

SUBJECT: Melvin R. Sampson Coho Hatchery
 Hatchery Effluent Discharge
 Yakima River Concentration Calculations

KRJ
 1/17/2018
 16-012

Purpose

The purpose of this calculation spreadsheet is to estimate the concentration of water quality parameters after mixing of hatchery effluent with Yakima River flows. The background flow is assumed to be the 7Q10 flow rate. Constituents analyzed include total ammonia nitrogen, dissolved oxygen, and total phosphorus.

References

- USGS, 1999. Surface-Water-Quality Assessment of the Yakima River Basin in Washington: Overview of Major Findings, 1987-1991.
- USGS 2003. Concentrations and Loads of Suspended Sediment and Nutrients in Surface Water of the Yakima River Basin, Washington, 1999-2000 – With an Analysis of Trends in Concentrations
- Curran, C.A., and Olsen, T.D., 2009, Estimating low-flow frequency statistics and hydrologic analysis of selected streamflow-gaging stations, Nooksack River basin, northwestern Washington and Canada: U.S.
- Bonneville Power Administration, 1996. Yakima Fisheries Project Final Environmental Impact Statement.

Calculations

| Wasteload Allocation (WLA) Calculations | | | | | | |
|---|----------------------|------------------------------|--------------------|---------------------------------------|---------------------------------|---------------------------------------|
| Facility: MR Sampson Hatchery | | | | | | |
| Wasteload Allocation Formula: | | | | | $Cr = (QsCs + QdCd)/Qr$ | |
| | Q_s | Q_d | Q_r | C_s | C_d | C_r |
| Parameter | Low Flow (7Q10), cfs | Effluent Discharge Rate, cfs | Combined Flow, cfs | Yakima River Background Concentration | Critical Effluent Concentration | Diluted Concentration in Yakima River |
| Total Ammonia Nitrogen (TAN) | 1,891 | 4 | 1,895 | 0.090 mg/L | 0.932 mg/L | 0.092 mg/L |
| Dissolved Oxygen (DO) | 1,891 | 4 | 1,895 | 92.6% | 90.0% | 92.6% |
| Total Phosphorous | 1,891 | 4 | 1,895 | 0.0100 mg/L | 0.185 mg/L | 0.0104 mg/L |

| 7Q10 Calculation | | | |
|------------------|--------|---------|-----------------------------------|
| E | 3.59 | 1000 ft | Mean basin elevation |
| DA | 975.76 | sq. mi. | Drainage Area above project site |
| P | 54.9 | in | |
| 7Q10 | 1,891 | cfs | Regression equation for 7Q10 flow |
| Qd | 4 | cfs | Hatchery discharge |

Conclusion

The 7Q10 flow rate in the Yakima River is more than 2 orders of magnitude larger than the anticipated discharge from the hatchery. For this reason, the diluted concentration of constituents analyzed is only nominally different (<4%) than the background concentrations in the Yakima River.