

CHRISTINE O. GREGOIRE
Director



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

7171 Cleanwater Lane, Building 8, LH-34 * Olympia, Washington 98504-6514

Water Body No. WA-07-1110
WA-07-1130
WA-07-1140
WA-07-1150
Segment No. 03-07-13
03-07-15
03-07-16

92-e34

January 30, 1992

TO: Dave Wright
THROUGH: Dick Cunningham *DC*
FROM: Brad Hopkins *BH*
SUBJECT: Upper Snoqualmie River Special Study

At the request of the Northwest Regional Office (NWRO), the Ambient Monitoring Section collected water quality information during low flow conditions (June-September 1991) at three additional locations (see Figure 1) on the Snoqualmie River. They were as follows:

| <u>Station #</u> | <u>Description</u> |
|------------------|---|
| 1) 07N070 | North Fork of the Snoqualmie River near Ellisville--River Mile 44.9, 0.3; Lat 46 59 43; Long 121 46 07 |
| 2) 07D150 | Middle Fork of the Snoqualmie River near Ellisville--River Mile 45.3; Lat 47 07 06; Long 121 46 06 |
| 3) 07M070 | South Fork of the Snoqualmie River at North Bend--River Mile 44.4, 2.01; Lat 47 33 12; Long 121 47 23 |

Water quality information generated at these locations will be used by the NWRO to evaluate possible outfall locations and to develop a water quality based permit for a planned WWTP expansion. Regional staff specifically expressed interest in background metals concentrations present during low flow conditions.

Attachment 1 and the enclosed floppy disk provide all of the current water quality information on the Snoqualmie River collected by our section from June-September 1991, including the two mainstem stations at the city of Snoqualmie and near Carnation. To compare data between stations, this same information is provided by date rather than by station in Table 1.

19.3 Carnation station

Snoqualmie R. at Snoqualmie

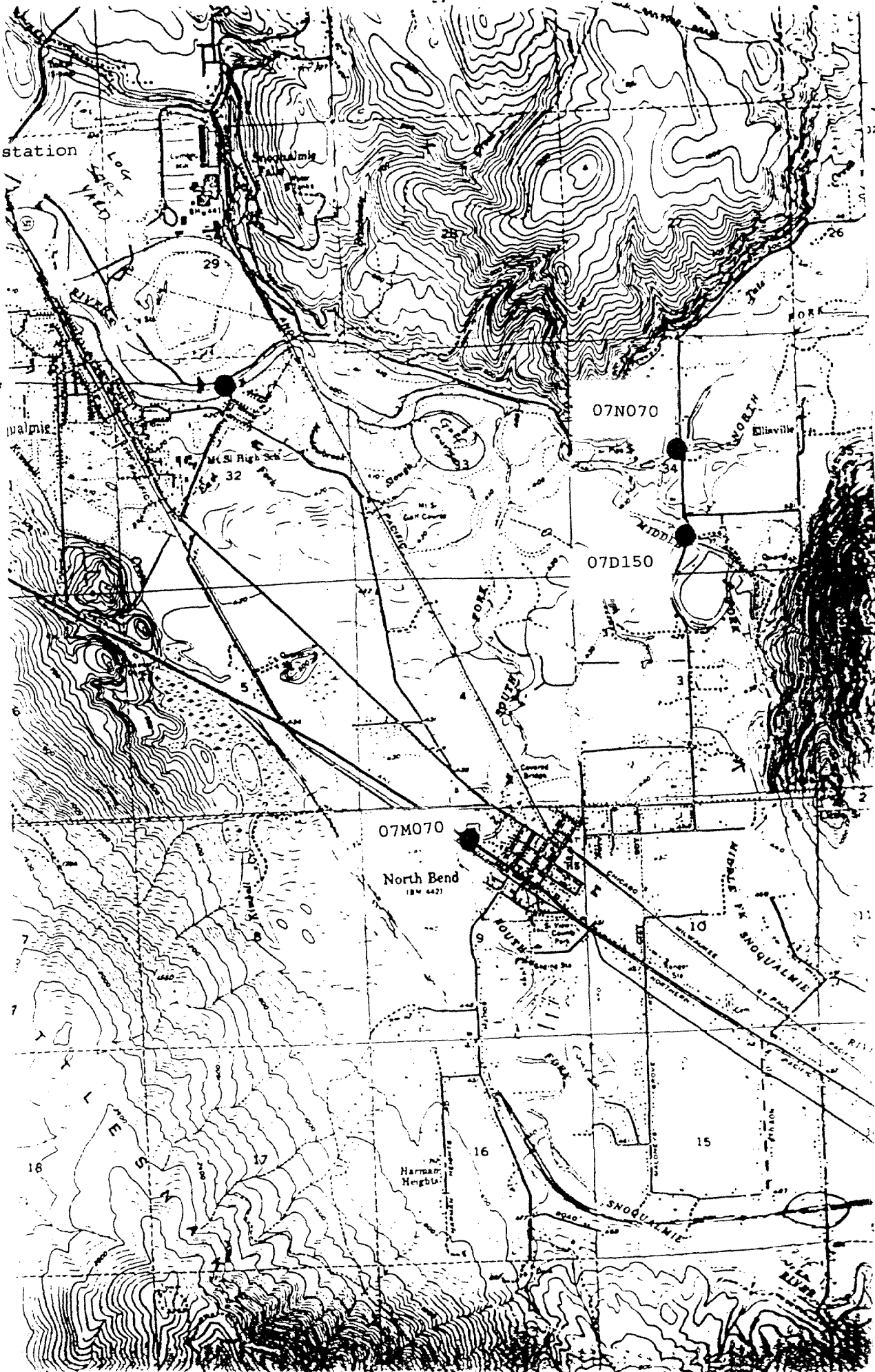


Table 1. General Water Quality on the Snoqualmie River

Date 06/17/91

| Station # | 07N070 | 07D150 | 07M070 | 07D130 | 07D070 |
|----------------|--------|--------|--------|--------|--------|
| Classification | AA | AA | AA | A | A |
| Flow | 980 | 2160 | 889 | 4000 | 5310 |
| Water Temp | 8.1 | 7.5 | 8.5 | 8.5 | 9.4 |
| Conductivity | 26 | 19 | 35 | 24 | 35 |
| DO | 11.7 | 11.9 | 11.9 | 11.9 | 11.3 |
| DO Sat (%) | 98.5 | 98.8 | 101.4 | 101.3 | 97.0 |
| pH | 6.9 | 6.8 | 7.1 | 6.9 | 6.9 |
| Residue | 3 | 25 | 3.0 | 12.0 | 21.0 |
| NH3+NH4 -N | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2-N (Diss) | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2+NO3 -N | 0.113 | 0.072 | 0.152 | 0.107 | 0.149 |
| Phos-Tot | 0.011 | 0.017 | 0.01K | 0.013 | 0.015 |
| Phos-Ortho | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| Turb | 1.2 | 12.0 | 1.0 | 3.5 | 6.5 |
| F.Coliform | 6 | 12 | 11 | 15 | 35 |

Date 07/22/91

| Station # | 07N070 | 07D150 | 07M070 | 07D130 | 07D070 |
|----------------|--------|--------|--------|--------|--------|
| Classification | AA | AA | AA | A | A |
| Flow | 205 | 1200 | 268 | 1390 | 1550 |
| Water Temp | 14.2 | 13.9 | 13.8 | 14.0 | 16.0 |
| Conductivity | 40 | 22 | 60 | 31 | 49 |
| DO | 10.2 | 10.4 | 10.5 | 10.2 | 10.0 |
| DO Sat (%) | 99.2 | 100.6 | 101.5 | 99.0 | 99.9 |
| pH | 6.9 | 6.7 | 7.6 | 7.0 | 6.9 |
| Residue | 2.0 | 4.0 | 2.0 | 2.0 | 2.0 |
| NH3+NH4 -N | 0.011 | 0.01K | 0.01K | 0.01 | 0.015 |
| NO2-N (Diss) | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2+NO3 -N | 0.141 | 0.029 | 0.215 | 0.093 | 0.121 |
| Phos-Tot | 0.01K | 0.017 | 0.01K | 0.01K | 0.01K |
| Phos-Ortho | 0.01K | 0.01K | 0.01K | 0.011 | 0.01K |
| Turb | 3.3 | 3.9 | 2.1 | 3.0 | 2.5 |
| F.Coliform | 5 | 6J | 12 | 7 | 12 |

Table 1. Continued.

Date 08/19/91

| Station # | 07N070 | 07D150 | 07M070 | 07D130 | 07D070 |
|----------------|--------|--------|--------|--------|--------|
| Classification | AA | AA | AA | A | A |
| Flow | 75 | 400 | 162 | 637 | 904 |
| Water Temp | 16.2 | 17.7 | 14.7 | 16.6 | 20.0 |
| Conductivity | 62 | 33 | 72 | 51 | 59 |
| DO | 8.9 | 9.4 | 10.2 | 9.2 | 9.3 |
| DO Sat (%) | 90.6 | 98.8 | 100.8 | 94.6 | 101.0 |
| pH | 7.1 | 6.6 | 7.2 | 6.8 | 7.0 |
| Residue | 3.0 | 9 | 3.0 | 3.0 | 2.0 |
| NH3+NH4 -N | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2-N (Diss) | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2+NO3 -N | 0.313 | 0.049 | 0.229 | 0.139 | 0.154 |
| Phos-Tot | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| Phos-Ortho | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| Turb | 1.6 | 2.8 | 1.5 | 2.8 | 2.0 |
| F.Coliform | 5 | 22 | 15 | 27 | 28 |

Date 09/16/91

| Station # | 07N070 | 07D150 | 07M070 | 07D130 | 07D070 |
|----------------|--------|--------|--------|--------|--------|
| Classification | AA | AA | AA | A | A |
| Flow | 80 | 195 | 129 | 415 | 686 |
| Water Temp | 12.0 | 12.8 | 12.4 | 12.4 | 14.7 |
| Conductivity | 91 | 46 | 83 | 60 | 70 |
| DO | 9.9 | 10.3 | 10.4 | 10.2 | 10.8 |
| DO Sat (%) | 91.9 | 97.4 | 97.5 | 95.7 | 105.0 |
| pH | 6.5 | 6.4 | 7.3 | 7.1 | 7.3 |
| Residue | 1.0 | 5 | 1.0 | 2.0 | 1.0 |
| NH3+NH4 -N | 0.01K | 0.01K | 0.015 | 0.01 | 0.01K |
| NO2-N (Diss) | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| NO2+NO3 -N | 0.222 | 0.065 | 0.296 | 0.174 | 0.167 |
| Phos-Tot | 0.011 | 0.014 | 0.017 | 0.016 | 0.015 |
| Phos-Ortho | 0.01K | 0.01K | 0.01K | 0.01K | 0.01K |
| Turb | 1.0K | 1.6 | 1.0K | 1.1 | 1.0K |
| F.Coliform | 3 | 100 | 8 | 12 | 6J |

K = Less than

J = Estimated value

☐ = Exceeds Water Quality Criteria

General Water Quality

Upper River

The general water quality at all three locations was, for the most part, very good, with the majority of the parameters within the expected range of waters of high quality. The only exceptions were five violations of Washington State Water Quality Standards as highlighted in Table 1 (see Attachment 2 for specific standards). The August temperature violations of 17.7 and 16.2°C (Class AA Criteria < 16°C) on the Middle and North Forks are most likely the result of combined effects of reduced flow and high ambient temperatures--a natural condition. Dissolved oxygen violations for the same time period of 9.4 and 8.9 mg/L (Class AA Criteria > 9.5 mg/L), show a weakness in the water quality standards, and do not reflect instream conditions. This weakness becomes evident upon review of the percent saturation for dissolved oxygen, which show both stations are above 90% of saturation level with 90.6 and 98.9 percent. The remaining two violations, pH of 6.4 and fecal coliform of 100 colonies per 100 mL of sample, for September are at or near the water quality criteria (6.5-8.5 for pH and < 10% of the samples may exceed 100 organisms for fecal coliform).

Mainstem

The water quality for the mainstem Snoqualmie Stations, at Snoqualmie and Carnation, were all within Class A Water Quality Standard (see Attachment 2), with the exception of an August temperature violation at the Carnation stations of 20.0°C (Class A Criteria < 18°C).

Metals

Metals concentrations at the three new locations and the corresponding water quality criteria are presented in Table 2. Most of these concentrations are at or near detection limits as denoted by the qualifier codes attached to the data. However, one cadmium value of 0.32 µg/L on the North Fork collected in June does exceed both the calculated acute (0.26 µg/L) and chronic (0.17 µg/L) criteria. This datum may be a laboratory artifact as an inordinately high number of detect were present for the June Northwest ambient monitoring samples. However, a review of the laboratory QA does not indicate a problem. Even if the datum is a valid concentration it should be noted that it is a total recoverable concentration, where as the standards are based on dissolved concentrations. This problem of different methods between water quality values and the standard to which they will be compared, will continue until EPA approves an acid-soluble (dissolved) method. In the interim, EPA recommends applying the criteria using the total recoverable method, even though these criteria may be overly protective.

Detection limits currently available for Hg, Cu, Pb, and Cd are in very close proximity to the chronic criteria, and may lead to overly restrictive permit conditions if the data provided in Table 2 is to be used in the WQBP-TOX.WK1 spreadsheet. It is my recommendation

Table 2. Metals Concentrations (ug/L) and Corresponding Water Quality Criteria on the Upper Snoqualmie River.

| | T-Hg | T-Cr | T-Cu | T-Pb | T-Zn | T-Cd | Hard | Calculated Water Quality Criteria Based on Total Hardness | | | | | | | | | | | |
|--------------------|--------|-------|------------|--------------|------|-------------|------|---|------------|----------|------------|----------|------------|----------|------------|----------|------------|----------|------------|
| | | | | | | | | Acute Hg | Chronic Hg | Acute Cr | Chronic Cr | Acute Cu | Chronic Cu | Acute Pb | Chronic Pb | Acute Zn | Chronic Zn | Acute Cd | Chronic Cd |
| <u>North Fork</u> | | | | | | | | | | | | | | | | | | | |
| 6/17/91 | 0.04 k | 0.4 | 3 k | 1 k | 6 | 0.32 | 9 | 2.4 | 0.012 | 241.66 | 28.80 | 1.83 | 1.51 | 3.81 | 0.15 | 15.21 | 13.78 | 0.26 | 0.17 |
| 7/22/91 | NS | | | | | | | | | | | | | | | | | | |
| 8/19/91 | 0.07 p | 0.6 v | 3 k | 2.4 p | 4 k | 0.1 k | 25 | 2.4 | 0.012 | 557.94 | 66.50 | 4.80 | 3.62 | 13.98 | 0.54 | 36.15 | 32.75 | 0.82 | 0.38 |
| 9/16/91 | 0.2 k | 0.3 k | 3 k | 1.9 p | 8 v | 0.13 p | 23 | 2.4 | 0.012 | 521.11 | 62.11 | 4.44 | 3.37 | 12.57 | 0.49 | 33.69 | 30.51 | 0.75 | 0.36 |
| <u>Middle Fork</u> | | | | | | | | | | | | | | | | | | | |
| 6/17/91 | 0.04 k | 2.3 | 3 p | 1 k | 7 v | 0.11 p | 6 | 2.4 | 0.012 | 173.37 | 20.67 | 1.25 | 1.07 | 2.27 | 0.09 | 10.79 | 9.77 | 0.16 | 0.12 |
| 7/22/91 | NS | | | | | | | | | | | | | | | | | | |
| 8/19/91 | 0.06 p | 0.5 v | 3 k | 1 k | 4 k | 0.1 k | 12 | 2.4 | 0.012 | 305.86 | 36.46 | 2.40 | 1.93 | 5.49 | 0.21 | 19.41 | 17.58 | 0.36 | 0.21 |
| 9/16/91 | 0.2 k | 0.3 k | 3 k | 1 k | 4 k | 0.1 k | 13 | 2.4 | 0.012 | 326.59 | 38.93 | 2.59 | 2.07 | 6.08 | 0.24 | 20.77 | 18.82 | 0.39 | 0.23 |
| <u>South Fork</u> | | | | | | | | | | | | | | | | | | | |
| 6/17/91 | 0.04 k | 0.4 | 3 p | 1 k | 6 | 0.1 k | 14 | 2.4 | 0.012 | 347.02 | 41.36 | 2.78 | 2.20 | 6.68 | 0.26 | 22.12 | 20.03 | 0.43 | 0.24 |
| 7/22/91 | NS | | | | | | | | | | | | | | | | | | |
| 8/19/91 | 0.07 p | 0.4 v | 3 k | 1 k | 4 k | 0.1 k | 35 | 2.4 | 0.012 | 734.97 | 87.60 | 6.59 | 4.82 | 21.46 | 0.84 | 48.08 | 43.55 | 1.20 | 0.50 |
| 9/16/91 | 0.2 k | 1.3 | 3 k | 1 k | 4 k | 0.42 p | 36 | 2.4 | 0.012 | 752.12 | 89.65 | 6.77 | 4.94 | 22.24 | 0.87 | 49.24 | 44.60 | 1.24 | 0.51 |

k = Less Than

p = Less Than Quantitation Limit

v = Also Detected in the Blank

NS = No Sample (Laboratory Misplaced Sample)

BOLD # = Exceeds Water Quality Criteria

data for these parameters be used to issue an interim permit subject to future review when analytical methods are adopted that allow true comparison between concentrations and criteria.

Summary

In general, the water quality conditions at the North, Middle, and South Forks of the Snoqualmie River during low flow conditions are very good with only minor water quality criteria violations. The only area of possible concern is temperature on the North and Middle Forks.

If you have any questions concerning the above information, please contact me at SCAN 234-2819.

BH:kd
Attachment

cc: Joe Joy

07D070 3307D070 12149000
 SNOQUALMIE RIVER NEAR CARNATION
 47 39 58.0 121 55 27.0 2F 0 Elev= 0 ft
 53033 Washington King Co. PACIFIC NORTHWEST
 PUGET SOUND (Snohomish-07) 131107
 21540000 Reach= 0.000 Drg= 0 sqmi
 Seg ID= 03-07-13 Class= AA Miles= 0.00 to 0.00
 AMBNT/STREAM/RMP

INDEX 1311116 000120
 MILES 0020.70 0023.01

| DATE | DEPTH | LAB | WATER | BAROMTRC | STREAM | COLOR | CNDUCTVY | DO | DO | PH | T ALK |
|----------|-------|--------|-------|----------|--------|-------|----------|---------|-------|------|-------|
| FROM | TIME | IDENT. | TEMP | PRESSURE | FLOW | PT-CO | LAB @ | MG/L | SATUR | SU | CACO3 |
| TO | METER | NUMBER | CENT | MM OF HG | CFS | UNITS | 25C UMHO | PERCENT | | | MG/L |
| 90/10/22 | 1145 | 436053 | 7.9 | 770 | 5310 | | 45 | 11.7 | 97.0 | 7.10 | |
| 90/11/18 | 1140 | 476053 | 6.9 | 772 | 5830 | | 43 | 12.1 | 97.7 | 6.80 | |
| 91/02/18 | 1100 | 86053 | 5.2 | 771 | 5150 | | 34 | 12.4 | 96.1 | 6.90 | |
| 91/03/18 | 1120 | 126053 | 6.7 | 761 | 2420 | | 55 | 11.5 | 93.7 | 7.30 | |
| 91/04/15 | 1105 | 166053 | 7.7 | 766 | 3860 | | 47 | 11.2 | 92.9 | 6.90 | |
| 91/05/20 | 1125 | 216053 | 8.8 | 768 | 3890 | | 37 | 11.5 | 97.6 | 7.10 | |
| 91/06/17 | 1230 | 256053 | 9.4 | 770 | 5310 | | 35 | 11.3 | 97.0 | 6.90 | |
| 91/07/22 | 1230 | 306053 | 16.0 | 765 | 1550 | | 49 | 10.0 | 99.9 | 6.90 | |
| 91/08/19 | 1200 | 346053 | 20.0 | 763 | 904 | | 59 | 9.3 | 101.0 | 7.00 | |
| 91/09/16 | 1255 | 386053 | 14.7 | 766 | 686 | | 70 | 10.8 | 105.0 | 7.30 | |

| DATE | DEPTH | HCO3 ION | CO3 ION | RESIDUE | NH3+NH4- | NO2-N | NO2-N | NO3-N | TOT KJEL | NO2+NO3 | PHOS-TOT |
|----------|-------|----------|---------|----------|----------|--------|-------|-------|----------|---------|----------|
| FROM | TIME | HCO3 | CO3 | TOT-NFLT | N TOTAL | DISS | TOTAL | TOTAL | N | N-TOTAL | MG/L P |
| TO | METER | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L |
| 90/10/22 | 1145 | | | 14.0 | 0.010K | 0.002K | | | | 0.293 | 0.017 |
| 90/11/18 | 1140 | | | 20.0 | 0.020 | 0.010K | | | | 0.300 | 0.020 |
| 91/02/18 | 1100 | | | 9.0 | 0.010K | 0.010K | | | | 0.280 | 0.040 |
| 91/03/18 | 1120 | | | 3.0 | 0.009 | 0.010K | | | | 0.294 | 0.007 |
| 91/04/15 | 1105 | | | 8.0 | 0.010K | 0.010K | | | | 0.310 | 0.010 |
| 91/05/20 | 1125 | | | 5.0 | 0.015 | 0.010K | | | | 0.135 | 0.011 |
| 91/06/17 | 1230 | | | 21.0 | 0.010K | 0.010K | | | | 0.149 | 0.015 |
| 91/07/22 | 1230 | | | 2.0 | 0.015 | 0.010K | | | | 0.121 | 0.010K |
| 91/08/19 | 1200 | | | 2.0 | 0.010K | 0.010K | | | | 0.154 | 0.010K |
| 91/09/16 | 1255 | | | 1.0 | 0.010K | 0.010K | | | | 0.167 | 0.015 |

| DATE | DEPTH | PHOS-DIS | TOT HARD | NC HARD | CALCIUM | MGNSIUM | SODIUM | PTSSIUM | CHLORIDE | SULFATE | FLUORIDE |
|----------|-------|----------|----------|---------|---------|---------|---------|---------|----------|---------|----------|
| FROM | TIME | ORTHO | CACO3 | CACO3 | CA,DISS | MG,DISS | NA,DISS | K,DISS | CL | SO4-TOT | F,DISS |
| TO | METER | MG/L P | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L |
| 90/10/22 | 1145 | 0.006 | | | | | | | | | |
| 90/11/18 | 1140 | 0.010K | | | | | | | | | |
| 91/02/18 | 1100 | 0.010K | | | | | | | | | |

MORE DATES NEXT PAGE

| DATE | DEPTH | 671 PHOS-DIS ORTHO | 900 TOT HARD CACO3 | 902 NC HARD CACO3 | 915 CALCIUM CA,DISS | 925 MGNSIUM MG,DISS | 930 SODIUM NA,DISS | 935 PTSSIUM K,DISS | 940 CHLORIDE CL | 945 SULFATE SO4-TOT | 950 FLUORIDE F,DISS |
|----------|-------|--------------------------|--------------------------|-------------------------|---------------------------|---------------------------|--------------------------|--------------------------|-----------------------|---------------------------|---------------------------|
| FROM | TO | MG/L P | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L |
| 91/03/18 | 1120 | 0.011 | | | | | | | | | |
| 91/04/15 | 1105 | 0.010K | | | | | | | | | |
| 91/05/20 | 1125 | 0.010K | | | | | | | | | |
| 91/06/17 | 1230 | 0.010K | | | | | | | | | |
| 91/07/22 | 1230 | 0.010K | | | | | | | | | |
| 91/08/19 | 1200 | 0.010K | | | | | | | | | |
| 91/09/16 | 1255 | 0.010K | | | | | | | | | |

| DATE | DEPTH | 955 SILICA DISOLVED | 1020 BORON B,DISS | 1030 CHROMIUM CR,DISS | 1040 COPPER CU,DISS | 1045 IRON FE,TOT | 1049 LEAD PB,DISS | 1080 STRONTIUM SR,DISS | 1090 ZINC ZN,DISS | 1130 LITHIUM LI,DISS | 31504 TOT COLI MFIM LES |
|------|-------|---------------------------|-------------------------|-----------------------------|---------------------------|------------------------|-------------------------|------------------------------|-------------------------|----------------------------|-------------------------------|
| FROM | TO | MG/L | UG/L | UG/L | UG/L | UG/L | UG/L | UG/L | UG/L | UG/L | /100ML |
| | | | | | | | | | | | |

| DATE | DEPTH | 31616 FEC COLI MFM-FCBR | 31672 FECSTREP PC M-ENT | 70300 RESIDUE DISS-180 | 71900 MERCURY HG,TOTAL | 82079 TURBIDTY LAB |
|----------|-------|-------------------------------|-------------------------------|------------------------------|------------------------------|--------------------------|
| FROM | TO | /100ML | /100ML | C MG/L | UG/L | NTU |
| 90/10/22 | 1145 | 17 | | | | 4.3 |
| 90/11/18 | 1140 | 59 | | | | 5.4 |
| 91/02/18 | 1100 | 23 | | | | 4.3 |
| 91/03/18 | 1120 | 8 | | | | 2.5 |
| 91/04/15 | 1105 | 22 | | | | 5.8 |
| 91/05/20 | 1125 | 30S | | | | 3.0 |
| 91/06/17 | 1230 | 35 | | | | 6.5 |
| 91/07/22 | 1230 | 12 | | | | 2.5 |
| 91/08/19 | 1200 | 28 | | | | 2.0 |
| 91/09/16 | 1255 | 6J | | | | 1.0K |

07N070 3307N070
 NF SNOQUALMIE RIVER NEAR ELLISVILLE
 46 59 43.0 121 46 07.0 2F000 Elev= 0 ft
 53033 Washington King Co. PACIFIC NORTHWEST
 PUGET SOUND (Snohomish-07) 131107
 21540000 Reach=17110010000 0.000 Drg= 0 sqmi
 AMBNT/STREAM/RMP

INDEX 1311116 000120 00650
 MILES 0020.50 0044.90 000.30

| DATE | DEPTH | LAB | WATER | BAROMTRC | STREAM | CNDUCTVY | DO | DO | PH | RESIDUE | NH3+NH4- |
|----------|-------|--------|-------|----------|--------|----------|---------|-------|------|----------|----------|
| FROM | TIME | IDENT. | TEMP | PRESSURE | FLOW | LAB @ | MG/L | SATUR | SU | TOT-NFLT | N TOTAL |
| TO | METER | NUMBER | CENT | MM OF HG | CFS | 25C UMHO | PERCENT | | | MG/L | MG/L |
| 91/06/17 | 1020 | 256077 | 8.1 | 762 | 980 | 26 | 11.7 | 98.5 | 6.90 | 3.0 | 0.010K |
| 91/07/22 | 1025 | 306077 | 14.2 | 757 | 205 | 40 | 10.2 | 99.2 | 6.90 | 2.0 | 0.011 |
| 91/08/19 | 1015 | 346077 | 16.2 | 754 | 75 | 62 | 8.9 | 90.6 | 7.10 | 3.0 | 0.010K |
| 91/09/16 | 1055 | 386077 | 12.0 | 756 | 80 | 91 | 9.9 | 91.9 | 6.50 | 1.0 | 0.010K |

| DATE | DEPTH | 613 | 630 | 665 | 671 | 900 | 1094 | 1113 | 1114 | 1118 | 1119 |
|----------|-------|--------|---------|----------|----------|----------|---------|---------|---------|----------|---------|
| FROM | TIME | NO2-N | NO2+NO3 | PHOS-TOT | PHOS-DIS | TOT HARD | ZINC | CADMIUM | LEAD | CHROMIUM | COPPER |
| TO | METER | DISS | N-TOTAL | MG/L P | ORTHO | CACO3 | TOT REC | TOT REC | TOT REC | TOT REC | TOT REC |
| | | MG/L | MG/L | | MG/L P | MG/L | UG/L | UG/L | UG/L | UG/L | UG/L |
| 91/06/17 | 1020 | 0.010K | 0.113 | 0.011 | 0.010K | 9 | 6.0 | 0.32 | 1.0K | 0.4 | 3.0K |
| 91/07/22 | 1025 | 0.010K | 0.141 | 0.010K | 0.010K | 16 | | | | | |
| 91/08/19 | 1015 | 0.010K | 0.313 | 0.010K | 0.010K | 25 | 4.0K | 0.10K | 2.4P | 0.6V | 3.0K |
| 91/09/16 | 1055 | 0.010K | 0.222 | 0.011 | 0.010K | 23 | 8.0V | 0.13P | 1.9P | 0.3K | 3.0K |

| DATE | DEPTH | 31616 | 71901 | 82079 |
|----------|-------|----------|---------|----------|
| FROM | TIME | FEC COLI | MERCURY | TURBIDTY |
| TO | METER | MFM-FCBR | TOT REC | LAB |
| | | /100ML | UG/L | NTU |
| 91/06/17 | 1020 | 6 | 0.04K | 1.2 |
| 91/07/22 | 1025 | 5 | | 3.3 |
| 91/08/19 | 1015 | 5 | 0.07P | 1.6 |
| 91/09/16 | 1055 | 3 | 0.20K | 1.0K |

07D150 3307D150
 MF SNOQUALMIE RIVER NEAR ELLISVILLE
 47 07 06.0 121 06 46.0 2F000 Elev= 0 ft
 53033 Washington King Co. PACIFIC NORTHWEST
 PUGET SOUND (Snohomish-07) 131107
 21540000 Reach=17110010000 0.000 Drg= 0 sqmi
 AMBNT/STREAM/RMP

INDEX 1311116 000120
 MILES 0020.50 0045.30

| DATE | DEPTH | LAB | WATER | BAROMTRC | STREAM | CNDUCTVY | DO | DO | PH | RESIDUE | NH3+NH4- |
|----------|-------|--------|-------|----------|--------|----------|---------|-------|------|----------|----------|
| FROM | TIME | IDENT. | TEMP | PRESSURE | FLOW | LAB @ | MG/L | SATUR | SU | TOT-NFLT | N TOTAL |
| TO | METER | NUMBER | CENT | MM OF HG | CFS | 25C UMHO | PERCENT | | | MG/L | MG/L |
| 91/06/17 | 1045 | 256078 | 7.5 | 762 | 2160 | 19 | 11.9 | 98.8 | 6.80 | 25.0 | 0.010K |
| 91/07/22 | 1050 | 306078 | 13.9 | 756 | 1200 | 22 | 10.4 | 100.6 | 6.70 | 4.0 | 0.010K |
| 91/08/19 | 1035 | 346078 | 17.7 | 754 | 400 | 33 | 9.4 | 98.8 | 6.60 | 9.0 | 0.010K |
| 91/09/16 | 1140 | 386078 | 12.8 | 755 | 195 | 46 | 10.3 | 97.4 | 6.40 | 5.0 | 0.010K |

| DATE | DEPTH | 613 | 630 | 665 | 671 | 900 | 1094 | 1113 | 1114 | 1118 | 1119 |
|----------|-------|--------|---------|----------|----------|----------|---------|---------|---------|----------|---------|
| FROM | TIME | NO2-N | NO2+NO3 | PHOS-TOT | PHOS-DIS | TOT HARD | ZINC | CADMIUM | LEAD | CHROMIUM | COPPER |
| TO | METER | DISS | N-TOTAL | MG/L P | ORTHO | CACO3 | TOT REC | TOT REC | TOT REC | TOT REC | TOT REC |
| | | MG/L | MG/L | | MG/L P | MG/L | UG/L | UG/L | UG/L | UG/L | UG/L |
| 91/06/17 | 1045 | 0.010K | 0.072 | 0.017 | 0.010K | 6 | 7.0V | 0.11 | 1.0K | 2.3 | 3.0 |
| 91/07/22 | 1050 | 0.010K | 0.029 | 0.010K | 0.010K | 8 | | | | | |
| 91/08/19 | 1035 | 0.010K | 0.049 | 0.010K | 0.010K | 12 | 4.0K | 0.10K | 1.0K | 0.5V | 3.0K |
| 91/09/16 | 1140 | 0.010K | 0.065 | 0.014 | 0.010K | 13 | 4.0K | 0.10K | 1.0K | 0.3K | 3.0K |

| DATE | DEPTH | 31616 | 71901 | 82079 |
|----------|-------|----------|---------|----------|
| FROM | TIME | FEC COLI | MERCURY | TURBIDTY |
| TO | METER | MFM-FCBR | TOT REC | LAB |
| | | /100ML | UG/L | NTU |
| 91/06/17 | 1045 | 12 | 0.04K | 12.0 |
| 91/07/22 | 1050 | 6J | | 3.9 |
| 91/08/19 | 1035 | 22 | 0.06P | 2.8 |
| 91/09/16 | 1140 | 100 | 0.20K | 1.6 |

07M070 3307M070
 SF SNOQUALMIE RIVER AT NORTH BEND
 47 33 12.0 121 47 23.0 2F000 Elev= 0 ft
 53033 Washington King Co. PACIFIC NORTHWEST
 PUGET SOUND (Snohomish-07) 131107
 21540000 Reach=17110010000 0.000 Drg= 0 sqmi
 AMBNT/STREAM/RMP

INDEX 1311116 000120 00620
 MILES 0020.50 0044.40 002.01

| DATE | DEPTH | LAB | WATER | BAROMTRC | STREAM | CNDUCTVY | DO | DO | PH | RESIDUE | NH3+NH4- |
|----------|-------|--------|-------|----------|--------|----------|---------|-------|------|----------|----------|
| FROM | TIME | IDENT. | TEMP | PRESSURE | FLOW | LAB @ | MG/L | SATUR | SU | TOT-NFLT | N TOTAL |
| TO | METER | NUMBER | CENT | MM OF HG | CFS | 25C UMHO | PERCENT | | | MG/L | MG/L |
| 91/06/17 | 1110 | 256079 | 8.5 | 760 | 889 | 35 | 11.9 | 101.4 | 7.10 | 3.0 | 0.010K |
| 91/07/22 | 1125 | 306079 | 13.8 | 755 | 268 | 60 | 10.5 | 101.5 | 7.60 | 2.0 | 0.010K |
| 91/08/19 | 1100 | 346079 | 14.7 | 753 | 162 | 72 | 10.2 | 100.8 | 7.20 | 3.0 | 0.010K |
| 91/09/16 | 1200 | 386079 | 12.4 | 755 | 129 | 83 | 10.4 | 97.5 | 7.30 | 1.0 | 0.015 |

| DATE | DEPTH | 613 | 630 | 665 | 671 | 900 | 1094 | 1113 | 1114 | 1118 | 1119 |
|----------|-------|--------|---------|----------|----------|----------|---------|---------|---------|----------|---------|
| FROM | TIME | NO2-N | NO2+NO3 | PHOS-TOT | PHOS-DIS | TOT HARD | ZINC | CADMIUM | LEAD | CHROMIUM | COPPER |
| TO | METER | DISS | N-TOTAL | MG/L P | ORTHO | CACO3 | TOT REC | TOT REC | TOT REC | TOT REC | TOT REC |
| | | MG/L | MG/L | | MG/L P | MG/L | UG/L | UG/L | UG/L | UG/L | UG/L |
| 91/06/17 | 1110 | 0.010K | 0.152 | 0.010K | 0.010K | 14 | 6.0 | 0.10K | 1.0K | 0.4 | 3.0 |
| 91/07/22 | 1125 | 0.010K | 0.215 | 0.010K | 0.010K | 25 | | | | | |
| 91/08/19 | 1100 | 0.010K | 0.229 | 0.010K | 0.010K | 35 | 4.0K | 0.10K | 1.0K | 0.4V | 3.0K |
| 91/09/16 | 1200 | 0.010K | 0.296 | 0.017 | 0.010K | 36 | 4.0K | 0.42P | 1.0K | 1.3 | 3.0K |

| DATE | DEPTH | 31616 | 71901 | 82079 |
|----------|-------|----------|---------|----------|
| FROM | TIME | FEC COLI | MERCURY | TURBIDTY |
| TO | METER | MFM-FCBR | TOT REC | LAB |
| | | /100ML | UG/L | NTU |
| 91/06/17 | 1110 | 11 | 0.04K | 1.0 |
| 91/07/22 | 1125 | 12 | | 2.1 |
| 91/08/19 | 1100 | 15 | 0.07P | 1.5 |
| 91/09/16 | 1200 | 8 | 0.20K | 1.0K |

07D130 3307D130 12144400 541044
 SNOQUALMIE RIVER AT SNOQUALMIE
 47 31 40.0 121 48 40.0 2F 0 Elev= 0 ft
 53033 Washington King Co. PACIFIC NORTHWEST
 PUGET SOUND (Snohomish-07) 131107
 21540000 Reach= 0.000 Drg= 0 sqmi
 Seg ID= 03-07-13 Class= AA Miles= 0.00 to 0.00
 AMBNT/STREAM/RMP

INDEX 1311116 000120
 MILES 0020.50 0042.30

| DATE | DEPTH | LAB | WATER | BAROMTRC | STREAM | TURB | COLOR | CNDUCTVY | DO | DO | PH |
|----------|-------|--------|-------|----------|--------|------|-------|----------|------|---------|------|
| FROM | TIME | IDENT. | TEMP | PRESSURE | FLOW | JKSN | PT-CO | LAB @ | | SATUR | |
| TO | METER | NUMBER | CENT | MM OF HG | CFS | JTU | UNITS | 25C UMHO | MG/L | PERCENT | SU |
| 90/10/22 | 1050 | 436052 | 7.3 | 759 | 4110 | | | 40 | 11.7 | 97.0 | 7.70 |
| 90/11/18 | 1100 | 476052 | 6.2 | 760 | 4010 | | | 55 | 12.2 | 98.3 | 7.40 |
| 90/12/10 | 1100 | 506052 | 5.6 | 752 | 6190 | | | 26 | 13.8 | 110.6 | 7.50 |
| 91/01/21 | 1035 | 46052 | 2.9 | 767 | 2760 | | | 38 | 12.8 | 93.8 | 8.00 |
| 91/02/18 | 1025 | 86052 | 4.6 | 760 | 3680 | | | 29 | 12.4 | 96.0 | 6.90 |
| 91/03/18 | 1030 | 126052 | 5.5 | 749 | 1560 | | | 46 | 11.7 | 94.1 | 7.50 |
| 91/04/15 | 1025 | 166052 | 6.5 | 754 | 2750 | | | 56 | 11.5 | 94.1 | 6.90 |
| 91/05/20 | 1045 | 216052 | 7.3 | 757 | 3290 | | | 30 | 11.6 | 96.4 | 7.20 |
| 91/06/17 | 1150 | 256052 | 8.5 | 761 | 4000 | | | 24 | 11.9 | 101.3 | 6.90 |
| 91/07/22 | 1145 | 306052 | 14.0 | 755 | 1390 | | | 31 | 10.2 | 99.0 | 7.00 |
| 91/08/19 | 1125 | 346052 | 16.6 | 753 | 637 | | | 51 | 9.2 | 94.6 | 6.80 |
| 91/09/16 | 1225 | 386052 | 12.4 | 755 | 415 | | | 60 | 10.2 | 95.7 | 7.10 |

| DATE | DEPTH | 410 | 440 | 445 | 530 | 610 | 613 | 615 | 620 | 630 | 660 |
|----------|-------|-------|----------|---------|----------|----------|--------|-------|-------|---------|----------|
| FROM | TIME | T ALK | HCO3 ION | CO3 ION | RESIDUE | NH3+NH4- | NO2-N | NO2-N | NO3-N | NO2+NO3 | ORTHOPO4 |
| TO | METER | CACO3 | HCO3 | CO3 | TOT-NFLT | N TOTAL | DISS | TOTAL | TOTAL | N-TOTAL | PO4 |
| | | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L | MG/L |
| 90/10/22 | 1050 | | | | 18.0 | 0.010K | 0.002K | | | 0.214 | |
| 90/11/18 | 1100 | | | | 16.0 | 0.010 | 0.010K | | | 0.210 | |
| 90/12/10 | 1100 | | | | 32.0 | 0.010 | 0.010K | | | 0.160 | |
| 91/01/21 | 1035 | | | | 12.0 | 0.010K | 0.010K | | | 0.250 | |
| 91/02/18 | 1025 | | | | 13.0 | 0.010K | 0.010K | | | 0.200 | |
| 91/03/18 | 1030 | | | | 4.0 | 0.010 | 0.010K | | | 0.203 | |
| 91/04/15 | 1025 | | | | 9.0 | 0.010K | 0.010K | | | 0.216 | |
| 91/05/20 | 1045 | | | | 7.0 | 0.015 | 0.010K | | | 0.105 | |
| 91/06/17 | 1150 | | | | 12.0 | 0.010K | 0.010K | | | 0.107 | |
| 91/07/22 | 1145 | | | | 2.0 | 0.010 | 0.010K | | | 0.093 | |
| 91/08/19 | 1125 | | | | 3.0 | 0.010K | 0.010K | | | 0.139 | |
| 91/09/16 | 1225 | | | | 2.0 | 0.010 | 0.010K | | | 0.174 | |

| DATE | DEPTH | 665 | 671 | 900 | 902 | 915 | 925 | 930 | 931 | 932 | 935 |
|------|-------|----------|----------|----------|---------|---------|---------|---------|----------|---------|---------|
| FROM | TIME | PHOS-TOT | PHOS-DIS | TOT HARD | NC HARD | CALCIUM | MGNSIUM | SODIUM | SODIUM | PERCENT | PTSSIUM |
| TO | METER | MG/L P | ORTHO | CACO3 | CACO3 | CA,DISS | MG,DISS | NA,DISS | ADSBTION | SODIUM | K,DISS |
| | | | MG/L P | MG/L | MG/L | MG/L | MG/L | MG/L | RATIO | % | MG/L |

MORE DATES NEXT PAGE

| DATE FROM TO | DEPTH TIME METER | 665 PHOS-TOT MG/L P | 671 PHOS-DIS ORTHO MG/L P | 900 TOT HARD CACO3 MG/L | 902 NC HARD CACO3 MG/L | 915 CALCIUM CA,DISS MG/L | 925 MGNSIUM MG,DISS MG/L | 930 SODIUM NA,DISS MG/L | 931 SODIUM ADSBTION RATIO | 932 PERCENT SODIUM % | 935 PTSSIUM K,DISS MG/L |
|--------------|------------------|---------------------|---------------------------|-------------------------|------------------------|--------------------------|--------------------------|-------------------------|---------------------------|----------------------|-------------------------|
| 90/10/22 | 1050 | 0.011 | 0.004 | | | | | | | | |
| 90/11/18 | 1100 | 0.010 | 0.010K | | | | | | | | |
| 90/12/10 | 1100 | 0.020 | 0.010K | | | | | | | | |
| 91/01/21 | 1035 | 0.030 | 0.010K | | | | | | | | |
| 91/02/18 | 1025 | 0.040 | 0.010K | | | | | | | | |
| 91/03/18 | 1030 | 0.008 | 0.010 | | | | | | | | |
| 91/04/15 | 1025 | 0.010K | 0.010K | | | | | | | | |
| 91/05/20 | 1045 | 0.012 | 0.010K | | | | | | | | |
| 91/06/17 | 1150 | 0.013 | 0.010K | | | | | | | | |
| 91/07/22 | 1145 | 0.010K | 0.011 | | | | | | | | |
| 91/08/19 | 1125 | 0.010K | 0.010K | | | | | | | | |
| 91/09/16 | 1225 | 0.016 | 0.010K | | | | | | | | |

| DATE FROM TO | DEPTH TIME METER | 940 CHLORIDE CL MG/L | 945 SULFATE SO4-TOT MG/L | 950 FLUORIDE F,DISS MG/L | 955 SILICA DISOLVED MG/L | 1000 ARSENIC AS,DISS UG/L | 1020 BORON B,DISS UG/L | 1032 CHROMIUM HEX-VAL UG/L | 1034 CHROMIUM CR,TOT UG/L | 1040 COPPER CU,DISS UG/L | 1042 COPPER CU,TOT UG/L |
|--------------|------------------|----------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------------|----------------------------|---------------------------|--------------------------|-------------------------|
|--------------|------------------|----------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------------|----------------------------|---------------------------|--------------------------|-------------------------|

| DATE FROM TO | DEPTH TIME METER | 1045 IRON FE,TOT UG/L | 1080 STRONTIUM SR,DISS UG/L | 1090 ZINC ZN,DISS UG/L | 1092 ZINC ZN,TOT UG/L | 1130 LITHIUM LI,DISS UG/L | 31501 TOT COLI MFIMENDO /100ML | 31504 TOT COLI MFIM LES /100ML | 31505 TOT COLI MPN CONF /100ML | 31507 TOT COLI MPN COMP /100ML | 31616 FEC COLI MFM-FCBR /100ML |
|--------------|------------------|-----------------------|-----------------------------|------------------------|-----------------------|---------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|--------------|------------------|-----------------------|-----------------------------|------------------------|-----------------------|---------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|

| | | | | | | | | | | | |
|----------|------|--|--|--|--|--|--|--|--|--|----|
| 90/10/22 | 1050 | | | | | | | | | | 17 |
| 90/11/18 | 1100 | | | | | | | | | | 3 |
| 90/12/10 | 1100 | | | | | | | | | | 9 |
| 91/02/18 | 1025 | | | | | | | | | | 1K |
| 91/03/18 | 1030 | | | | | | | | | | 1 |
| 91/04/15 | 1025 | | | | | | | | | | 4 |
| 91/05/20 | 1045 | | | | | | | | | | 9 |
| 91/06/17 | 1150 | | | | | | | | | | 15 |
| 91/07/22 | 1145 | | | | | | | | | | 7 |
| 91/08/19 | 1125 | | | | | | | | | | 27 |
| 91/09/16 | 1225 | | | | | | | | | | 12 |

| DATE FROM TO | DEPTH TIME METER | 70300 RESIDUE DISS-180 C MG/L | 70303 DISS SOL TONS PER ACRE-FT | 71851 NITRATE DISS-NO3 MG/L | 82079 TURBIDTY LAB NTU |
|--------------|------------------|-------------------------------|---------------------------------|-----------------------------|------------------------|
|--------------|------------------|-------------------------------|---------------------------------|-----------------------------|------------------------|

| | | | | | |
|----------|------|--|--|--|------|
| 90/10/22 | 1050 | | | | 3.1 |
| 90/11/18 | 1100 | | | | 4.2 |
| 90/12/10 | 1100 | | | | 13.0 |
| 91/01/21 | 1035 | | | | 3.2 |

MORE DATES NEXT PAGE

| DATE | | 70300 | 70303 | 71851 | 82079 |
|----------|------------|----------|----------|----------|----------|
| FROM | DEPTH | RESIDUE | DISS SOL | NITRATE | TURBIDTY |
| TO | TIME METER | DISS-180 | TONS PER | DISS-NO3 | LAB |
| | | C | ACRE-FT | MG/L | NTU |
| 91/02/18 | 1025 | | | | 4.1 |
| 91/03/18 | 1030 | | | | 1.2 |
| 91/04/15 | 1025 | | | | 5.5 |
| 91/05/20 | 1045 | | | | 3.5 |
| 91/06/17 | 1150 | | | | 3.5 |
| 91/07/22 | 1145 | | | | 3.0 |
| 91/08/19 | 1125 | | | | 2.8 |
| 91/09/16 | 1225 | | | | 1.1 |

Chapter 173-201 WAC

WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON

WAC

| | |
|-------------|---|
| 173-201-010 | Introduction. |
| 173-201-025 | Definitions. |
| 173-201-035 | General considerations. |
| 173-201-045 | General water use and criteria classes. |
| 173-201-047 | Toxic substances. |
| 173-201-070 | General classifications. |
| 173-201-080 | Specific classifications—Freshwater. |
| 173-201-085 | Specific classifications—Marine water. |
| 173-201-090 | Achievement considerations. |
| 173-201-100 | Implementation. |
| 173-201-110 | Surveillance. |
| 173-201-120 | Enforcement. |

**DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS
CHAPTER**

| | |
|-------------|---|
| 173-201-020 | Water use and quality criteria. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-020, filed 1/17/78; Order 73-4, § 173-201-020, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035. |
| 173-201-030 | Water use and quality criteria—General water use and criteria classes. [Order 73-4, § 173-201-030, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035. |
| 173-201-040 | Water use and quality criteria—General considerations. [Order 73-4, § 173-201-040, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035. |
| 173-201-050 | Characteristic uses to be protected. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-050, filed 1/17/78; Order 73-4, § 173-201-050, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035. |
| 173-201-060 | Water course classification. [Order 73-4, § 173-201-060, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035. |
| 173-201-130 | Definitions. [Order 73-4, § 173-201-130, filed 7/6/73.] Repealed by 78-02-043 (Order DE 77-32), filed 1/17/78. Statutory Authority: RCW 90.48.035. |
| 173-201-140 | Miscellaneous. [Statutory Authority: RCW 90.48.035. 78-02-043 (Order DE 77-32), § 173-201-140, filed 1/17/78; Order 73-4, § 173-201-140, filed 7/6/73.] Repealed by 82-12-078 (Order DE 82-12), filed 6/2/82. Statutory Authority: RCW 90.48.035. |

WAC 173-201-010 Introduction. (1) The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment thereof, and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW and the policies and purposes thereof.

(2) This chapter shall be reviewed periodically by the department and appropriate revisions shall be undertaken.

(3) The water use and quality criteria set forth in WAC 173-201-035 through 173-201-085 are established in conformance with present and potential water uses of the surface waters of the state of Washington and in consideration of the natural water quality potential and limitations of the same. These shall be the sole criteria for said waters. [Statutory Authority: RCW 90.48.035 and 90.48.260. 88-02-058 (Order 87-6), § 173-201-010, filed 1/6/88. Statutory Authority: RCW 90.48.035. 82-12-078 (Order DE 82-12), § 173-201-010, filed 6/2/82; 78-02-043 (Order DE 77-32), § 173-201-010, filed 1/17/78; Order 73-4, § 173-201-010, filed 7/6/73.]

WAC 173-201-025 Definitions. (1) **Background conditions:** The biological, chemical, and physical conditions of a water body, upstream from the point or non-point source of any discharge under consideration. Background sampling location in an enforcement action would be upstream from the point of discharge, but not upstream from other inflows. If several discharges to any water body exist, and enforcement action is being taken for possible violations to the standards, background sampling would be undertaken immediately upstream from each discharge.

(2) **Department:** State of Washington department of ecology.

(3) **Director:** Director of the state of Washington department of ecology.

(4) **Hardness:** A measure of the calcium and magnesium salts present in water. For purposes of this chapter, hardness is measured in milligrams per liter as calcium carbonate (CaCO₃).

(5) **Fecal coliform:** That portion of the coliform group which is present in the intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within 24 hours at 44.5 plus or minus 0.2 degrees Celsius.

(6) **Geometric mean:** The nth root of a product of n factors.

(7) **Mean detention time:** The time obtained by dividing a reservoir's mean annual minimum total storage by the 30-day ten-year low-flow from the reservoir.

(8) **Permit:** A document issued pursuant to RCW 90.48.160 et seq. or 90.48.260 or both, specifying the waste treatment and control requirements and waste discharge conditions.

(9) **pH:** The negative logarithm of the hydrogen ion concentration.

(10) **Primary contact recreation:** Activities where a person would have direct contact with water to the point

WAC 173-201-045 General water use and criteria classes. The following criteria shall apply to the various classes of surface waters in the state of Washington:

(1) Class AA (extraordinary).

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria.

(i) Fecal coliform organisms.

(A) Freshwater - fecal coliform organisms shall not exceed a geometric mean value of 50 organisms/100 mL, with not more than 10 percent of samples exceeding 100 organisms/100 mL.

(B) Marine water - fecal coliform organisms shall not exceed a geometric mean value of 14 organisms/100 mL, with not more than 10 percent of samples exceeding 43 organisms/100 mL.

(ii) Dissolved oxygen.

(A) Freshwater - dissolved oxygen shall exceed 9.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels can be degraded by up to 0.2 mg/L by man-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 16.0°C (freshwater) or 13.0°C (marine water) due to human activities. Temperature increases shall not, at any time, exceed $t=23/(T+5)$ (freshwater) or $t=8/(T-4)$ (marine water).

When natural conditions exceed 16.0°C (freshwater) and 13.0°C (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a dilution zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8°C, and

the maximum water temperature shall not exceed 16.3°C (freshwater).

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a man-caused variation within a range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health (see WAC 173-201-047).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) Class A (excellent).

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria.

(i) Fecal coliform organisms.

(A) Freshwater - fecal coliform organisms shall not exceed a geometric mean value of 100 organisms/100 mL, with not more than 10 percent of samples exceeding 200 organisms/100 mL.

(B) Marine water - fecal coliform organisms shall not exceed a geometric mean value of 14 organisms/100 mL, with not more than 10 percent of samples exceeding 43 organisms/100 mL.

(ii) Dissolved oxygen.

(A) Freshwater - dissolved oxygen shall exceed 8.0 mg/L.

(B) Marine water - dissolved oxygen shall exceed 6.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 6.0 mg/L, natural dissolved oxygen levels can be degraded by up to 0.2 mg/L by man-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(95) Skykomish River from mouth to May Creek (above Gold Bar at river mile 41.2).

Class A

(96) Skykomish River from May Creek (above Gold Bar at river mile 41.2) to headwaters.

Class AA

(97) Snake River from mouth to Washington-Idaho-Oregon border (river mile 176.1). Special condition.

(a) Below Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.

(b) Above Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined.

(98) Snohomish River from mouth and east of longitude 122°13'40"W upstream to latitude 47°56'30"N (southern tip of Ebey Island river mile 8.1). Special condition - fecal coliform organisms shall not exceed a geometric mean value of 200, organisms/100 mL with not more than 10 percent of samples exceeding 400 organisms/100 mL.

Class A

(99) Snohomish River upstream from latitude 47°56'30"N (southern tip of Ebey Island river mile 8.1) to confluence with Skykomish and Snoqualmie River (river mile 20.5).

Class A

(100) Snoqualmie River and tributaries from mouth to west boundary of Twin Falls State Park on south fork (river mile 9.1).

Class A

(101) Snoqualmie River, middle fork.

Class AA

(102) Snoqualmie River, north fork.

Class AA

(103) Snoqualmie River, south fork, from west boundary of Twin Falls State Park (river mile 9.1) to headwaters.

Class AA

(104) Soleduck River and tributaries.

Class AA

(105) Spokane River from mouth to Long Lake Dam (river mile 33.9). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t=34/(T+9)$.

Class A

(106) Spokane River from Long Lake Dam (river mile 33.9) to Nine Mile Bridge (river mile 58.0). Special conditions:

(a) The average euphotic zone concentration of total phosphorus (as P) shall not exceed 25µg/L during the period of June 1 to October 31.

(b) Temperature shall not exceed 20.0°C, due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed $t=34/(T+9)$.

Lake Class

(107) Spokane River from Nine Mile Bridge (river mile 58.0) to the Idaho border (river mile 96.5). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed $t=34/(T+9)$.

Class A

(108) Stehekin River.

Class AA

(109) Stillaguamish River from mouth to north and south forks (river mile 17.8).

Class A

(110) Stillaguamish River, north fork, from mouth to Squire Creek (river mile 31.2).

Class A

(111) Stillaguamish River, north fork, from Squire Creek (river mile 31.2) to headwaters.

Class AA

(112) Stillaguamish River, south fork, from mouth to Canyon Creek (river mile 33.7).

Class A

(113) Stillaguamish River, south fork, from Canyon Creek (river mile 33.7) to the headwaters.

Class AA

(114) Sulphur Creek.

Class B

(115) Sultan River from mouth to Chaplain Creek (river mile 5.9).

Class A

(116) Sultan River and tributaries from Chaplain Creek (river mile 5.9) to headwaters. Special condition - no waste discharge will be permitted above city of Everett Diversion Dam (river mile 9.4).

Class AA

(117) Sumas River from Canadian border (river mile 12) to headwaters (river mile 23).

Class A

(118) Tieton River.

Class AA

(119) Tolt River, south fork and tributaries from mouth to west boundary of Sec. 31-T26N-R9E (river mile 6.9).

Class AA

(120) Tolt River, south fork from west boundary of Sec. 31-T26N-R9E (river mile 6.9) to headwaters. Special condition - no waste discharge will be permitted.

Class AA

(121) Touchet River, north fork from Dayton water intake structure (river mile 3.0) to headwaters.

Class AA