

Technical Memorandum

2010 Basin Study – Yakima River Basin



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Title: Municipal and Domestic Conservation Scenarios

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One element of the Integrated Water Resources Management Plan (IWRMP) is water conservation. Conservation programs applied to municipal or domestic water uses are quite distinct from applications in the agricultural sector. This memo summarizes characteristics of conservation in the municipal sector and describes scenarios the HDR Study Team will use for modeling the potential effects of municipal and domestic water conservation programs in the Yakima Basin.

Results from the municipal water conservation analysis will also be used in our assessment of out-of-stream water needs within the Basin.

Background

Over the past 20 years many communities in the western states have adopted water conservation programs aimed at reducing use of potable water supplies. The most advanced and comprehensive programs have been developed for large cities, especially in the southwestern states. Examples include Albuquerque, Austin, Denver, Las Vegas, Los Angeles, Portland and Seattle, among many others. Approaches developed in those settings have then filtered down to smaller cities with fewer staff and program resources. At this time it is relatively uncommon for smaller cities and towns (e.g. population less than 25,000) to have detailed conservation programs or staff to support them. Domestic well users outside municipal systems typically have not been identified for water conservation programs. This is true in the Yakima River Basin as in other areas across the West.

The Washington State Legislature passed the Municipal Water Law in 2003, which led to adoption by the Washington State Department of Health (WSDOH) of Municipal Water Use Efficiency requirements. These took effect in 2007 and are contained in various subsections of Chapter 246-290 of the Washington Administrative Code (WAC). Under these regulations municipal water suppliers must adopt water conservation goals, document a water-use efficiency program in their water system planning documents, and report annually to WSDOH. They are required to meter water production, as well as water delivered to individual customers. Water system leakage and other losses are limited to a maximum of 10% of water produced.

Several communities in the Yakima Basin have recently adopted conservation goals and identified actions to achieve their goals under the state requirements.

While there are many variations, municipal water conservation actions can be categorized generally as follows:

- Supply-side actions to reduce water losses from distribution piping, manage uses for water main flushing programs used to maintain water quality, and control un-metered uses such as construction site activities.
- Distribution of water efficient equipment for indoor uses such as low-flow toilets, showerheads, faucets and clotheswashers.
- Public education, voluntary customer audits, and incentives to encourage design of water-efficient landscapes, careful use of irrigation water by municipal customers, and installation of efficient lawn irrigation equipment.
- Implementation of water rate structures that encourage customers to limit their water use. The most common of these are “inclined-block” rate structures and rates that are higher in summer months than in other months. Rate structures must also provide revenue stability and comply with other State and local requirements and these needs must be balanced against water efficiency objectives.
- Mandated plumbing codes (typically federal and/or state) prohibiting sale of indoor plumbing equipment that does not meet defined standards. In Washington State, the plumbing code currently has efficiency standards for toilets, urinals, showerheads and faucets. It’s possible that state or federal actions may add new code requirements in the future.

The plumbing code is statewide and affects all municipal system customers as well as homes with domestic wells. Other program elements listed above vary considerably from one community to another.

The most effective water conservation programs involve careful program design, consistent investment and sustained public outreach. Social factors affecting conservation practices include awareness of water scarcity; receptiveness to government-sponsored programs; and the cost of water in relation to household income; among others.

Modeling Approach for IWRMP

HDR has developed a quantitative model designed to assess potential water savings from municipal conservation programs. The model focuses on uses by customers, and does not address water system “supply-side” actions. The model allows users to enter data on population, households and businesses for a given region, select particular conservation actions; and define expected participation rates by water users. The model then estimates total water savings and associated costs. Participation rates are a key factor in the model, and this factor will be used in analyzing scenarios for the 2010 Basin Study. In addition to municipal water systems, the model will be extended to address homes with their own domestic wells.

The Yakima Basin includes many communities that have differing goals and programs. This effort will not attempt to characterize individual community conservation programs. Instead, it will group conservation programs into two categories: a.) all Group A and Group B community water systems and b.) all households with individual domestic wells. A standard set of assumptions will be applied Basin-wide. Results will then be broken down by: the Upper Basin (above Parker); Lower Basin (below Parker) and Naches Subbasin. This breakdown will be proportional, based simply on population in those three areas.

The assessment will also characterize expected effects of conservation actions as related to key objectives of the study, such as reliability of supply; ability of communities to grow; and contribution to instream flow objectives. Water saved by conservation practices does not necessarily offer one-to-one contributions to these objectives, since much of the reduction may affect non-consumptive uses.

Conservation Scenarios to be Modeled

We are currently scoped to analyze two alternative scenarios for water conservation. We suggest the following scenarios that will provide “bookends” in terms of water savings and costs.

Scenario 1: No Action Scenario

In this context, “No-Action” means there would be no federal/state action under the IWRMP to address water conservation for municipal water systems and domestic wells. However, this does not mean that current conditions will remain static over the 50-year period. This scenario will reflect an increased level of water conservation between 2010 and 2060, but will be substantially less than the activities modeled under Scenario 2. Under the No-Action scenario, the following assumptions will be used:

- Current societal trends continue to make consumers and business owners more aware of resource scarcity and receptive to water conservation practices. This includes generational change across 50 years.
- Equipment manufacturers continue to improve technology of plumbing devices, appliances, and commercial equipment, leading to gradual improvement in water-use efficiency over 50 years.
- Current Washington State Plumbing Code requirements for water use efficiency stay the same.
- In response to Washington State DOH requirements, local municipal water systems become somewhat more active in promoting water conservation. However these programs will not be coordinated across the basin and will not include domestic well owners.

For purposes of modeling these changes quantitatively, Table 1 shows detailed assumptions on participation rates proposed for Scenario 1. The participation rates address only “target” customers, meaning households or business that have the relevant type of water use for a given conservation action. Participation rates are assumed to increase between 2010 and 2060, due to the factors listed above.

Scenario 2: Comprehensive Basin Wide Conservation Scenario.

Scenario 2 will explore a hypothetical question: if the communities and residential population of the Yakima River Basin adopted common, basin-wide practices promoting a high degree of municipal and domestic water efficiency, how much water would be saved, what results would this have for IWRMP objectives; and how much would it cost? This scenario will estimate the upper-end of water savings that could be achieved. Assumptions for this scenario include:

- Societal and market trends will develop in the same ways described under Scenario 1.
- Over the 50-year period, this scenario assumes that Washington State plumbing code requirements will become more stringent, requiring greater efficiencies in more kinds of plumbing equipment, water-using appliances, and landscape irrigation systems.
- Under this scenario it is assumed that local municipal water systems will become much more active in promoting water conservation; that programs will be coordinated across the Yakima Basin. Also it is assumed that programs will provide conservation services to domestic well owners as well as municipal water system customers.

Detailed assumptions proposed for modeling Scenario 2 are shown in Table 2, attached. Participation rates between 2010 and 2060 are increased substantially over those in Scenario 1, due to the higher level of conservation implementation activity in Scenario 2.

“Supply-Side” Actions

The tables discussed above relate to conservation actions by households and businesses. Water can also be saved by municipal water systems, through “supply-side” actions that reduce water leakage from distribution piping systems as well as managing other water losses and system uses. This will be modeled as a straight percentage of water production. For the No-Action Scenario it will be assumed that all water systems reduce their water losses to 10%, matching current Washington State standards. For Scenario 2 the assumption will be that additional management of supply-side losses is able to reduce losses to 8% of water produced on average. Both of these percentages will be applied at year 2030, and held constant to 2060.

Water Rate Structures

Rate structures (pricing) will not be modeled directly in the analysis. However, it is assumed that under Scenario 2, pricing of water to provide economic incentives for customers to manage their water use carefully will be one means that municipal water systems will use to raise participation rates to the levels shown in Table 2.

Conclusion

Together, these two scenarios will bracket estimates of municipal and domestic water conservation effects (Note: it may be possible to add additional scenarios later, depending on available budget resources as various project tasks are completed under the Basin Study).

These scenarios are not policy recommendations for the IWRMP. They have been developed only to bracket the upper and lower limits of municipal and domestic water conservation effects, by applying two very different assumptions about the 50-year planning period. We anticipate the Out-of-Stream Water Needs Subcommittee and the full Workgroup will use the information generated to support further discussion of how municipal and domestic water conservation should be considered in the IWRMP.

Table 1: Scenario 1- No Action

| Participation Rate by Customer Category* | | | | | | |
|---|--------------------------------------|-----------|-----------|-------------------------------------|-----------|-----------|
| Conservation Measure | First Year of Planning Period | | | Last Year of Planning Period | | |
| | 2010 | | | 2060 | | |
| | SF | MF | NR | SF | MF | NR |
| Efficient Clotheswashers | 5% | 5% | 5% | 75% | 75% | 75% |
| Bathroom Faucet Aerators - 0.5 gpm | 5% | 5% | 5% | 25% | 25% | 100% |
| Showerhead - 1.5 gpm | 5% | 5% | 5% | 25% | 25% | 25% |
| High Efficiency Toilets - 1.28 gpf | 1% | 1% | 1% | 25% | 25% | 25% |
| Urinals - 0.5 gpf | N/A | N/A | 5% | N/A | N/A | 10% |
| Kitchen Spray Valve – 1.25 gpm | N/A | N/A | 5% | N/A | N/A | 90% |
| <i>Faucets - Decrease Use</i> | 5% | 5% | N/A | 5% | 5% | N/A |
| <i>Showerheads - Decrease Use</i> | 5% | 5% | N/A | 5% | 5% | N/A |
| <i>Toilets - Leak Detection</i> | 5% | 5% | N/A | 15% | 15% | N/A |
| <i>Toilets - Decrease Flushes</i> | 1% | 1% | N/A | 1% | 1% | N/A |
| Irrigation Controllers - ET Model | 0% | 5% | 5% | 25% | 25% | 25% |
| Outdoor Irrigation Kits | 5% | N/A | N/A | 15% | N/A | N/A |
| <i>Outdoor Audit</i> | N/A | 1% | 1% | N/A | 5% | 5% |
| <i>Lawn Replacement</i> | 5% | 5% | N/A | 5% | 5% | N/A |

*Percent of Target Customers that Participate in Water Conservation Programs

Behavior Measures are *italicized*.

Customer Categories: SF = Single Family Households; MF = Multifamily Households; NR = Non-Residential
N/A---Not Applicable

Note 1: Participation rates for 2010 are based on qualitative information provided to the Study Team by municipal water systems in the Yakima Basin in May 2010.

Note 2: Under Scenario 1, participation rates at 2030 will be estimated as 40% of the change in participation rates from 2010 to 2060 (20 years of the 50-year period represents 40% of the time period).

Note 3: Future trends due to improvements in equipment technology have been assumed to be more powerful than trends that change personal behavior by consumers.

Table 2: Scenario 2 - Comprehensive Basin-Wide Conservation

| Participation Rate by Customer Category* | | | | | | |
|--|-------------------------------|-----|-----|------------------------------|-----|------|
| Conservation Measure | First Year of Planning Period | | | Last Year of Planning Period | | |
| | 2010 | | | 2060 | | |
| | SF | MF | NR | SF | MF | NR |
| Efficient Clotheswashers - Residential | 5% | 5% | 5% | 90% | 90% | 90% |
| Bathroom Faucet Aerators - 0.5 gpm | 5% | 5% | 5% | 90% | 90% | 100% |
| Showerhead - 1.5 gpm | 5% | 5% | 5% | 90% | 90% | 90% |
| High Efficiency Toilets - 1.28 gpf | 1% | 1% | 1% | 90% | 90% | 90% |
| Urinals - 0.5 gpf | N/A | N/A | 5% | N/A | N/A | 90% |
| Kitchen Spray Valve – 1.25 gpm | N/A | N/A | 5% | N/A | N/A | 90% |
| <i>Faucets - Decrease Use</i> | 5% | 5% | N/A | 50% | 50% | N/A |
| <i>Showerheads - Decrease Use</i> | 5% | 5% | N/A | 50% | 50% | N/A |
| <i>Toilets - Leak Detection</i> | 5% | 5% | N/A | 50% | 50% | N/A |
| <i>Toilets - Decrease Flushes</i> | 1% | 1% | N/A | 50% | 50% | N/A |
| Irrigation Controllers - ET Model | 0% | 5% | 5% | 90% | 90% | 90% |
| Outdoor Irrigation Kits | 5% | N/A | N/A | 90% | N/A | N/A |
| <i>Outdoor Audit</i> | N/A | 1% | 1% | N/A | 90% | 90% |
| <i>Lawn Replacement</i> | 5% | 5% | N/A | 50% | 50% | N/A |

*Percent of Target Customers that Participate in Water Conservation Programs

Behavior Measures are *italicized*.

Customer Categories: SF = Single Family Households; MF = Multifamily Households; NR = Non-Residential
N/A---Not Applicable in this customer category

Note 1: Participation rates for 2010 are based on qualitative information provided to the Study Team by municipal water systems in the Yakima Basin in May 2010.

Note 2: For Scenario 2, participation rates at 2030 will be more accelerated than Scenario 1: they will be estimated as 60% of the change in participation rates from 2010 to 2060.

Note 3: Future trends due to improvements in equipment technology have been assumed to be more powerful than trends that change personal behavior by consumers.