

General Comments:

- In general, the technical writing needs to be improved as follows:
 - Citations should be included (along with a list of citations) so that readers can locate the sources and check facts
 - All data and other sources information should be provided – so that the information can be reviewed and checked
 - All assumptions should be defended
 - The tables and figures in the appendices should be labeled and referred to explicitly in the body of the text (Table A1, etc...)
 - In many cases the tables and figures in the report need to be described more fully – particularly by including detailed table and figure captions
- In general, this assessment can also be improved by
 - Defending all assumptions
 - Investigating the discrepancies in various methods and data sources and to examine the sensitivity of the results to these discrepancies
 - Throughout the report, keep in mind that *data* is plural and *datum* is singular

Specific Comments:

Chapter 1:

- Second paragraph is too vague in terms of who was part of the workgroup.

Chapter 2:

- Page 6 - Second paragraph – needs reference for study related to 16,400 acres and 45,500 AF on consumptive use.
- Page 6 - Fourth paragraph – please define “severe economic loss”. Does this mean they can live with 70% every year and donate the rest of their water for conservation?
- Page 6 - Fourth paragraph – is KRD return flow instantaneous or are there timing issues?
- Page 6 - Last paragraph on page 6 – How do you know “a lower quantity is LIKELY used...” outside the area?
- Page 7 – First paragraph - where did the 70% non-consumptive estimate for 34,000 AF of domestic wells come from?
- Page 7 – Second paragraph – If 70% non-consumptive why 20,000 AF instead of 15,000 AF?
- Page 7 – Third paragraph – Given concerns over exempt wells in region, non-community public water systems (is that code for exempt wells?), why isn’t mitigation for these an issue?

Chapter 3:

- Page 8 – continuing paragraph – Specify instream flows and show wet, average, and dry hydrographs and unmet demand.
- Page 8 – Second paragraph – TWSA in normally... Specify how often (1 in 10, 1 in 30...)
- Page 8 – Fourth paragraph – quantify “small effect” e.g., less than x % of total.
- Table 1: It would be nice to have another column for post-1905 entitlements, even those these are smaller than the other entitlements
- Page 10, paragraph 1: What criteria were used in selecting the drought years?
- Table 2: Why isn't the '92-'94 drought not included in Table 2?
- Table 2 caption: *Diversions* is misspelled.
- Table 2 – explain why KID diversion is greater than entitlement.
- Page 10, last paragraph – is there a reason that decline in total diversions is “most likely” caused by... Is conversion to drip for wine grapes a large factor?
- Figure 2 – could be our laser printer but color between WIP & KRD hard to distinguish.
- Page 11, paragraph 2: Defend the assumption here that daily return flow is the sum of the mentioned irrigation diversions divided by 2.
- Exactly how are the return flows estimated here taken into account in this analysis?
- Table 3: The discrepancies between the irrigation district and the WSDA data are a major concern and should be investigated in depth. Non-inclusion of irrigated pasture lands does not seem like it can be the only cause of this discrepancy. Also, what is the sensitivity of the water demand results to this discrepancy? Is it possible that the irrigation estimates are biased in any way? You say in paragraph below that it may be partly because WSDA excluded irrigated pasture but is that the majority of the difference?
- Table 4: What are the years represented in this table?
- Table 5: Will the information from the other irrigation districts eventually be included? Also, “ND” needs to be inserted for KRD column. WIP vegetable estimates are off by 100%.
- Page 13, paragraph 1: Why is it most likely that hay/silage and non-crop cereal grain groups comprise most of the acreage missing from the WSDA survey?
- Tables 6 & 7 – Should sprinkler, wheel and center pivot in Table 6 be added to get sprinkler percentages in Table 7. In other words, what did districts call wheel and center pivot?
- Page 15: Describe in more detail how CIR is calculated.
- It would be very useful to provide a map of the Yakima basin that has topography as well as the locations of each of the WIG stations used and the delineations of each of the irrigation districts – this would help in demonstrating the representativeness of the WIG stations for each district.
- It would also be helpful to include a table for each of the crop types in each district and the source of information used in determining the CIR, whether it be a WIG station, Agrimet station, or weighted average. Also, what was the metric in determining if a crop type was similar to another crop type?

- Page 15, paragraph 1: These are weighted by area? How did the irrigation districts determine their crop irrigation requirements? This would help in understanding the comparison presented in table 9.
- Table 10 – different categories than Table 6. Why? Are these included under “other”?
- Tables 10 and 11: These values will vary under different conditions. E.g. percent evaporated is strongly controlled by climate. Percent return flow will depend on soil conditions. This should at least be mentioned and the accuracy should be discussed.
- Table 13: These estimates are for an averaged historical climate condition?
- Page 17, second paragraph, last sentence: What are the seepage losses for lined versus unlined systems – are these taken into account in this analysis?
- Table 14: Spell out WCP and MWD. Provide proper references for these sources of information. What is the methodology used in the cited reports in determining the conveyance losses and is the methodology consistent for each irrigation district? How accurate are these estimates?
- Table 16: Mention explicitly how the difference values in the two bottom rows were calculated (e.g., the first difference value is a subtraction of “estimated total on-farm delivery needs” from “estimated deliveries to farms”).
- Table 16: Except for SVID, most of the on-farm delivery needs are under-estimated. Why is this so? What is the source of the under-estimation?
- Table 16: The Roza and YTID results should also in this table. Rather than stating that results were poor therefore a different method was used, the results should be shown and a discussion of the reasons for the poor results should be provided. Also, if subtracting conveyance losses from average diversions was best for Roza and YTID, why wasn’t this method also used for the other irrigation districts?
- Page 18, last paragraph, first sentence is awkward - explain why it is ok to change approach.
- Page 19, first paragraph: It would be give to give some accuracy estimates for each of these rather than just stating that many errors are inherent in the data. Also, it would be good to investigate the sensitivity of these inaccuracies to the results.
- Page 19, second paragraph – repetitive – copied directly from earlier in report.
- Page 19, second paragraph – what is/are SVID and YTID reason(s) for not needing water?
- Page 19, last paragraph – sometimes Parker gage and other times Parker Gage – consistent use of g or G throughout document would be preferable.
- Page 22, second paragraph – where does leased water come from?
- Page 22, fifth paragraph: typo: “Different methods can *be* used..”
- Figure 6: mention in the text or in the caption that the shortfall is the gray area, which is the difference between the 2001 and non-drought average diversions. Same with the other figures.
- Page 25, third paragraph – what is the criteria for “severe”?
- Page 25, fourth paragraph: consider rewording: “A calculation of the volume of water *a* 70 percent...”
- Table 20: there are grammatical problems in the first column of this table
- Figure 9: Why are leased water amounts not included in this Figure but they are in Table 20? Should these be consistent?

- Table 21: Adding another row for 70% reliability would be interesting.
- Page 27, third paragraph, first sentence: typo: "...using leased water need to be added..."
- Page 27, second to last paragraph: define "short time period".
- Page 27, second to last paragraph: "...the total shortfall should be reduced to approximately 282,300 acre-feet in the 2001 drought year." - Using which method?

Chapter 4:

- Page 29, first paragraph: Ec was based on professional judgment. Please cite a proper source.
- Table 22: WSDOA should be WSDA
- Table 22: Where did the 15% adjustment factor come from? Defend this value.

Chapter 5:

- Page 31, third paragraph, first sentence: "Water conservation measures result in the *greatest water savings* in years with at least average water supply." Is better to write than that they are most effective in years with at least average water supply. This is because they are not as important in the high water years as they are in the low water years. So "effective" is not the best choice of words here.
- Page 32, first paragraph: Similarly, this language needs to be clarified. "During drought years, the water savings would be reduced as less water is applied to fields." Say that the volume of water is reduced, but not necessarily the percentage of water savings.
- Page 32, third paragraph: Explain in more detail why a reduction of seepage on the mentioned farms does not improve water supply conditions in the basin.
- Page 32, 5th paragraph: Briefly mention what some of the reasons are for why Wapato lands are idle.
- It would help to mention at the beginning of Chapter 5 that new acreage is not likely to occur because current entitlements are not sufficient to serve current acreage during drought years.
- Table 23: Remove the footnote that states that the units are in acre-feet. These are percentages. Also, mention what these percentages are of: are these percentages of the areal extent of all irrigated agriculture in the basin? Or are they a percent of how much water is utilized by each crop as a percentage of the total irrigation water needs in the basin? Can both of these be shown in table 23? Also, why are developed and CRP lands shown in the other category if they do not have any irrigation demands?
- Table 24: Also in this table, mention exactly what the percentages are. Are they of area? What area?
- Section 5.5: Why not directly apply the UW work? A more defensible method than relying on "professional judgment" should be used. Also, will changes in seasonality in water availability be dealt with? Total annual streamflow amounts may or may not decrease, but the change in the seasonality of surface water availability will cause water stress in the Yakima basin. How will this be dealt with?

Chapter 6:

- Page 36, third paragraph: how reliable are population projections? Is under reporting an issue?

- Axis labels are missing from many of the figures in this section – e.g., Figure 13
 - Figure 14: Average ANNUAL use seems very high. Was anything mentioned in DOH municipal report on leaks or lost water? Could there be more people per house than reported? Why is Yakima much greater than Ellensburg? Is peak summer demand more of an issue than average?
 - Page 43, second paragraph: be clear if this is total or consumptive use. How do the values vary during dry versus average water year?
 - Page 45, first bullet: be more specific in the verbiage here: mention that total basin (not municipal) water used is reduced as lands are converted from agricultural use to urban use. Also, these are offset by the reduction in irrigation use (last sentence in that bullet).
 - Table 34: be clearer with respect to consumptive or total needs.
 - Page 48, third paragraph: WSDA not WSDOA. Also, based on the earlier analysis, is the WSDA cropland geodatabase reliable enough for this analysis? Also, in this paragraph, what is the source of the assumption that one third of the land would be developed by 2030 and two-thirds by 2060? Are these linked to population growth and density?
 - Should the unit acre-feet per acre should be replaced in all instances by the unit feet?
 - Page 48, fifth paragraph: “homeowners reportedly tend to use at least as much water as adjacent farmlands” – what is the source of this information? Is it reliable?
 - Page 48, sixth paragraph: Defend the assumption that one third of the lands converting would be low density. Is this the current trend?
 - Table 37: You used 7,000 and 9300. Put in comma.
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- Somewhere you should estimate that water demand is likely to be larger than values because reservoir evaporation and seepage losses could be significant. It is probably too soon to look at specific reservoir sites but you should mention that you can’t just store what is needed.
 - Appendices – put table numbers and captions even in these sections.