DEPARTMENT OF ECOLOGY

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SUBJECT: Addendum to the 1993 Puyallup River TMDL Report

INTRODUCTION

This memo documents changes to the recommended Total Maximum Daily Loads (TMDLs) for biochemical oxygen demand (BOD) and ammonia in the Puyallup River. These changes supersede information presented in the TMDL report (Pelletier, 1993). The changes include revised waste load allocations (WLAs) for municipal and industrial dischargers, fish hatcheries, and the reserve WLA for water quality protection or future growth for 5-day BOD (BOD_5) and total ammonia. The WLAs for McAlder Elementary School were removed from the TMDL to reflect termination of the discharge.

This memo also discusses two issues that were raised during public comment: recommendations for application of seasonal permit limits; and exchanging a portion of an ammonia allocation to increase an allocation for BOD_5.

This memo presents results of revised statistical analyses of flow and water quality data from USGS and Ecology monitoring stations in the Puyallup River basin. The purpose of the statistical summaries is to provide data for determining critical conditions for seasonal NPDES permits in the Puyallup River basin.

Seasonal design conditions were evaluated for two alternative divisions of semi-annual periods:

May-October dry season and November-April wet season;
May-November dry season and December-April wet season.

Both of the alternatives for semi-annual divisions would be equally protective of water quality standards. The choice of which division to apply to a particular permit may be made based on whichever provides the greatest advantage to the discharger. Both alternatives are provided because for some dischargers it may be advantageous to exclude November from the dry season because of low temperatures for nitrification. However, for other dischargers it may be more advantageous to exclude November from the wet season because of low river flows for dilution. All of the municipal and industrial permit limits except for Wilkeson were based on either May-October/November-April seasons or applied year-round. Only the Wilkeson permit was based on the May-November/December-April seasons.

The 1993 TMDL report proposed a TMDL for residual chlorine. The Water Quality Program decided not to implement a TMDL for residual chlorine for the following reasons:

- the analysis in the TMDL report showed that there was not a reasonable potential for water quality standards to be violated with application of the mixing zone rule (WAC 173-201A-100),

- no violations of standards for residual chlorine have been observed in surface waters downstream from NPDES dischargers, and

- far-field cumulative effects of chlorine from multiple dischargers is not expected because of rapid losses from volatility, photolysis, and chemical demand in surface waters.

SEASONAL IMPLEMENTATION OF THE TMDLs

The proposed TMDLs for BOD_5 and ammonia can be restricted to a critical season for protection of the dissolved oxygen standard. The critical season should be defined based on occurrence of high temperatures, low dissolved oxygen, and low flows. Based on these criteria, the dry season period of May through October is appropriate for defining the season during which the proposed TMDLs for BOD_5 and ammonia apply. Far-field modeling to include the Wilkeson discharge, which has permit seasons of May-November and December-April, was based on the conservative assumption that November-April conditions were represented by permitted loading from Wilkeson during December-April.

Extension of the TMDLs for BOD_5 and ammonia to November through April is not considered necessary for protection of the dissolved oxygen and ammonia standards for the following reasons:

- High concentrations of dissolved oxygen (generally greater than 10 mg/L) have always been observed during the wet season. No violations of the dissolved oxygen standard have been observed at any time in the Puyallup River at ambient monitoring stations.

- No violations of the ammonia standard have been observed during the wet season.

- No violations of either the dissolved oxygen or ammonia standards were predicted at critical conditions of permitted pollutant discharge and loading capacity during the November-April season. In general the November-April season has significantly greater assimilative capacity compared with critical loadings and loading capacity during the May-October season.

- Lower temperatures during the November-April season reduce oxygen consumption rates from carbonaceous and nitrogenous BOD.

- Lower temperature and pH during the November-April season increase the loading capacity for discharge of ammonia.

- Stream flows and effluent dilution are typically higher in the November-April season than in the May-October season, which reduces instream concentrations of BOD and ammonia from NPDES dischargers.

- Water quality-based permit limits for ammonia to meet the un-ionized ammonia standard at mixing zone boundaries for NPDES discharges were found to be adequately protective of May-October dissolved oxygen with AKART limits for BOD_5. Therefore, AKART limits for BOD_5 can probably be considered protective of the dissolved oxygen standard year-round provided that un-ionized ammonia criteria are met year-round at the mixing zone boundaries of NPDES dischargers.

- Application of the mixing zone rule (WAC 173-201A-100) was found to be adequately protective of the ammonia standard basin-wide during May-October critical conditions. Therefore, ammonia standards are expected to also be met basin-wide if water quality-based permit limits are calculated for NPDES dischargers during the November-April season.

The recommended approach to implementing WLAs for BOD_5 and ammonia for NPDES dischargers is as follows during the November-April season:

- AKART limits for BOD_5 during the November-April season can be assumed to be protective of the dissolved oxygen standard.

- Ammonia concentrations in the river can be assumed to be protected if either:

    - May-October WLAs are applied also during the November-April season, or;

- separate May-October and November-April season WLAs are calculated for NPDES dischargers based on critical conditions from each season and compliance with ammonia standards at mixing zone boundaries.

SEASONAL DESIGN FLOWS FOR RIVERS

Critical river flows were derived for modeling of mixing zones, which are documented in the Fact Sheets for each NPDES permit. Critical river flows for far-field modeling using QUAL2E were also evaluated as discussed below. Critical conditions of low flow at USGS river gaging stations were estimated using the Log-Pearson Type III distribution (Table 1). For representing annual conditions, the 7-day low flow with a recurrence interval of 10 years (7Q10) was estimated. For semi-annual conditions, the 7-day low flow with a recurrence interval of 20 years (7Q20) was estimated from data within each semi-annual season. Annual 7Q10 low flows are recommended for deriving permit limits that apply year-round (Ecology, 1991). Seasonal 7Q20 low flows are recommended for deriving semi-annual permit limits. The purpose of increasing the recurrence interval for seasonal versus annual design flows is to maintain equivalent annual risks of water quality violations for seasonal and annual permitting schemes.

Critical low river flows for evaluation of mixing zones for selected NPDES dischargers are presented in Table 2. The selected NPDES discharges represent permits that are being considered for seasonal limits in the Puyallup basin (Harvester, 1993). River flows presented in Tables 1 and 2 are different from design flows presented in the TMDL report (Pelletier, 1993). The river flows in Tables 1 and 2 are based on updated flow data from the USGS and represent near-field conditions at each mixing zone. River flows for far-field modeling for input to the QUAL2E model are presented in Table 3 and represent a calculated balance of flows throughout the basin that contribute to conditions in the Puyallup River at the critical location for dissolved oxygen sag.

The largest difference between critical flows for the far-field analysis and the near-field modeling of mixing zones occurs in the White River between river mile 0 and 3.6 (between the mouth of the White River and the Lake Tapps Diversion at Dieringer). The major reason for this difference is timing of critical low flows at various locations in the basin. For example, Table 1 lists the 7Q10 for the White River at its mouth to be 199.2 cfs, while the 7Q10 of the Puyallup River at Alderton is 332 cfs. The sum of these two 7Q10 flows (531 cfs) is significantly less than the true 7Q10 of the Puyallup River at Puyallup (757 cfs). For near-field modeling of mixing zones it is appropriate to use the true 7Q10 flows at each location. However, for far-field evaluation of dissolved oxygen sag, the critical flow in the White River was adjusted upward to account for the true 7Q10 flow in the lower Puyallup River segment.

Relatively minor changes in the 7Q10 flows were found for the Puyallup River gages at Puyallup and Orting. The flows presented in the TMDL report for these gages (774 and 160 cfs for Puyallup and Orting, respectively) were for data collected through water year 1987. The revised flows in Table 1 (757 and 160.9 cfs) incorporate data collected through water year 1991. This change does not significantly affect the TMDL since the revised flows varied by only about 2 percent.

Flow in the White River at the location of the Enumclaw and Buckley municipal discharges is controlled by the Puget Sound Power and Light Company (Puget Power) by agreement with the Muckleshoot Tribe to maintain a minimum of 130 cfs in the White River at approximately river mile 15.7. Puget Power controls flow in this reach of the river by diverting water to Lake Tapps upstream from the NPDES dischargers. The diversion is located at approximately river mile 24.2. The Enumclaw and Buckley discharges are located at approximately river miles 23 and 22, respectively. The diversion is operated to maintain minimum flows at the USGS gage at White River mile 23.1 (USGS station 121000000) of no less than 110 cfs to account for an additional 20 cfs discharge from operation of fish screens at river mile 21.1 (Barnes, 1993). Seven-day average flows at USGS station 12100000 of less than 130 cfs have frequently occurred since the current operating program began in 1986. Low flows can occur during any month of the year as a result of diversion operations. For the purpose of estimating critical low river flows for evaluating mixing zones for NPDES permitting, a river flow of 110 cfs in the White River is recommended for seasonal or annual permitting schemes for evaluating the Enumclaw and Buckley permits to represent current operations of the diversion.

The City of Orting discharges to the Carbon River at approximately river mile 2.0. There are no USGS gaging stations in the Carbon River near this location. Critical flows for the Carbon River were estimated by the difference between low flows at gages in the Puyallup River at Alderton (USGS station 12096500) and Orting (USGS station 12093500). The flow records at these stations indicate that low flows occur in the Puyallup and Carbon Rivers during the same months, which supports using the difference between the Puyallup gages to estimate the Carbon River flow. The difference in flows at the two Puyallup gages was scaled proportional to drainage area to estimate flow in the Carbon River. The Carbon River has a drainage area of approximately 230 square miles compared with 266 square miles represented between the two gages. Therefore, the Carbon River flow at the location of the Orting discharge was estimated in Table 2 as the ratio of 230/266 applied to the difference in flows at the two Puyallup River gages.

River flows at the location of the City of Puyallup and Matsushita Semiconductor Corporation discharges is represented by USGS station 12101500.

The Beatrice Cheese Company discharges to the White River at approximately river mile 1.8, which is downstream from the return flow of the diversion through Lake Tapps. The City of Sumner also discharges to this segment of the White River. Flows for analysis of mixing zones in the White River between river mile 0 and 3.6 were estimated by the sum of flows reported in the White River upstream from the return flow from Lake Tapps (USGS station 12100496 from 1987-91 or 12100500 from 1943-69) with flows reported for the Lake Tapps Diversion at Dieringer (USGS station 12101100). A record of daily flows for the sum of the two USGS stations was calculated. Critical low flows were then estimated by fitting these calculated daily flows to the Log-Pearson Type III distribution.

Critical Conditions for Water Quality

Critical water quality conditions at Ecology monitoring stations in the Puyallup basin are presented in Table 4. Ecology monitoring data from 1985 to the present were used when available to represent the most recent conditions. Older data were used to represent areas with no recent data. The critical conditions for temperature, ammonia criteria, and ambient ammonia concentrations were estimated. Critical conditions were defined as the most restrictive 10th or 90th percentile for each parameter (Ecology, 1991).

Ammonia criteria were calculated for each sampling date from temperature and pH data. The calculated ammonia criteria represent the amount of total ammonia that would correspond to the aquatic life criteria for un-ionized ammonia in WAC 173-201A. The criteria for total ammonia were estimated by dividing the criteria for un-ionized ammonia by the estimated fraction of total ammonia present as un-ionized ammonia (EPA, 1988). In general, the ammonia criteria during November-April are less restrictive than May-October because of cooler temperatures and lower pH.

REVISION OF THE BOD_5 AND AMMONIA WLAS AND TMDLS

The WLAs for BOD_5 and ammonia were revised to incorporate the following changes:

- Mixing zone WLAs and permit limits for ammonia and technology-based limits for BOD_5 for municipal and industrial NPDES dischargers were recalculated using the current policies described in the Ecology Water Quality Program Permit Writer's Manual (Ecology, 1993). The details of the revised mixing zone WLA and technology-based limit calculations are documented in the Fact Sheets for each NPDES permit.

- Hatchery loads of ammonia and BOD_5 were changed to account for revised estimates of maximum pounds of fish on hand. The revisions affect the following hatcheries: Trout Springs Inc., Troutco Inc., Department of Fisheries Puyallup Salmon Hatchery, and Department of Wildlife Puyallup Trout Hatchery.

- The WLAs for McAlder Elementary School were eliminated because the discharge has been discontinued.

- Ultimate carbonaceous BOD (CBODU) was estimated for background, tributary nonpoint sources, and hatcheries as $BOD_5/0.68$. The TMDL report had assumed that CBODU was equal to BOD_5 for these sources, which may have been an underestimate. This change accounts for the relationship between 5-day and ultimate BOD based on a BOD decay constant of 0.23 day^{-1} (base e). For this revision, all BOD loads to the river were estimated as CBODU based on its relationship with BOD_5.

- Critical conditions for river flow and water quality were revised for evaluation of seasonal permit periods consistent with Ecology guidelines (Ecology, 1991). Critical river flows for seasonal periods were estimated as lowest 7-day average flows with recurrence intervals of 20 years (7Q20) for each season. Other water quality conditions (e.g., temperature, ammonia criteria, headwater and tributary water quality) were estimated as critical 10th or 90th percentiles during each season whenever possible.

The revised estimates of BOD_5 and ammonia loading from fish hatcheries, nonpoint, and background sources are shown in Tables 5, 6a, and 6b. Table 7 summarizes the proposed mixing zone WLAs and technology-based limits described in the permit Fact Sheets.

The QUAL2E model described by Pelletier (1993) was updated using revised estimates of critical conditions as follows (printouts of the revised QUAL2E input files for critical conditions during May-October and November-April are presented in Appendix A):

- proposed mixing zone and technology-based WLAs for NPDES dischargers were included as summarized in Table 7.

- revised hatchery, nonpoint, and background loads were included as summarized in Tables 6a and 6b.

- revised river flows, temperatures, and boundary conditions were included according to data presented in Tables 3 and 4.

Results of the May-October model of critical conditions were similar to the model results presented in Figures 4.9 through 4.13 of the 1993 TMDL report (Pelletier, 1993). The critical location for compliance with dissolved oxygen standards was found to be river mile 1.0 of the Puyallup River. Critical conditions at Puyallup River mile 1.0 resulted in a surplus of 0.51 mg/L of dissolved oxygen during the May-October period and 1.8 mg/L during November-April.

Chronic Ammonia WLAs for Enumclaw and Buckley

The critical location for compliance with ammonia criteria during May-October was found to be in the White River between the Enumclaw/Buckley discharge points and the outflow from Lake Tapps (White River mile 23 to 3.6). This reach of the White River was the only location where ammonia criteria became significantly more restrictive downstream from effluent mixing zones. Chronic criteria for ammonia progressively decrease proceeding downstream from Enumclaw until the observed critical point at river mile 8.0 (Table 3.2 of Pelletier, 1993). Ammonia criteria increase significantly after the Lake Tapps outflow enters the river because pH decreases. The QUAL2E model predicted that the chronic ammonia criteria at White River mile 8.0 might not be met at critical conditions during May-October. Therefore, a spreadsheet model of the White River was developed to estimate chronic WLAs that would meet water quality criteria at the critical location at river mile 8.0.

The spreadsheet model to calculate chronic WLAs for Enumclaw and Buckley to meet ammonia criteria in the White River is presented in Figure 1 and Appendix B. The spreadsheet was based on the same model schematic and inputs as the QUAL2E model with the following modifications:

- Enumclaw and Buckley discharges were input at maximum monthly average design flows to be consistent with Ecology guidelines for evaluating chronic critical conditions.
- Chronic WLAs during May-October were estimated by trial until the chronic criteria were met using the same effluent concentrations for Enumclaw and Buckley.
- The location of the fishpipe return flow of 20 cfs was placed at river mile 21.1 in the model and the White River canal diversion flow was adjusted to maintain a flow of 110 cfs at USGS gage 12100000 (downstream from Boise Creek).
- Ammonia was modeled as a first-order decay process with the same kinetic coefficients used in the QUAL2E model. Organic N was assumed to be negligible.
- Chronic criteria were applied at the positions where temperature and pH measurements were made for May-October (Table 3.2 of Pelletier, 1993 for May-October).

The sum of chronic ammonia WLAs from the spreadsheet model for Enumclaw and Buckley for the May-October season is 97.1 lbs/day of ammonia as N (Figure 1 and Appendix B). A chronic WLA of 97.1 lbs/day corresponds to a daily maximum permit limit of 160 lbs/day from both dischargers combined using the permit limit calculation methods required by Ecology and EPA (Box 5-2 of EPA's Technical Support Document, EPA, 1991, assuming effluent coefficient of variation of 0.6 and 99th percentile for long-term average and daily maximum limit derivations). The proposed WLAs documented in the Fact Sheets of the

NPDES permits correspond to a daily maximum total of 161 lbs/day from both dischargers combined, which is equivalent to the daily maximum limit required to protect the chronic criteria at river mile 8. Therefore, the proposed WLAs are concluded to be protective of the ammonia criteria downstream at river mile 8.0. However, increases above the proposed WLAs for ammonia from Enumclaw, Buckley, and Rainier School should not be allowed during May-October because ammonia criteria at river mile 8 are not predicted to be met at higher loads.

Chronic criteria during November-April were not approached by the proposed WLAs in the White River (Figure 1). Mixing zone WLAs during November-April may be increased if WTP design flows increase. The loading capacity of the White River during November-April can accommodate more than a tripling of ammonia loading before chronic criteria are approached. Therefore, mixing zone WLAs are considered adequately protective and application of the TMDL during November-April is not considered necessary in the White River.

Reserve Capacity, Recommended WLAs, and TMDLs

If the proposed mixing zone WLAs are adopted there will be a surplus of dissolved oxygen and ammonia throughout the river system compared with state standards (with the exception of the White River as discussed in the previous section). The surplus could be reserved for water quality protection or allocated to additional future ammonia and BOD_5 loads from NPDES dischargers as long as water quality standards are met as discussed in Pelletier (1993). The reserve WLA corresponding to surplus water quality was recalculated using the same methods described by Pelletier (1993) and is shown in Table 8. Any combination of increased ammonia and BOD_5 loading that meets the dissolved oxygen and ammonia standards basin-wide is considered acceptable.

The ammonia criteria appear to be protected basin-wide by application of Ecology's mixing zone policy. The QUAL2E model showed that dissolved oxygen criteria would be violated before ammonia criteria if ammonia and BOD_5 loading increased during May-October (with the exception of the White River segment from river mile 23 to 3.6, which is limited by the ammonia criteria at White River mile 8.0). Therefore, Ecology's mixing zone policy may be considered adequately protective of ammonia criteria throughout the basin. However, increased loading above the proposed WLAs for ammonia during May-October should not be allowed in the White River upstream from river mile 3.6, as discussed above.

If future loading sources discharge to the river at the same ratio of BOD_5/ammonia as the currently proposed WLAs, then an additional 1,200 lbs/day of ammonia as N and 3,670 lbs/day of BOD_5 could be assimilated with protection of the dissolved oxygen and ammonia standards. Other combinations of additional ammonia and BOD_5 loading would also be acceptable as described in Table 8.

The revised WLAs, Load Allocations (LAs), and TMDLs for BOD_5 and ammonia are summarized in Table 9. The WLAs for NPDES dischargers may be increased by allocating the reserve WLA to accommodate future growth. The QUAL2E model was used to test whether dissolved oxygen and ammonia criteria would be protected by allocation of the reserve WLA for future growth. Increases of up to 67 percent over the WLAs for ammonia and BOD_5 for all municipal and industrial dischargers presented in Table 9 have been verified as protective of water quality standards basin-wide, provided that no increases in ammonia loading occur in the White River above river mile 3.6, and no increases in nonpoint or hatchery loads occur at critical conditions. For example, dissolved oxygen and ammonia standards would be met if the WLAs for the City of Puyallup were increased by 67 percent (to 3,480 lbs/day of BOD_5 and 1,470 lbs/day of ammonia as N). Various strategies for allocating part or all of the reserve WLA may be acceptable and may be developed in more detail in the future. Future WLAs for NPDES dischargers would also need to comply with mixing zone regulations and AKART standards, which may restrict increases to less than 67 percent.

Exchanging Portions of Ammonia and BOD_5 WLAs

It would be reasonable to allow the option of reducing a WLA for ammonia to increase the WLA for BOD_5 since both parameters together influence dissolved oxygen. WLAs for BOD_5 could also be reduced to allow increases in ammonia WLAs provided that ammonia WLAs also satisfy requirements for mixing zones in WAC 173-201A-100 and no increases in ammonia loading occur in the White River above river mile 3.6. The TMDL analysis provides a quantitative basis for calculating either:

- the amount of increase in BOD_5 which can be allowed for a given decrease in a WLA for ammonia, or
- the amount of increase in ammonia which can be allowed for a given decrease in a WLA for BOD_5.

The DO response to ammonia and BOD_5 is presented in Table 8 and is summarized as follows:

DO response to ammonia load: 0.346 mg/L per 1000 lbs/day of NH_3-N
DO response to BOD_5 load: 0.0258 mg/L per 1000 lbs/day of BOD_5.

Therefore, a WLA for BOD_5 can be increased by 13.4 lbs/day for each 1 lb/day decrease in a WLA for ammonia with no net effect on dissolved oxygen. Similarly, a WLA for ammonia may be increased by 1 lb/day for each 13.4 lbs/day decrease in a WLA for BOD_5 provided that ammonia WLAs also satisfy requirements for mixing zones and no increases in ammonia loading occur in the White River above river mile 3.6. For example, the City of

Puyallup may decide to trade 150 lbs/day of ammonia loading for an additional 2,010 lbs/day of BOD_5 loading (provided that AKART standards are met). The following alternative WLAs for ammonia and BOD_5 for the Puyallup WTP are acceptable to meet the dissolved oxygen and ammonia standards during May through October for this example (other amounts of trade are also allowable using the same procedure):

WLA Alternative	Puyallup WTP WLAs (lbs/d)		Puyallup River TMDLs (lbs/d)	
	NH_3-N	BOD_5	NH_3-N	BOD_5
WLAs in Table 7 and 9	880	2085	3350	20322
Trade 150 lbs/day NH3-N for 2,010 lbs/day BOD_5	730	4095	3200	22332

Therefore, the TMDLs for ammonia and BOD_5 would change by an amount equivalent to the amount of exchange in the WLAs. The reserve WLAs would not be affected by exchange of ammonia for BOD_5 within a WLA for a NPDES discharger. However, a portion of the reserve WLA for ammonia could be traded for increasing the reserve WLA for BOD_5, as explained in Table 8, which would also change the TMDLs by a corresponding amount.

Trades of ammonia for BOD_5 WLAs can also be made after a portion of the reserve WLA is allocated to a particular discharger. For example, 150 lbs/day could be subtracted from the reserve WLA for ammonia and added to the ammonia WLA for the City of Puyallup. The City of Puyallup could then trade 150 lbs/day from their increased ammonia WLA for an additional 2,010 lbs/day increase in their WLA for BOD_5. The net effect of such a trade would be a 150 lb/day reduction in the TMDL and reserve WLA for ammonia, and a 2,010 lb/day increase in Puyallup's WLA for BOD_5 and the TMDL for BOD_5.

Results from the QUAL2E model and sensitivity analysis in Table 8 were used to predict that water quality standards for dissolved oxygen and ammonia would be met if BOD_5 or ammonia WLAs for individual dischargers are increased by more than 67 percent through allocation of the reserve WLA to municipal and industrial NPDES dischargers and trading of ammonia and BOD_5 WLAs provided that the following conditions are met:

- ammonia WLAs satisfy requirements for mixing zones in WAC 173-201A-100,
- no increases in ammonia loading occur in the White River above river mile 3.6,

- the total dissolved oxygen deficit at Puyallup RM 1.0 predicted by the sensitivity equation in Step 2 of Table 8 for each discharger does not increase by more than 67 percent relative to WLAs for ammonia and BOD_5 in Table 9. Therefore, the revised WLAs for BOD_5 and ammonia to accommodate future growth would be limited to the following equations based on the DO response shown in Step 2 of Table 8:

$$WLA_{BOD5,revised} \leq 1.67\ (\ WLA_{BOD5} + 13.4\ WLA_{NH3N}\ )\ -\ 13.4\ WLA_{NH3N,revised} \qquad \text{(equation 1)}$$

$$WLA_{NH3N,revised} \leq 1.67\ (\ (1/13.4)\ WLA_{BOD5} + WLA_{NH3N}\ )\ -\ (1/13.4)\ WLA_{BOD5,revised} \qquad \text{(equation 2)}$$

where:

WLA_{BOD5} = WLA for BOD_5 from Table 9 (lbs/day)
WLA_{NH3N} = WLA for ammonia from Table 9 (lbs/day)
$WLA_{BOD5,revised}$ = revised BOD_5 WLA to accommodate future growth (lbs/day)
$WLA_{NH3N,revised}$ = revised ammonia WLA to accommodate future growth (lbs/day).

CONCLUSIONS AND RECOMMENDATIONS

- WLAs and permit limits for ammonia and BOD_5 summarized in Tables 7 and 9 are predicted to protect water quality standards for dissolved oxygen and ammonia basin-wide.

- Water quality criteria for dissolved oxygen and ammonia will be met if the ammonia and BOD_5 WLAs for all municipal and industrial NPDES discharger are increased by up to 67 percent over the WLAs presented in Table 9 by allocation of the reserve WLA, provided that no increases in ammonia loading occur in the White River above river mile 3.6, and no increases in nonpoint or hatchery loads occur at critical conditions. Increases in WLAs of up to 67 percent have been verified as protective of far-field water quality standards using the QUAL2E model. Future WLAs for NPDES dischargers would also need to comply with mixing zone regulations and AKART standards, which may restrict increases to less than 67 percent.

- WLAs for ammonia loading to the White River above river mile 3.6 during May-October should not be increased above the amounts currently proposed in Tables 7 and 9.

- Seasonal implementation of the TMDL is considered to be adequate to protect dissolved oxygen and ammonia standards basin-wide. The proposed TMDL applies to the May-October season. Extension of the TMDL to the November-April season is not considered necessary for protection of water quality standards for dissolved oxygen and ammonia. Water quality standards for dissolved oxygen and ammonia during November-April are expected to be adequately protected by application of policies in Ecology's Permit Writer's Manual regarding mixing zones and technology-based limits.

- It is reasonable to allow the option of reducing a WLA for ammonia to increase a WLA for BOD_5 since both parameters together influence dissolved oxygen. Increases in WLAs for BOD_5 may be allowed provided that WLAs for ammonia are decreased. Trades of ammonia for BOD_5 WLAs may be made at the ratio of 13.4 lbs/day of BOD_5 increase for each 1 lb/day ammonia reduction. The TMDLs for BOD_5 and ammonia should be adjusted by an amount corresponding to any trades of ammonia for BOD_5 WLAs. The net effect of such trades on water quality can be considered to be negligible.

- Various strategies for allocating part or all of the reserve WLAs to increases in WLAs for NPDES dischargers may be developed in the future. A portion of the reserve WLA may also be set aside for possible increases in nonpoint loads, hatchery loads, or water quality protection. One possibility which can be considered, which is predicted to be protective of far-field criteria for dissolved oxygen and ammonia, is to allow increases of up to 67 percent over the currently proposed WLAs for ammonia and BOD_5 for municipal and industrial NPDES dischargers. Trades of ammonia for BOD_5 WLAs could also be allowed before or after allocation of part of the reserve WLAs to particular NPDES dischargers. Increases in BOD_5 or ammonia WLAs could exceed 67 percent through trading of ammonia and BOD_5 WLAs provided that:

  - increases in DO depletion at Puyallup RM 1.0 caused by each discharger is limited to less than 67 percent relative to the proposed WLAs,

  - ammonia WLAs also satisfy requirements for mixing zones, and

  - no increases in ammonia loading occur in the White River above river mile 3.6 relative to WLAs in Table 9.

  Any allocations of the reserve WLAs to NPDES dischargers should be subtracted from the reserve and will not affect the TMDL. Any trades of ammonia for BOD_5 WLAs should be subtracted from the ammonia TMDL and added to the BOD_5 TMDL. Any trades of BOD_5 for ammonia WLAs should be subtracted from the BOD_5 TMDL and added to the ammonia TMDL.

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Table 1. Summary of river design flows at USGS gaging stations in the Puyallup River basin.

Station	Description	Period of Record	Annual 7Q10 Low Flow in cfs (1)	Seasonal 7Q20 Low Flows in cfs (1)			
				May-Oct	Nov-Apr	May-Nov	Dec-Apr
USGS STATIONS:							
12093500	Puyallup River near Orting	1931-91	160.9	170.5	143.5	135.7	182.7
12095000	South Prairie Cr at S.Prairie	1949-91	29.0	27.9	43.2	27.7	58.9
12098500	White River near Buckley	1929-90	291.5	284.6	287.1	257.1	324.9
12099500/12099600	Boise Creek	1945-91	3.4	2.9	7.9	2.9	11.0
12100000	White River at Buckley (2)	--	110	110	110	110	110
12096500	Puyallup River at Alderton	1914-57	332.0	354.6	282.1	267.4	366.8
12101500	Puyallup River at Puyallup	1914-91	757.0	755.0	756.5	681.1	911.2
CALCULATED FLOWS (SUM OF STATIONS) (3):							
	White River at Mouth (sum of 12100500 with 12101100 and 12100496 with 12101100)	1943-91	199.2	167.8	319.6	162.4	336.2

1) Log-Pearson Type III analysis using USGS frequency factor method using WQHYDRO software (Aroner, 1992).
7Q10 = 7-day-10-year low flow
7Q20 = 7-day-20-year low flow

2) Minimum flow for current operations by Puget Power. An additional 20 cfs is discharged from fishpipe return flows to White River mile 21.1.

3) Daily flows were estimated for the White River at the mouth by summing flows from two stations:
Sum of USGS 12100500 and 12101100 during 1943-69, and sum of 12100496 and 12101100 during 1987-91.
Log-Pearson Type III statistics were calculated for the estimated daily flows from the sum of stations.

Table 2. Critical low river flows for selected NPDES dischargers in the Puyallup basin.

NPDES Discharger	Annual 7Q10 Low Flow in cfs	Seasonal 7Q20 Low Flows in cfs			
		May-Oct	Nov-Apr	May-Nov	Dec-Apr
MUNICIPAL					
Buckley (1)	110	110	110	110	110
Enumclaw (1)	110	110	110	110	110
Orting (2)	148	159	120	114	159
Puyallup (3)	757	755	757	681	911
Sumner (4)	199	168	320	162	336
Wilkeson (5)	8.9	8.6	13.3	8.5	18.1
INDUSTRIAL					
Beatrice (4)	199	168	320	162	336
Matsushita (3)	757	755	757	681	911

1) Estimated as the operational minimum flow at USGS gage 12100000 to reflect current and future operations by Puget Power and the location of return flow of 20 cfs from fish screens downstream from Enumclaw and Buckley WTPs.
The minimum flows in this reach are maintained by Puget Power by agreement with the Muckleshoot Tribe.
Low flows occur during all months of the year in this reach.

2) Estimated by difference between USGS 12096500 (Puyallup at Alderton) and 12093500 (Puyallup at Orting) scaled by ratio of drainage areas for the Carbon River at its mouth (230 square miles) compared with the drainage area represented by the difference between the two gaging stations (266 square miles between gages).

3) Estimated at USGS 12101500.

4) Estimated by Log-Pearson Type III analysis of daily flows estimated as sum of White River at Sumner (USGS 12100496 and 12100500) and Lake Tapps Diversion at Dieringer (USGS 12101100).

5) Estimated by scaling critical flows at USGS 12095000 (South Prairie Creek at South Prairie) proportional to drainage areas (79.5 square mile drainage area for USGS 12095000 and 24.4 square mile drainage area for Wilkeson Creek at Wilkeson discharge point)

Table 3. Estimated headwater and pointload flows for TMDL design conditions for QUAL2E modeling (model schematic is described in Pelletier, 1993).

	QUAL2E Headwater or Poindload Number	Annual 7Q10 (cfs)	May-Oct 7Q20 (cfs)	Nov-Apr 7Q20 (cfs)
Puyallup r.m. 18.0	HW-01	160.90	170.50	143.50
Carbon r.m. 16.1	HW-02	105.84	118.51	62.71
South Prairie Ck r.m. 7.4	HW-03	20.01	19.25	29.81
Wilkeson Ck r.m. 4.0	HW-04	8.96	8.62	13.36
Voights Ck above hatchery	HW-05	0.00	0.00	-0.00
Canyon Falls Ck above hatchery	HW-06	0.00	0.00	0.00
White r.m. 25.2	HW-07	291.50	284.60	287.10
Boise Ck r.m. 5.8	HW-08	3.40	2.90	7.90
Government Canal above Boeing	HW-09	0.00	0.00	0.00
Clarks Ck above hatchery	HW-10	42.05	42.05	42.05
Diru Ck above hatchery	HW-11	0.10	0.10	0.10
Clear Ck above hatchery	HW-12	0.00	0.00	0.00
Swan Ck above Lige Dickson	HW-13	1.40	1.40	1.40
Carbonado WTP	PL-01	0.15472	0.15472	0.15472
Lily Ck	PL-02	1.08	1.08	1.08
Wilkeson WTP	PL-03	0.10057	0.10057	0.27850
South Praire WTP	PL-04	0.05879	0.05879	0.08819
Dept. of Fisheries Hatchery	PL-05	16.81	18.24	13.23
Orting WTP	PL-06	1.3306	1.3306	3.2491
Reach 16 Dummy	PL-07	0.00	0.00	0.00
Trout Springs Hatchery	PL-08	8.33	8.33	8.33
Reach 18 Dummy	PL-09	0.00	0.00	0.00
Fennel Ck	PL-10	6.37	6.37	6.37
Reach 19 Dummy	PL-11	0.00	0.00	0.00
Unnamed Trib at Puyallup r.m. 13.0	PL-12	3.08	3.08	3.08
McAlder WTP	PL-13	0.00	0.00	0.00
Reach 20 Dummy	PL-14	0.00	0.00	0.00
Rainier School WTP	PL-15	0.40227	0.40227	0.64982
White River Canal Diversion (1)	PL-16	-170.30	-162.90	-170.65
Muckleshoot Tribe Hatchery	PL-17	5.00	5.00	5.00
Weyerhauser Enumclaw Mill Pond	PL-18	0.00	0.00	0.00
Enumclaw WTP	PL-19	2.6302	2.6302	6.1888
Buckley WTP	PL-20	2.1042	2.1042	2.6302
Unnamed Trib at White r.m. 15.0	PL-21	0.78	0.78	0.78
Bowman Ck	PL-22	0.32	0.32	0.32
Boeing Auburn Cooling Water	PL-23	0.00	0.00	0.00
Lake Tapps Diversion Outflow	PL-24	274.80	250.20	324.20
Strawberry (Salmon) Ck	PL-25	6.75	6.75	6.75
Beatrice Cheese WTP	PL-26	0.46416	0.46416	0.46416
Sonoco WTP	PL-27	0.48427	0.48427	0.48427
Unnamed Trib at White r.m. 1.3	PL-28	2.57	2.57	2.57
Fleischmans WTP	PL-29	1.3151	1.3151	1.3151
Sumner WTP	PL-30	4.6416	4.6416	10.2115
Reach 37 Dummy	PL-31	0.00	0.00	0.00
Sum of Puyallup and Matsushita WTPs (2)	PL-32	11.527	11.527	31.872
Dept. of Wildlife Hatchery	PL-33	12.07	12.07	12.07
Puyallup Tribe Hatchery	PL-34	0.780	0.780	0.780
Troutco Hatchery	PL-35	9.60	9.60	9.60
Lige Dickson	PL-36	0.00	0.00	0.00
Reach 46 Dummy	PL-37	0.00	0.00	0.00
Reach 47 Dummy	PL-38	0.00	0.00	0.00

1) Net diversion to the White River Canal after accounting for approximately 20 cfs returned to the White River by Puget Power for operation of fishpipes (Barnes, 1993).

2) Separate flows are as follows:	7Q10 (cfs)	May-Oct 7Q20 (cfs)	Nov-Apr 7Q20 (cfs)
Puyallup:	9.051	9.051	29.397
Matsushita:	2.476	2.476	2.476

Table 4. Summary of critical percentiles of temperature (90th %tile), ammonia criteria (10th %tile), and ammonia concentrations (90th%tile) at Ecology ambient monitoring stations. White River stations 10C085 and 10C090 were discontinued in 1975. Data collected from October 1985 through September 1993 are presented where available to represent the most recent conditions. For ammonia criteria during May-October or May-November, refer to Tables 3.1, 3.2, and 3.4 of Pelletier (1993), which include additional sampling stations and intensive studies.

Station River Mile (RM)	Ecology Stations	Period of Record	Temp-erature (deg C)	Total NH3-N Conc-entration (mg/L as NH3-N)	Temp-erature (deg C)	Chronic Total NH3-N Criteria (mg/L as NH3-N)	Acute Total NH3-N Criteria (mg/L as NH3-N)	Total NH3-N Conc-entration (mg/L as NH3-N)
Semi-annual permit period:			May-October (1)		November-April			
Puyallup RM 8.3	10A070	10/85 - 9/93	14.5	0.06	9.2	1.9	11.2	0.07
Puyallup RM 22.2	10A110	10/85 - 9/93	11.4	0.03	7.8	1.7	9.0	0.03
Carbon RM 5.8	10B070	10/92 - 9/93	11.2	0.01	6.9	1.9	10.0	0.02
White RM 0.7	10C070	10/85 - 9/93	17.6	0.05	9.8	1.8	9.8	0.10
White RM 4.9-6.3	10C085/10C090	10/61 - 9/75	19.0	--	10.6	1.7	9.1	--
Commencement Bay (2)	CMB003	10/85 - 9/93	15.7	0.06	11.0	2.0	13.4	0.05
Semi-annual permit period:			May-November (1)		December-April			
Puyallup RM 8.3	10A070	10/85 - 9/93	14.2	0.04	9.3	1.9	11.3	0.07
Puyallup RM 22.2	10A110	10/85 - 9/93	11.0	0.03	7.9	1.9	10.1	0.04
Carbon RM 5.8	10B070	10/92 - 9/93	11.2	0.02	6.9	1.9	10.0	0.02
White RM 0.7	10C070	10/85 - 9/93	16.6	0.05	9.9	1.8	10.3	0.10
White RM 4.9-6.3	10C085/10C090	10/61 - 9/75	18.0	--	11.2	1.8	11.6	--

1) Statistics for critical low-flow periods during the May-October and May-November seasons (August-October is the critical period of the May-October season; August-November is the critical period of the May-November season).

2) Statistics for the surface sample at CMB003. Critical conditions for dissolved oxygen at CMB003 were estimated by 10th %tiles as follows: 5.73 mg/L for the May-October season and 7.52 mg/L for November-April.

Table 5. Summary of net BOD5 and ammonia N loading from fish hatcheries (1).

Hatchery	Maximum Pounds Fish On Hand	Net BOD5 Load (1) (lbs/day)	Net Ammonia N Load (1) (lbs N/day)
Dept. of Fisheries	85000	50	13
Dept. of Wildlife	163568	96	26
Muckleshoot Tribe	28300	17	4
Puyallup Tribe	10000	6	2
Trout Springs	470000	277	74
Troutco, Inc.	245000	144	38

1) Net loads estimated based on regression analysis of Kendra (1989) data:
   0.157 lbs NH_3-N/day per 1000 pounds fish on hand
   0.589 lbs BOD5/day per 1000 pounds fish on hand

Net loads in this table do not include load from influent to hatchery.
Total loads in Table 6a and 6b include hatchery influent loading and net loading from maximum fish on hand.

Table 6a. Summary of load allocations for background/nonpoint sources and WLAs for hatcheries for May-October 7Q20 critical conditions for parameters that affect ammonia and dissolved oxygen mass balance in the QUAL2E model. Includes revised estimates for hatchery maximum pounds fish on hand shown in Table 5.

Source	QUAL2E Headwater or Pointload Number	Flow (cfs)	Dissolved Oxygen (mg/L)	5-day BOD5 (mg/L)	Ammonia-N (mgN/L)	Organic N (mgN/L)	5-day BOD5 (lbs/d)	Ammonia-N (lbsN/d)
QUAL2E HEADWATERS:								
Puyallup RM 18.0	HW-01	170.50	10.9	2.5	0.030	0.387	2299.0	27.6
Carbon RM 16.1	HW-02	118.51	11.0	2.5	0.022	0.465	1598.0	14.1
S. Prairie Ck RM 7.4	HW-03	19.25	10.1	2.7	0.027	0.309	280.3	2.8
Wilkeson Ck RM 4.0	HW-04	8.62	10.3	2.4	0.022	0.296	111.6	1.0
Voights Ck abv Hatchery	HW-05	0.00	--	--	--	--	--	--
Canyon Falls Ck abv Hatchery	HW-06	0.00	--	--	--	--	--	--
White RM 25.2	HW-07	284.60	10.5	1.7	0.049	0.268	2609.5	75.2
Boise Ck RM 0.1	HW-08	2.90	8.6	2.7	0.078	0.920	42.2	1.2
Government Canal abv Boeing	HW-09	0.00	--	--	--	--	--	--
Clarks Ck abv Hatchery	HW-10	42.05	7.8	1.8	0.011	0.338	408.2	2.5
Diru C abv Hatchery	HW-11	0.10	9.2	2.2	0.054	0.081	1.2	0.03
Clear Ck abv Hatchery	HW-12	0.00	--	--	--	--	--	--
Swan Ck	HW-13	1.40	8.9	1.7	0.089	0.556	12.8	0.7
QUAL2E POINTLOADS:								
Lily Ck	PL-02	1.08	7.6	3.4	0.046	0.331	19.8	0.3
Dept of Fisheries Hatchery	PL-05	18.24	8.2	3.7	0.154	0.614	364.8	15.2
Trout Springs Hatchery	PL-08	8.33	8.6	8.7	1.658	1.260	389.3	74.5
Fennel Ck	PL-10	6.37	9.2	2.0	0.024	0.645	68.7	0.8
Unnamed Puyallup Trib at RM 13.0	PL-12	3.08	8.2	2.1	0.086	2.230	34.9	1.4
White River Canal Diversion	PL-16	-162.90	--	--	--	--	--	--
Muckleshoot Tribe Hatchery	PL-17	5.00	9.6	3.1	0.170	0.473	84.4	4.6
Unnamed White R Trib at RM 15.0	PL-21	0.78	7.7	2.2	0.023	0.748	9.2	0.1
Bowman Ck	PL-22	0.32	8.2	1.9	0.055	0.576	3.3	0.1
Lake Tapps Outflow to White River	PL-24	250.20	8.0	1.7	0.049	0.187	2294.1	66.1
Strawberry (Salmon) Ck	PL-25	6.75	8.5	1.7	0.032	0.195	61.9	1.2
Unnamed White R Trib at RM 1.3	PL-28	2.57	2.9	1.7	0.096	1.139	23.5	1.3
Dept of Wildlife Hatchery	PL-33	12.07	7.7	3.3	0.410	0.876	213.2	26.7
Puyallup Tribe Hatchery	PL-34	0.78	8.9	3.6	0.530	0.291	15.3	2.2
Troutco Hatchery	PL-35	9.60	7.7	5.3	0.750	2.670	273.4	38.8
TOTAL HATCHERY WASTE LOAD ALLOCATION (lbs/day) (1):							1,340	162
BACKGROUND/NONPOINT LOAD ALLOCATION (lbs/day) (2):							9,878	196

1) Includes load from maximum fish on hand plus 90th percentile of hatchery influent load.

2) Includes all headwaters and tributaries excluding hatchery effluent.

Miscellaneous assumptions for May-October 7Q20:
* Flows for HW-01,02,03,04,07,08, and PL-05,16, and 24 assumed to be at calculated 7Q20 for May-October period
* Other flows assumed to be at annual 7Q10 conditions documented by Pelletier (1993).

Table 6b. Summary of load allocations for background/nonpoint sources and WLAs for hatcheries for November-April 7Q20 critical conditions for parameters that affect ammonia and dissolved oxygen mass balance in the QUAL2E model. Includes revised estimates for hatchery maximum pounds fish on hand shown in Table 5.

Source	QUAL2E Headwater or Pointload Number	Flow (cfs)	Dissolved Oxygen (mg/L)	5-day BOD5 (mg/L)	Ammonia-N (mgN/L)	Organic N (mgN/L)
QUAL2E HEADWATERS:						
Puyallup RM 18.0	HW-01	143.50	11.9	2.5	0.030	0.387
Carbon RM 16.1	HW-02	62.71	12.2	2.5	0.022	0.465
S. Prairie Ck RM 7.4	HW-03	29.81	12.2	2.7	0.027	0.309
Wilkeson Ck RM 4.0	HW-04	13.36	12.2	2.4	0.022	0.296
Voights Ck abv Hatchery	HW-05	0.00	--	--	--	--
Canyon Falls Ck abv Hatchery	HW-06	0.00	--	--	--	--
White RM 25.2	HW-07	287.10	11.1	1.7	0.049	0.268
Boise Ck RM 0.1	HW-08	7.90	8.6	2.7	0.078	0.920
Government Canal abv Boeing	HW-09	0.00	--	--	--	--
Clarks Ck abv Hatchery	HW-10	42.05	7.8	1.8	0.011	0.338
Diru C abv Hatchery	HW-11	0.10	9.2	2.2	0.054	0.081
Clear Ck abv Hatchery	HW-12	0.00	--	--	--	--
Swan Ck	HW-13	1.40	8.9	1.7	0.089	0.556
QUAL2E POINTLOADS:						
Lily Ck	PL-02	1.08	7.6	3.4	0.046	0.331
Dept of Fisheries Hatchery	PL-05	13.23	8.2	3.9	0.204	0.614
Trout Springs Hatchery	PL-08	8.33	8.6	8.7	1.658	1.260
Fennel Ck	PL-10	6.37	9.2	2.0	0.024	0.645
Unnamed Puyallup Trib at RM 13.0	PL-12	3.08	8.2	2.1	0.086	2.230
White River Canal Diversion	PL-16	-170.65	--	--	--	--
Muckleshoot Tribe Hatchery	PL-17	5.00	9.6	3.1	0.170	0.473
Unnamed White R Trib at RM 15.0	PL-21	0.78	7.7	2.2	0.023	0.748
Bowman Ck	PL-22	0.32	8.2	1.9	0.055	0.576
Lake Tapps Outflow to White River	PL-24	324.20	8.0	1.7	0.049	0.187
Strawberry (Salmon) Ck	PL-25	6.75	8.5	1.7	0.032	0.195
Unnamed White R Trib at RM 1.3	PL-28	2.57	2.9	1.7	0.096	1.139
Dept of Wildlife Hatchery	PL-33	12.07	7.7	3.3	0.410	0.876
Puyallup Tribe Hatchery	PL-34	0.78	8.9	3.6	0.530	0.291
Troutco Hatchery	PL-35	9.60	7.7	5.3	0.750	2.670

1) Includes load from maximum fish on hand plus 90th percentile of hatchery influent load.

2) Includes all headwaters and tributaries excluding hatchery effluent.

Miscellaneous assumptions for November-April 7Q20:
* Flows for HW-01,02,03,04,07,08, and PL-05,16, and 24 assumed to be at calculated 7Q20 for November-April period
* Other flows assumed to be at annual 7Q10 conditions documented by Pelletier (1993).

Table 7. Summary of proposed maximum loading of 5-day BOD and ammonia from permit limits for NPDES dischargers in the Puyallup basin (1).

Permittee	Seasonal Permit Period	5-day BOD (lbs/day)	Ammonia NH3-N (lbs/day)
MUNICIPAL			
Buckley	May-Oct	280	62
	Nov-Apr	280	149
Carbonado	May-Oct	38	21
	Nov-Apr	38	21
Enumclaw	May-Oct	504	99
	Nov-Apr	504	300
Orting	May-Oct	221	186.5
	Nov-Apr	221	455
Puyallup	May-Oct	2085	880
	Nov-Apr	2085	2850
Rainier School	May-Oct	61	33
	Nov-Apr	61	52.5
South Prairie	May-Oct	9.5	8
	Nov-Apr	9.5	12
Sumner	May-Oct	1284	213
	Nov-Apr	1284	969
Wilkeson	May-Nov	26	6.5
	Dec-Apr	26	39
INDUSTRIAL			
Beatrice	May-Oct	42	21
	Nov-Apr	42	21
Fleischmann's	May-Oct	35	21.3
	Nov-Apr	35	21.3
Matsushita	May-Oct	175	240
	Nov-Apr	175	240
Sonoco	May-Oct	673	1.1
	Nov-Apr	673	1.1

1) Proposed permit limits of maximum loading with the following conditions:
- BOD load limits apply all year as permit limits
- BOD limits are weekly maximum for municipals and daily maximum for industrials
- ammonia concentration limits are daily maximum and apply all year as permit limits.
- ammonia load limits are daily maximum and apply during May-October or May-November
- ammonia load limits shown for November-April or December-April are for information only and are estimated as the product of daily maximum design flow and concentration limits
- limits shown for Fleischmann's apply to non-contact cooling water only
- values shown for the following are estimated potential maximum loads and will not necessarily be applied as permit limits: ammonia from Carbonado, South Prairie, and Sonoco; 5-day BOD from Fleischmann's.

Table 8. Estimation of May-October WLAs for reserve or future growth in total ammonia N and 5-day BOD loading assuming exisiting NPDES dischargers have mixing zone WLAs in place for ammonia.

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1. Estimate allocatable excess dissolved oxygen at Puyallup RM 1.0 from comparison of model simulation with water quality standard for existing dischargers with proposed WLAs for ammonia and 5-day BOD.

DO at Puyallup RM 1.0 with existing dischargers at proposed WLAs:	8.51 mg/L
Water Quality Standard for Dissolved Oxygen:	8.00 mg/L
Allocatable excess DO:	0.51 mg/L

2. Allocate excess DO to alternative combinations of future 5-day BOD and ammonia N loads assuming average sensitivity of Puyallup RM 1.0 dissolved oxygen from the QUAL2E model:

DO decrease from increased ammonia N load:	0.346 mg/L per 1000 lbs NH3-N/day
DO decrease from increased 5-day BOD load:	0.0258 mg/L per 1000 lbs BOD5/day

DO depletion at Puyallup RM 1.0 from ammonia and 5-day BOD loads can be predicted as:
[0.346 * (NH3-N load in 1000 lbs N/day)] + [0.0258 * (5-day BOD load in 1000 lbs/day)]

Any combination of additional ammonia N and 5-day BOD load is acceptable if the following condition is met:

[0.346 * (added NH3-N load in 1000 lbs N/day)] + [0.0258 * (added 5-day BOD load in 1000 lbs/day)] <= 0.51 mg/L

Alternative acceptable combinations of reserve/growth WLAs for ammonia N and 5-day BOD:

Reserve/ Future Growth Ammonia N WLA (lbs N/day)	Reserve/ Future Growth BOD5 WLA (lbs BOD5/day)	
0	19770	
500	13060	
1000	6360	
1200	3670	<-- Same ratio of BOD5/NH3-N as proposed WLAs for existing dischargers
1475	0	

Table 9. Summary of recommended TMDLs and WLAs (1) for May-October water quality-based permit limits.

	5-Day BOD: (lbs/day)	Total Ammonia N: (lbs/day)
MUNICIPAL NPDES PERMITS		
Buckley WTP	280	62
Carbonado WTP (2)	38	21
Enumclaw WTP	504	99
Orting WTP	221	186.5
Puyallup WTP	2,085	880
Rainier School WTP	61	33
South Prairie WTP (2)	9.5	8
Sumner WTP	1,284	213
Wilkeson WTP	26	6.5
INDUSTRIAL NPDES PERMITS		
Fleischmann's Yeast (2)	35	21.3
Matsushita	175	240
Beatrice Cheese	42	21
Sonoco Products (2)	673	1.1
TOTAL FISH HATCHERY WLA (3)	1,340	162
BACKGROUND/NONPOINT LA (3)	9,878	196
WLA FOR RESERVE (4)	3,670	1,200
TOTAL MAXIMUM DAILY LOAD (5)	20,322	3,350

1) The proposed WLAs for ammonia for municipal and industrial NPDES dischargers are proposed as daily maximum loads not to be exceeded. The proposed WLAs for BOD are maximum weekly averages with the exception of Matsushita, Beatrice, and Sonoco, which are maximum daily averages.
2) Waste load allocations based on water quality considerations are less limiting than technology-based limits. The proposed WLAs for ammonia loading from Carbonado, South Prairie, and Sonoco, and BOD loading from Fleischmann's non-contact cooling water are estimated potential maximum loads and may not require permit limits (refer to NPDES permit fact sheets for explanation).
3) From Table 6a.
4) See Table 8 for other acceptable combinations of reserve WLA for BOD5 and ammonia N loading.
5) TMDL estimated as the sum of all WLAs (municipal, industrial, hatchery, reserve) plus background/nonpoint LA.

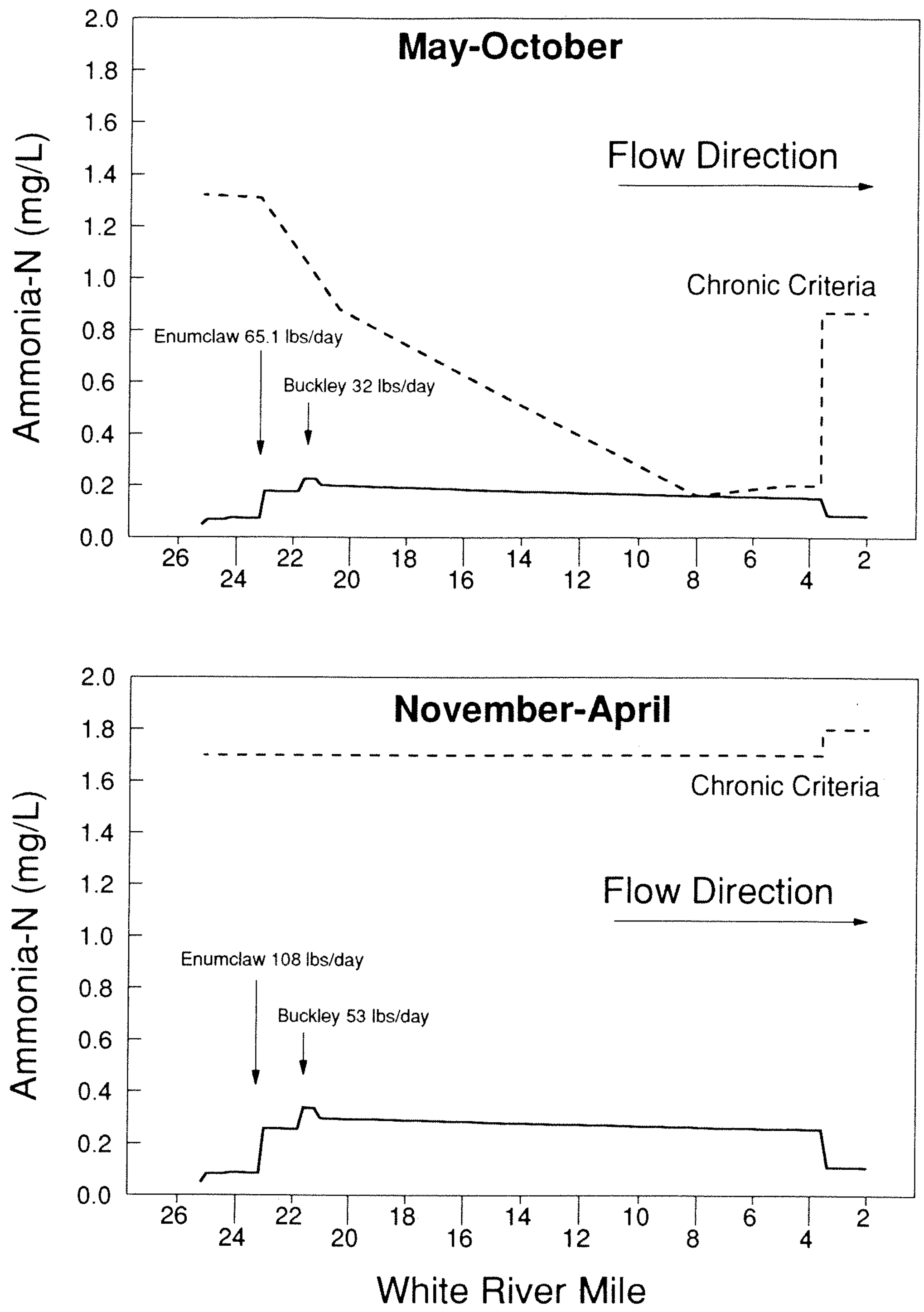

Figure 1. Predicted ammonia concentrations in the White River (solid lines) for proposed chronic WLAs compared with chronic criteria (dashed lines).

APPENDIX A

QUAL2E Input Files for Critical Conditions During May-October and November-April
(Refer to EPA, 1987 for documentation of QUAL2E input file formats)

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TITLE01              PUYALLUP RIVER MODEL: !MAYOCT.IN, Revised 12-Jul-94
TITLE02              MAY-OCT 7Q20 W/ WTP DESIGN FLOWS AND PROPOSED WLAs
TITLE03    NO        CONSERVATIVE MINERAL I
TITLE04    NO        CONSERVATIVE MINERAL II
TITLE05    NO        CONSERVATIVE MINERAL III
TITLE06    NO        TEMPERATURE
TITLE07   YES        BIOCHEMICAL OXYGEN DEMAND
TITLE08    NO        ALGAE AS CHL-A IN UG/L
TITLE09    NO        PHOSPHORUS CYCLE AS P IN MG/L
TITLE10                (ORGANIC-P, DISSOLVED-P)
TITLE11   YES        NITROGEN CYCLE AS N IN MG/L
TITLE12                (ORGANIC-N, AMMONIA-N, NITRITE-N, NITRITE-N)
TITLE13   YES        DISOLVED OXYGEN IN MG/L
TITLE14    NO        FECAL COLIFORMS IN NO./100 ML
TITLE15    NO        ARBITRARY NON-CONSERVATIVE
ENDTITLE
LIST DATA INPUT
WRITE OPTIONAL SUMMARY
NO FLOW AUGMENTATION
STEADY STATE
DISCHARGE COEFFICIENTS
NO PRINT SOLAR/LCD DATA
NO PLOT DO AND BOD
FIXED DNSTM COND (YES=1)=    1.00000        5D-ULT BOD CONV K COEF  =    0.00000
INPUT METRIC (YES=1)     =   0.00000        OUTPUT METRIC (YES=1)   =    0.00000
NUMBER OF REACHES        =  47.00000        NUMBER OF JUNCTIONS     =   12.00000
NUM OF HEADWATERS        =  13.00000        NUMBER OF POINT LOADS   =   38.00000
TIME STEP (HOURS)        =                  LNTH  COMP  ELEMENT (DX)=    0.20000
MAXIMUM ITERATIONS       =  30.00000        TIME INC. FOR RPT2 (HRS)=
LATITUDE OF BASIN (DEG) =  47.00000         LONGITUDE OF BASIN (DEG)= 122.00000
STANDARD MERIDIAN (DEG) =  75.00000         DAY OF YEAR START TIME  = 261.00000
EVAP. CO AE (FT/HR-INHG)=   0.00068         EVAPCO BE (FT/HR-IN-MPH)=    0.00027
ELEV. OF BASIN (FT)     = 000.00000         DUST ATTENUATION COEF.  =    0.13000
ENDATA1
O UPTAKE BY NH3 OXID(MG O/MG N)= 3.4300  O UPTAKE BY NO2 OXID(MG O/MG N)= 1.1400
O PROD  BY ALGAE (MG O/MG A)   = 1.6000  O UPTAKE BY ALGAE (MG O/MG A)   = 2.0000
N CONTENT OF ALGAE (MG N/MG A) = 0.0800  P CONTENT OF ALGAE (MG P/MG A) = 0.0110
ALG MAX SPEC GROWTH RATE(1/DAY)= 2.3000  ALGAE RESPIRATION RATE (1/DAY) = 0.1200
N HALF SATURATION CONST (MG/L) = 0.0200  P HALF SATURATION CONST  (MG/L)= 0.0050
LIN ALG EXCO (1/FT)/(UGCHLA/L) = 0.0130  NLINCO (1/FT)/(UGCHLA/L)**(2/3)= 0.0000
LIGHT FUNCTION OPTION (LFNOPT) = 1.0000  LIGHT SAT'N COEFF (BTU/FT2/MIN)= 0.0920
DAILY AVERAGING OPTION (LAVOPT)=      2  LIGHT AVERAGING FACTOR (AFACT) = 1.0000
NUMBER OF DAYLIGHT HOURS (DLH) = 14.000  TOTAL DAILY SOLR RAD (BTU/FT2) = 1800.0
ALGY GROWTH CALC OPTION(LGROPT)= 2.0000  ALGAL PREF FOR NH3-N (PREFN)   = 0.9000
ALG/TEMP SOLR RAD FACTOR(TFACT)= 0.4500  NITRIFICATION INHIBITION COEF  = 0.6000
ENDATA1A
THETA    BOD SETT    1.000
THETA    SOD RATE    1.047
THETA    ORGN SET    1.000
THETA    NH3 DECA    1.080
THETA    PORG SET    1.000
THETA    ALG SETT    1.000
ENDATA1B
STREAM REACH     1.RCH= PUYALLUP R       FROM       18.4    TO        18.0
STREAM REACH     2.RCH= CARBON R         FROM       17.8    TO        15.4
STREAM REACH     3.RCH= CARBON R         FROM       15.4    TO        11.4
STREAM REACH     4.RCH= CARBON R         FROM       11.4    TO         7.4
STREAM REACH     5.RCH= CARBON R         FROM        7.4    TO         6.0
STREAM REACH     6.RCH= S PRAIRIE CK     FROM        7.2    TO         6.8
STREAM REACH     7.RCH= WILKESON CK      FROM        4.2    TO         4.0
STREAM REACH     8.RCH= WILKESON CK      FROM        4.0    TO         0.0
STREAM REACH     9.RCH= S PRAIRIE CK     FROM        6.8    TO         5.6
STREAM REACH    10.RCH= S PRAIRIE CK     FROM        5.6    TO         1.6
STREAM REACH    11.RCH= S PRAIRIE CK     FROM        1.6    TO         0.0
STREAM REACH    12.RCH= CARBON R         FROM        6.0    TO         4.0
STREAM REACH    13.RCH= VOIGHTS CK       FROM        0.8    TO         0.0
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STREAM REACH     14.RCH= CARBON R          FROM       4.0    TO       2.0
STREAM REACH     15.RCH= CARBON R          FROM       2.0    TO       0.0
STREAM REACH     16.RCH= PUYALLUP R        FROM      18.0    TO      16.4
STREAM REACH     17.RCH= CANYON FALLS      FROM       1.0    TO       0.0
STREAM REACH     18.RCH= PUYALLUP R        FROM      16.4    TO      15.6
STREAM REACH     19.RCH= PUYALLUP R        FROM      15.6    TO      12.2
STREAM REACH     20.RCH= PUYALLUP R        FROM      12.2    TO      10.4
STREAM REACH     21.RCH= WHITE R           FROM      25.4    TO      24.6
STREAM REACH     22.RCH= WHITE R           FROM      24.6    TO      23.4
STREAM REACH     23.RCH= BOISE CK          FROM       5.8    TO       1.8
STREAM REACH     24.RCH= BOISE CK          FROM       1.8    TO       0.0
STREAM REACH     25.RCH= WHITE R           FROM      23.4    TO      21.8
STREAM REACH     26.RCH= WHITE R           FROM      21.8    TO      19.8
STREAM REACH     27.RCH= WHITE R           FROM      19.8    TO      17.8
STREAM REACH     28.RCH= WHITE R           FROM      17.8    TO      15.8
STREAM REACH     29.RCH= WHITE R           FROM      15.8    TO      13.8
STREAM REACH     30.RCH= WHITE R           FROM      13.8    TO      11.8
STREAM REACH     31.RCH= WHITE R           FROM      11.8    TO       9.8
STREAM REACH     32.RCH= WHITE R           FROM       9.8    TO       8.0
STREAM REACH     33.RCH= WHITE R           FROM       8.0    TO       5.4
STREAM REACH     34.RCH= GOV'T CANAL       FROM       1.8    TO       0.0
STREAM REACH     35.RCH= WHITE R           FROM       5.4    TO       3.6
STREAM REACH     36.RCH= WHITE R           FROM       3.6    TO       0.0
STREAM REACH     37.RCH= PUYALLUP R        FROM      10.4    TO       7.0
STREAM REACH     38.RCH= PUYALLUP R        FROM       7.0    TO       5.8
STREAM REACH     39.RCH= CLARKS CK         FROM       4.0    TO       2.0
STREAM REACH     40.RCH= DIRU CK           FROM       0.8    TO       0.0
STREAM REACH     41.RCH= CLARKS CK         FROM       2.0    TO       0.0
STREAM REACH     42.RCH= PUYALLUP R        FROM       5.8    TO       3.0
STREAM REACH     43.RCH= CLEAR CK          FROM       2.4    TO       0.4
STREAM REACH     44.RCH= SWAN CK           FROM       1.2    TO       0.0
STREAM REACH     45.RCH= CLEAR CK          FROM       0.4    TO       0.0
STREAM REACH     46.RCH= PUYALLUP R        FROM       3.0    TO       1.0
STREAM REACH     47.RCH= PUYALLUP R        FROM       1.0    TO       0.0
ENDATA2
ENDATA3
FLAG FIELD RCH=   1.        2          1 3
FLAG FIELD RCH=   2.       12          1 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=   3.       20          2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 6 2
FLAG FIELD RCH=   4.       20          6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=   5.        7          2 2 2 2 2 2 3
FLAG FIELD RCH=   6.        2          1 3
FLAG FIELD RCH=   7.        1          1
FLAG FIELD RCH=   8.       20          6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=   9.        6          4 2 2 2 2 2
FLAG FIELD RCH=  10.       20          6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  11.        8          2 2 2 2 2 2 2 3
FLAG FIELD RCH=  12.       10          4 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  13.        4          1 6 2 3
FLAG FIELD RCH=  14.       10          4 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  15.       10          6 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  16.        8          4 2 2 2 6 2 2 3
FLAG FIELD RCH=  17.        5          1 6 2 2 3
FLAG FIELD RCH=  18.        4          4 6 2 2
FLAG FIELD RCH=  19.       17          6 2 2 2 2 6 2 2 2 2 2 2 6 2 2 2 2
FLAG FIELD RCH=  20.        9          6 6 2 2 2 2 2 2 3
FLAG FIELD RCH=  21.        4          1 6 2 2
FLAG FIELD RCH=  22.        6          7 6 2 2 2 3
FLAG FIELD RCH=  23.       20          1 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  24.        9          2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  25.        8          4 6 2 2 2 2 2 2
FLAG FIELD RCH=  26.       10          6 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  27.       10          2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  28.       10          2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  29.       10          2 6 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  30.       10          2 2 2 2 2 2 2 2 2 2
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FLAG FIELD RCH=  31.   10   2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  32.    9   2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  33.   13   6 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  34.    9   1 6 2 2 2 2 2 2 3
FLAG FIELD RCH=  35.    9   4 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  36.   18   6 2 2 2 2 2 2 6 2 6 6 6 6 2 2 2 6 3
FLAG FIELD RCH=  37.   17   4 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  38.    6   6 2 2 2 2 3
FLAG FIELD RCH=  39.   10   1 6 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  40.    4   1 6 2 3
FLAG FIELD RCH=  41.   10   4 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  42.   14   4 2 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  43.   10   1 6 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  44.    6   1 6 2 2 2 3
FLAG FIELD RCH=  45.    2   4 3
FLAG FIELD RCH=  46.   10   4 2 2 2 6 2 2 2 2 2
FLAG FIELD RCH=  47.    5   6 2 2 2 5
ENDATA4
HYDRAULICS RCH=   1.             0.500     0.280   0.150   0.460   0.040
HYDRAULICS RCH=   2.             0.480     0.400   0.036   0.600   0.045
HYDRAULICS RCH=   3.             0.480     0.400   0.036   0.600   0.045
HYDRAULICS RCH=   4.             0.480     0.400   0.036   0.600   0.045
HYDRAULICS RCH=   5.             1.000     0.230   0.190   0.290   0.045
HYDRAULICS RCH=   6.             0.074     0.690   0.760   0.071   0.040
HYDRAULICS RCH=   7.             0.620     0.400   0.053   0.600   0.040
HYDRAULICS RCH=   8.             0.620     0.400   0.053   0.600   0.040
HYDRAULICS RCH=   9.             0.074     0.690   0.760   0.071   0.040
HYDRAULICS RCH=  10.             0.074     0.690   0.760   0.071   0.040
HYDRAULICS RCH=  11.             0.074     0.690   0.760   0.071   0.040
HYDRAULICS RCH=  12.             1.100     0.220   0.220   0.310   0.044
HYDRAULICS RCH=  13.             0.520     0.400   0.073   0.600   0.040
HYDRAULICS RCH=  14.             0.920     0.180   0.100   0.400   0.041
HYDRAULICS RCH=  15.             0.440     0.320   0.130   0.400   0.039
HYDRAULICS RCH=  16.             0.540     0.290   0.380   0.280   0.035
HYDRAULICS RCH=  17.             1.300     0.400   0.036   0.600   0.040
HYDRAULICS RCH=  18.             0.750     0.190   0.200   0.360   0.040
HYDRAULICS RCH=  19.             0.500     0.250   0.130   0.450   0.047
HYDRAULICS RCH=  20.             0.260     0.350   0.160   0.410   0.038
HYDRAULICS RCH=  21.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  22.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  23.             0.940     0.400   0.100   0.600   0.040
HYDRAULICS RCH=  24.             0.940     0.400   0.100   0.600   0.040
HYDRAULICS RCH=  25.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  26.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  27.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  28.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  29.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  30.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  31.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  32.             0.095     0.560   0.190   0.300   0.045
HYDRAULICS RCH=  33.             0.410     0.330   0.180   0.360   0.041
HYDRAULICS RCH=  34.             0.300     0.400   0.280   0.600   0.040
HYDRAULICS RCH=  35.             0.420     0.310   0.160   0.350   0.038
HYDRAULICS RCH=  36.             0.078     0.490   0.100   0.510   0.040
HYDRAULICS RCH=  37.             0.200     0.340   0.290   0.330   0.036
HYDRAULICS RCH=  38.             0.180     0.360   0.063   0.540   0.030
HYDRAULICS RCH=  39.             0.390     0.400   0.140   0.600   0.040
HYDRAULICS RCH=  40.             0.390     0.400   0.140   0.600   0.040
HYDRAULICS RCH=  41.             0.390     0.400   0.140   0.600   0.040
HYDRAULICS RCH=  42.   2.19E3    0.044     0.530   0.620   0.240   0.030
HYDRAULICS RCH=  43.             0.410     0.400   0.210   0.600   0.040
HYDRAULICS RCH=  44.             0.650     0.400   0.410   0.600   0.040
HYDRAULICS RCH=  45.             0.410     0.400   0.210   0.600   0.040
HYDRAULICS RCH=  46.   4.30E3    0.00068   0.980   5.600   0.000   0.029
HYDRAULICS RCH=  47.   8.06E3    0.00013   1.100   7.600   0.000   0.028
ENDATA5
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ENDATA5A
REACT COEF RCH=   1.    0.86    0.00   -0.14   3    0.00   0.054
REACT COEF RCH=   2.    1.05    0.00   -0.09   3    0.00   0.054
REACT COEF RCH=   3.    1.04    0.00   -0.09   3    0.00   0.054
REACT COEF RCH=   4.    1.04    0.00   -0.09   3    0.00   0.054
REACT COEF RCH=   5.    1.04    0.00   -0.09   3    0.00   0.054
REACT COEF RCH=   6.    2.37    0.00   -0.17   3    0.00   0.054
REACT COEF RCH=   7.    3.33    0.00   -0.30   8    0.00   0.110
REACT COEF RCH=   8.    3.33    0.00   -0.30   8    0.00   0.110
REACT COEF RCH=   9.    1.98    0.00   -0.17   3    0.00   0.054
REACT COEF RCH=  10.    1.97    0.00   -0.17   3    0.00   0.054
REACT COEF RCH=  11.    1.97    0.00   -0.17   3    0.00   0.054
REACT COEF RCH=  12.    0.92    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  13.    2.58    0.00    0.00   8    0.00   0.110
REACT COEF RCH=  14.    0.87    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  15.    0.87    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  16.    0.61    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  17.    3.33    0.00    0.00   8    0.00   0.110
REACT COEF RCH=  18.    0.61    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  19.    0.60    0.00   -0.12   3    0.00   0.054
REACT COEF RCH=  20.    0.60    0.00   -0.20   3    0.00   0.054
REACT COEF RCH=  21.    0.64    0.00   -0.13   3    0.00   0.054
REACT COEF RCH=  22.    0.98    0.00   -0.11   3    0.00   0.054
REACT COEF RCH=  23.    0.00    0.00    0.00   1    0.00   0.000
REACT COEF RCH=  24.    0.00    0.00    0.00   1    0.00   0.000
REACT COEF RCH=  25.    0.95    0.00   -0.11   3    0.00   0.054
REACT COEF RCH=  26.    0.94    0.00   -0.11   3    0.00   0.054
REACT COEF RCH=  27.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  28.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  29.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  30.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  31.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  32.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  33.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  34.    3.33    0.00    0.00   8    0.00   0.110
REACT COEF RCH=  35.    0.94    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  36.    0.52    0.00   -0.30   3    0.00   0.054
REACT COEF RCH=  37.    0.40    0.00   -0.20   3    0.00   0.054
REACT COEF RCH=  38.    0.39    0.00   -0.20   3    0.00   0.054
REACT COEF RCH=  39.    1.46    0.00    0.00   3    0.00   0.054
REACT COEF RCH=  40.    3.33    0.00    0.00   8    0.00   0.110
REACT COEF RCH=  41.    1.45    0.00    0.00   3    0.00   0.054
REACT COEF RCH=  42.    0.39    0.00    0.00   3    0.00   0.054
REACT COEF RCH=  43.    3.33    0.00    0.00   3    0.00   0.110
REACT COEF RCH=  44.    3.33    0.00    0.00   3    0.00   0.110
REACT COEF RCH=  45.    3.18    0.00    0.00   3    0.00   0.110
REACT COEF RCH=  46.    0.39    0.00    0.00   3    0.00   0.054
REACT COEF RCH=  47.    0.39    0.00    0.00   3    0.00   0.054
ENDATA6
N AND P COEF   RCH=   1.   0.10  0.000   0.20   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   2.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   3.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   4.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   5.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   6.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   7.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   8.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=   9.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  10.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  11.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  12.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  13.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  14.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  15.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  16.   0.10  0.000   0.20   0.00   4.00   0.10   0.00   0.00
N AND P COEF   RCH=  17.   0.10  0.000   0.45   0.00   4.00   0.10   0.00   0.00
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N AND P COEF	RCH= 18.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 19.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 20.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 21.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 22.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 23.	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
N AND P COEF	RCH= 24.	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
N AND P COEF	RCH= 25.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 26.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 27.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 28.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 29.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 30.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 31.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 32.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 33.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 34.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 35.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 36.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 37.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 38.	0.10	0.000	4.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 39.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 40.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 41.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 42.	0.10	0.000	4.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 43.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 44.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 45.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 46.	0.10	0.000	4.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 47.	0.10	0.000	4.00	0.00	4.00	0.10	0.00	0.00

ENDATA6A

ALG/OTHER COEF RCH= 1.
ALG/OTHER COEF RCH= 2.
ALG/OTHER COEF RCH= 3.
ALG/OTHER COEF RCH= 4.
ALG/OTHER COEF RCH= 5.
ALG/OTHER COEF RCH= 6.
ALG/OTHER COEF RCH= 7.
ALG/OTHER COEF RCH= 8.
ALG/OTHER COEF RCH= 9.
ALG/OTHER COEF RCH= 10.
ALG/OTHER COEF RCH= 11.
ALG/OTHER COEF RCH= 12.
ALG/OTHER COEF RCH= 13.
ALG/OTHER COEF RCH= 14.
ALG/OTHER COEF RCH= 15.
ALG/OTHER COEF RCH= 16.
ALG/OTHER COEF RCH= 17.
ALG/OTHER COEF RCH= 18.
ALG/OTHER COEF RCH= 19.
ALG/OTHER COEF RCH= 20.
ALG/OTHER COEF RCH= 21.
ALG/OTHER COEF RCH= 22.
ALG/OTHER COEF RCH= 23.
ALG/OTHER COEF RCH= 24.
ALG/OTHER COEF RCH= 25.
ALG/OTHER COEF RCH= 26.
ALG/OTHER COEF RCH= 27.
ALG/OTHER COEF RCH= 28.
ALG/OTHER COEF RCH= 29.
ALG/OTHER COEF RCH= 30.
ALG/OTHER COEF RCH= 31.
ALG/OTHER COEF RCH= 32.
ALG/OTHER COEF RCH= 33.
ALG/OTHER COEF RCH= 34.
ALG/OTHER COEF RCH= 35.

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ALG/OTHER COEF RCH=  36.
ALG/OTHER COEF RCH=  37.
ALG/OTHER COEF RCH=  38.
ALG/OTHER COEF RCH=  39.
ALG/OTHER COEF RCH=  40.
ALG/OTHER COEF RCH=  41.
ALG/OTHER COEF RCH=  42.
ALG/OTHER COEF RCH=  43.
ALG/OTHER COEF RCH=  44.
ALG/OTHER COEF RCH=  45.
ALG/OTHER COEF RCH=  46.
ALG/OTHER COEF RCH=  47.
ENDATA6B
INITIAL COND-1 RCH=   1.   52.5
INITIAL COND-1 RCH=   2.   52.2
INITIAL COND-1 RCH=   3.   52.2
INITIAL COND-1 RCH=   4.   52.2
INITIAL COND-1 RCH=   5.   52.2
INITIAL COND-1 RCH=   6.   59.0
INITIAL COND-1 RCH=   7.   57.2
INITIAL COND-1 RCH=   8.   57.2
INITIAL COND-1 RCH=   9.   59.0
INITIAL COND-1 RCH=  10.   59.0
INITIAL COND-1 RCH=  11.   59.0
INITIAL COND-1 RCH=  12.   52.2
INITIAL COND-1 RCH=  13.   59.0
INITIAL COND-1 RCH=  14.   52.2
INITIAL COND-1 RCH=  15.   52.2
INITIAL COND-1 RCH=  16.   51.8
INITIAL COND-1 RCH=  17.   57.2
INITIAL COND-1 RCH=  18.   51.8
INITIAL COND-1 RCH=  19.   51.8
INITIAL COND-1 RCH=  20.   51.8
INITIAL COND-1 RCH=  21.   55.4
INITIAL COND-1 RCH=  22.   57.6
INITIAL COND-1 RCH=  23.   57.2
INITIAL COND-1 RCH=  24.   57.2
INITIAL COND-1 RCH=  25.   59.7
INITIAL COND-1 RCH=  26.   61.9
INITIAL COND-1 RCH=  27.   64.0
INITIAL COND-1 RCH=  28.   66.2
INITIAL COND-1 RCH=  29.   66.2
INITIAL COND-1 RCH=  30.   66.2
INITIAL COND-1 RCH=  31.   66.2
INITIAL COND-1 RCH=  32.   66.2
INITIAL COND-1 RCH=  33.   66.2
INITIAL COND-1 RCH=  34.   66.2
INITIAL COND-1 RCH=  35.   66.2
INITIAL COND-1 RCH=  36.   63.7
INITIAL COND-1 RCH=  37.   58.1
INITIAL COND-1 RCH=  38.   58.1
INITIAL COND-1 RCH=  39.   51.8
INITIAL COND-1 RCH=  40.   51.8
INITIAL COND-1 RCH=  41.   51.8
INITIAL COND-1 RCH=  42.   58.1
INITIAL COND-1 RCH=  43.   51.8
INITIAL COND-1 RCH=  44.   57.2
INITIAL COND-1 RCH=  45.   51.8
INITIAL COND-1 RCH=  46.   58.1
INITIAL COND-1 RCH=  47.   58.1
ENDATA7
INITIAL COND-2 RCH=   1.
INITIAL COND-2 RCH=   2.
INITIAL COND-2 RCH=   3.
INITIAL COND-2 RCH=   4.
INITIAL COND-2 RCH=   5.
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INITIAL COND-2 RCH=   6.
INITIAL COND-2 RCH=   7.
INITIAL COND-2 RCH=   8.
INITIAL COND-2 RCH=   9.
INITIAL COND-2 RCH=  10.
INITIAL COND-2 RCH=  11.
INITIAL COND-2 RCH=  12.
INITIAL COND-2 RCH=  13.
INITIAL COND-2 RCH=  14.
INITIAL COND-2 RCH=  15.
INITIAL COND-2 RCH=  16.
INITIAL COND-2 RCH=  17.
INITIAL COND-2 RCH=  18.
INITIAL COND-2 RCH=  19.
INITIAL COND-2 RCH=  20.
INITIAL COND-2 RCH=  21.
INITIAL COND-2 RCH=  22.
INITIAL COND-2 RCH=  23.
INITIAL COND-2 RCH=  24.
INITIAL COND-2 RCH=  25.
INITIAL COND-2 RCH=  26.
INITIAL COND-2 RCH=  27.
INITIAL COND-2 RCH=  28.
INITIAL COND-2 RCH=  29.
INITIAL COND-2 RCH=  30.
INITIAL COND-2 RCH=  31.
INITIAL COND-2 RCH=  32.
INITIAL COND-2 RCH=  33.
INITIAL COND-2 RCH=  34.
INITIAL COND-2 RCH=  35.
INITIAL COND-2 RCH=  36.
INITIAL COND-2 RCH=  37.
INITIAL COND-2 RCH=  38.
INITIAL COND-2 RCH=  39.
INITIAL COND-2 RCH=  40.
INITIAL COND-2 RCH=  41.
INITIAL COND-2 RCH=  42.
INITIAL COND-2 RCH=  43.
INITIAL COND-2 RCH=  44.
INITIAL COND-2 RCH=  45.
INITIAL COND-2 RCH=  46.
INITIAL COND-2 RCH=  47.
ENDATA7A
INCR INFLOW-1  RCH=   1.
INCR INFLOW-1  RCH=   2.
INCR INFLOW-1  RCH=   3.
INCR INFLOW-1  RCH=   4.
INCR INFLOW-1  RCH=   5.
INCR INFLOW-1  RCH=   6.
INCR INFLOW-1  RCH=   7.
INCR INFLOW-1  RCH=   8.
INCR INFLOW-1  RCH=   9.
INCR INFLOW-1  RCH=  10.
INCR INFLOW-1  RCH=  11.
INCR INFLOW-1  RCH=  12.
INCR INFLOW-1  RCH=  13.
INCR INFLOW-1  RCH=  14.
INCR INFLOW-1  RCH=  15.
INCR INFLOW-1  RCH=  16.
INCR INFLOW-1  RCH=  17.
INCR INFLOW-1  RCH=  18.
INCR INFLOW-1  RCH=  19.
INCR INFLOW-1  RCH=  20.
INCR INFLOW-1  RCH=  21.
INCR INFLOW-1  RCH=  22.
INCR INFLOW-1  RCH=  23.
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INCR INFLOW-1  RCH=  24.
INCR INFLOW-1  RCH=  25.
INCR INFLOW-1  RCH=  26.
INCR INFLOW-1  RCH=  27.
INCR INFLOW-1  RCH=  28.
INCR INFLOW-1  RCH=  29.
INCR INFLOW-1  RCH=  30.
INCR INFLOW-1  RCH=  31.
INCR INFLOW-1  RCH=  32.
INCR INFLOW-1  RCH=  33.
INCR INFLOW-1  RCH=  34.
INCR INFLOW-1  RCH=  35.
INCR INFLOW-1  RCH=  36.
INCR INFLOW-1  RCH=  37.
INCR INFLOW-1  RCH=  38.
INCR INFLOW-1  RCH=  39.
INCR INFLOW-1  RCH=  40.
INCR INFLOW-1  RCH=  41.
INCR INFLOW-1  RCH=  42.
INCR INFLOW-1  RCH=  43.
INCR INFLOW-1  RCH=  44.
INCR INFLOW-1  RCH=  45.
INCR INFLOW-1  RCH=  46.
INCR INFLOW-1  RCH=  47.
ENDATA8
INCR INFLOW-2  RCH=   1.
INCR INFLOW-2  RCH=   2.
INCR INFLOW-2  RCH=   3.
INCR INFLOW-2  RCH=   4.
INCR INFLOW-2  RCH=   5.
INCR INFLOW-2  RCH=   6.
INCR INFLOW-2  RCH=   7.
INCR INFLOW-2  RCH=   8.
INCR INFLOW-2  RCH=   9.
INCR INFLOW-2  RCH=  10.
INCR INFLOW-2  RCH=  11.
INCR INFLOW-2  RCH=  12.
INCR INFLOW-2  RCH=  13.
INCR INFLOW-2  RCH=  14.
INCR INFLOW-2  RCH=  15.
INCR INFLOW-2  RCH=  16.
INCR INFLOW-2  RCH=  17.
INCR INFLOW-2  RCH=  18.
INCR INFLOW-2  RCH=  19.
INCR INFLOW-2  RCH=  20.
INCR INFLOW-2  RCH=  21.
INCR INFLOW-2  RCH=  22.
INCR INFLOW-2  RCH=  23.
INCR INFLOW-2  RCH=  24.
INCR INFLOW-2  RCH=  25.
INCR INFLOW-2  RCH=  26.
INCR INFLOW-2  RCH=  27.
INCR INFLOW-2  RCH=  28.
INCR INFLOW-2  RCH=  29.
INCR INFLOW-2  RCH=  30.
INCR INFLOW-2  RCH=  31.
INCR INFLOW-2  RCH=  32.
INCR INFLOW-2  RCH=  33.
INCR INFLOW-2  RCH=  34.
INCR INFLOW-2  RCH=  35.
INCR INFLOW-2  RCH=  36.
INCR INFLOW-2  RCH=  37.
INCR INFLOW-2  RCH=  38.
INCR INFLOW-2  RCH=  39.
INCR INFLOW-2  RCH=  40.
INCR INFLOW-2  RCH=  41.
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INCR INFLOW-2  RCH=  42.
INCR INFLOW-2  RCH=  43.
INCR INFLOW-2  RCH=  44.
INCR INFLOW-2  RCH=  45.
INCR INFLOW-2  RCH=  46.
INCR INFLOW-2  RCH=  47.
ENDATA8A
STREAM JUNCTION       1.     JNC= WIL/SPR              63       85       84
STREAM JUNCTION       2.     JNC= SPR/CAR              61      119      118
STREAM JUNCTION       3.     JNC= VOI/CAR             128      133      132
STREAM JUNCTION       4.     JNC= CAR/PUY               2      153      152
STREAM JUNCTION       5.     JNC= CAN/PUY             160      166      165
STREAM JUNCTION       6.     JNC= BOI/WHI             205      235      234
STREAM JUNCTION       7.     JNC= GOV/WHI             324      334      333
STREAM JUNCTION       8.     JNC= WHI/PUY             195      361      360
STREAM JUNCTION       9.     JNC= DIR/CLA             393      398      397
STREAM JUNCTION      10.     JNC= CLA/PUY             383      408      407
STREAM JUNCTION      11.     JNC= SWA/CLE             431      438      437
STREAM JUNCTION      12.     JNC= CLE/PUY             421      440      439
ENDATA9
HEADWTR-1 HDW=   1.  PUY RM 18.0      170.50         10.9 3.676
HEADWTR-1 HDW=   2.  CAR RM 17.8      118.51         11.0 3.676
HEADWTR-1 HDW=   3.  S PRAIRIE 7.4     19.25         10.1 3.971
HEADWTR-1 HDW=   4.  WILKESON 4.0       8.62         10.3 3.529
HEADWTR-1 HDW=   5.  VOIGHTS CK        0.001
HEADWTR-1 HDW=   6.  CANYON FALLS      0.001
HEADWTR-1 HDW=   7.  WHITE RM 25.2    284.60         10.5 2.500
HEADWTR-1 HDW=   8.  BOISE CK           2.90          8.6 3.971
HEADWTR-1 HDW=   9.  GOV'T CANAL       0.001
HEADWTR-1 HDW=  10.  CLARKS CK         42.05          7.8 2.647
HEADWTR-1 HDW=  11.  DIRU CK            0.10          9.2 3.235
HEADWTR-1 HDW=  12.  CLEAR CK          0.001
HEADWTR-1 HDW=  13.  SWAN CK            1.40          8.9 2.500
ENDATA10
HEADWTR-2  HDW=   1.                    .387  .030
HEADWTR-2  HDW=   2.                    .465  .022
HEADWTR-2  HDW=   3.                    .309  .027
HEADWTR-2  HDW=   4.                    .296  .022
HEADWTR-2  HDW=   5.
HEADWTR-2  HDW=   6.
HEADWTR-2  HDW=   7.                    .268  .049
HEADWTR-2  HDW=   8.                    .920  .078
HEADWTR-2  HDW=   9.
HEADWTR-2  HDW=  10.                    .338  .011
HEADWTR-2  HDW=  11.                    .081  .054
HEADWTR-2  HDW=  12.
HEADWTR-2  HDW=  13.                    .556  .089
ENDATA10A
POINTLD-1 PTL=   1. CRBNADO WTP      0.15472          0.8 66.97
POINTLD-1 PTL=   2. LILY CK             1.08          7.6   5.0
POINTLD-1 PTL=   3. WLKESON WTP      0.10057          2.0 70.49
POINTLD-1 PTL=   4. S PRAIR WTP      0.05879          1.5 44.06
POINTLD-1 PTL=   5. WDF HTCHRY         18.24          8.2 5.453
POINTLD-1 PTL=   6. ORTING WTP        1.3306          0.1 45.29
POINTLD-1 PTL=   7. RCH16
POINTLD-1 PTL=   8. TRTSPR HTCH         8.33          8.6 12.74
POINTLD-1 PTL=   9. RCH18
POINTLD-1 PTL=  10. FENNEL CK           6.37          9.2 2.941
POINTLD-1 PTL=  11. RCH19
POINTLD-1 PTL=  12. PTRIB 13            3.08          8.2 3.088
POINTLD-1 PTL=  13. MCALDER WTP         0.00          0.0   0.0
POINTLD-1 PTL=  14. RCH20
POINTLD-1 PTL=  15. RAINSCH WTP      0.40227          1.9 41.34
POINTLD-1 PTL=  16. WHI R CANAL      -162.90
POINTLD-1 PTL=  17. MTRIBE HTCH         5.00          9.6 4.603
POINTLD-1 PTL=  18. RCH23
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POINTLD-1 PTL=  19. ENUMCLW WTP      2.6302          2.2 52.25
POINTLD-1 PTL=  20. BUCKLEY WTP      2.1042          2.5 36.28
POINTLD-1 PTL=  21. WTRIB 15           0.78          7.7 3.235
POINTLD-1 PTL=  22. BOWMAN CK          0.32          8.2 2.794
POINTLD-1 PTL=  23. RCH34
POINTLD-1 PTL=  24. L TAPPS DIV      250.20          8.0   2.5
POINTLD-1 PTL=  25. STRAWB CK          6.75          8.5   2.5
POINTLD-1 PTL=  26. BEATRICE        0.46416          1.6 24.67
POINTLD-1 PTL=  27. SONOCO          0.48427          2.4 378.9
POINTLD-1 PTL=  28. WTRIB 1.3          2.57          2.9   2.5
POINTLD-1 PTL=  29. FLEISCHMANS      1.3151          2.4 7.265
POINTLD-1 PTL=  30. SUMNER WTP       4.6416          1.1 75.42
POINTLD-1 PTL=  31. RCH37
POINTLD-1 PTL=  32. PUY/MATSU        11.527          1.6 53.46
POINTLD-1 PTL=  33. WDW HTCHRY        12.07          7.7 4.816
POINTLD-1 PTL=  34. PTRIBE HTCH       0.780          8.9 5.333
POINTLD-1 PTL=  35. TRTCO HTCH         9.60          7.7 7.766
POINTLD-1 PTL=  36. RCH44
POINTLD-1 PTL=  37. RCH46
POINTLD-1 PTL=  38. RCH47
ENDATA11
POINTLD-2  PTL=   1.                 11.63 25.00
POINTLD-2  PTL=   2.                 0.331 0.046
POINTLD-2  PTL=   3.                 12.32 11.50
POINTLD-2  PTL=   4.                 10.60 25.00
POINTLD-2  PTL=   5.                 0.614 0.154
POINTLD-2  PTL=   6.                 18.87 26.00
POINTLD-2  PTL=   7.
POINTLD-2  PTL=   8.                 1.260 1.658
POINTLD-2  PTL=   9.
POINTLD-2  PTL=  10.                 0.645 0.024
POINTLD-2  PTL=  11.
POINTLD-2  PTL=  12.                 2.230 0.086
POINTLD-2  PTL=  13.                  0.00  0.00
POINTLD-2  PTL=  14.
POINTLD-2  PTL=  15.                 6.302 15.00
POINTLD-2  PTL=  16.
POINTLD-2  PTL=  17.                 0.473 0.170
POINTLD-2  PTL=  18.
POINTLD-2  PTL=  19.                 5.788 7.000
POINTLD-2  PTL=  20.                 4.446 5.500
POINTLD-2  PTL=  21.                 0.748 0.023
POINTLD-2  PTL=  22.                 0.576 0.055
POINTLD-2  PTL=  23.
POINTLD-2  PTL=  24.                 0.187 0.049
POINTLD-2  PTL=  25.                 0.195 0.032
POINTLD-2  PTL=  26.                 55.85   8.4
POINTLD-2  PTL=  27.                 10.28 0.416
POINTLD-2  PTL=  28.                 1.140 0.096
POINTLD-2  PTL=  29.                 0.203   3.0
POINTLD-2  PTL=  30.                 8.308   8.5
POINTLD-2  PTL=  31.
POINTLD-2  PTL=  32.                  9.63 17.99
POINTLD-2  PTL=  33.                 0.876 0.410
POINTLD-2  PTL=  34.                 0.291 0.530
POINTLD-2  PTL=  35.                 2.670 0.750
POINTLD-2  PTL=  36.
POINTLD-2  PTL=  37.
POINTLD-2  PTL=  38.
ENDATA11A
ENDATA12
DOWNSTREAM BOUNDARY-1            5.73    2.0
ENDATA13
DOWNSTREAM BOUNDARY-2                  0.057
ENDATA13A
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TITLE01              PUYALLUP RIVER MODEL: !NOVAPR.IN, Revised 12-Jul-94
TITLE02              NOV-APR 7Q20 W/ WTP DESIGN FLOWS AND PROPOSED WLAs
TITLE03    NO        CONSERVATIVE MINERAL I
TITLE04    NO        CONSERVATIVE MINERAL II
TITLE05    NO        CONSERVATIVE MINERAL III
TITLE06    NO        TEMPERATURE
TITLE07   YES        BIOCHEMICAL OXYGEN DEMAND
TITLE08    NO        ALGAE AS CHL-A IN UG/L
TITLE09    NO        PHOSPHORUS CYCLE AS P IN MG/L
TITLE10                (ORGANIC-P, DISSOLVED-P)
TITLE11   YES        NITROGEN CYCLE AS N IN MG/L
TITLE12                (ORGANIC-N, AMMONIA-N, NITRITE-N, NITRITE-N)
TITLE13   YES        DISOLVED OXYGEN IN MG/L
TITLE14    NO        FECAL COLIFORMS IN NO./100 ML
TITLE15    NO        ARBITRARY NON-CONSERVATIVE
ENDTITLE
LIST DATA INPUT
WRITE OPTIONAL SUMMARY
NO FLOW AUGMENTATION
STEADY STATE
DISCHARGE COEFFICIENTS
NO PRINT SOLAR/LCD DATA
NO PLOT DO AND BOD
FIXED DNSTM COND (YES=1)=    1.00000        5D-ULT BOD CONV K COEF  =    0.00000
INPUT METRIC (YES=1)     =   0.00000        OUTPUT METRIC (YES=1)   =    0.00000
NUMBER OF REACHES        =  47.00000        NUMBER OF JUNCTIONS     =   12.00000
NUM OF HEADWATERS        =  13.00000        NUMBER OF POINT LOADS   =   38.00000
TIME STEP (HOURS)        =                  LNTH  COMP  ELEMENT (DX)=    0.20000
MAXIMUM ITERATIONS       =  30.00000        TIME INC. FOR RPT2 (HRS)=
LATITUDE OF BASIN (DEG) =  47.00000         LONGITUDE OF BASIN (DEG)= 122.00000
STANDARD MERIDIAN (DEG) =  75.00000         DAY OF YEAR START TIME  = 261.00000
EVAP. CO AE (FT/HR-INHG)=   0.00068         EVAPCO BE (FT/HR-IN-MPH)=    0.00027
ELEV. OF BASIN (FT)      = 000.00000        DUST ATTENUATION COEF.  =    0.13000
ENDATA1
O UPTAKE BY NH3 OXID(MG O/MG N)= 3.4300  O UPTAKE BY NO2 OXID(MG O/MG N)= 1.1400
O PROD  BY ALGAE (MG O/MG A)    = 1.6000  O UPTAKE BY ALGAE (MG O/MG A)   = 2.0000
N CONTENT OF ALGAE (MG N/MG A) = 0.0800  P CONTENT OF ALGAE (MG P/MG A) = 0.0110
ALG MAX SPEC GROWTH RATE(1/DAY)= 2.3000  ALGAE RESPIRATION RATE (1/DAY) = 0.1200
N HALF SATURATION CONST (MG/L) = 0.0200  P HALF SATURATION CONST  (MG/L)= 0.0050
LIN ALG EXCO (1/FT)/(UGCHLA/L) = 0.0130  NLINCO (1/FT)/(UGCHLA/L)**(2/3)= 0.0000
LIGHT FUNCTION OPTION (LFNOPT) = 1.0000  LIGHT SAT'N COEFF (BTU/FT2/MIN)= 0.0920
DAILY AVERAGING OPTION (LAVOPT)=       2  LIGHT AVERAGING FACTOR (AFACT) = 1.0000
NUMBER OF DAYLIGHT HOURS (DLH) = 14.000  TOTAL DAILY SOLR RAD (BTU/FT2) = 1800.0
ALGY GROWTH CALC OPTION(LGROPT)= 2.0000  ALGAL PREF FOR NH3-N (PREFN)   = 0.9000
ALG/TEMP SOLR RAD FACTOR(TFACT)= 0.4500  NITRIFICATION INHIBITION COEF  = 0.6000
ENDATA1A
THETA    BOD SETT    1.000
THETA    SOD RATE    1.047
THETA    ORGN SET    1.000
THETA    NH3 DECA    1.080
THETA    PORG SET    1.000
THETA    ALG SETT    1.000
ENDATA1B
STREAM REACH     1.RCH= PUYALLUP R       FROM        18.4     TO        18.0
STREAM REACH     2.RCH= CARBON R         FROM        17.8     TO        15.4
STREAM REACH     3.RCH= CARBON R         FROM        15.4     TO        11.4
STREAM REACH     4.RCH= CARBON R         FROM        11.4     TO         7.4
STREAM REACH     5.RCH= CARBON R         FROM         7.4     TO         6.0
STREAM REACH     6.RCH= S PRAIRIE CK     FROM         7.2     TO         6.8
STREAM REACH     7.RCH= WILKESON CK      FROM         4.2     TO         4.0
STREAM REACH     8.RCH= WILKESON CK      FROM         4.0     TO         0.0
STREAM REACH     9.RCH= S PRAIRIE CK     FROM         6.8     TO         5.6
STREAM REACH    10.RCH= S PRAIRIE CK     FROM         5.6     TO         1.6
STREAM REACH    11.RCH= S PRAIRIE CK     FROM         1.6     TO         0.0
STREAM REACH    12.RCH= CARBON R         FROM         6.0     TO         4.0
STREAM REACH    13.RCH= VOIGHTS CK       FROM         0.8     TO         0.0
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STREAM REACH     14.RCH= CARBON R          FROM         4.0    TO          2.0
STREAM REACH     15.RCH= CARBON R          FROM         2.0    TO          0.0
STREAM REACH     16.RCH= PUYALLUP R        FROM        18.0    TO         16.4
STREAM REACH     17.RCH= CANYON FALLS      FROM         1.0    TO          0.0
STREAM REACH     18.RCH= PUYALLUP R        FROM        16.4    TO         15.6
STREAM REACH     19.RCH= PUYALLUP R        FROM        15.6    TO         12.2
STREAM REACH     20.RCH= PUYALLUP R        FROM        12.2    TO         10.4
STREAM REACH     21.RCH= WHITE R           FROM        25.4    TO         24.6
STREAM REACH     22.RCH= WHITE R           FROM        24.6    TO         23.4
STREAM REACH     23.RCH= BOISE CK          FROM         5.8    TO          1.8
STREAM REACH     24.RCH= BOISE CK          FROM         1.8    TO          0.0
STREAM REACH     25.RCH= WHITE R           FROM        23.4    TO         21.8
STREAM REACH     26.RCH= WHITE R           FROM        21.8    TO         19.8
STREAM REACH     27.RCH= WHITE R           FROM        19.8    TO         17.8
STREAM REACH     28.RCH= WHITE R           FROM        17.8    TO         15.8
STREAM REACH     29.RCH= WHITE R           FROM        15.8    TO         13.8
STREAM REACH     30.RCH= WHITE R           FROM        13.8    TO         11.8
STREAM REACH     31.RCH= WHITE R           FROM        11.8    TO          9.8
STREAM REACH     32.RCH= WHITE R           FROM         9.8    TO          8.0
STREAM REACH     33.RCH= WHITE R           FROM         8.0    TO          5.4
STREAM REACH     34.RCH= GOV'T CANAL       FROM         1.8    TO          0.0
STREAM REACH     35.RCH= WHITE R           FROM         5.4    TO          3.6
STREAM REACH     36.RCH= WHITE R           FROM         3.6    TO          0.0
STREAM REACH     37.RCH= PUYALLUP R        FROM        10.4    TO          7.0
STREAM REACH     38.RCH= PUYALLUP R        FROM         7.0    TO          5.8
STREAM REACH     39.RCH= CLARKS CK         FROM         4.0    TO          2.0
STREAM REACH     40.RCH= DIRU CK           FROM         0.8    TO          0.0
STREAM REACH     41.RCH= CLARKS CK         FROM         2.0    TO          0.0
STREAM REACH     42.RCH= PUYALLUP R        FROM         5.8    TO          3.0
STREAM REACH     43.RCH= CLEAR CK          FROM         2.4    TO          0.4
STREAM REACH     44.RCH= SWAN CK           FROM         1.2    TO          0.0
STREAM REACH     45.RCH= CLEAR CK          FROM         0.4    TO          0.0
STREAM REACH     46.RCH= PUYALLUP R        FROM         3.0    TO          1.0
STREAM REACH     47.RCH= PUYALLUP R        FROM         1.0    TO          0.0
ENDATA2
ENDATA3
FLAG FIELD RCH=   1.        2        1 3
FLAG FIELD RCH=   2.       12        1 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=   3.       20        2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 6 2
FLAG FIELD RCH=   4.       20        6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=   5.        7        2 2 2 2 2 2 3
FLAG FIELD RCH=   6.        2        1 3
FLAG FIELD RCH=   7.        1        1
FLAG FIELD RCH=   8.       20        6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=   9.        6        4 2 2 2 2 2
FLAG FIELD RCH=  10.       20        6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  11.        8        2 2 2 2 2 2 2 3
FLAG FIELD RCH=  12.       10        4 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  13.        4        1 6 2 3
FLAG FIELD RCH=  14.       10        4 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  15.       10        6 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  16.        8        4 2 2 2 6 2 2 3
FLAG FIELD RCH=  17.        5        1 6 2 2 3
FLAG FIELD RCH=  18.        4        4 6 2 2
FLAG FIELD RCH=  19.       17        6 2 2 2 2 6 2 2 2 2 2 2 6 2 2 2 2
FLAG FIELD RCH=  20.        9        6 6 2 2 2 2 2 2 3
FLAG FIELD RCH=  21.        4        1 6 2 2
FLAG FIELD RCH=  22.        6        7 6 2 2 2 3
FLAG FIELD RCH=  23.       20        1 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  24.        9        2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=  25.        8        4 6 2 2 2 2 2 2
FLAG FIELD RCH=  26.       10        6 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  27.       10        2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  28.       10        2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  29.       10        2 6 2 2 2 2 2 2 2 2
FLAG FIELD RCH=  30.       10        2 2 2 2 2 2 2 2 2 2
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FLAG FIELD RCH=	31.	10	2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=	32.	9	2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=	33.	13	6 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=	34.	9	1 6 2 2 2 2 2 2 3
FLAG FIELD RCH=	35.	9	4 2 2 2 2 2 2 2 2
FLAG FIELD RCH=	36.	18	6 2 2 2 2 2 2 6 2 6 6 6 6 2 2 2 6 3
FLAG FIELD RCH=	37.	17	4 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
FLAG FIELD RCH=	38.	6	6 2 2 2 2 3
FLAG FIELD RCH=	39.	10	1 6 2 2 2 2 2 2 2 3
FLAG FIELD RCH=	40.	4	1 6 2 3
FLAG FIELD RCH=	41.	10	4 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=	42.	14	4 2 2 2 2 2 2 2 2 2 2 2 2 3
FLAG FIELD RCH=	43.	10	1 6 2 2 2 2 2 2 2 3
FLAG FIELD RCH=	44.	6	1 6 2 2 2 3
FLAG FIELD RCH=	45.	2	4 3
FLAG FIELD RCH=	46.	10	4 2 2 2 6 2 2 2 2 2
FLAG FIELD RCH=	47.	5	6 2 2 2 5

ENDATA4

HYDRAULICS RCH=	1.		0.500	0.280	0.150	0.460	0.040
HYDRAULICS RCH=	2.		0.480	0.400	0.036	0.600	0.045
HYDRAULICS RCH=	3.		0.480	0.400	0.036	0.600	0.045
HYDRAULICS RCH=	4.		0.480	0.400	0.036	0.600	0.045
HYDRAULICS RCH=	5.		1.000	0.230	0.190	0.290	0.045
HYDRAULICS RCH=	6.		0.074	0.690	0.760	0.071	0.040
HYDRAULICS RCH=	7.		0.620	0.400	0.053	0.600	0.040
HYDRAULICS RCH=	8.		0.620	0.400	0.053	0.600	0.040
HYDRAULICS RCH=	9.		0.074	0.690	0.760	0.071	0.040
HYDRAULICS RCH=	10.		0.074	0.690	0.760	0.071	0.040
HYDRAULICS RCH=	11.		0.074	0.690	0.760	0.071	0.040
HYDRAULICS RCH=	12.		1.100	0.220	0.220	0.310	0.044
HYDRAULICS RCH=	13.		0.520	0.400	0.073	0.600	0.040
HYDRAULICS RCH=	14.		0.920	0.180	0.100	0.400	0.041
HYDRAULICS RCH=	15.		0.440	0.320	0.130	0.400	0.039
HYDRAULICS RCH=	16.		0.540	0.290	0.380	0.280	0.035
HYDRAULICS RCH=	17.		1.300	0.400	0.036	0.600	0.040
HYDRAULICS RCH=	18.		0.750	0.190	0.200	0.360	0.040
HYDRAULICS RCH=	19.		0.500	0.250	0.130	0.450	0.047
HYDRAULICS RCH=	20.		0.260	0.350	0.160	0.410	0.038
HYDRAULICS RCH=	21.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	22.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	23.		0.940	0.400	0.100	0.600	0.040
HYDRAULICS RCH=	24.		0.940	0.400	0.100	0.600	0.040
HYDRAULICS RCH=	25.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	26.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	27.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	28.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	29.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	30.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	31.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	32.		0.095	0.560	0.190	0.300	0.045
HYDRAULICS RCH=	33.		0.410	0.330	0.180	0.360	0.041
HYDRAULICS RCH=	34.		0.300	0.400	0.280	0.600	0.040
HYDRAULICS RCH=	35.		0.420	0.310	0.160	0.350	0.038
HYDRAULICS RCH=	36.		0.078	0.490	0.100	0.510	0.040
HYDRAULICS RCH=	37.		0.200	0.340	0.290	0.330	0.036
HYDRAULICS RCH=	38.		0.180	0.360	0.063	0.540	0.030
HYDRAULICS RCH=	39.		0.390	0.400	0.140	0.600	0.040
HYDRAULICS RCH=	40.		0.390	0.400	0.140	0.600	0.040
HYDRAULICS RCH=	41.		0.390	0.400	0.140	0.600	0.040
HYDRAULICS RCH=	42.	2.19E3	0.044	0.530	0.620	0.240	0.030
HYDRAULICS RCH=	43.		0.410	0.400	0.210	0.600	0.040
HYDRAULICS RCH=	44.		0.650	0.400	0.410	0.600	0.040
HYDRAULICS RCH=	45.		0.410	0.400	0.210	0.600	0.040
HYDRAULICS RCH=	46.	4.30E3	0.00068	0.980	5.600	0.000	0.029
HYDRAULICS RCH=	47.	8.06E3	0.00013	1.100	7.600	0.000	0.028

ENDATA5

ENDATA5A

REACT COEF RCH=	1.	0.86	0.00	-0.14	3	0.00	0.054
REACT COEF RCH=	2.	1.05	0.00	-0.09	3	0.00	0.054
REACT COEF RCH=	3.	1.04	0.00	-0.09	3	0.00	0.054
REACT COEF RCH=	4.	1.04	0.00	-0.09	3	0.00	0.054
REACT COEF RCH=	5.	1.04	0.00	-0.09	3	0.00	0.054
REACT COEF RCH=	6.	2.37	0.00	-0.17	3	0.00	0.054
REACT COEF RCH=	7.	3.33	0.00	-0.30	8	0.00	0.110
REACT COEF RCH=	8.	3.33	0.00	-0.30	8	0.00	0.110
REACT COEF RCH=	9.	1.98	0.00	-0.17	3	0.00	0.054
REACT COEF RCH=	10.	1.97	0.00	-0.17	3	0.00	0.054
REACT COEF RCH=	11.	1.97	0.00	-0.17	3	0.00	0.054
REACT COEF RCH=	12.	0.92	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	13.	2.58	0.00	0.00	8	0.00	0.110
REACT COEF RCH=	14.	0.87	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	15.	0.87	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	16.	0.61	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	17.	3.33	0.00	0.00	8	0.00	0.110
REACT COEF RCH=	18.	0.61	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	19.	0.60	0.00	-0.12	3	0.00	0.054
REACT COEF RCH=	20.	0.60	0.00	-0.20	3	0.00	0.054
REACT COEF RCH=	21.	0.64	0.00	-0.13	3	0.00	0.054
REACT COEF RCH=	22.	0.98	0.00	-0.11	3	0.00	0.054
REACT COEF RCH=	23.	0.00	0.00	0.00	1	0.00	0.000
REACT COEF RCH=	24.	0.00	0.00	0.00	1	0.00	0.000
REACT COEF RCH=	25.	0.95	0.00	-0.11	3	0.00	0.054
REACT COEF RCH=	26.	0.94	0.00	-0.11	3	0.00	0.054
REACT COEF RCH=	27.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	28.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	29.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	30.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	31.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	32.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	33.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	34.	3.33	0.00	0.00	8	0.00	0.110
REACT COEF RCH=	35.	0.94	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	36.	0.52	0.00	-0.30	3	0.00	0.054
REACT COEF RCH=	37.	0.40	0.00	-0.20	3	0.00	0.054
REACT COEF RCH=	38.	0.39	0.00	-0.20	3	0.00	0.054
REACT COEF RCH=	39.	1.46	0.00	0.00	3	0.00	0.054
REACT COEF RCH=	40.	3.33	0.00	0.00	8	0.00	0.110
REACT COEF RCH=	41.	1.45	0.00	0.00	3	0.00	0.054
REACT COEF RCH=	42.	0.39	0.00	0.00	3	0.00	0.054
REACT COEF RCH=	43.	3.33	0.00	0.00	3	0.00	0.110
REACT COEF RCH=	44.	3.33	0.00	0.00	3	0.00	0.110
REACT COEF RCH=	45.	3.18	0.00	0.00	3	0.00	0.110
REACT COEF RCH=	46.	0.39	0.00	0.00	3	0.00	0.054
REACT COEF RCH=	47.	0.39	0.00	0.00	3	0.00	0.054

ENDATA6

N AND P COEF RCH=	1.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	2.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	3.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	4.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	5.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	6.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	7.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	8.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	9.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	10.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	11.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	12.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	13.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	14.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	15.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	16.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF RCH=	17.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00

N AND P COEF	RCH= 18.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 19.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 20.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 21.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 22.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 23.	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
N AND P COEF	RCH= 24.	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00
N AND P COEF	RCH= 25.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 26.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 27.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 28.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 29.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 30.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 31.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 32.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 33.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 34.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 35.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 36.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 37.	0.10	0.000	0.20	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 38.	0.10	0.000	1.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 39.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 40.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 41.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 42.	0.10	0.000	1.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 43.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 44.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 45.	0.10	0.000	0.45	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 46.	0.10	0.000	1.00	0.00	4.00	0.10	0.00	0.00
N AND P COEF	RCH= 47.	0.10	0.000	1.00	0.00	4.00	0.10	0.00	0.00

ENDATA6A

ALG/OTHER COEF RCH= 1.
ALG/OTHER COEF RCH= 2.
ALG/OTHER COEF RCH= 3.
ALG/OTHER COEF RCH= 4.
ALG/OTHER COEF RCH= 5.
ALG/OTHER COEF RCH= 6.
ALG/OTHER COEF RCH= 7.
ALG/OTHER COEF RCH= 8.
ALG/OTHER COEF RCH= 9.
ALG/OTHER COEF RCH= 10.
ALG/OTHER COEF RCH= 11.
ALG/OTHER COEF RCH= 12.
ALG/OTHER COEF RCH= 13.
ALG/OTHER COEF RCH= 14.
ALG/OTHER COEF RCH= 15.
ALG/OTHER COEF RCH= 16.
ALG/OTHER COEF RCH= 17.
ALG/OTHER COEF RCH= 18.
ALG/OTHER COEF RCH= 19.
ALG/OTHER COEF RCH= 20.
ALG/OTHER COEF RCH= 21.
ALG/OTHER COEF RCH= 22.
ALG/OTHER COEF RCH= 23.
ALG/OTHER COEF RCH= 24.
ALG/OTHER COEF RCH= 25.
ALG/OTHER COEF RCH= 26.
ALG/OTHER COEF RCH= 27.
ALG/OTHER COEF RCH= 28.
ALG/OTHER COEF RCH= 29.
ALG/OTHER COEF RCH= 30.
ALG/OTHER COEF RCH= 31.
ALG/OTHER COEF RCH= 32.
ALG/OTHER COEF RCH= 33.
ALG/OTHER COEF RCH= 34.
ALG/OTHER COEF RCH= 35.

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ALG/OTHER COEF RCH=  36.
ALG/OTHER COEF RCH=  37.
ALG/OTHER COEF RCH=  38.
ALG/OTHER COEF RCH=  39.
ALG/OTHER COEF RCH=  40.
ALG/OTHER COEF RCH=  41.
ALG/OTHER COEF RCH=  42.
ALG/OTHER COEF RCH=  43.
ALG/OTHER COEF RCH=  44.
ALG/OTHER COEF RCH=  45.
ALG/OTHER COEF RCH=  46.
ALG/OTHER COEF RCH=  47.
ENDATA6B
INITIAL COND-1 RCH=   1.   46.0
INITIAL COND-1 RCH=   2.   44.4
INITIAL COND-1 RCH=   3.   44.4
INITIAL COND-1 RCH=   4.   44.4
INITIAL COND-1 RCH=   5.   44.4
INITIAL COND-1 RCH=   6.   44.4
INITIAL COND-1 RCH=   7.   44.4
INITIAL COND-1 RCH=   8.   44.4
INITIAL COND-1 RCH=   9.   44.4
INITIAL COND-1 RCH=  10.   44.4
INITIAL COND-1 RCH=  11.   44.4
INITIAL COND-1 RCH=  12.   44.4
INITIAL COND-1 RCH=  13.   44.4
INITIAL COND-1 RCH=  14.   44.4
INITIAL COND-1 RCH=  15.   44.4
INITIAL COND-1 RCH=  16.   46.7
INITIAL COND-1 RCH=  17.   46.7
INITIAL COND-1 RCH=  18.   46.7
INITIAL COND-1 RCH=  19.   46.7
INITIAL COND-1 RCH=  20.   46.7
INITIAL COND-1 RCH=  21.   51.1
INITIAL COND-1 RCH=  22.   51.1
INITIAL COND-1 RCH=  23.   51.1
INITIAL COND-1 RCH=  24.   51.1
INITIAL COND-1 RCH=  25.   51.1
INITIAL COND-1 RCH=  26.   51.1
INITIAL COND-1 RCH=  27.   51.1
INITIAL COND-1 RCH=  28.   51.1
INITIAL COND-1 RCH=  29.   51.1
INITIAL COND-1 RCH=  30.   51.1
INITIAL COND-1 RCH=  31.   51.1
INITIAL COND-1 RCH=  32.   51.1
INITIAL COND-1 RCH=  33.   51.1
INITIAL COND-1 RCH=  34.   51.1
INITIAL COND-1 RCH=  35.   51.1
INITIAL COND-1 RCH=  36.   49.6
INITIAL COND-1 RCH=  37.   48.6
INITIAL COND-1 RCH=  38.   48.6
INITIAL COND-1 RCH=  39.   48.6
INITIAL COND-1 RCH=  40.   48.6
INITIAL COND-1 RCH=  41.   48.6
INITIAL COND-1 RCH=  42.   48.6
INITIAL COND-1 RCH=  43.   48.6
INITIAL COND-1 RCH=  44.   48.6
INITIAL COND-1 RCH=  45.   48.6
INITIAL COND-1 RCH=  46.   48.6
INITIAL COND-1 RCH=  47.   48.6
ENDATA7
INITIAL COND-2 RCH=   1.
INITIAL COND-2 RCH=   2.
INITIAL COND-2 RCH=   3.
INITIAL COND-2 RCH=   4.
INITIAL COND-2 RCH=   5.
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INITIAL COND-2 RCH=   6.
INITIAL COND-2 RCH=   7.
INITIAL COND-2 RCH=   8.
INITIAL COND-2 RCH=   9.
INITIAL COND-2 RCH=  10.
INITIAL COND-2 RCH=  11.
INITIAL COND-2 RCH=  12.
INITIAL COND-2 RCH=  13.
INITIAL COND-2 RCH=  14.
INITIAL COND-2 RCH=  15.
INITIAL COND-2 RCH=  16.
INITIAL COND-2 RCH=  17.
INITIAL COND-2 RCH=  18.
INITIAL COND-2 RCH=  19.
INITIAL COND-2 RCH=  20.
INITIAL COND-2 RCH=  21.
INITIAL COND-2 RCH=  22.
INITIAL COND-2 RCH=  23.
INITIAL COND-2 RCH=  24.
INITIAL COND-2 RCH=  25.
INITIAL COND-2 RCH=  26.
INITIAL COND-2 RCH=  27.
INITIAL COND-2 RCH=  28.
INITIAL COND-2 RCH=  29.
INITIAL COND-2 RCH=  30.
INITIAL COND-2 RCH=  31.
INITIAL COND-2 RCH=  32.
INITIAL COND-2 RCH=  33.
INITIAL COND-2 RCH=  34.
INITIAL COND-2 RCH=  35.
INITIAL COND-2 RCH=  36.
INITIAL COND-2 RCH=  37.
INITIAL COND-2 RCH=  38.
INITIAL COND-2 RCH=  39.
INITIAL COND-2 RCH=  40.
INITIAL COND-2 RCH=  41.
INITIAL COND-2 RCH=  42.
INITIAL COND-2 RCH=  43.
INITIAL COND-2 RCH=  44.
INITIAL COND-2 RCH=  45.
INITIAL COND-2 RCH=  46.
INITIAL COND-2 RCH=  47.
ENDATA7A
INCR INFLOW-1  RCH=   1.
INCR INFLOW-1  RCH=   2.
INCR INFLOW-1  RCH=   3.
INCR INFLOW-1  RCH=   4.
INCR INFLOW-1  RCH=   5.
INCR INFLOW-1  RCH=   6.
INCR INFLOW-1  RCH=   7.
INCR INFLOW-1  RCH=   8.
INCR INFLOW-1  RCH=   9.
INCR INFLOW-1  RCH=  10.
INCR INFLOW-1  RCH=  11.
INCR INFLOW-1  RCH=  12.
INCR INFLOW-1  RCH=  13.
INCR INFLOW-1  RCH=  14.
INCR INFLOW-1  RCH=  15.
INCR INFLOW-1  RCH=  16.
INCR INFLOW-1  RCH=  17.
INCR INFLOW-1  RCH=  18.
INCR INFLOW-1  RCH=  19.
INCR INFLOW-1  RCH=  20.
INCR INFLOW-1  RCH=  21.
INCR INFLOW-1  RCH=  22.
INCR INFLOW-1  RCH=  23.
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INCR INFLOW-1  RCH=  24.
INCR INFLOW-1  RCH=  25.
INCR INFLOW-1  RCH=  26.
INCR INFLOW-1  RCH=  27.
INCR INFLOW-1  RCH=  28.
INCR INFLOW-1  RCH=  29.
INCR INFLOW-1  RCH=  30.
INCR INFLOW-1  RCH=  31.
INCR INFLOW-1  RCH=  32.
INCR INFLOW-1  RCH=  33.
INCR INFLOW-1  RCH=  34.
INCR INFLOW-1  RCH=  35.
INCR INFLOW-1  RCH=  36.
INCR INFLOW-1  RCH=  37.
INCR INFLOW-1  RCH=  38.
INCR INFLOW-1  RCH=  39.
INCR INFLOW-1  RCH=  40.
INCR INFLOW-1  RCH=  41.
INCR INFLOW-1  RCH=  42.
INCR INFLOW-1  RCH=  43.
INCR INFLOW-1  RCH=  44.
INCR INFLOW-1  RCH=  45.
INCR INFLOW-1  RCH=  46.
INCR INFLOW-1  RCH=  47.
ENDATA8
INCR INFLOW-2  RCH=   1.
INCR INFLOW-2  RCH=   2.
INCR INFLOW-2  RCH=   3.
INCR INFLOW-2  RCH=   4.
INCR INFLOW-2  RCH=   5.
INCR INFLOW-2  RCH=   6.
INCR INFLOW-2  RCH=   7.
INCR INFLOW-2  RCH=   8.
INCR INFLOW-2  RCH=   9.
INCR INFLOW-2  RCH=  10.
INCR INFLOW-2  RCH=  11.
INCR INFLOW-2  RCH=  12.
INCR INFLOW-2  RCH=  13.
INCR INFLOW-2  RCH=  14.
INCR INFLOW-2  RCH=  15.
INCR INFLOW-2  RCH=  16.
INCR INFLOW-2  RCH=  17.
INCR INFLOW-2  RCH=  18.
INCR INFLOW-2  RCH=  19.
INCR INFLOW-2  RCH=  20.
INCR INFLOW-2  RCH=  21.
INCR INFLOW-2  RCH=  22.
INCR INFLOW-2  RCH=  23.
INCR INFLOW-2  RCH=  24.
INCR INFLOW-2  RCH=  25.
INCR INFLOW-2  RCH=  26.
INCR INFLOW-2  RCH=  27.
INCR INFLOW-2  RCH=  28.
INCR INFLOW-2  RCH=  29.
INCR INFLOW-2  RCH=  30.
INCR INFLOW-2  RCH=  31.
INCR INFLOW-2  RCH=  32.
INCR INFLOW-2  RCH=  33.
INCR INFLOW-2  RCH=  34.
INCR INFLOW-2  RCH=  35.
INCR INFLOW-2  RCH=  36.
INCR INFLOW-2  RCH=  37.
INCR INFLOW-2  RCH=  38.
INCR INFLOW-2  RCH=  39.
INCR INFLOW-2  RCH=  40.
INCR INFLOW-2  RCH=  41.
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INCR INFLOW-2  RCH=  42.
INCR INFLOW-2  RCH=  43.
INCR INFLOW-2  RCH=  44.
INCR INFLOW-2  RCH=  45.
INCR INFLOW-2  RCH=  46.
INCR INFLOW-2  RCH=  47.
ENDATA8A
STREAM JUNCTION        1.    JNC= WIL/SPR               63       85       84
STREAM JUNCTION        2.    JNC= SPR/CAR               61      119      118
STREAM JUNCTION        3.    JNC= VOI/CAR              128      133      132
STREAM JUNCTION        4.    JNC= CAR/PUY                2      153      152
STREAM JUNCTION        5.    JNC= CAN/PUY              160      166      165
STREAM JUNCTION        6.    JNC= BOI/WHI              205      235      234
STREAM JUNCTION        7.    JNC= GOV/WHI              324      334      333
STREAM JUNCTION        8.    JNC= WHI/PUY              195      361      360
STREAM JUNCTION        9.    JNC= DIR/CLA              393      398      397
STREAM JUNCTION       10.    JNC= CLA/PUY              383      408      407
STREAM JUNCTION       11.    JNC= SWA/CLE              431      438      437
STREAM JUNCTION       12.    JNC= CLE/PUY              421      440      439
ENDATA9
HEADWTR-1 HDW=   1.  PUY RM 18.0      143.50         11.9 3.676
HEADWTR-1 HDW=   2.  CAR RM 17.8       62.71         12.2 3.676
HEADWTR-1 HDW=   3.  S PRAIRIE 7.4     29.81         12.2 3.971
HEADWTR-1 HDW=   4.  WILKESON 4.0      13.36         12.2 3.529
HEADWTR-1 HDW=   5.  VOIGHTS CK        0.001
HEADWTR-1 HDW=   6.  CANYON FALLS      0.001
HEADWTR-1 HDW=   7.  WHITE RM 25.2    287.10         11.1 2.500
HEADWTR-1 HDW=   8.  BOISE CK           7.90          8.6 3.971
HEADWTR-1 HDW=   9.  GOV'T CANAL       0.001
HEADWTR-1 HDW=  10.  CLARKS CK         42.05          7.8 2.647
HEADWTR-1 HDW=  11.  DIRU CK            0.10          9.2 3.235
HEADWTR-1 HDW=  12.  CLEAR CK          0.001
HEADWTR-1 HDW=  13.  SWAN CK            1.40          8.9 2.500
ENDATA10
HEADWTR-2  HDW=   1.                    .387  .030
HEADWTR-2  HDW=   2.                    .465  .022
HEADWTR-2  HDW=   3.                    .309  .027
HEADWTR-2  HDW=   4.                    .296  .022
HEADWTR-2  HDW=   5.
HEADWTR-2  HDW=   6.
HEADWTR-2  HDW=   7.                    .268  .049
HEADWTR-2  HDW=   8.                    .920  .078
HEADWTR-2  HDW=   9.
HEADWTR-2  HDW=  10.                    .338  .011
HEADWTR-2  HDW=  11.                    .081  .054
HEADWTR-2  HDW=  12.
HEADWTR-2  HDW=  13.                    .556  .089
ENDATA10A
POINTLD-1 PTL=   1. CRBNADO WTP     0.15472          0.8 66.97
POINTLD-1 PTL=   2. LILY CK            1.08          7.6   5.0
POINTLD-1 PTL=   3. WLKESON WTP     0.27850          2.0 25.45
POINTLD-1 PTL=   4. S PRAIR WTP     0.08819          1.5 29.37
POINTLD-1 PTL=   5. WDF HTCHRY        13.23          8.2 5.736
POINTLD-1 PTL=   6. ORTING WTP       3.2491          0.1 18.55
POINTLD-1 PTL=   7. RCH16
POINTLD-1 PTL=   8. TRTSPR HTCH        8.33          8.6 12.74
POINTLD-1 PTL=   9. RCH18
POINTLD-1 PTL=  10. FENNEL CK          6.37          9.2 2.941
POINTLD-1 PTL=  11. RCH19
POINTLD-1 PTL=  12. PTRIB 13           3.08          8.2 3.088
POINTLD-1 PTL=  13. MCALDER WTP        0.00          0.0   0.0
POINTLD-1 PTL=  14. RCH20
POINTLD-1 PTL=  15. RAINSCH WTP     0.64982          1.9 25.59
POINTLD-1 PTL=  16. WHI R CANAL     -170.65
POINTLD-1 PTL=  17. MTRIBE HTCH        5.00          9.6 4.603
POINTLD-1 PTL=  18. RCH23
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POINTLD-1 PTL=  19. ENUMCLW WTP      6.1888          2.2 22.20
POINTLD-1 PTL=  20. BUCKLEY WTP      2.6302          2.5 29.03
POINTLD-1 PTL=  21. WTRIB 15           0.78          7.7 3.235
POINTLD-1 PTL=  22. BOWMAN CK          0.32          8.2 2.794
POINTLD-1 PTL=  23. RCH34
POINTLD-1 PTL=  24. L TAPPS DIV      324.20          8.0   2.5
POINTLD-1 PTL=  25. STRAWB CK          6.75          8.5   2.5
POINTLD-1 PTL=  26. BEATRICE        0.46416          1.6 24.67
POINTLD-1 PTL=  27. SONOCO          0.48427          2.4 378.9
POINTLD-1 PTL=  28. WTRIB 1.3          2.57          2.9   2.5
POINTLD-1 PTL=  29. FLEISCHMANS      1.3151          2.4 7.265
POINTLD-1 PTL=  30. SUMNER WTP      10.2115          1.1 34.28
POINTLD-1 PTL=  31. RCH37
POINTLD-1 PTL=  32. PUY/MATSU        31.872          1.2 19.33
POINTLD-1 PTL=  33. WDW HTCHRY        12.07          7.7 4.816
POINTLD-1 PTL=  34. PTRIBE HTCH       0.780          8.9 5.333
POINTLD-1 PTL=  35. TRTCO HTCH         9.60          7.7 7.766
POINTLD-1 PTL=  36. RCH44
POINTLD-1 PTL=  37. RCH46
POINTLD-1 PTL=  38. RCH47
ENDATA11
POINTLD-2  PTL=   1.                11.63 25.00
POINTLD-2  PTL=   2.                0.331 0.046
POINTLD-2  PTL=   3.                12.32 26.00
POINTLD-2  PTL=   4.                10.60 25.00
POINTLD-2  PTL=   5.                0.614 0.204
POINTLD-2  PTL=   6.                18.87 26.00
POINTLD-2  PTL=   7.
POINTLD-2  PTL=   8.                1.260 1.658
POINTLD-2  PTL=   9.
POINTLD-2  PTL=  10.                0.645 0.024
POINTLD-2  PTL=  11.
POINTLD-2  PTL=  12.                2.230 0.086
POINTLD-2  PTL=  13.                 0.00  0.00
POINTLD-2  PTL=  14.
POINTLD-2  PTL=  15.                6.302 15.00
POINTLD-2  PTL=  16.
POINTLD-2  PTL=  17.                0.473 0.170
POINTLD-2  PTL=  18.
POINTLD-2  PTL=  19.                5.788 9.000
POINTLD-2  PTL=  20.                4.446 10.50
POINTLD-2  PTL=  21.                0.748 0.023
POINTLD-2  PTL=  22.                0.576 0.055
POINTLD-2  PTL=  23.
POINTLD-2  PTL=  24.                0.187 0.049
POINTLD-2  PTL=  25.                0.195 0.032
POINTLD-2  PTL=  26.                55.85   8.4
POINTLD-2  PTL=  27.                10.28 0.416
POINTLD-2  PTL=  28.                1.140 0.096
POINTLD-2  PTL=  29.                0.203   3.0
POINTLD-2  PTL=  30.                8.308  17.6
POINTLD-2  PTL=  31.
POINTLD-2  PTL=  32.                10.28 18.00
POINTLD-2  PTL=  33.                0.876 0.410
POINTLD-2  PTL=  34.                0.291 0.530
POINTLD-2  PTL=  35.                2.670 0.750
POINTLD-2  PTL=  36.
POINTLD-2  PTL=  37.
POINTLD-2  PTL=  38.
ENDATA11A
ENDATA12
DOWNSTREAM BOUNDARY-1          7.52    2.0
ENDATA13
DOWNSTREAM BOUNDARY-2                0.050
ENDATA13A
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APPENDIX B

Spreadsheet Model of Ammonia in the White River

Appendix B. Spreadsheet to calculate chronic WLAs for ammonia to meet far-field criteria in the White River. QUAL2E reach numbers and data types are as documented in Pelletier (1993) and EPA (1987).

QUAL2E Reach Number	QUAL2E Reach Element Number	Down-stream River Mile	Significant Feature	Up-stream River Mile	Down-stream River Mile	QUAL2E DATA4 Flag	QUAL2E DATA10 Headwater Flow (cfs)	QUAL2E DATA11 Pointload Flow (cfs)	Headwater/ Pointload NH3-N (mg/L)	Calculated Element Outflow (cfs)	QUAL2E DATA 5: Hydraulics Data a for V=aQ^b	b for V=aQ^b	c for D=cQ^d	d for D=cQ^d	V=Velocity (ft/sec)	Travel Time for Element (days)	D=Depth (ft)	Temper-ature (deg F)	Temper-ature (deg C)	Ammonia Decay At 20 deg C (day^-1)	Ammonia Decay At Ambient Temper-ature (day^-1)	Element Initial NH3-N (mg/L)	Element Final NH3-N (mg/L)	Chronic NH3-N Criterion (mg/L)
May-October 7Q20 (Maximum monthly average Enumclaw/Buckley flows and chronic WLAs; Rainier School as daily maximum technology-based limits)																								
21	1	-25.2	Headwater	25.4	25.2	1	284.60		0.049	284.60	0.095	0.56	0.19	0.3	2.25	0.00543	1.04	55.4	13.0	0.45	0.263	0.049	0.049	
21	2	-25.0	Rainier School POTW	25.2	25.0	6		0.4023	15	285.00	0.095	0.56	0.19	0.3	2.25	0.00543	1.04	55.4	13.0	0.45	0.263	0.070	0.070	
21	3	-24.8		25.0	24.8	2				285.00	0.095	0.56	0.19	0.3	2.25	0.00543	1.04	55.4	13.0	0.45	0.263	0.070	0.070	
21	4	-24.6		24.8	24.6	2				285.00	0.095	0.56	0.19	0.3	2.25	0.00543	1.04	55.4	13.0	0.45	0.263	0.070	0.070	
22	1	-24.4	White R Canal	24.6	24.4	7		-182.90	0.070	102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76	57.6	14.2	0.45	0.288	0.070	0.070	
22	2	-24.2	Muckleshoot Hatchery	24.4	24.2	6		5.00	0.17	107.10	0.095	0.56	0.19	0.3	1.30	0.00939	0.77	57.6	14.2	0.45	0.288	0.074	0.074	
22	3	-24.0		24.2	24.0	2				107.10	0.095	0.56	0.19	0.3	1.30	0.00939	0.77	57.6	14.2	0.45	0.288	0.074	0.074	
22	4	-23.8		24.0	23.8	2				107.10	0.095	0.56	0.19	0.3	1.30	0.00939	0.77	57.6	14.2	0.45	0.288	0.074	0.074	
22	5	-23.6		23.8	23.6	2				107.10	0.095	0.56	0.19	0.3	1.30	0.00939	0.77	57.6	14.2	0.45	0.288	0.074	0.073	
22	6	-23.4	Abv Junc. Boise Cr	23.6	23.4	3				107.10	0.095	0.56	0.19	0.3	1.30	0.00939	0.77	57.6	14.2	0.45	0.288	0.073	0.073	
25	1	-23.2	Boise Cr	23.4	23.2	4		2.90	0.078	110.00	0.095	0.56	0.19	0.3	1.32	0.00925	0.78	59.7	15.4	0.45	0.316	0.073	0.073	
25	2	-23.0	Enumclaw POTW	23.2	23.0	6		2.0114	5.958	112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.179	0.178	
25	3	-22.8		23.0	22.8	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.178	0.178	
25	4	-22.6		22.8	22.6	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.178	0.177	
25	5	-22.4		22.6	22.4	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.177	0.177	
25	6	-22.2		22.4	22.2	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.177	0.176	
25	7	-22.0		22.2	22.0	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.176	0.176	
25	8	-21.8		22.0	21.8	2				112.01	0.095	0.56	0.19	0.3	1.33	0.00916	0.78	59.7	15.4	0.45	0.316	0.176	0.175	
26	1	-21.6	Buckley POTW	21.8	21.6	6		0.9902	5.958	113.00	0.095	0.56	0.19	0.3	1.34	0.00911	0.78	61.9	16.6	0.45	0.347	0.226	0.225	
26	2	-21.4		21.6	21.4	2				113.00	0.095	0.56	0.19	0.3	1.34	0.00911	0.78	61.9	16.6	0.45	0.347	0.225	0.224	
26	3	-21.2		21.4	21.2	2				113.00	0.095	0.56	0.19	0.3	1.34	0.00911	0.78	61.9	16.6	0.45	0.347	0.224	0.224	
26	4	-21.0	Fishpipe Return Flow	21.2	21.0	6		20.00	0.070	133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.201	0.200	
26	5	-20.8		21.0	20.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.200	0.199	
26	6	-20.6		20.8	20.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.199	0.199	
26	7	-20.4		20.6	20.4	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.199	0.198	
26	8	-20.2		20.4	20.2	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.198	0.198	
26	9	-20.0		20.2	20.0	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.198	0.197	
26	10	-19.8		20.0	19.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	61.9	16.6	0.45	0.347	0.197	0.197	
27	1	-19.6		19.8	19.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.197	0.196	
27	2	-19.4		19.6	19.4	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.196	0.195	
27	3	-19.2		19.4	19.2	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.195	0.195	
27	4	-19.0		19.2	19.0	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.195	0.194	
27	5	-18.8		19.0	18.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.194	0.194	
27	6	-18.6		18.8	18.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.194	0.193	
27	7	-18.4		18.6	18.4	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.193	0.192	
27	8	-18.2		18.4	18.2	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.192	0.192	
27	9	-18.0		18.2	18.0	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.192	0.191	
27	10	-17.8		18.0	17.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	64.0	17.8	0.45	0.379	0.191	0.190	
28	1	-17.6		17.8	17.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.190	0.190	
28	2	-17.4		17.6	17.4	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.190	0.189	
28	3	-17.2		17.4	17.2	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.189	0.189	
28	4	-17.0		17.2	17.0	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.189	0.188	
28	5	-16.8		17.0	16.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.188	0.187	
28	6	-16.6		16.8	16.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.187	0.187	
28	7	-16.4		16.6	16.4	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.187	0.186	
28	8	-16.2		16.4	16.2	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.186	0.185	
28	9	-16.0		16.2	16.0	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.185	0.185	
28	10	-15.8		16.0	15.8	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.185	0.184	
29	1	-15.6	Muckleshoot Boundary	15.8	15.6	2				133.00	0.095	0.56	0.19	0.3	1.47	0.00832	0.82	66.2	19.0	0.45	0.417	0.184	0.183	
29	2	-15.4	WTrib 15	15.6	15.4	6		0.78	0.023	133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.182	0.182	
29	3	-15.2		15.4	15.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.182	0.181	
29	4	-15.0		15.2	15.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.181	0.181	
29	5	-14.8		15.0	14.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.181	0.180	
29	6	-14.6		14.8	14.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.180	0.179	
29	7	-14.4		14.6	14.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.179	0.179	
29	8	-14.2		14.4	14.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.179	0.178	
29	9	-14.0		14.2	14.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.178	0.177	
29	10	-13.8		14.0	13.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.177	0.177	

Appendix B. Spreadsheet to calculate chronic WLAs for ammonia to meet far-field criteria in the White River. QUAL2E reach numbers and data types are as documented in Pelletier (1993) and EPA (1987).

WHITERIV.WK1
08-Jul-94

QUAL2E Reach Number	QUAL2E Reach Element Number	Down-stream River Mile	Significant Feature	Up-stream River Mile	Down-stream River Mile	QUAL2E DATA4 Flag	QUAL2E DATA10 Headwater Flow (cfs)	QUAL2E DATA11 Pointload Flow (cfs)	Headwater/ Pointload NH3-N (mg/L)	Calculated Element Outflow (cfs)	QUAL2E DATA 5: Hydraulics Data: a for V= aQ^b	b for V= aQ^b	c for D= cQ^d	d for D= cQ^d	V= Velocity (ft/sec)	Travel Time for Element (days)	D= Depth (ft)	Temper-ature (deg F)	Temper-ature (deg C)	Ammonia Decay At 20 deg C (day^-1)	Ammonia Decay At Ambient Temper-ature (day^-1)	Element Initial NH3-N (mg/L)	Element Final NH3-N (mg/L)	Chronic NH3-N Criterion (mg/L)
May-October (continued):																								
30	1	-13.6		13.8	13.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.177	0.176	
30	2	-13.4		13.6	13.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.176	0.176	
30	3	-13.2		13.4	13.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.176	0.175	
30	4	-13.0		13.2	13.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.175	0.174	
30	5	-12.8		13.0	12.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.174	0.174	
30	6	-12.6		12.8	12.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.174	0.173	
30	7	-12.4		12.6	12.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.173	0.173	
30	8	-12.2		12.4	12.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.173	0.172	
30	9	-12.0		12.2	12.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.172	0.171	
30	10	-11.8		12.0	11.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.171	0.171	
31	1	-11.6		11.8	11.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.171	0.170	
31	2	-11.4		11.6	11.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.170	0.170	
31	3	-11.2		11.4	11.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.170	0.169	
31	4	-11.0		11.2	11.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.169	0.168	
31	5	-10.8		11.0	10.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.168	0.168	
31	6	-10.6		10.8	10.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.168	0.167	
31	7	-10.4		10.6	10.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.167	0.167	
31	8	-10.2		10.4	10.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.167	0.166	
31	9	-10.0		10.2	10.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.166	0.166	
31	10	-9.8		10.0	9.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.166	0.165	
32	1	-9.6		9.8	9.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.165	0.164	
32	2	-9.4		9.6	9.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.164	0.164	
32	3	-9.2		9.4	9.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.164	0.163	
32	4	-9.0		9.2	9.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.163	0.163	
32	5	-8.8		9.0	8.8	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.163	0.162	
32	6	-8.6		8.8	8.6	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.162	0.162	
32	7	-8.4		8.6	8.4	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.162	0.161	
32	8	-8.2		8.4	8.2	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.161	0.161	
32	9	-8.0		8.2	8.0	2				133.78	0.095	0.56	0.19	0.3	1.47	0.00829	0.83	66.2	19.0	0.45	0.417	0.161	0.160	
33	1	-7.8	Bowman Cr	8.0	7.8	6		0.32	0.055	134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.160	0.159	
33	2	-7.6		7.8	7.6	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.159	0.159	
33	3	-7.4		7.6	7.4	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.159	0.159	
33	4	-7.2		7.4	7.2	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.159	0.158	
33	5	-7.0		7.2	7.0	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.158	0.158	
33	6	-6.8		7.0	6.8	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.158	0.157	
33	7	-6.6		6.8	6.6	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.157	0.157	
33	8	-6.4		6.6	6.4	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.157	0.157	
33	9	-6.2		6.4	6.2	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.157	0.156	
33	10	-6.0		6.2	6.0	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.156	0.156	
33	11	-5.8		6.0	5.8	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.156	0.155	
33	12	-5.6		5.8	5.6	2				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.155	0.155	
33	13	-5.4	Abv Junc. Gov't Canal	5.6	5.4	3				134.10	0.41	0.33	0.18	0.36	2.06	0.00592	1.05	66.2	19.0	0.45	0.417	0.155	0.155	
35	1	-5.2	Gov't Canal	5.4	5.2	4		0.001	0	134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.155	0.154	
35	2	-5.0		5.2	5.0	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.154	0.154	
35	3	-4.8		5.0	4.8	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.154	0.153	
35	4	-4.6		4.8	4.6	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.153	0.153	
35	5	-4.4		4.6	4.4	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.153	0.153	
35	6	-4.2		4.4	4.2	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.153	0.152	
35	7	-4.0		4.2	4.0	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.152	0.152	
35	8	-3.8		4.0	3.8	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.152	0.151	
35	9	-3.6		3.8	3.6	2				134.10	0.42	0.31	0.16	0.35	1.92	0.00637	0.89	66.2	19.0	0.45	0.417	0.151	0.151	
36	1	-3.4	Lake Tapps Diversion	3.6	3.4	6		250.20	0.049	384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.085	0.084	
36	2	-3.2		3.4	3.2	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	3	-3.0		3.2	3.0	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	4	-2.8		3.0	2.8	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	5	-2.6		2.8	2.6	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	6	-2.4		2.6	2.4	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	7	-2.2		2.4	2.2	2				384.30	0.078	0.49	0.1	0.51	1.44	0.00848	2.08	63.7	17.6	0.2	0.166	0.084	0.084	
36	8	-2.0	Strawberry (Salmon) Cr	2.2	2.0	6		6.75	0.032	391.05	0.078	0.49	0.1	0.51	1.45	0.00841	2.10	63.7	17.6	0.2	0.166	0.083	0.083	
Chronic NH3-N criteria in mg/L (from Table 3.2 of the 1993 TMDL report: Pelletier, 1993):																								
		-25.2																						1.32
		-23.2																						1.31
		-20.4																						0.88
		-8.0																						0.16
		-4.8																						0.20
		-3.6																						0.20
		-3.6																						0.87
		-2.0																						0.87

Appendix B. Spreadsheet to calculate chronic WLAs for ammonia to meet far-field criteria in the White River. QUAL2E reach numbers and data types are as documented in Pelletier (1993) and EPA (1987).

QUAL2E Reach Number	QUAL2E Reach Element Number	Down-stream River Mile	Significant Feature	Up-stream River Mile	Down-stream River Mile	QUAL2E DATA4 Flag	QUAL2E DATA10 Headwater Flow (cfs)	QUAL2E DATA11 Pointload Flow (cfs)	Headwater/ Pointload NH3-N (mg/L)	Calculated Element Outflow (cfs)	QUAL2E DATA 5: Hydraulics Data: a for V=aQ^b	b for V=aQ^b	c for D=cQ^d	d for D=cQ^d	V=Velocity (ft/sec)	Travel Time for Element (days)	D=Depth (ft)	Temperature (deg F)	Temperature (deg C)	Ammonia Decay At 20 deg C (day^-1)	Ammonia Decay At Ambient Temperature (day^-1)	Element Initial NH3-N (mg/L)	Element Final NH3-N (mg/L)	Chronic NH3-N Criterion (mg/L)
November-April 7Q20 (maximum monthly average Enumclaw/Buckley WTP flows and chronic WLAs; Rainier School as daily maximum technology-based limits)																								
21	1	-25.2	Headwater	25.4	25.2	1	287.10		0.049	287.10	0.095	0.56	0.19	0.3	2.26	0.00541	1.04		10.6	0.45	0.218	0.049	0.049	
21	2	-25.0	Rainier School POTW	25.2	25.0	6		0.6498	15	287.75	0.095	0.56	0.19	0.3	2.26	0.00540	1.04		10.6	0.45	0.218	0.083	0.083	
21	3	-24.8		25.0	24.8	2				287.75	0.095	0.56	0.19	0.3	2.26	0.00540	1.04		10.6	0.45	0.218	0.083	0.083	
21	4	-24.6		24.8	24.6	2				287.75	0.095	0.56	0.19	0.3	2.26	0.00540	1.04		10.6	0.45	0.218	0.083	0.082	
22	1	-24.4	White R Canal	24.6	24.4	7		-190.65	0.082	97.10	0.095	0.56	0.19	0.3	1.23	0.00992	0.75		10.6	0.45	0.218	0.082	0.082	
22	2	-24.2	Muckleshoot Hatchery	24.4	24.2	6		5.00	0.17	102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76		10.6	0.45	0.218	0.087	0.086	
22	3	-24.0		24.2	24.0	2				102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76		10.6	0.45	0.218	0.086	0.086	
22	4	-23.8		24.0	23.8	2				102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76		10.6	0.45	0.218	0.086	0.086	
22	5	-23.6		23.8	23.6	2				102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76		10.6	0.45	0.218	0.086	0.086	
22	6	-23.4	Abv Junc. Boise Cr	23.6	23.4	3				102.10	0.095	0.56	0.19	0.3	1.27	0.00965	0.76		10.6	0.45	0.218	0.086	0.086	
25	1	-23.2	Boise Cr	23.4	23.2	4		7.90	0.078	110.00	0.095	0.56	0.19	0.3	1.32	0.00925	0.78		10.6	0.45	0.218	0.085	0.085	
25	2	-23.0	Enumclaw POTW	23.2	23.0	6		3.7133	5.4	113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.258	0.258	
25	3	-22.8		23.0	22.8	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.258	0.257	
25	4	-22.6		22.8	22.6	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.257	0.257	
25	5	-22.4		22.6	22.4	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.257	0.256	
25	6	-22.2		22.4	22.2	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.256	0.256	
25	7	-22.0		22.2	22.0	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.256	0.255	
25	8	-21.8		22.0	21.8	2				113.71	0.095	0.56	0.19	0.3	1.35	0.00908	0.79		10.6	0.45	0.218	0.255	0.255	
26	1	-21.6	Buckley POTW	21.8	21.6	6		1.5472	6.35	115.26	0.095	0.56	0.19	0.3	1.36	0.00901	0.79		10.6	0.45	0.218	0.337	0.336	
26	2	-21.4		21.6	21.4	2				115.26	0.095	0.56	0.19	0.3	1.36	0.00901	0.79		10.6	0.45	0.218	0.336	0.335	
26	3	-21.2		21.4	21.2	2				115.26	0.095	0.56	0.19	0.3	1.36	0.00901	0.79		10.6	0.45	0.218	0.335	0.335	
26	4	-21.0	Fishpipe Return Flow	21.2	21.0	6		20.00	0.082	135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.297	0.297	
26	5	-20.8		21.0	20.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.297	0.296	
26	6	-20.6		20.8	20.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.296	0.296	
26	7	-20.4		20.6	20.4	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.296	0.295	
26	8	-20.2		20.4	20.2	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.295	0.295	
26	9	-20.0		20.2	20.0	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.295	0.294	
26	10	-19.8		20.0	19.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.294	0.294	
27	1	-19.6		19.8	19.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.294	0.293	
27	2	-19.4		19.6	19.4	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.293	0.293	
27	3	-19.2		19.4	19.2	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.293	0.292	
27	4	-19.0		19.2	19.0	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.292	0.292	
27	5	-18.8		19.0	18.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.292	0.291	
27	6	-18.6		18.8	18.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.291	0.291	
27	7	-18.4		18.6	18.4	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.291	0.290	
27	8	-18.2		18.4	18.2	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.290	0.290	
27	9	-18.0		18.2	18.0	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.290	0.289	
27	10	-17.8		18.0	17.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.289	0.288	
28	1	-17.6		17.8	17.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.288	0.288	
28	2	-17.4		17.6	17.4	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.288	0.287	
28	3	-17.2		17.4	17.2	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.287	0.287	
28	4	-17.0		17.2	17.0	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.287	0.286	
28	5	-16.8		17.0	16.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.286	0.286	
28	6	-16.6		16.8	16.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.286	0.285	
28	7	-16.4		16.6	16.4	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.285	0.285	
28	8	-16.2		16.4	16.2	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.285	0.284	
28	9	-16.0		16.2	16.0	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.284	0.284	
28	10	-15.8		16.0	15.8	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.284	0.283	
29	1	-15.6	Muckleshoot Boundary	15.8	15.6	2				135.26	0.095	0.56	0.19	0.3	1.48	0.00824	0.83		10.6	0.45	0.218	0.283	0.283	
29	2	-15.4	WTrib 15	15.6	15.4	6		0.78	0.023	136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.281	0.281	
29	3	-15.2		15.4	15.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.281	0.280	
29	4	-15.0		15.2	15.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.280	0.280	
29	5	-14.8		15.0	14.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.280	0.279	
29	6	-14.6		14.8	14.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.279	0.279	
29	7	-14.4		14.6	14.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.279	0.278	
29	8	-14.2		14.4	14.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.278	0.278	
29	9	-14.0		14.2	14.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.278	0.277	
29	10	-13.8		14.0	13.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.277	0.277	

Appendix B. Spreadsheet to calculate chronic WLAs for ammonia to meet far-field criteria in the White River. QUAL2E reach numbers and data types are as documented in Pelletier (1993) and EPA (1987).

QUAL2E Reach Number	QUAL2E Reach Element Number	Down-stream River Mile	Significant Feature	Up-stream River Mile	Down-stream River Mile	QUAL2E DATA4 Flag	QUAL2E DATA10 Headwater Flow (cfs)	QUAL2E DATA11 Pointload Flow (cfs)	Headwater/ Pointload NH3-N (mg/L)	Calculated Element Outflow (cfs)	QUAL2E DATA 5: Hydraulics Data: a for V=aQ^b	b for V=aQ^b	c for D=cQ^d	d for D=cQ^d	V=Velocity (ft/sec)	Travel Time for Element (days)	D=Depth (ft)	Temper-ature (deg F)	Temper-ature (deg C)	Ammonia Decay At 20 deg C (day^-1)	Ammonia Decay At Ambient Temper-ature (day^-1)	Element Initial NH3-N (mg/L)	Element Final NH3-N (mg/L)	Chronic NH3-N Criterion (mg/L)
November-April (continued):																								
30	1	-13.6		13.8	13.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.277	0.276	
30	2	-13.4		13.6	13.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.276	0.276	
30	3	-13.2		13.4	13.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.276	0.275	
30	4	-13.0		13.2	13.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.275	0.275	
30	5	-12.8		13.0	12.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.275	0.274	
30	6	-12.6		12.8	12.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.274	0.274	
30	7	-12.4		12.6	12.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.274	0.273	
30	8	-12.2		12.4	12.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.273	0.273	
30	9	-12.0		12.2	12.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.273	0.272	
30	10	-11.8		12.0	11.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.272	0.272	
31	1	-11.6		11.8	11.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.272	0.271	
31	2	-11.4		11.6	11.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.271	0.271	
31	3	-11.2		11.4	11.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.271	0.270	
31	4	-11.0		11.2	11.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.270	0.270	
31	5	-10.8		11.0	10.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.270	0.269	
31	6	-10.6		10.8	10.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.269	0.269	
31	7	-10.4		10.6	10.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.269	0.269	
31	8	-10.2		10.4	10.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.269	0.268	
31	9	-10.0		10.2	10.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.268	0.268	
31	10	-9.8		10.0	9.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.268	0.267	
32	1	-9.6		9.8	9.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.267	0.267	
32	2	-9.4		9.6	9.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.267	0.266	
32	3	-9.2		9.4	9.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.266	0.266	
32	4	-9.0		9.2	9.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.266	0.265	
32	5	-8.8		9.0	8.8	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.265	0.265	
32	6	-8.6		8.8	8.6	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.265	0.264	
32	7	-8.4		8.6	8.4	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.264	0.264	
32	8	-8.2		8.4	8.2	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.264	0.263	
32	9	-8.0		8.2	8.0	2				136.04	0.095	0.56	0.19	0.3	1.49	0.00821	0.83		10.6	0.45	0.218	0.263	0.263	
33	1	-7.8	Bowman Cr	8.0	7.8	6		0.32	0.055	136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.262	0.262	
33	2	-7.6		7.8	7.6	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.262	0.262	
33	3	-7.4		7.6	7.4	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.262	0.261	
33	4	-7.2		7.4	7.2	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.261	0.261	
33	5	-7.0		7.2	7.0	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.261	0.261	
33	6	-6.8		7.0	6.8	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.261	0.260	
33	7	-6.6		6.8	6.6	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.260	0.260	
33	8	-6.4		6.6	6.4	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.260	0.260	
33	9	-6.2		6.4	6.2	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.260	0.259	
33	10	-6.0		6.2	6.0	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.259	0.259	
33	11	-5.8		6.0	5.8	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.259	0.259	
33	12	-5.6		5.8	5.6	2				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.259	0.258	
33	13	-5.4	Abv Junc. Gov't Canal	5.6	5.4	3				136.36	0.41	0.33	0.18	0.36	2.08	0.00589	1.06		10.6	0.45	0.218	0.258	0.258	
35	1	-5.2	Gov't Canal	5.4	5.2	4		0.00	0	136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.258	0.258	
35	2	-5.0		5.2	5.0	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.258	0.257	
35	3	-4.8		5.0	4.8	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.257	0.257	
35	4	-4.6		4.8	4.6	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.257	0.257	
35	5	-4.4		4.6	4.4	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.257	0.256	
35	6	-4.2		4.4	4.2	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.256	0.256	
35	7	-4.0		4.2	4.0	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.256	0.255	
35	8	-3.8		4.0	3.8	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.255	0.255	
35	9	-3.6		3.8	3.6	2				136.36	0.42	0.31	0.16	0.35	1.93	0.00634	0.89		10.6	0.45	0.218	0.255	0.255	
36	1	-3.4	Lake Tapps Diversion	3.6	3.4	6		324.20	0.049	460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.110	
36	2	-3.2		3.4	3.2	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.110	
36	3	-3.0		3.2	3.0	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.110	
36	4	-2.8		3.0	2.8	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.110	
36	5	-2.6		2.8	2.6	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.110	
36	6	-2.4		2.6	2.4	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.110	0.109	
36	7	-2.2		2.4	2.2	2				460.56	0.078	0.49	0.1	0.51	1.57	0.00776	2.28		9.8	0.2	0.091	0.109	0.109	
36	8	-2.0	Strawberry (Salmon) Cr	2.2	2.0	6		6.75	0.032	467.31	0.078	0.49	0.1	0.51	1.59	0.00771	2.30		9.8	0.2	0.091	0.108	0.108	
Criteria NH3-N criteria in mg/L (critical 10th percentiles from November-April from Table 4):																								
		-25.2																						1.70
		-3.6																						1.70
		-3.6																						1.80
		-2.0																						1.80