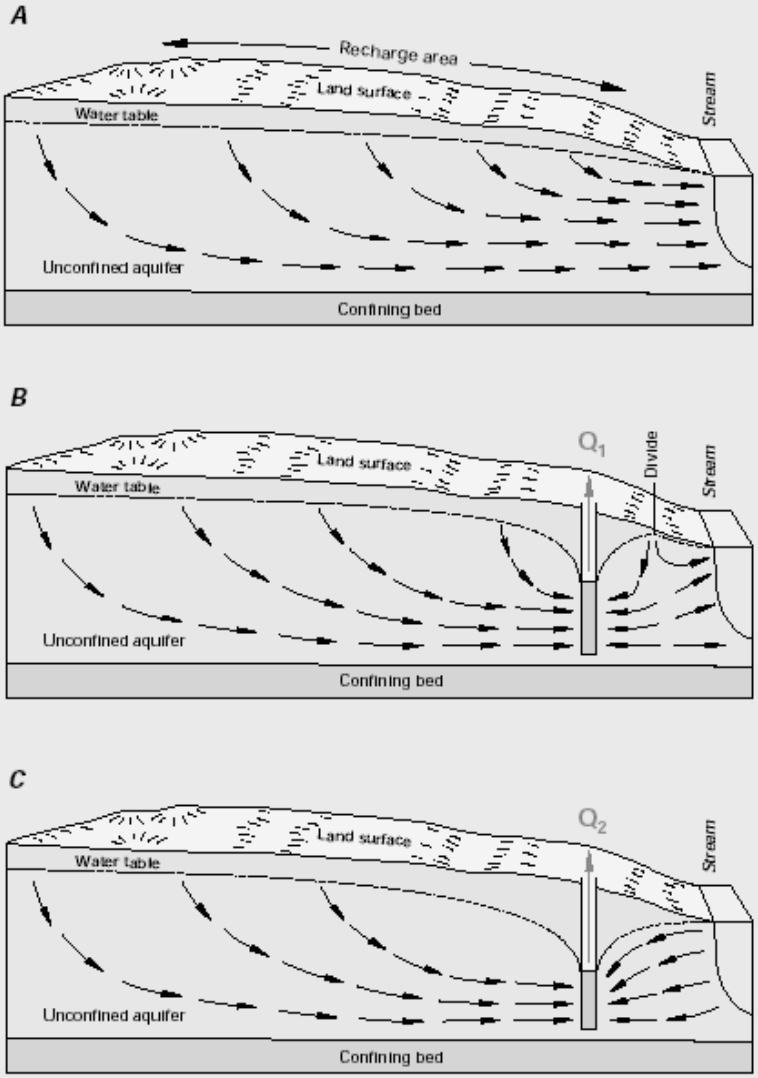


*Figure C–1. In a schematic hydrologic setting where ground water discharges to a stream under natural conditions (A), placement of a well pumping at a rate ($Q_1$) near the stream will intercept part of the ground water that would have discharged to the stream (B). If the well is pumped at an even greater rate ($Q_2$), it can intercept additional water that would have discharged to the stream in the vicinity of the well and can draw water from the stream to the well (C).*

database poll totaled 21,672 gpm and 5,276 ac-ft/year. MWG (1999) reports that groundwater claims total 2,445 acre-feet/year for the area served by the WUA. The *Comprehensive Water Conservation Plan* provides a map showing the distribution of groundwater claims by annual volume and section.

The 2000 WRATS poll shows a small volume of water is claimed in East WRIA 18 from groundwater sources: 86 acre-feet/year and 150 gpm for agricultural purposes, and 560 gpm and 77.3 acre-feet per year for potable use (Ecology 2000). There are, however, claims totaling 3291 acres of irrigation from surface and ground water sources for which no volume of water is recorded.[8] At an average irrigation requirement of 2.75 acre-feet per acre (based on crop irrigation requirements and efficiencies described in MWG 1999), this would amount to a demand of 9,050 acre-feet/year, or about 18% of the combined surface and groundwater rights and claims counted in East WRIA 18.

The 2002 WRATS poll identified no claimed instantaneous quantities in East WRIA 18 and 1752 acres irrigated with claims (a little more than half the acres irrigated identified in the 2000 WRATS poll). In West WRIA 18, the 2002 WRATS poll found claims totaling 70 gpm, 101 acre feet/year, and 504 acres irrigated.

**Exempt Wells**

Certain wells are exempted from permitting under RCW 90.44.050. These “exempt wells” are allowed for stockwatering or the watering of a lawn or noncommercial garden up to one-half acre, for single or group domestic use up to 5000 gallons per day, or for industrial purpose up to 5000 gallons per day.

The USGS has developed a series of analyses of water availability in the Sequim-Dungeness area over the past 20 years. Studies in the 1980s (Drost 1983, 1986) concluded that adequate groundwater for individual domestic use exists in almost all developed areas, but that in the more mountainous interior of the region there may be large areas of inadequate groundwater to supply even single domestic needs. More recently, Thomas et al. (1999) conclude that the additional withdrawals will either reduce groundwater discharge to surface and marine waters, or lower water levels in wells.

The DQ Plan (1994) notes substantial concern regarding the proliferation of “single, non-permitted” wells, a concern that continues to be expressed in this 2514 watershed planning process. The DQ Plan (1994) calculated a total of 3,014 single domestic wells in eleven Clallam County planning subareas. Well density averaged 0.046 wells per acre (or one well per 22 acres) across these subareas. The Sequim-Dungeness Groundwater Committee (1994) documented 3,060 wells in a 135 $mi^2$ area (well density 0.036/acre), over half of them less than 80 feet deep and three-quarters less than 125 feet. The wells were drilled predominantly during the building booms of the 1970s and again in the early 1990s. Typical yields range from 20 to 40 gpm.

Total groundwater withdrawals estimated by Thomas et al. for the area amounted to 6,055 acre-feet in 1996, of which 26% was attributed to domestic “self-supplied users” (e.g., exempt wells). This yields a 1996 estimate of 1,574 acre-feet (513 MGY or 967 gpm) in

[8]According to Ecology, this may reflect the fact that these claims predate the requirement to assess annual volume (Cynthia Nelson, pers. comm. February 2001).

exempt well withdrawals. This is equivalent to about 5% of total certificated groundwater withdrawal rights (based on Ecology 2000 database poll). MWG (1999) estimated somewhat less groundwater, 1,251 acre-feet/year, is withdrawn from domestic wells in the Sequim-Dungeness area. *The Comprehensive Water Conservation Plan* provides a cumulative bar chart of the number of wells installed over time and an updated well density map, showing the numbers of wells by section (MWG 1999: Figures 7-9,7-10).

The CCDCD maintains a well information database (based on well-drillers logs), including depth, location, owner, and date of construction. The log shows that the number of wells in the East WRIA 18 planning area alone has jumped from about 200 in 1970 to more than 4,000 in 2000 (Foster Wheeler 2002, Thomas et al. 1999). It is not known which of these wells are used, the extent to which they are used, or for what purposes they are used. U.S. Census data (2000) totals 22,488 occupied residential units in WRIA 18 census tracts. Clallam County GIS data (considered more accurate, as it is based on actual Assessor's records) indicates a slightly lower number: 21,904 residential units. From public water system reports to the DOH, it is known that Group A and B systems in WRIA 18 serve a total of 16,872 residential connections (some Group B systems are on exempt wells and some other systems may maintain an exempt well that could be used for outdoor watering). Taking the difference between the number of known public water system connections and the higher census data on total number of occupied residences, there could be as many as 5,616 residences unserved by public water systems in WRIA 18; presumably these residences would be on exempt wells. This number agrees fairly well with GIS analysis of the County well log that identifies 5,062 wells in WRIA 18.

At an average water use rate of 350 gallons per day (see discussion of water use rates below), and assuming the higher number (5,616) of residential exempt wells, water demand would be approximately 2 MGD (million gallons per day), or 2,200 AFY (acre-feet per year). If these wells were all in perfect hydraulic continuity with WRIA 18 streams this would equate to a 3 cfs withdrawal spread across all streams in the WRIA (in proportion to well density in each subbasin). However, a general rule of thumb is that 70 percent of residential use returns to groundwater via septic systems, so the net combined effect on all streams in the WRIA would be on the order of 1 cfs or less.

In East WRIA 18, where nearly 90% of the wells identified in the Clallam County database are drilled (4,500 of 5,062), great concern exists regarding exempt wells in continuity with flow-limited streams. Again assuming 350 gpd water use, these wells would represent a water demand of 1.6 MGD or about 1,800 acre-feet per year. If perfect hydraulic continuity is again assumed, this would represent an annual stream flow demand of 0.73 cfs spread across all the streams and rivers of East WRIA 18.

Table 2.3-4 presents GIS analysis of wells by subbasin, including the number, density and depth distribution of wells. The greatest well density is found in the Cassalery subbasin (165 wells/$mi^2$), and Bear, Bell, Gierin and Matriotti creeks, as well as Dungeness Bay, all of which have densities in the 40-55 wells/$mi^2$ range. Very low densities are found in the more rural subbasins and in the Port Angeles drainages. Overall most wells are shallow: 21% are 50 feet or less, and 60% are 100 feet or less. Only 5% each are in the 150-250 foot and 250-500 foot depth classes, and 1% are in the 500-1000 foot class.

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**Table 2.3-4 WRIA 18 Well Numbers, Density, and Depth: Distribution by Subbasin**

| Subbasin | Number of Wells | Subbasin Square Miles | Wells per Square Mile | Distribution of Well Depths | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0-50' | 51-100' | 101-150' | 151-250' | 251-500' | 500-1000' |
| Bagley Creek | 25 | 6.78 | 3.7 | 20% | 44% | 12% | 12% | 12% | 0% |
| Bear Creek | 169 | 4.17 | 40.5 | 15% | 33% | 17% | 18% | 14% | 4% |
| Bell Creek | 299 | 7.59 | 39.4 | 16% | 38% | 19% | 17% | 9% | 1% |
| Canyon Creek | 2 | 7.78 | 0.3 | 0% | 0% | 0% | 0% | 100% | 0% |
| Cassalery Creek | 589 | 3.56 | 165.3 | 37% | 47% | 14% | 2% | 1% | 0% |
| Chicken Coop Creek | 69 | 5.98 | 11.5 | 10% | 26% | 20% | 20% | 23% | 0% |
| Dean Creek | 28 | 2.91 | 9.6 | 21% | 18% | 11% | 18% | 25% | 7% |
| Dry Creek | 55 | 6.39 | 8.6 | 64% | 2% | 9% | 20% | 5% | 0% |
| Dungeness Bay inner | 184 | 3.38 | 54.4 | 2% | 48% | 33% | 11% | 4% | 2% |
| Dungeness Bay outer | 91 | 4.16 | 21.9 | 22% | 36% | 27% | 10% | 3% | 1% |
| Dungeness River | 1,039 | 174.32 | 6.0 | 23% | 48% | 19% | 6% | 3% | 1% |
| Elwha River | 118 | 281.38 | 0.4 | 19% | 19% | 27% | 28% | 5% | 1% |
| Ennis Creek | 44 | 8.83 | 5.0 | 91% | 2% | 2% | 2% | 2% | 0% |
| Gierin Creek | 273 | 5.12 | 53.3 | 25% | 49% | 13% | 12% | 2% | 0% |
| Indian Creek | 46 | 18.03 | 2.6 | 24% | 41% | 22% | 11% | 2% | 0% |
| Jimmycomelately Creek | 33 | 16.06 | 2.1 | 15% | 36% | 21% | 12% | 12% | 3% |
| Johnson Creek | 104 | 6.18 | 16.8 | 10% | 18% | 24% | 32% | 10% | 7% |
| Lees Creek | 83 | 5.81 | 14.3 | 36% | 14% | 20% | 25% | 4% | 0% |
| Little River | 3 | 22.90 | 0.1 | 0% | 0% | 67% | 33% | 0% | 0% |
| Matriotti Creek | 678 | 13.84 | 49.0 | 17% | 54% | 16% | 10% | 4% | 1% |
| McDonald Creek | 309 | 23.34 | 13.2 | 10% | 30% | 35% | 21% | 3% | 2% |
| Meadowbrook Creek | 23 | 0.95 | 24.2 | 39% | 30% | 17% | 13% | 0% | 0% |
| Morse Creek | 95 | 57.16 | 1.7 | 9% | 19% | 23% | 34% | 14% | 1% |
| Peabody Creek | 52 | 4.57 | 11.4 | 81% | 4% | 8% | 6% | 2% | 0% |
| Port Angeles small tributaries | 5 | 3.78 | 1.3 | 0% | 60% | 0% | 0% | 40% | 0% |
| Sequim Bay small tributaries | 216 | 10.62 | 20.3 | 11% | 19% | 19% | 28% | 20% | 4% |
| Siebert Creek | 71 | 18.79 | 3.8 | 8% | 34% | 27% | 20% | 10% | 1% |
| Strait small tributaries | 298 | 9.48 | 31.4 | 4% | 33% | 43% | 14% | 6% | 0% |
| Tumwater Creek | 40 | 6.04 | 6.6 | 53% | 13% | 20% | 13% | 3% | 0% |
| Valley Creek | 11 | 4.06 | 2.7 | 18% | 18% | 9% | 36% | 18% | 0% |
| White Creek | 10 | 2.11 | 4.7 | 10% | 30% | 30% | 20% | 10% | 0% |
| TOTAL | 5,069 | 746.08 | 6.8 | 21% | 39% | 21% | 13% | 5% | 1% |

*(Based on buildout analysis by Clallam County GIS, 2002)*

*Note:* The georeferenced well log database included a number of wells listed with a depth of "0". The meaning of this class is unclear, but the wells are included in the 0-50' depth class in the table.

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Depending on how concentrated exempt wells may be near WRIA 18 streams, potential effects on stream flows would be pronounced only when high instantaneous demands from a high density of exempt wells in close proximity to a small stream occurs during the low flow season. Both water quantity and water quality concerns are related to exempt well development, however these data suggest that the more significant concern with exempt wells may be the potential they afford for groundwater contamination.

Based on concerns regarding the proliferation of exempt wells, a series of strategies to protect groundwater resources was identified in the DQ Plan (1994). A more detailed strategic plan was completed by the Sequim-Dungeness Groundwater Committee (SDGC and CCDCD 1994). (See Appendix 1-B for recommendations from these two plans.)

## Reserved and Trust Rights

### Federal

No federal reserved rights appurtenant to National Park or National Forest lands within WRIA 18 boundaries have been asserted or quantified.

### Tribal

The principal tribal water issues at stake in WRIA 18 arise through treaty rights to harvest fish and to fish at usual and accustomed fishing places. Both the Jamestown S'Klallam and Lower Elwha Klallam tribes hold such rights. Both reservations also have water demands associated with tribal land use. The DQ Plan articulates the situation well:

> "... tribal claims to water [are] connected not only with tribal lands, but also with treaty-reserved rights to fisheries resources, and the instream flows necessary to support fisheries' habitat. The 1974 Boldt decision held that the tribes who had signed treaties in 1855, in what is now Washington state, were entitled to the opportunity to harvest half of the harvestable salmon and steelhead returning to off-reservation fishing grounds (U.S. v. Washington 384 F. Supp. 312 [1974]). A subsequent decision held that the right to harvest fish implies a right to protection of fisheries habitat ...(506 F. Supp. 187, 203 [1980]). ... An independent fact finder hired by the Washington State Legislature in 1988 to review state water policies indicated that the legal entitlement of Indian tribes for both on-reservation use and regional fisheries will have a major impact on the direction of state water policies."

Also of potential application are federal tribal trust responsibilities.[9]

[9]For example, such rights have been established by the Pyramid Lake Paiutes with regard to managing irrigation applications at a Bureau of Reclamation project on the Truckee River, to minimize the waste of water. Under this concept, the federal government has been held to have an ongoing fiduciary responsibility to the tribes to proactively protect water resources, even in a situation in which the river basin has been adjudicated and a no-jeopardy opinion has been issued with respect to fish listed under the Endangered Species Act (that is, operations were concluded not to jeopardize the continued existence of listed fish).

**State Trust Water Rights for Agriculture and Instream Flows**

Washington State's first Trust Water Rights agreement was negotiated between the WUA and Ecology, and signed as a Memorandum of Understanding to Transfer Water Under Trust Water Rights Program Chapter 90.42 RCW (MOU) between the parties dated April 13, 1998. Substantially all of the perfected surface water irrigation rights on the Dungeness River are brought under this MOU. Subsequently challenged, the MOU was upheld by the Washington State Environmental Hearing Board in 1999 (PCHB 1999).

Under the Trust Water Right Program MOU, the irrigators agree to divert no more than half the flow of the Dungeness River, and transfer saved water to trust status. This represents achievement of a cornerstone of the DQ Plan. The WUA also characterizes the Agreement as "a cornerstone" for their conservation efforts, inasmuch as it "protect[s] water rights from relinquishment under RCW 90.42, while providing for conserved water to be used for future agricultural growth in the Dungeness Valley" (1999a). The MOU (1998) contains a number of other notable purposes and provisions for watershed planning, particularly:

- It establishes certainty and a collaborative basis for water conservation and efficiency improvements for agricultural water use, to extend limited water supplies.
- It protects the water placed in the program from relinquishment under Washington law.
- It reserves one-third of the water for future use under adjudicated rights of the water users, and transfers two-thirds to instream flow.

Under the MOU, trust water rights are administered as provided under Chapter 90.42 RCW. A net water savings (the difference between the historically diverted and beneficially used amount of water, and the quantity diverted after conservation measures have been implemented) was calculated as eligible for transfer to the trust. In 1998, 4,700 acre-feet – equivalent to a constant diversion rate of 15.5 cfs – was considered eligible based on historical beneficial use and diversion data for 1990-93 (see the MOU for detail as to calculations).[10]

Trust water eventually will be distributed one-third to future adjudicated uses by WUA members and two-thirds to instream flows to be administered by Ecology. It retains the priority date of the underlying water rights (some of which date back as early as 1895), except that, relative to WUA members, the trust right is made inferior and subordinate to the 1921 Dungeness Irrigation District water right (the most recent of the WUA water rights decreed in the 1924 adjudication). If the full slate of structural water conservation projects recommended in the *Comprehensive Water Conservation Plan* (MWG 1999) were implemented, saving as much as 33 cfs (9,032 acre-feet over a 138-day average irrigation season), then the overall WUA water rights could ultimately be reduced by two-thirds that amount (6,022 acre-feet) to a total of 23,228 acre-feet.

Future water placed in trust will be calculated and designated for use according to the same methods and formulas as used for establishment of the trust water right. That water placed in trust and designated to future adjudicated uses for the WUA will remain instream

[10]The initial (1998) transfer to trust will be updated in seven years (2005) and annually thereafter.

until such time as it is needed, and may be called for such use under conditions set forth in the MOU.

The agreement to limit diversions to no more than half the flow of the Dungeness River creates a further potential credit, when irrigation demand exceeds the allowable diversion (however, since the Trust Water Agreement, irrigation demand has never approached 50% of the river's flow). To irrigate beyond the 7,000-acre limit would require application to Ecology for a change to add irrigation acreage and would be subject to the process for changing water rights under the existing RCW.

When it is determined that conservation measures have fully captured the available water savings, new permanent (superseding) water right certificates will be issued. Ecology has issued orders (DE 98 WR-S196) to each irrigation district and company amending their water rights to transfer water to a temporary trust and to create a temporary trust water right for each WUA member. It conditions each water right to leave no less than half the flow of the river instream below the lowest point of diversion.

The PCHB (1999) clarifies that Ecology's orders do not create a permanent trust water right but only a temporary right. Ecology will not finally determine the quantity of water to be put into trust for all purposes, both instream flows and irrigation reserves, until hydrogeologic assessments are complete and conservation measures are in place for the region. The PCHB (1999) holds that only when these steps are taken can irrigators apply to use trust water for irrigation beyond the 7,000 acres.

Leakage from irrigation ditches is exceeded as a source of groundwater recharge in the Sequim-Dungeness area only by leakage from the Dungeness River, according to Thomas et al. (1999), and increased efficiency may affect a substantial number of wells finished in the shallow aquifer.[11] PCHB (1999) states that Ecology must study return flows before making permanent any temporary trust water right.

Recording and crediting of saved water was to be based on biweekly measures of diversions from April 15 to June 15 and weekly records through the remainder of the irrigation season. However, the WUA installed real-time and remote access gages to measure each outtake. Further recording and reporting requirements are spelled out in the MOU. The MOU allows Ecology or any party with saved water held in trust for adjudicated purposes to convene a review of the agreement at any time.

Although the Trust Water Rights Program MOU between Ecology and the WUA is not a minimum instream flow regulation for the purposes of protecting instream resources, it does create a pool of water designated to instream flows. For 1998, that pool amounted to two-thirds of the 4,700 acre-feet eligible for Trust placement, or about 3,133 acre-feet of water (10.33 cfs). This Trust volume represents 2.7% of the average annual flow of the Dungeness River and 7.3% of the August-September low flow (at 90% exceedance). As noted above, when it is determined that conservation measures have fully captured the available water savings, a permanent trust water right certificate for instream flows will be issued. Assuming that the full 33 cfs of irrigation water conservation measures recommended by the Montgomery Water Group are eventually implemented, water rights

[11]Potential effects could include lowering aquifer levels, resulting in the dewatering of shallower wells.

designated to instream flows under the MOU could reach 22 cfs (this augments the commitment to never divert more than half the flows).

### Water Right Purpose of Use

Ecology's (2000) water rights analysis indicates a strong division of water source by purpose. Domestic and municipal water rights combine to more than three-quarters of the gross and net groundwater instantaneous rights in WRIA 18, but only 0.5% of the net surface instantaneous water rights (2% of gross surface water rights). This reflects the fact that potable and purveyor water systems in WRIA 18 are strongly groundwater based. By contrast, irrigation accounts for three-quarters of the surface water instantaneous rights in the WRIA (not counting hydropower rights, which are largely Elwha River and Morse Creek water rights). Irrigation also holds 15% of the net groundwater instantaneous rights (and 20% of the gross). Whereas municipal supplemental instantaneous water rights are proportionately about equal as between surface and ground sources, irrigation tends to rely on its surface instantaneous water rights as a primary supply (99+% of its total surface water rights are primary rights), and to look to its groundwater rights for supplementation (45% of its ground water instantaneous rights are supplemental).

Turning to annual volumes that may be withdrawn or diverted under these water rights,[12],these trends are even more clear: municipal surface water gross and net annual water rights account for less than 1% of total surface water rights, but 81- to 86% of gross and net total groundwater annual rights. Irrigation holds 12% of gross and 6.5% of net total groundwater annual rights, but 92 to 94% of gross and net surface water annual rights. Again, a substantial portion of irrigation's groundwater annual rights are supplemental (54%), but only 1% of its surface water annual rights are so conditioned.

The Ecology analysis distinguishes a number of additional water right purposes, but most are minor, with two exceptions: fish propagation amounts to more than 7% of the net total groundwater annual rights (and 3% of net groundwater instantaneous rights, but only 0.1 percent of surface water rights). Commercial and industrial use holds 5% of net total surface water annual rights (but only a negligible share of groundwater rights). Importantly, no minimum instream flows have been established by regulation for streams and rivers in WRIA 18 (although many have either closures or low flow provisions under 75.20 RCW, and recommended flows have been identified for others through DQ and other processes). The watershed planning process recommends instream flows in Chapter 3.

Tables 2.3-5 and 2.3-6 show the 2002 analysis of water rights purpose as a percentage of total rights by source and by WRIA 18 total applications, certificates and permits, and claims. On an instantaneous basis, new groundwater applications are roughly evenly divided between agricultural and municipal and domestic purposes, with a small fraction for commercial and industrial purposes. New surface water applications for instantaneous

[12]"Annual water rights" will be used as a shorthand for the annual volumes of water allowed under water rights.

**Table 2.3-5. Water Right Purpose as a Percent of Source Total.**

| Type | Source | Purpose | Percent of Source | | |
|---|---|---|---|---|---|
| | | | cfs | gpm | acre-feet |
| Applications | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | 48% | |
| | | Commercial & Industrial | | 2% | |
| | | Municipal & Domestic | | 50% | 100% |
| | Surface water | | | | |
| | | Agriculture | 1% | | 84% |
| | | Commercial & Industrial | 1% | | |
| | | Municipal & Domestic | 12% | | |
| | | Other | 86% | | 16% |
| Certificates & Permits | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | 13% | 10% |
| | | Commercial & Industrial | | <1% | |
| | | Municipal & Domestic | | 82% | 86% |
| | | Other | | 5% | 4% |
| | Surface water | | | | |
| | | Agriculture | 69% | | 6% |
| | | Commercial & Industrial | 4% | | |
| | | Municipal & Domestic | 8% | | 2% |
| | | Other | 19% | | 93% |
| Claims | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | | 100% |
| | | Municipal & Domestic | | 100% | |
| | Surface water | | | | |
| | | Agriculture | | | 100% |
| | | Municipal & Domestic | | | |

quantities are for hydropower purposes (on the Dungeness) and one disproportionately large request for a 25 cfs water right for single domestic use on Indian Creek. On an annual basis, no agricultural groundwater applications request water quantities (indicating applications are for supplemental purposes); annual groundwater quantities are only requested for municipal and domestic purposes. Most surface water annual quantities (84%) are for agricultural purposes. Nearly three-quarters of total applications for annual

quantities are for groundwater municipal and domestic purposes and about one quarter are for surface water agricultural purposes.

Of certificates and permits, more than 80% of groundwater rights are for municipal and domestic purposes, whether for instantaneous or annual quantities. More than 90% of surface water annual rights are for “other” purposes (primarily hydropower and fish propagation); disregarding these, three-quarters of the remaining annual surface water quantities are for agriculture and one-quarter for municipal and domestic purposes. However, 69% of surface water instantaneous rights are for agriculture (primarily diversions from the Dungeness River). As a percent of total rights, municipal and domestic purposes make up 42% of annual rights, with “other” purposes accounting for 50% of the total annual rights.

**Table 2.3-6. Water Right Purpose as a Percent of Total Rights.**

| Type | Source | Purpose | Percent of Total | | |
|---|---|---|---|---|---|
| | | | cfs | gpm | acre-feet |
| Applications | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | 48% | |
| | | Commercial & Industrial | | 2% | |
| | | Municipal & Domestic | | 50% | 72% |
| | Surface water | | | | |
| | | Agriculture | 1% | | 24% |
| | | Commercial & Industrial | 1% | | |
| | | Municipal & Domestic | 12% | | |
| | | Other | 86% | | 4% |
| Certificates & Permits | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | 13% | 5% |
| | | Commercial & Industrial | | | |
| | | Municipal & Domestic | | 82% | 41% |
| | | Other | | 5% | 2% |
| | Surface water | | | | |
| | | Agriculture | 69% | | 3% |
| | | Commercial & Industrial | 4% | | |
| | | Municipal & Domestic | 8% | | 1% |
| | | Other | 19% | | 48% |
| Claims | | | | | |
| | Groundwater | | | | |
| | | Agriculture | | | |
| | | Municipal & Domestic | | 100% | |
| | Surface water | | | | |
| | | Agriculture | 99% | | 100% |
| | | Municipal & Domestic | 1% | | |

## 2.3.3. Water Use

### Municipal and Domestic Water Use

#### Public Water Service

Figures 2.3-1, 2 & 3 show the boundaries of Class A public water systems serving the study area. Table 2.3-7 provides additional detail on the Class A systems shown in Figures 2.3-1, 2 & 3. The largest of these include the cities of Port Angeles and Sequim, and the Public Utility District Number 1 of Clallam County. The PUD operates four water systems in WRIA 18, including Evergreen, Carlsborg, Panoramic Heights, and the Port Angeles Composite System. It finances and constructs many of these systems through Local Utility Districts. A total of 78 Class A systems (more than 15 connections) and 278 Class B systems (2 to 15 connections) comprise the many smaller water associations and community well systems providing municipal and domestic water service. Class A and B systems (listed in Appendix 2-C) report the numbers of connections and population served to the DOH (Table 2.3-8).

Public water systems serve a total of 43,101 persons in WRIA 18 through 16,872 residential connections. These numbers represent 84% of the WRIA's population and existing occupied residential units (based on U.S. Census 2000 and buildout analysis described in Section 2.1.2, assuming a vacancy rate of 9.22% based on census data).

These data vary markedly from historical estimates. In 1994, the Sequim-Dungeness Regional Comprehensive Plan estimated that 58% of total residential demand is met by Group A systems, 38% by single domestic wells, and 4% by small Group B systems (the DQ Plan provides a breakout by subareas within Clallam County[13]). The share of residential demand met by single domestic wells was estimated by subtracting the Group A/B total from the census total.

Interties

The City of Port Angeles wholesales Elwha River water to the Clallam PUD via two intertie connections. Total intertie flows averaged 0.36 MGD for the period 1996-2000 (City of Port Angeles Water System Comprehensive Plan, 2001).[14] The City of Sequim has not been approached to intertie with any other public water system and is not seeking interties (pers. comm., Jim Bay, City of Sequim, January 2002).

[13]The DQ Plan provides only a "general overview" of water use in the planning region, often based on broad assumptions and rough estimating procedures.

[14]This is equivalent to about 405 AFY or about 0.56 cfs of Elwha River flow on a daily basis.

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# Class A Water Systems

This Map depicts Class "A" Water Systems and their sources. Water System service areas are shaded to show remaining development potential, and are labeled with their Public Water System ID (see table 2.3-7). Where water sources are not within the corresponding service area, or service areas are not mapped, sources are labeled in italic, with their corresponding ID.

Scale 1:62,500 (1 inch = 1 mi)

1 0 1 Miles

- Subbasins (label in box)
- $ Water Source Locations
- Highways

Class "A" Water Systems

- 0 - 20% Built out
- 20-40% Built out
- 40-60% Built out
- 60-80% Built out
- 80-100% Built out
- Tribes

N

Port Angeles

PA Harbor Small Tributaries

Dry Creek

68550

20050

Peabody Creek

Lees Creek

Strait Small Tributaries

43296

Strait Small Tributaries

36991

55990

Donald Cr

01265

McDonald Cr

02868

Irrigation Ditch

19110

81315

00302

Dry Cr

07221

Valley Creek

Tumwater Creek

Tumwater Cr

Valley Cr

02890

Peabody Cr

White Cr

43296

White Creek

Ennis Creek

Ennis Cr

Lees Cr

East Fork Lees Cr

11111

Morse Creek

Morse Cr

Frog Cr

Bagley Creek

Bagley Cr

Siebert Creek

Siebert Cr

Pederson Cr

Matriotti Creek

Irrigation Ditch

Gold Cr

McDonald Creek

07221

Little River

Little River

02632

Lk Dawn

Lake Cr

00307

Figure 2.3.2
Class A WaterSystems
in Central WRIA 18

Clallam County
Dept. of Community Development
June 2003

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# Class A Water Systems

This Map depicts Class "A" Water Systems and their sources. Water System service areas are shaded to show remaining development potential, and are labeled with their Public Water System ID (see table 2.3-7). Where water sources are not within the corresponding service area, or service areas are not mapped, sources are labeled in italic, with their corresponding ID.

Scale 1:62,500 (1 inch = 1 mi)

1 0 1 Miles

- Subbasins (label in box)
- $ Water Source Locations
- Highways

Class "A" Water Systems

- 0 - 20% Built out
- 20-40% Built out
- 40-60% Built out
- 60-80% Built out
- 80-100% Built out
- Tribes
- Outside of Planning Area

N

Inner Dungeness Bay
Strait Small Tributaries
Meadowbrook Creek
Outer Dungeness Bay
Cassalery Creek
Gierin Creek
Dungeness River
Outer Dungeness Bay
Matriotti Creek
Bell Creek
Sequim
Sequim Bay
McDonald Creek
Bear Creek
Johnson Creek
Bell Creek
Sequim Bay Small Tributaries
Chicken Coop Creek
Jimmycomelately Creek
Dean Creek
Canyon Creek

McDonald Cr
Matriotti Cr
Cassalery Cr
Gierin Cr
Dungeness River
Irrigation Ditch
Bell Cr
Gold Cr
Bear Cr
Johnson Cr
Eagle Cr
WRIA 18
WRIA 17
101

50518 33662 88130 01619 20300 50400 10774 20350 20425 25449 98182 50085 85257 06344 85260 58144 46658 03645 77620 19184 02315 25600 36754 04511 10351 06947 08166 20453 36991 55990 01265 02868 81315 19110 09155 36836 00029 29358 00307 04629 02699 05990 77620 24181 20445 54192 30976 77620Y 01990 06954

Figure 2.3.3
Class A WaterSystems
in East WRIA 18

Clallam County
Dept. of Community Development
June 2003

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## Table 2.3-7. Class A Water Systems: Connections and Sources.

page 2 of Table 2.3-7

page 3 of Table 2.3-7

page 4 of Table 2.3-7

page 5 of Table 2.3-7

**Table 2.3-8. WRIA 18 Class A and B Public Water Systems.**

| | Group A Systems | Group B Systems | Total |
|---|---|---|---|
| Number | 78 | 278 | 356 |
| Residential Population | 40,899 | 2,202 | 43,101 |
| Residential Connections | 15,997 | 875 | 16,872 |
| Average Persons per Residential Connection | 2.56 | 2.52 | 2.55 |
| Non-Residential Connections | 652 | 122 | 774 |
| Total Connections | 16,649 | 997 | 17,646 |

**Water Use Consumption Rate**

The City of Sequim Water System Comprehensive Plan (2000) reports 1.84 persons per connection, a marked drop from the 3.33 persons per connection reported in the City's 1992 Water Plan. Sequim reports 170 gallons per day (gpd) water use for single family residences and 100 gpd for multi-family connections. The City of Port Angeles Water System Comprehensive Plan (2001) does not report persons per connection, but Census (2000) data show 2.12 persons per household for the City. Port Angeles reports a 204 gpd water use for an equivalent residential unit (ERU).

According to the CCDCD, household size in unincorporated Clallam County averages 2.31 persons per household (pers. comm., Steve Gray, June 18, 2002; this number is consistent with Census 2000 data, which indicate an average population of 2.28 persons per household across all WRIA 18 subbasins). This average household size (2.31) was multiplied by an average per-person water use rate of 150 gpd (pers. comm. John Ryding, Regional Engineer, Department of Health, August 21, 2002), to arrive at an estimated water use rate of 347 gpd for rural residences. This higher rate is consistent with expected greater outdoor use of water in rural areas (e.g., lawn and garden watering, stock watering). These assumptions are consistent with those used by Thomas et al. (1999), who estimated 350 gpd per household, and 2.4 persons/household.

The MWG (1999) looked at water use by the Sunland Water District, Dungeness Heights, City of Sequim, and three areas served by the Clallam PUD (Carlsborg, Mains Farm, and Evergreen). Connections in 1996 ranged from 61 to 1,030 and water use per connection ranged from 173 gpd (Sequim) to 492 gpd (Dungeness Heights).

For the DQ Plan, water use rates were derived from data for Clallam PUD's Fairview and Carlsborg systems, the City of Sequim, and Sunland. These systems ranged from 146-224 gpd water use per household in winter, and from 285-643 gpd/household in summer. Household size in the DQ Plan ranged from 1.9 (Sunland) to 3.5 (Clallam PUD at Fairview), based on DOH records for each system.

The DQ Plan (1994) notes that summer water use increases due to residential landscape watering and other outdoor use, but does not present a peak use factor. The City of

Sequim (Gray and Osborne, Inc. 2000) reports that summer peak day production averaged 2.2 times average day consumption for the 1995-1998 period. The City of Port Angeles computed that summer maximum day demand averaged 2.39 times average day demand for the 1996-2000 period. Factors potentially accounting for variation in water use, in addition to season, include land use density (e.g., rural, suburban, urban); metering; billing rates; water system efficiency and pressure (e.g., leaks, etc.); accounting system differences; landscaping; parcel size; microclimate and soil types; household occupancy rates; and type of water fixtures and water conservation measures in place.

Unaccounted water is on the order of 30% of total City of Sequim production; in Port Angeles it has varied from 2 to 16% in the 1994-1999 period. These data suggest that water use rates might be adjusted for unaccounted water loss. However, because it was not possible to disaggregate multi-family from single family use in the GIS subbasin analysis, the higher single family consumption rate was used in analyzing Sequim water demand (a composite ERU rate was used for Port Angeles). This may partially offset any underestimation due to unaccounted water.

**Residential Water Demand**

Combining water use rates with the analysis of existing residential units and buildout potential described above, existing and projected water demand for WRIA 18 subbasins is presented in Table 2.3-9. Each subbasin was classified into one of the three water use rate categories described above (City of Sequim, City of Port Angeles, or rural), as shown in the eighth column of the table. Water demand growth rate was assumed equivalent to population growth.

Existing residential water demand by subbasin is shown in the second column, and this demand is escalated to the year 2020 in the next column (using the subbasin growth rate shown at the far right of the table). For comparison, potential demand with additional residential development (under existing zoning and land division) is shown, as is demand at the maximum buildout density (using clustering and TDRs, as described above). The number of years to reach maximum potential demand and the year in which that demand is reached are the same as shown for population growth in Table 2.2-4 (because this analysis is based on population growth).

Existing water demand, as shown in the table, is estimated to be about 4.6 MGD (million gallons per year), which equates to about 5141 AFY (acre-feet per year) or the equivalent of a 7.1 cfs instantaneous flow.[15] On an annual basis, demand is projected to increase to about 6330 AFY by 2020, and to about 14,700 AFY with buildout. Maximum buildout could reach 19,185 AFY demand. This would correspond to a demand of 8.74 cfs in 2020, 20.31 cfs with buildout, and 26.5 cfs at maximum buildout.

Groundwater Withdrawals

As noted in the analysis of water rights, groundwater is the preferred source for public water supply in WRIA 18. The DQ Plan (1994) states that almost all of Clallam County's

[15]Public water systems typically account for water in terms of million gallons; data are converted to acre-feet and to cfs (for surface diversions) or gpm (for well withdrawal) for watershed planning.

## Table 2.3-9. Municipal and Domestic Water Demand by Subbasin

public water systems use wells (totaling 165 wells for the eleven subareas in East WRIA 18). A total groundwater use of 1,045 MGY (3,207 acre-feet per year) in 1992 was estimated for the eleven planning subareas of Clallam County in East WRIA 18. The *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan Draft EIS* (November 2002, Table 4.3-6) reports a total of 812 AFY withdrawn from groundwater for public water supply in East WRIA 18, of which 42% is taken from the shallow aquifer.

The City of Sequim co-funded a water resources study (recommended by the DQ Plan) to assess the ability of deep wells at the Port Williams Wellfield to meet current and future needs. Based on the study, the City reduced the use of its Ranney System to a minimum and substantially reduced its use of the City's Silberhorn Wellfield. The City of Sequim has developed a second well at the Port Williams wellfield and has three additional wells permitted. The City's order of priority for its water sources is (1) Port Williams wellfield; (2) Silberhorn wellfield; and (3) the Dungeness River Ranney collector (a groundwater source determined not to be under the influence of surface water). Sequim may withdraw up to 1,850 acre-feet per year from any combination of its ground and surface water rights (although the Dungeness is slated to become limited to emergency backup use). Its instantaneous rights are 2,250 gpm from its Port Williams wellfield, 700 gpm from its Silberhorn wells, and 718 gpm from the Dungeness River infiltration gallery.

The City continues to operate its Dungeness River Ranney collector at a minimum level in order to maintain its system at times when its reservoirs are not full (about 200 gpm, equivalent to about a 0.5 cfs demand on the Dungeness River). The City views this source as critical for emergency supply (this source is gravity flow, and could be supplied even if power were interrupted).

Applying the Thomas et al. (1999) estimate of 6,055 acre-feet total groundwater withdrawals for 1996 in the Sequim-Dungeness area, and the reported 41% attributed to public water supply, yields a 1996 estimate of 2,482 acre-feet in public water system groundwater withdrawals.[16] Montgomery Water Group (1999) estimated groundwater withdrawal from public water supply wells based on a 1996 database obtained from the Washington Department of Health and reported water consumption from several major public supply systems. Total withdrawals from public water supply wells were estimated at 2,003 acre-feet/year. An additional 89 acre-feet/year were estimated withdrawn for golf course turf irrigation and 4 acre-feet/year for commercial and industrial operations.

Surface Water Diversions

The City of Port Angeles owns two Elwha River water rights, one of which is a permit for municipal supply (50 cfs, or 22,500 gpm). The development schedule for perfection under this permit was extended to 2020 by Ecology in 1998.

The City of Port Angeles also owns two water rights to divert from Morse Creek, totaling 20 cfs. The Port Angeles water rights were used for municipal water supply until 1977, when they were revised for hydropower use. Ecology considers the City's Morse Creek water right to be restricted to use as an emergency supply, limited to periods when water is not available in sufficient quantity from its Elwha source. From 1926 to 1977 the City withdrew

[16] This is equivalent to 2.2 MGD or 809 MGY. The equivalent instantaneous demand is 1,530 gpm.

up to 19 cfs from Morse Creek for municipal water supply. Daily stream flows (measured at the USGS gage downstream of the diversion structure) were reduced to as low as 17 cfs during the 10 years of record (1967-1976) (City of Port Angeles 1984).

Clallam County Public Utility District No. 1 owns a Morse Creek water right for 1.5 cfs. The water right is used to provide water service in the Port Angeles Composite System. The PUD withdraws 375 gpm (average, equivalent to 0.84 cfs) to 600 gpm (peak, equivalent to 1.34 cfs) from Morse Creek at its pumping station near the falls. PUD data for the Morse Creek Local Utility District (LUD) No. 1 shows a ten-year average of 10,677 thousand cubic feet (kcf) of water per year, equivalent to 245 AFY (0.34 cfs). Ten-year average use ranges from a low of 386 KCF (8.9 acre-feet) in January to a high of 1526 KCF (35 acre-feet) in August. Peak-day use draws 443 gpm, or 1.96 acre-feet per day.

The City of Sequim holds a water right to divert 1.4 cfs from the Dungeness River, with a priority date of May 24, 1924. This is the most junior of the Dungeness adjudicated water rights and is now used only as a back-up. It represents 0.27% of Dungeness water rights and 0.36% of mean Dungeness flows.

**Municipal and Domestic Water Conservation**

Successful water conservation programs use specific tools: conservation incentives, conservation measures, and conservation programs (Vickers 1997). Conservation incentives involve public education campaigns, rate strategies, and regulations that promote conservation and motivate customers to adopt specific measures. Conservation measures actually save water and involve using water more efficiently on a long-term basis.

Water conservation is generally achieved through either supply or demand management measures. Supply management measures are those taken by the utility to control leakage, loss, or other supply activities. Demand measures refer to customer or general activities which include the use of water efficient devices, rate incentives, educational programs, and various other methods used to change use patterns and control consumption within the differing classes of users. Measures may combine a mix of enforceable requirements and voluntary actions, and should include:

- Better monitoring and metering of water use
- Standards for water use (e.g., flush volumes for toilets)
- Strong incentives for efficient water use
- Water rates that encourage conservation
- Stringent leak detection and repair, as well as water audits

Appendix 2.3-D presents information on these water conservation measures. Ecology may require conservation as a condition of issuing new water rights. The Washington Department of Health administers Chapter 246-290 WAC, which requires conservation plans as part of Water System Comprehensive Plans for all new Group A water systems and for existing Group A systems that have 1,000 or more connections, that are experiencing certain problems, that are expanding, or that are in coordinated water system planning areas. Department of Health handbooks and publications provide further

guidelines and assistance for conservation. The following conservation measures are required for all public water systems regardless of size:

- Source meter installation
- Program promotion
- Leak detection and repair (if lost and unaccounted-for water exceeds 20 percent)

DOH guidelines contain other recommended conservation measures based on the number of water service connections. Sequim, Port Angeles, and the Clallam PUD No. 1 all fall into the "medium" category (systems serving between 1,000 and 25,000 connections). For these systems, DOH recommends the following additional conservation program measures:

- Purveyor assistance
- Customer assistance
- Consumption history shown on the water bill
- Service meters
- Water Conservation kits
- Nursery/agriculture/landscape management
- Conservation pricing

A joint Washington Departments of Health and Ecology list of municipal conservation projects (March 2000) listed several targets in the Dungeness area:

- The City of Sequim was in the process of updating its Water System Conservation Plan (since completed) and an enhanced conservation plan was expected (see discussion below).
- The Sunland water system plan was not current, and Health/Ecology noted that a conservation program should be developed in conjunction with the Sunland reuse project (described below).
- The Dungeness Bay and Bridgeview community (Group B) systems were noted for high water use. Dungeness Bay reportedly peaked at more than 900 gpd (presumably per residence) during the summer, and Bridgeview was also "very high" in the summer. No conservation incentives or meters existed at Dungeness Bay, and while Bridgeview had meters, they did not bill based on usage. Both communities were targeted for implementation of an enhanced conservation program.

City of Sequim

The City of Sequim water right permit for its new Port Williams well field is conditioned on implementation of the City's 1995 conservation plan. That plan set a 20-year conservation goal of 15% reduction in average yearly demand and a 20 percent reduction in peak day demand. The City's Comprehensive Water System Plan (2000) conservation program states that meeting these goals would result in an average water use of 168 gpcd (gallons per capita day) and a peak water use of 360 gpcd. Citing data from 1997-1998, the City's

2000 Water System Comprehensive Plan indicated that these goals had not yet been met. The Sequim water conservation program includes the following:

- *Source meter and service installation:* Source meters are installed on all City water sources, and service meters are installed for all customers except several recreational connections (e.g., Carrie Blake Park). The City expects to convert a large portion of its currently unmetered water use to reclaimed water.
- *Program promotion:* The City has an ongoing conservation education program. The City has used a postcard billing format, but will convert to envelopes for mailing bills and will include conservation brochures at that time. The planned water audit program is deferred while staff concentrate on the program to reduce unaccounted water.
- *Leak detection and repair:* A leak detection survey was scheduled for 2000.
- *Consumption history shown on the water bill:* This program element is not currently implemented. The City plans to purchase a software package which prints consumption history "the next time they update their billing software."
- *Water Conservation kits:* The City does not intend to distribute kits via mail at this time, but may reconsider after rate increases take effect and water use patterns have been monitored.
- *Low flow fixture conversion:* This program also has not been implemented, and the City intends to monitor reductions in water consumption resulting from leak detection and water rate structure changes before pursuing any City-funded retrofit of fixtures.
- *Conservation pricing:* The City's Utility Rate Task Force Committee is reviewing the City's water rate structure. The current rate structure is an inclined block rate (higher rates apply after 400 cf of use). A seasonal water rate has not been adopted, as the inclined block rate is believed to stimulate conservation.

According to the Sequim Public Works Director, the City's conservation program has resulted in an approximately 40% reduction in per capita water use since the 1980s (Jim Bay, pers. Comm.., February 2002). He states that, over the past 20 years, City water use per capita has dropped from 280 gpcd to less than 170 gpcd (apparently achieving the goal set forth in the City's Water System Plan), and that this compares favorably with other municipalities in similar climates. The Sequim City Council is empowered to implement mandatory restrictions during shortages or for health or environmental reasons. This was last done during a 1994 water shortage. The City requires water conservation on all new construction, remodel, and plumbing permits. Commercial uses also are required to meet the conservation requirements recommended in the DQ Plan.

City of Port Angeles

The City of Port Angeles has focused conservation efforts and funding on measures that result in the greatest water savings per dollar. The City has placed special emphasis on its leak detection and repair program (Water System Comprehensive Plan 2001). The City's goal is to achieve a 10% reduction in both average and maximum day demand over its 20-year planning horizon.

The Port Angeles water conservation program includes the following:

- *Source meter and service installation:* The City meters its Elwha Ranney collector supply. Nearly all City customers are metered, and meters are annually tested and replaced as needed.
- *Program promotion:* The City has handouts and brochures available at City Hall, at the annual Home Show, and at the annual county fair.
- *Leak detection and repair:* The City has emphasized this program. A contractor repairs 20 miles of pipeline per year.
- *Consumption history shown on the water bill:* City water bills show the previous year's consumption for the same month.
- *Water Conservation kits:* The City provides free low-flow shower heads and faucets, as well as toilet bags.
- *Conservation pricing:* The City's rate structure is a flat rate and is not seasonally adjusted. This replaced a previous declining scale rate structure.
- *Technical assistance:* The City assists customers and the PUD on an as-needed, request basis.
- *Nursery/Agriculture/Landscape management:* The water superintendent visits nurseries annually. The City minimizes public lawn watering and leaves the grass relatively long.
- *Water Shortage Response Plan:* The City has developed a Plan to coordinate the City's response to times of short water supply. The Plan includes five stages (and triggers):
    - Stage I: Internal preparations (a water shortage is anticipated but not imminent)
    - Stage II: Voluntary conservation (immediate voluntary reductions in consumption are needed)
    - Stage III: Outdoor restrictions including every-other-day sprinkling (water supplies are critically impacted and demand must be reduced)
    - Stage IV: Mandatory outdoor restrictions and indoor conservation (emergency conditions exist where maximum flow reduction is immediately required; only essential water uses are allowed; lawn watering is not allowed)
    - Stage V: Water rationing (a regional disaster is declared and water rationing is implemented; emergency water distribution may be needed)

The City's Plan includes implementation strategies, public information plans, engineering response, and follow-up actions and identifies Plan teams and targets. The City developed the Plan with the Lower Elwha Tribe, particularly with regard to "fish triggers" defined by snowpack conditions and Elwha River flows, as follows:

- Stage I triggered by snowpack at 50% of average in April
- Stage II triggered by snowpack at 80% of average in May or June, or flows of 500 cfs or lower at the McDonald bridge gage
- Stage III triggered by flows of 400 cfs or lower at the McDonald bridge gage
- Stage IV triggered by flows of 300 cfs or lower at the McDonald bridge gage

- Stage V triggered by flows of 200 cfs or lower at the McDonald bridge gage

Clallam PUD No. 1

Clallam PUD owns and operates five small water systems and one medium-sized system following the DOH conservation planning requirements. Clallam PUD established its water conservation program in 1994 for all its systems and estimates that it has reduced system demand by about 5% to date. It expects to maintain this reduction in water demand, but does not forecast any additional reductions.

The Clallam PUD water conservation plan includes the following:

- Public education and awareness (including consumption history in water bills; actively publicizing the need for water conservation, especially in times of peak demand using bill inserts, an information line, and media announcements; and public appearances at community events and schools by three fulltime staff dedicated to energy and water conservation).
- Provision and promotion of water efficient devices and appliances (including rebates on purchases of low-water-use plumbing and appliances [washers, dishwashers, water heaters]; installation services; indoor plumbing replacement program; water conserving devices for sale at PUD offices [low-flow showerheads, faucet aerators, nozzles, and water measurement devices]).
- Monitoring of non-revenue water (including leak detection, metering of all sources and connections, inspection and maintenance of service meters).
- Conservation rate structure (this would include winter-summer differential pricing and inclining block charges). This rate structure is not in place, but is periodically reviewed as an option by the PUD Board of Commissioners.
- Water shortage response plan (defined by four increasingly stringent stages of controls, beginning with voluntary conservation and moving through outdoor restrictions, mandatory outdoor restrictions and indoor conservation, and water rationing).

Drought Response

While water conservation reflects long-term sustained reduction in the supply and demand patterns for the water utility (EES 1991), water curtailment reflects a temporary reduction either in the supply or use of water, generally occurring during a severe drought or under some form of resource or facility emergency. Typically, these reductions disappear after the drought or emergency is over. Water utilities in areas of similar aridity to East WRIA 18 around the West have adopted drought management plans for cutback in water supply during a series of dry years. East Bay Municipal Utility District (EBMUD)[17] provides a good example, with average precipitation of 20 to 25 inches/year. EBMUD provides for staged district-wide (averaged across all customer classes) drought reductions of 10, 15, and 25% in water delivery. Based on Board decision-making, the drought management plan guides increasing reductions over extended periods of drought.

[17]EBMUD serves the Oakland area, east of San Francisco Bay, California. This area has an aridity comparable to the Sequim-Dungeness plain.

### Commercial and Industrial Water Use

Commercial and industrial (C&I) water demand was estimated by a combination of data from Water System Comprehensive Plans and GIS analysis. Table 2.3-10 presents C&I buildout potential by subbasin and projected water demand.

The water consumption of commercial and industrial facilities depends far more on the type of facility, the number of employees, and the square footage of the plant than the raw number of parcels that may be developed. Commercial and Industrial water use reported in the City of Sequim and City of Port Angeles Water System Comprehensive Plans was used to generate average use per C&I connection (Table 2.3-10). The City of Sequim rate (877 gpd per C&I connection) was also used for unincorporated Clallam County. The City of Port Angeles rate (1425 gpd per C&I connection) did not include the City's largest customers in the calculation of an average rate, as incorporating this data could overstate the average C&I connection water use rate. The Nippon paper mill, which uses 8.5 to 9.5 MGD (with short term spikes to 12 MGD) was added to the calculated totals, in the Elwha River subbasin. Based on these C&I water use rates and GIS analysis of the distribution of existing and potential C&I parcels by subbasin, existing C&I water demand is estimated at about 4062 MGY (equivalent to 12,466 AFY or 17.22 cfs).

Overall economic growth rates may be the most useful proxy for estimating the rate of increase in commercial water consumption. An annual economic growth rate of 0.5% per year was used, based on a 30-year trend (pers. comm., Mona Gates, Clallam County Economic Development Council, December 12, 2002). Based on this growth rate, C&I water demand in the year 2020 is estimated at about 4444 MGY (equivalent to 13637 AFY or 18.84 cfs).

For the full-buildout C&I scenario, the GIS analysis of undeveloped C&I parcels by subbasins was used for all subbasins except the Elwha River. For the Elwha, full buildout assumes use of the Port Angeles industrial water right to its full capacity (100 cfs, assuming that the additional 50 cfs now allocated to fisheries purpose under the right is not converted back to a commercial/industrial purpose). At full buildout, estimated C&I water demand would reach about 24,876 MGY (equivalent to 76,341 AFY or 105.45 cfs).

### Groundwater Withdrawals and Surface Water Diversions

In general, commercial and industrial use served by public water systems is served by the same water rights as are described above. One notable exception is an Elwha River water right owned by the City of Port Angeles with an industrial (manufacturing) purpose. This right was for 150 cfs, but in 1974 a change-of-use permit was granted for 50 cfs of the water right for use by the Washington Department of Fisheries for fish rearing. The City first diverted water in 1927 to supply two pulp and paper mills; it is considered a municipal water right by Ecology and is not subject to relinquishment for nonuse (City of Port Angeles Water System Comprehensive Plan, 2001). The *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan Draft EIS* (November 2002, Table 4.3-6) reports a total of 4.25 AFY withdrawn from groundwater for industrial water supply in East WRIA 18, all of which is taken from the shallow aquifer.

## Table 2.3-10. Commercial and Industrial Water Demand by Subbasin.

### Agricultural Water Use

The *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan Draft EIS* (November 2002, Table 4.3-6) reports a total of 294 AFY withdrawn from groundwater for agricultural water supply in East WRIA 18, of which 68% is taken from the shallow aquifer. An additional 88 AFY is withdrawn for golf course irrigation.

### Sequim-Dungeness Valley Agricultural Water Users Association

The Sequim-Dungeness area has been irrigated extensively with Dungeness River water since about 1895 (the oldest of the priority dates for the agricultural water rights). Nine irrigation companies and districts were established between 1895 and 1921: the Agnew, Clallam, Cline, Dungeness Company, Dungeness District, Eureka, Highland, Independent, and Sequim Prairie. The irrigation districts are quasi-municipal entities organized under Chapter 87 RCW; the companies are owned by private shareholders. Water is diverted at five locations on the Dungeness River (see KCM 1990: Table 3.6 for exact locations and Lichatowich 1993b: Figure 3 for a map), and conveyed for irrigation, as well as for stock watering, fire protection, and domestic use. In addition to their Dungeness River water rights, WUA members hold certificates to 10.0 cfs on Hurd Creek and 5.0 cfs on McDonald Creek. Of 769 turnouts served by the irrigation companies and districts, 527 (69%) are for domestic irrigation, 210 (27%) are for agriculture, and 32 (4%) are for stock watering. Figure 2.3-4 shows the location and boundaries of these irrigation districts and companies, as of 1998.

Members of the Water Users Association maintain an extensive system of ditches, including about 173 miles of canals, laterals, and tailwaters (Montgomery Water Group 1999). An additional 150 miles of conveyance run from delivery points to end users (Mike Jeldness pers. comm., November 5, 1999). All irrigation canals are gravity fed; a few piped laterals are pressurized. Unused water is discharged as tailwater. Montgomery calculated that tailwater amounted to 15% of diversions during peak irrigation times (July and August) but increased to as much as 25% during lower demand periods (May, June, and September). While irrigated acreage has declined since its peak, most of the irrigation ditches remain in use.

The irrigation season in the Dungeness River Basin and East WRIA 18 is considered to run from April 15 to September 15 (153 days), although irrigation diversions may continue into October with permission from Ecology. Under average climate and soil conditions, the irrigation season runs 138 days, as irrigation water is not generally needed until May (Montgomery Water Group 1999).

Table 4-4 and Appendix B-7 of the Comprehensive Water Conservation Plan (Montgomery Water Group 1999) contains monthly crop irrigation requirements based on climate data for Sequim, for hay/alfalfa, pasture/turf, orchard with cover (apples), spring grain (barley and oats), and strawberries. Total irrigation season water requirements for these crops range from 2.35 inches for strawberries to 17.25 inches for apples (with cover). The PCHB (1999) undertakes a detailed historical analysis of water duty. The DQ Plan (1994) demonstrated that irrigators were actually diverting 5.1 acre-feet per acre, rather than the 6.0 acre-feet used in the 1924 decree. Ecology concluded that although

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**Figure 2.3-4. Sequim-Dungeness Irrigation Districts and Companies (East WRIA 18)**

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historic water use amounted to 5.1 acre-feet per acre, this did not represent “reasonably efficient” practice. The agency determined that reasonable efficiency for the then-existing WUA water system would be achieved if 55% of water diverted reached the crops.

Table 2.3-11 presents an estimated summer irrigation water budget for the Water Users Association, comparing estimates by Thomas et al. (1999) and Montgomery Water Group (1999). The most notable difference between these two irrigation water budgets lies in the allocation of losses to either conveyance or to on-farm losses (percolation of unconsumed irrigation water). However, the sum of these irrigation water losses is similar between the two (35.0 cfs versus 37.5 cfs), so actual irrigation recharge estimates do not differ greatly.

**Table 2.3-11. Estimated Annual WUA Irrigation Water Budget**

| | Thomas et al. (1999) 1995-1997 | Montgomery Water Group (1999) 1996 |
|---|---|---|
| Total diversions | 74.4 | 75.2 |
| Tailwater and spill losses | 15.3 | 15.2 |
| Net water supplied | 59.1 | 57.8 |
| Conveyance loss | 30.0 | 23.7 |
| Crop irrigation | 24.1 | 25.5 |
| On-farm loss (percolation of unconsumed water) | 5.0 | 13.8 |

Notes:

1. Thomas et al. 1999 averaged 1996 and 1997 irrigation seasons. Montgomery Water Group data are for 1996 season.

2. Crop irrigation derived from Thomas et al. data by subtracting percolation from water applied to fields.

3. Tailwater losses, water supplied, and conveyance losses were unavailable for Eureka and Independent Irrigation Companies for July 1996; the values in the table are calculated from data in Montgomery Water Group 1999 for the other 7 irrigation districts and companies.

Table 2.3-12 summarizes irrigation water rights and current water use. Certificates held by WUA members are summarized in Montgomery Water Group (1999:Table 4-1). Based on the tentative determination of irrigation water rights under the Trust Water Rights MOU discussed above, irrigation water rights held by the WUA have been tentatively determined to be 156 cfs instantaneous and 29,250 acre-feet per year for the purpose of irrigation between April 15 and September 15 and for application to a total of 7,000 acres within the boundaries of the WUA member’s water rights. As WUA members continue to reduce their water use, this will be reflected in future additions to the trust water right and through superseding certificates.

**Table 2.3-12. WUA Water Rights and Current Use**

| Watershed | WATER RIGHTS | | | CURRENT WATER DEMAND | | |
|---|---|---|---|---|---|---|
| | Instantaneous Diversion (cfs) | Annual Amount (ac-ft/year) | Acres Irrigated | Existing Acres Under Agricultural Assessment (2000) | Water Duty (ac-ft per acre) | 2001 Water Demand (ac-ft) |
| Dungeness River | 156 | 29,250 | 7000 | 5025 | 2.75 | 13,819 |
| Hurd Creek | 10 | 0 | 500* | 0 | 2.75 | 0 |
| McDonald Creek | 5 | 0 | 250* | 0 | 2.75 | 0 |
| TOTAL | 171 | 29,250 | 7,750 | 5,025 | 8.25 | 13,819 |

*Note: It is assumed that although Hurd Creek and McDonald Creek are not brought specifically within the Dungeness River adjudication, the WUA will not use these rights to irrigate any of their allowed acreage.

The total annual water use reported by the WUA for 2001 (16,913 ac-ft) is greater than the quantity shown in the table (13,819 ac-ft) because the WUA report includes service to both agricultural purposes and domestic purposes. This table includes only the agricultural water use by the WUA. Domestic use is reported in Table 2.3-9. The agricultural irrigated acreage reported by the WUA includes water delivered to irrigate recreational facilities (e.g., golf courses). The share of WUA 2001 diversions allocated to agricultural use amounts to a seasonal average flow of 46.04 cfs.

Although it appears to be the intent that the Trust Water Agreement establish the total irrigated acreage to be served by the WUA, it does not explicitly include the Hurd Creek or McDonald Creek water rights owned by WUA member companies and districts (Agnew and Dungeness irrigation districts). This analysis assumes that the Trust Water Agreement sets an upper limit on the total WUA irrigated acreage, and that no further acres will be irrigated from the Hurd Creek or McDonald Creek water rights beyond the total specified.

In reviewing the 1924 adjudication decree, the PCHB (1999) states that there never were 26,000 acres under irrigation in the Dungeness. The Referee's Report acknowledges that only 8,830 acres were actually under irrigation.[18] The status of the remaining acres was "inchoate." PCHB thought that the Superior Court may have adopted acres that irrigators "intended to irrigate" due to an acute shortage of dynamite for land clearing during the 1920s. Regardless, the MOU states that even less acreage was irrigated, setting the historic maximum irrigated acreage for the WUA at 7,000 acres. This reduces the acreage recognized for irrigation under the adjudicated water rights to 7000 acres (PCHB 1999 provides detail as to how this number was estimated). An appeal of the MOU by the Okanogan Wilderness League (OWL) contending that the irrigation land limit should be 5,200 acres was rejected by the PCHB.

The WUA (1999f) 1996/1999 irrigated land report shows that over the three years reported, total agricultural irrigated land among the seven members of the WUA dropped by 7% (from 5,400 acres to 5,025 acres), while irrigation of domestic lands increased 35 percent (from 527 acres to 713 acres). Thus the overall decrease of a little more than 3 percent in irrigated lands from 1996 to 1999 masks a deeper dynamic. Montgomery Water

[18] An estimated maximum of 14,000 acres were historically irrigated, either directly or by subirrigation (Cynthia Nelson, pers. comm. February 2001).

Group (1999) also reviews trends in conversion of agricultural land to residential use, concluding that a decrease in total irrigated area may result, together with a change in timing of use (with less predictability in urban lawn irrigation). These trends reflect land use change generally in the region and, more fundamentally, the economic pressures driving those changes.

### Other Agricultural Water Use

The *Report of the 2001 Clallam County Agricultural Lands Advisory Committee* documents a decades-long decline in County agricultural land. Since 1950, farms and farmland acreage have declined by 70%. Including WUA irrigated acreage, a total of approximately 18,900 acres of farmland is estimated to remain in WRIA 18. According to Clallam County GIS data, 13,886 acres remain in the County that are assessed for agricultural use and that are also outside WUA boundaries (or if inside boundaries, are in excess of the total served by the WUA).

Table 2.3-13 presents projected current and future water demand, by subbasin, for non-WUA agriculture in WRIA 18. No good source of data has been identified to estimate what portion of WRIA 18 non-WUA lands under agricultural assessment is actually irrigated. Most agricultural land use outside of the WUA is for small livestock and grazing pasture. Irrigation of these lands is believed to be very minimal (pers. comm. Joe Holtrop, Clallam Conservation District, Dec 12, 2002). In order to project water use, it is conservatively estimated that 10% of non-WUA-served acres under assessment are actually irrigated, although this very likely overstates actual irrigation. No water conservation is forecast to occur for this category of land use (although this could change in the future). Under these assumptions, estimated current water demand for non-WUA agricultural purposes is minimal, totaling 1115 AFY (equivalent to 0.5 cfs for a year or 1.35 cfs over the irrigation season) for the entire WRIA. Assuming that land conversion continues at the 1.3% per year rate that has characterized the past 40 years, water demand for this category of use in the year 2020 would drop to 881 AFY (0.4 cfs).

Total irrigation use based on water claims could be considerable if claims were accurate reflections of actual use. For example, in Morse Creek, claims amount to 7.465 cfs of flow, 837.8 AFY of surface water rights and 1,553.651 AFY of groundwater rights.

### Agricultural Water Conservation

Agricultural water conservation is critical to closing the gap between consumptive water use and environmental needs identified in the 1994 DQ Plan. Figure 2.3-5 compares water withdrawals from the Dungeness River in the month of September for the years 1987 and 1998, showing savings from the water conservation program. The WUA and Tribe have pursued a cooperative program of water infrastructure improvements for more than ten years. In 1999 the Tribe and WUA were jointly honored with national and state awards for sustainability and environmental excellence in recognition of these efforts.

#### Comprehensive Water Conservation Plan

Fulfilling agreements under the Trust Water Agreement and commitments made in the DQ Plan, the WUA completed a three-and-one-half year effort to develop a Comprehensive Water Conservation Plan (Montgomery Water Group 1999) and initiated the conservation

## Table 2.3-13. Current and Future Water Demand for WRIA 18 Non-WUA Agricultural Land.

Figure 2.3-5. Comparison of Water Withdrawals from Dungeness River in September 1987 and September 1998; Estimated Savings from Proposed Water Conservation Project.

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program it described. The Plan provides preliminary engineering and cost for a variety of recommended infrastructure and management improvements to conserve 28 to 33 cfs during periods of low streamflows. Recent improvements included:

- Extensive pipeline work, including replacement of high-loss open ditch laterals and in-creek conveyances; replacing leaky lengths of pipe in conjunction with road and other construction projects; new pipe installation; and slip-lining badly leaking siphons. These projects both eliminated tailwater (in some situations) and conveyance losses.
- Replacement of an antiquated and leaky three-way diversion structure on the Dungeness River.
- Water conservation public education program resulting in lining, reducing or eliminating irrigation ponds.
- Reducing evapotranspiration by elimination of deciduous vegetation on ditch banks.
- Employment of a Water Users Association Coordinator for water management of all diversions by all member districts and companies.

The Comprehensive Water Conservation Plan provides preliminary engineering and cost estimates for a variety of recommended infrastructure and management improvements to conserve a further 28 to 33 cfs during periods of low streamflows. Many of the structural improvements recommended in the Comprehensive Water Conservation Plan have been implemented. They include:

- Replacing existing open ditches with pipelines to reduce seepage losses;
- Combining canal systems to reduce seepage losses;
- Abandoning reaches of the existing canal and replacing the water supply with ground water;
- Constructing re-regulating reservoirs either on-farm or in-line to reduce tailwater losses and better regulate river diversions;
- Constructing additional measuring weirs and control boxes to control flow throughout the system; and
- Investigating use of treated wastewater from the City of Sequim to replace water diverted from the Dungeness River.
- Non-structural improvements were also recommended. These consist of changes to system operations and maintenance, including:
- Combining irrigation districts and companies to provide a larger rate base and improve maintenance and operations (underway);
- Implementing a drought response plan for water-short periods;
- Improving maintenance on existing open canals by removing brush and trees;
- Expanding the existing program of water measurement by requiring metering or flow control;

- Designating individuals from each of the irrigation districts and companies to coordinate water conservation activities.

Even as the WUA Comprehensive Water Conservation Plan was being developed, a number of its recommendations were implemented by the WUA, Jamestown S'Klallam Tribe, City of Sequim, Clallam County, Department of Ecology, Clallam County Conservation District, Natural Resources Conservation Service and others. These included:

- Began to address the goal of pipelining 69 miles of the remaining 138 miles of open ditch.
- Under funding by the Clallam County office of the Washington State University Cooperative Extension Sustainable Farming Program, the WUA developed a three-hour class on irrigation best management practices, delivered first in fall 1999.
- For communication, education, and data management, the WUA invested in a state-of-the-art data processing system, allowing Internet access to streamflow and snowpack data, among other advantages. WUA is also participating in the SNOTEL program. These data capabilities will be used to predict drought, forecast streamflows, and plan crops and irrigation.
- Three members' districts have consolidated operations and maintenance, and further options for structural, organizational, and financial consolidation are under review.
- A drought response plan was developed and adopted, including an educational element to improve water user awareness of the need to conserve water.
- Weirs and control structures were constructed for more accurate measurement of water diversions and distribution of water. A Referendum 38 grant was obtained to construct real-time monitoring stations at each of the five outtakes on the Dungeness River, with an estimated on-line date of 2000.

Agricultural Water Use Efficiency

Water use efficiency is estimated in some detail in the Comprehensive Water Conservation Plan (Montgomery Water Group 1999). A water application efficiency of 65% is assumed, based on efficiencies listed in the State Irrigation Guide for the type of system in predominant use (hand lines or large gun-type sprinkler systems). Water conveyance efficiencies are calculated for each of the WUA member irrigation districts and companies. Conveyance efficiencies aggregated for all WUA members ranged from 52- to 77% by month. The Comprehensive Water Conservation Plan reports an "overall efficiency" which includes inefficiencies in on-farm losses as a component of the productive use of water. Efficiency calculated as actual crop irrigation requirements divided by total diversions ranged from 17% to 45% by month for the 1996-1997 study period, and averaged 34% for the agricultural water system as a whole.

Reasonable efficiency for agricultural water use, as defined in State regulation, is based on the condition and capabilities of an existing water system. At the time the WUA initiated the Comprehensive Water Conservation Plan, the water conveyance system was 70 to 100 years old and most of the system was in open, unlined ditches fanning out from the

river for hundreds of miles. Maintenance has been historically poor and major sections of the water system require repairs. WUA members primarily irrigate their farms with non-mechanized hand-lines and wheel sprinklers, rather than modern drip, trickle, or microspray systems (PCHB 1999). Considering these system limitations, Ecology considered 4.5 acre-feet per acre to be "reasonably efficient" water use and held that the difference between that amount and the amount historically used (5.1 acre-feet/acre) had not been beneficially used.

Applying Ecology's 4.5 acre-feet per acre water duty to the 1999 WUA irrigated acreage, would allow a use under "reasonable efficiency" of 22,612.5 acre-feet. Actual use during 2001 represents a 25% improvement over and above the level considered "reasonably efficient" under the then-existing WUA system.

Thomas et al. (1999) also provide data from which efficiency may be calculated. Efficiency of water delivered to the farm for the two 1996-1997 water years was 39% (29.1 cfs water applied divided by 74.4 cfs water diverted). The amount of water applied by different irrigation companies and districts ranged widely, from 6.3 inches to 53.4 inches[19], suggesting that there may significant variation in efficiency within the overall irrigation system (or differences due to microclimates and soils). Total percolation of unconsumed water was 5.0 cfs (slightly less for "irrigated areas"), and ranged from 0.1 inches to 34.6 inches for the irrigated areas. Subtracting this from water applied to fields would lower overall efficiency even further (including both water system and on-farm water use) in the 1996 and 1997 irrigation seasons. Thomas et al. data show efficiency varying from 17- to 39% for the eight irrigation companies or districts, which agrees well with the 17- to 45% calculated by Montgomery Water Group (Eureka and Independent were combined in the Thomas et al. analysis). Average efficiency is 32% for all of the irrigation districts and companies combined. (It is important to note that these efficiencies do not allow for any reasonable conveyance loss or on-farm water loss.)

Drought Response

The WUA (1999) has developed a priority-of-use list as part of an overall drought response plan. This plan responds to a DQ Plan recommendation, anticipating critically low streamflows in the Dungeness River, and complies with their Comprehensive Water Conservation Plan. Cuts will be requested in the following order in the event of drought:

- Filling ponds used as irrigation reservoirs
- Decorative landscaping, lawns, and gardens
- Home fruit and vegetable gardens that could be adequately watered from wells
- Recreational use (turf irrigation for golf courses, ball fields, etc.)
- Rationing of general agricultural water providing primary or secondary income

During the summer 2001 drought, flows were anticipated to be even lower than normal in late season, and Ecology worked with the Water Users Association in the Dungeness watershed to reduce demand on the river. Irrigators agreed to participate in late-season drought water leases that removed approximately 20% of their commercially irrigated acreage from production between August 1, 2001 and September 15th (the end of the

[19] "Inches per cell" are reported by Thomas et al., relating to the deep percolation model they developed.

irrigation season). Irrigation continued through July, and instream flows were augmented by leased water from August 1 on, when Chinook, pink, and chum salmon return to spawn. Water that would have irrigated over 1,000 acres was committed to the temporary trust program.

This leased water came *in addition to* commitments already made under the 1998 Trust Water Right MOU between the Water Users Association members and Ecology (described above). In that agreement, the irrigators had committed to divert not more than half the flow of the river. For the summer 2001 water leasing program, Ecology and the on-farm crop irrigation demand. measured leased water using Actual instream flow benefits to the river may have been two or three times more than calculated, due to forgone conveyance losses.

**Surface Water Diversions**

Prior to the agreement to divert no more than half the flow of the Dungeness River, the region's nine irrigation districts and companies had diverted fully 80% of the river flow at critical times (Wampler and Hiss 1991, PCHB 1999). Under the Trust Water Agreement (discussed above), the irrigators collectively limited themselves to a maximum instantaneous diversion rate of 156 cfs (a rate which may be taken only if collective diversions meet the "50% of flow" test). In addition, irrigators also divert from McDonald Creek (Thomas et al. 1999 estimated an average diversion of about 5.0 cfs in the 1996 and 1997 irrigation seasons).

Based on data analyzed for the Trust Water Right MOU, annual season diversions prior to 1990 averaged 109.2 cfs, with a maximum rate of 156 cfs. However, irrigation withdrawals have fallen to levels considerably less than this amount (Table 2.3-14).[20]

**Table 2.3-14. Recent WUA Dungeness River Diversions *(Source: WUA Annual Reports)***

| Year | Average Diversion Rate (cfs) | Irrigation Volume (acre-feet) (April 15 to September 15) |
|---|---|---|
| 1999 | 55.83 | 16,940 |
| 2000 | 52.65 | 15,952 |
| 2001 | 56.35 | 16,913 |

Decreased diversions are attributable to improvements in management and infrastructure (see discussion of conservation measures below). Agricultural diversions during 2001 ranged from lows of 12.10 and 11.88 cfs in late season for stockwatering only (September

[20]Data for 2002 is provisional (not ready for publication) because the water measuring system was rebuilt in that year. Additional historical data is contained in appendices B-1 through B-4 of the Comprehensive Water Conservation Plan (Montgomery Water Group 1999), which contain historic ditch flow measurements (1978-1997), summary monthly outtakes (1996-1997), USGS gage information for ditch flows by irrigation district or company, and average monthly flow in selected ditch reaches for the combined 1996-1997 irrigation seasons.

18 and October 17, respectively) to a peak on July 26 (78.38 cfs), when the river ran at 211 cfs. The diversion at peak amounted to 37.15% of flow and this was the largest percentage diversion during the irrigation season. However this was a year of record drought. Normally, irrigation diversions are largest in proportion to streamflow in fall. In 1999, for example, peak diversions occurred in June and amounted to only 3.5% of Dungeness flow at the time, while September 1999 withdrawals diverted 19.7% of river flow. In 2001, late season diversions were curtailed by a water lease program, and were as low as 12%of river flow (August 22, 2001). Tailwater fluctuated between 2.82 cfs (October 16) and 17.86 cfs (July 3) during 1999, and from 0.68 cfs (September 18) and 8.16 cfs (July 5) in 2001 (WUA 1999b,c,d, 2001).[21]

A near-linear reduction in annual diversions appears in the WUA records of Dungeness River agricultural water use from 1979 to 2000 (WUA 1999e) (Figure 2.3-6). In 1979, diversions just topped 40,000 acre-feet for the year and, according to data presented in the MOU, annual diversions prior to 1990 averaged 33,139 acre-feet over the irrigation season. However, in 2000 they were less than half the 1979 volume. These reductions reflect a long-term commitment to water conservation improvements (see discussion below).

The Agnew Irrigation District owns a 5 cfs water right on McDonald Creek, conveys Dungeness River water through McDonald Creek, and may divert up to about 4 cfs from the creek using existing infrastructure. However, much of that diversion represents retrieval of Dungeness River water delivered to McDonald Creek upstream. As noted above, it is not assumed that additional acres are irrigated from McDonald Creek water beyond those addressed by the Trust Water Agreement.

The Dungeness Irrigation District owns a 10 cfs water right on Hurd Creek. Hurd Creek's flow at the diversion point has decreased substantially since flood irrigation has ceased. A very minimal diversion continues from Hurd Creek, but is not measured.

### Groundwater Withdrawals

In addition to surface water diversions, a small amount of groundwater is used for agriculture in East WRIA 18. Montgomery Water Group (1999) estimates that in 1996, 159 acre-feet were withdrawn for irrigation and 100 acre-feet for dairy operations.

## Fish Propagation

### Elwha River

The Washington Department of Fish and Wildlife (WDFW) and the Lower Elwha Tribe each operate a hatchery on the Elwha River. Figure 2.3-7 shows the Elwha River hatchery water budget over the course of the year. Total demands are projected to be consistently at 26.35 cfs for a range of programs (captive broodstock, yearling, zero-age, fry, and smolt). However, recent communication indicates that this number could increase to as much as 44 cfs (Brian Winter, pers. comm. April 15, 2003).

[21] Appendix B-5 of the Comprehensive Water Conservation Plan (Montgomery Water Group 1999) describes the locations of tailwater measurement sites and Appendix B-6 contains data on tailwater flows (1996-1997 irrigation seasons).

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Figure 2.3-6. Dungeness River Agricultural Water Users Association: Average Annual Diversion Rates 1979-2000.

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Figure 2.3-7. Washington State Department of Fish and Wildlife Elwha River Fish Hatchery Water Budget.

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Figure 2.3-8. Lower Elwha Klallam Tribe Elwha River Fish Hatchery Water Budget.

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The Lower Elwha Klallam Tribe reports that the Lower Elwha Fish Hatchery currently uses 4 to 11 cfs from the Elwha River (see Figure 2.3-8), but plans to increase use to 28 cfs, plus an additional 3.2 MGD of groundwater, after the Elwha River dams are removed (Larry Ward, pers. comm. January 8, 2003).

The combined Elwha River fish hatchery water use could range from 50 to 72 cfs (the lower limit being the volume that the City of Port Angeles has committed to supply to hatchery use from its Elwha River water rights) (Brian Winter, pers. comm. April 15, 2003).

**Morse Creek**

A total of 1.75 cfs and 52 AFY of surface water rights on Morse Creek have fish propagation purposes (primarily for a private trout pond). Figure 2.3-9 shows the WDFW Morse Creek water budget for yearlings and fingerlings. The demand varies by month, peaking at 15 cfs in November, and is 9.19 to 10.19 cfs during the low flow months of September and October.

**Dungeness River and Tributaries**

The Washington Department of Fish and Wildlife (WDFW) owns two hatcheries on the Dungeness River system. Surface water rights (for nonconsumptive water use) for the Dungeness Hatchery include 40 cfs from the Dungeness River (30 cfs taken at the upper Agnew Ditch and 10 cfs taken at the lower Agnew Ditch) and 8.5 cfs from Canyon Creek. This hatchery is entirely supplied from surface water, but the Hurd Creek Hatchery is largely supplied from groundwater (using a 1390 gpm groundwater right from five wells on hatchery grounds). (The Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan Draft EIS (November 2002, Table 4.3-6) reports 1620 AFY are withdrawn from groundwater for the Hurd Creek Hatchery, all of which is taken from the shallow aquifer.) Although the State holds a 3.33 cfs water right from Hurd Creek, the dependable flow from the creek has deteriorated to the point that only approximately 2 cfs is now available to the hatchery.

The DQ Plan reports that the 1992-1993 water use for the hatcheries at Upper Dungeness and Hurd Creek amounted to 3,420 MGY (10,496 ac-ft) and 955 MGY (2,931 ac-ft), respectively. This was equivalent to sustained surface water diversions of 14.5 cfs for the Upper Dungeness Hatchery and 4.0 cfs for the Hurd Creek Hatchery, respectively. Currently, WDFW reports that water needs for the Dungeness Hatchery vary significantly from month to month, depending upon the particular fishery programs in operation. Demands range from a low of about 13.55 cfs in September to a high of 19 cfs in April for such purposes as fish rearing, smolt bypass, incubation, blow off, and freeze/flood protection (see Figure 2.3-10). This water may be diverted from the Dungeness River under existing water rights; however the fish hatchery also diverts from Canyon Creek, a tributary to the Dungeness River, to avoid ice-slurry problems with Dungeness River diversions during the winter. Projected future demands range from 10.75 cfs to 15 cfs, with Canyon Creek diversions of 4 to 6 cfs in the spring (April-June), and the remainder from the Dungeness River in all months. Low-flow season demands are projected to be 10.25 to 12.25 cfs in September and October.

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**Figure 2.3-9. Washington State Department of Fish and Wildlife Morse Creek Fish Production Water Budget.**

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**Figure Table 2.3-10. Washington State Department of Fish and Wildlife Hatchery Water Budget: Dungeness River and Hurd Creek.**

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Thomas et al. (1999) estimated 27% of total withdrawals from groundwater in 1996 (6,055 acre-feet) was used by the Hurd Creek hatchery. This is equivalent to 1,635 acre-feet, 533 MGY, avoiding a sustained diversion of 2.3 cfs. This is consistent with the Montgomery Water Group (1999) estimate of groundwater withdrawals for fish hatcheries at 1,620 acre-feet/year. The Hurd Creek hatchery is reportedly entirely supplied by groundwater.

### Hydropower

#### Elwha River

Four hydropower rights on the Elwha River were originally granted to Northwestern Power and Light Company for operation of the Elwha River Glines Canyon and Elwha dams, reservoirs, and hydroelectric facilities. These rights total 800 cfs and 65,000 acre-feet. The flow rights (800 cfs) are nonconsumptive, and the annual rights are for storage. The rights have priorities dating to 1925 and 1926. The dams are currently operated as run of the river facilities.

#### Morse Creek

As described above, the City of Port Angeles has two Morse Creek water rights totaling 20 cfs that were used for municipal water supply until 1977, when they were changed to hydropower use and emergency municipal use. In 1984, the City of Port Angeles applied for a license for Morse Creek Project No. 6461. This small hydropower project diverts water at RM 7.2, delivering it to a powerhouse at RM 5.0. Flows return to the creek 2.2 miles below the diversion dam, and just below the powerhouse (City of Port Angeles 1984, FERC 1985), which consequently bypasses nearly one half mile of anadromous stream habitat below the falls.

In August 1999, the City of Port Angeles published a Final Environmental Assessment and Application for Surrender of License. This document states that the City discontinued operation of the Morse Creek hydro project in October 1997. However the City has since decided to continue operating the facility through a lease to a professional hydroelectric operator.

## 2.3.4 Water Availability

### Surface Water

Table 2.3-15 summarizes water rights (instantaneous cfs) and instream flows by subbasin for WRIA 18, and compares estimated peak water use impacts, at buildout, on flows. Stream flows are shown in terms of annual average flows and dry season flows. Dry season flows are the low month (usually September or October) for the subbasin at the 90% exceedance level (that is, 90% of the time, flows will be higher). Suggested regulatory stream flows are the flow levels identified that would maximize the biological potential of the stream, and which were considered by WRIA 18 planning units in establishing recommended minimum instream flows. These are not necessarily indicative of what the natural hydrology would provide on average, but rather what the biological potential of the habitat could use. Peak water use impact is calculated assuming 100% hydraulic continuity for the groundwater component of use (thus, the actual effect is somewhat

**Table 2.3-15. Comparison of Stream Flows to WRIA 18 Water Rights and Water Use by Subbasin.**

overstated, or worst case). Peak use at buildout was estimated based on existing zoning and land division, and does not consider the use of clustering or tradable development rights (TDRs).

Comparing low flows to water rights and peak use (for those streams for which data is currently available), many streams appear to be overappropriated on a purely physical flow basis, without considering biological instream values and needs for water. When biological needs are considered, every stream for which a regulatory instream flow is recommended is shown to be overappropriated. As recommended in Chapter 3.4 of this plan, most WRIA 18 subbasins are proposed for closure. For some West WRIA 18 basins (Tumwater, Valley, Dry, Peabody, White, and Lees creeks), formal closure is not recommended so that groundwater could continue to be appropriated in these subbasins. However, EMMT recommended that no new surface water rights be issued in these basins.

**Dungeness River**

In Table 2.3-15, the Dungeness River water rights are adjusted to reflect the relinquishment of irrigation water rights under the Trust Water Agreement. Water rights certificates granted in the early part of the twentieth century seriously overappropriated Dungeness River flow. Table 2.3-16 summarizes the appropriation of water under the 1924 adjudication, in water rights established since that date, and claims recorded since the claims registry was opened.

**Table 2.3-16. Water Rights and Claims on the Dungeness River**

| 1924 Adjudication Decreed Water Rights | Pre-MOU Appropriation (cfs) | Post-MOU Tentative Determination (cfs) |
|---|---|---|
| Dungeness River WUA[1] | 518.16 | 156.00 |
| Other Decreed Rights[2] | 61.1 | 8.84 |
| WDFW Fish Propagation | 40.00 | 40.00 |
| City of Sequim | 1.40 | 1.40 |
| Others | 0.01 | 0.01 |
| Water Claims[3] | 1.90 | 1.90 |
| TOTAL | 622.57 | 208.15 |

Notes:

1. Subject to agreement not to divert more than 50 percent of river flow.
2. Post-MOU total treats Happy Valley Irrigation District Certificate as relinquished, as reflected in PCHB totals.
3. A total of 15 water claims exist which are unquantified as to instantaneous or annual diversion but which total 180 acres.

As the table shows, at one time the total of certificates amounted to 622.57 cfs, more than 1.6 times the river's average annual flow. The post-MOU total, 208.15 cfs, is subject to the WUA agreement not to divert more than 50 percent of the river's flow and a more recent voluntary agreement to not divert any more than would maintain flow at a minimum of 60 cfs. The river is administratively closed to new appropriations.

### Groundwater

#### East WRIA 18

Thomas et al. (1999) offer the opinion that groundwater is "in balance" with demands and groundwater levels. Consequently, meeting new demands from groundwater can be considered likely to reduce water levels in wells.

#### West WRIA 18

Very little is known about the volumes and depths of aquifers in West WRIA 18, although studies are underway.

## 2.3.5 Future Water Supply Requirements

Discussion of WRIA 18 future water supply requirements focuses on three key needs:

- Water for public water systems (based on policy endorsed by the WRIA 18 Planning Units to encourage connection to public water systems and discourage the proliferation of exempt wells)
- Water for irrigation (particularly in East WRIA 18)
- Water for salmon recovery (including instream flows)

### Public Water Systems

Table 2.3-9 indicates that by 2020, municipal and domestic water demand growth can be expected on the order of 1.1 MGD (equivalent to about 1189 AFY or about 1.6 cfs of flow). In the same period, Table 2.3-10 shows that commercial and industrial demand growth can be expected on the order of 1.0 MGD (equivalent to about 1171 AFY or about 1.6 cfs of flow). Total municipal and industrial demand in 2002 is estimated at 2.5 MGD (2849 AFY or 3.9 cfs).

At maximum buildout, the two tables indicate that 12.5 MGD of additional water (equivalent to about 14,000 AFY or about 19.4 cfs of flow) would be required to serve new municipal and domestic growth and 56.3 MGD (equivalent to about 63,118 AFY or about 87.2 cfs of flow) would be required for new commercial growth.

Few Group A purveyors have reported their water right capacity to the Department of Health. For the largest WRIA 18 municipal water purveyors, current Water System Comprehensive Plans project the following availability of water rights to serve new demand (after satisfying all projected demand growth within public water system boundaries):

- City of Port Angeles projects a surplus (unused) capacity in 2020 of about 14.6 MGD (approximately 22.5 cfs) on an average demand day (ADD) basis, and a surplus of about 23.4 MGD (about 36.2 cfs) on a maximum demand day (MDD) basis from its Elwha River municipal water right.[22]
- City of Sequim projects a year 2018 unused capacity of about one third of its water rights, or about 600 acre-feet (equivalent to approximately 0.5 MGD or about 1 cfs).
- Clallam PUD reports that it will require new water rights to meet projected demand growth for its Carlsborg system, and it projects growth very near its available water rights for its Evergreen system.

West WRIA 18 buildout demand is estimated to be 31% of the total buildout demand in the year 2020, and 43% of the total maximum buildout potential demand. This equates to a demand of about 1.2 MGD (1389 AFY or 1.9 cfs of flow) in 2020 and 8 MGD (8959 AFY or 12.4 cfs) at maximum buildout. All of these West WRIA 18 municipal and industrial demand levels are within the expected City of Port Angeles 2020 projected surplus water right capacity (and that surplus is calculated after satisfying the large portion of the projected West WRIA 18 buildout that lies within the City's public water system service area). These data indicate that the water right capacity exists to meet West WRIA 18 buildout within existing water rights.

The same is not true for East WRIA 18 projected municipal and industrial water demand at buildout. The two largest municipal water purveyors serving that area (City of Sequim and Clallam PUD) would need expanded water rights or wholesale water purchases from municipal purveyors via interties (probably to the west) if they were to take on the challenge of meeting projected growth. The projected need for new water rights is on the order of 2,500 AFY (4.3 cfs) in the year 2020 and 11,200 AFY (15.3 cfs) at maximum buildout (this assumes continuation of water conservation programs in place).

Table 2.3-17 shows projected buildout by subbasin for existing Group A public water system service areas. About 73% of existing water demand is served within Group A water system boundaries, but only 60% of projected buildout lies within Group A boundaries. This indicates a trend for development in the more rural areas of the WRIA and suggests that unless Group A service boundaries expand, more new growth will be served by exempt wells or small community water systems.

[22]The MDD daily surplus is larger than the ADD surplus because the MDD is compared to the maximum river instantaneous flow, whereas the ADD is compared to average flow.

**Table 2.3-17. Residential Water Demand by Subbasin within Group A Public Water System Boundaries.**

### Irrigation

The Trust Water Program Memorandum of Understanding between Ecology and the WUA estimates that the acreage irrigated under the WUA water rights amounts to 6,500 acres and quantifies the water right at 29,250 acre-feet/year, based on a the 1998 assessment of "reasonable efficiency" of 4.5 acre-feet/acre. However, under the MOU, the WUA may water up to 7,000 acres. The water rights as quantified are equivalent to a constant average flow over a 153-day irrigation season of about 96 cfs. Applying a 4.5 acre-feet per acre water duty to the 1999 WUA irrigated acreage (5,025 acres), results in an estimate of use under "reasonable efficiency" (under the "pre-conservation" WUA system) of 22,612.5 acre-feet.

However, a substantial conservation program has already begun to be implemented and it appears very unlikely that the WUA will require water at such a rate in the future. Using data reported in the Comprehensive Water Conservation Plan (1999), it can be calculated that average year crop irrigation requirements total 1.2 acre-feet/acre over the irrigation season. Assuming that Conservation Plan measures were implemented (using this crop irrigation requirement together with the 65% application efficiency and 52% project efficiency calculated in the Comprehensive Water Conservation Plan), the average-year water requirement for WUA would be 3.5 acre-feet/acre, and the present water requirement would be 17,686 acre-feet for 5,025 acres. During the past several years, actual water use has been slightly less than this amount.

The Comprehensive Water Conservation Plan (Montgomery Water Group 1999) does not address the question of conservation potential in terms of potential improvements to overall reasonable efficiency expressed as a per-acre water duty, but does conclude that efficiency improvements alone could reduce peak diversions by 28 to 33 cfs, depending upon level of investment (ranging from $9.3 M to $12 M to realize these savings). These savings all arise from structural improvements recommended by Montgomery Water Group (1999) and they represent recovery of 72- to 85% of the sum of tailwater, spill, and conveyance losses identified by Montgomery Water Group (1999) for the 1996 irrigation season. No improvements are recommended that would affect on-farm application efficiency, which is assumed to be a function of the type of water systems typically in use and not of how these systems are used. Thus, education and other non-structural improvements cannot be quantified as to savings. Therefore, the water budget reported in Thomas et al. (1999, Tables 3-7 and 3-8) is based on subtracting the saved water from either tailwater losses and spills or from conveyance losses, directly reducing total diversions and improving overall project efficiency.

Taking peak savings estimated by Montgomery Water Group as a percentage of peak-month (July) diversions, the conservation improvements represent a potential savings of 34- to 40%. Assuming that savings at this rate can be realized over the entire year (pers. comm. Bob Montgomery, August 21, 2000), total water use rate would drop to about 2.1 to 2.3 acre-feet/year per acre for the 28 and 33 cfs water savings, respectively.

### Future Water Requirements

Table 2.3-18 presents projected future WUA water demand under three scenarios:

- **Scenario A.** Water conservation under *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan Draft EIS* (November 2002) recommended Alternative 4 (Economic Efficiency Alternative), no land conversion.
- **Scenario B.** Water conservation as in Scenario A with growth to 7000 acres irrigated as allowed under the Trust Water Agreement (reflected as a negative land conversion rate – in other words, conversion of land *to* irrigation).
- **Scenario C.** Water conservation as in Scenario A, plus land conversion at rate shown by trend data reported for 1950-1997 in *Report of the 2001 Clallam County Agricultural Lands Advisory Committee* (December 2001). (Note that this scenario assumes that all land converted from agriculture is not irrigated, which may not always be true.)

The table shows WUA water demand varying between 26.93 cfs and 47.48 cfs, depending on assumptions made about land conversion rate, water conservation, and acres irrigated.

**Table 2.3-18. Future Agricultural Water Demand on the Dungeness River (2020).**

| | Scenario A | Scenario B | Scenario C |
|---|---|---|---|
| Land Conversion Rate (percent/year) | 0.00% | -1.86% | 1.30% |
| Water Conservation Rate (percent/year) | 1.71% | 1.71% | 1.71% |
| Acres Under Agricultural Irrigation in 2020 | 5025 | 7000 | 3970 |
| Estimated 2020 Water Demand | 10,140 ac-ft<br>34.08 cfs | 14,126 ac-ft<br>47.48 cfs | 8,012 ac-ft<br>26.93 cfs |

Notes

1. Land use conversion rate for Scenario B is the rate of growth in agricultural land that would result in the full 7000 acres allowed under the Trust Water Agreement to be irrigated by 2020. The land conversion rate for Scenario C is the rate of loss of agricultural land for 1969-1997 as reported in the cited report.
2. Water conservation rate is the annual rate that would need to be achieved to obtain all of the savings estimated in the EIS Alternative 4 (33.72 cfs) by the year 2020. The WUA has also seen a trend toward planting less water-intensive specialty crops. However, this analysis does not assume further water conservation gains by this means. Offsetting such gains, chemical riparian vegetation control has been temporarily limited by recent court decisions, leading to increased evapotranspiration water loss along ditches.
3. Water duty is calculated as 15 inches per acre (average of requirements for hay and alfalfa, apples with cover, barley and oats, and pasture and turf), a 65% application efficiency, and a 70% conveyance efficiency (Montgomery Water Group 1999).

The water budget assumes that by the year 2020, all 33 cfs of water conservation improvements are in place under all three scenarios.

### Dry-Year Agricultural Water Requirement

The current lack of storage in the system (other than irrigation reregulation reservoirs) together with intraseasonal variability in precipitation (e.g., the early part of the season may be wet and the later part dry) may mean that irrigators do not react strongly to wet-dry cycles in river flow in the Sequim-Dungeness area (e.g., by deficit watering or other water application conservation measures). Irrigators could reduce both dry year and late summer low flow conflicts by emphasizing crop types that do not need a late summer or early fall watering, such as corn silage, oats, barley, seed crops, or bent grass (Mike Jeldness pers. comm. August 14, 2000). Drought-year water leasing, as was done in 2001 (see discussion above), may be the preferred method to manage irrigation water use when river flows are projected to be very low. The State currently has funds available to acquire late season water, either through lease or purchase.

### Salmon Recovery

No instream flows have been set by rule for streams in WRIA 18. The DQ "shared sacrifice" concept recognizes the need to balance instream and out-of-stream needs in a situation where a "gap" exists, and this concept was extended to all streams in the planning area by the DQ planning group. Stocks that are depressed or critical may need to be shielded from the stress of low flows as much as possible until sustainable population levels are recovered. Also, where stream conditions have degraded, especially in loss of deep pool refugia and shading, low flows may have much more serious impacts to fish than under more natural conditions.

#### Dungeness River

Instream flow (IFIM) studies conducted in 1990-91 as part of the DQ planning process identified that Dungeness River flows of 60 cfs would preserve a little less than 50% of the weighted usable area (WUA) needed for Chinook spawning and about 85% of the WUA for pink salmon spawning, 100 cfs would preserve about 75% of the WUA for Chinook spawning and nearly all the WUA for pink salmon spawning, and 180 cfs would provide 100% of the WUA for Chinook. These flow recommendations were reviewed in 2000 by the Dungeness River Restoration Work Group and were confirmed.

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