

## FACT SHEET

United States Environmental Protection Agency (EPA)  
Region 10  
Park Place Building, 13th Floor  
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Seattle, Washington 98101  
(206) 553-1214

Date: August 14, 1998

Permit No.: ID-002715-4

### PROPOSED REISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO THE PROVISIONS OF THE CLEAN WATER ACT (CWA)

University of Idaho  
Aquaculture Laboratory  
1108 West Sixth Street  
Moscow, Idaho 83844-2030

has applied for reissuance of an NPDES permit to discharge pollutants pursuant to the provisions of the CWA.

This Fact Sheet includes (a) the tentative determination of the Environmental Protection Agency (EPA) to reissue the permit, (b) information on public comment, public hearing, and appeal procedures, (c) the description of the current discharge, (d) a listing of tentative effluent limitations, schedules of compliance, and other conditions, and (e) a sketch, map, or detailed description of the discharge location. We call your special attention to the technical material presented in the latter part of this document.

Persons wishing to comment on the tentative determinations contained in the proposed permit reissuance may do so by the expiration date of the Public Notice. All written comments should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Director, Office of Water, will make final determinations with respect to the permit reissuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the public notice period.

The permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The proposed NPDES permit and other related documents are on file at the Region 10 office and may be inspected at the office in Seattle, WA any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing or by calling the NPDES Permits Unit at the above address. This material is also available at:

EPA Idaho Operations Office  
1435 North Orchard Street  
Boise, Idaho 83706  
(208)378-5746

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## I. BACKGROUND

### A. Applicant

University of Idaho  
Aquaculture Laboratory, West Farm  
1108 West Sixth Street  
Moscow, Idaho 83844-2030

Facility contact: Fred Hutchison, Safety Officer  
(208)885-6524

### B. Activity

The University of Idaho owns and operates an aquaculture research laboratory. The aquaculture laboratory is designed to conduct research in fish disease, nutrition, effluent treatment, genetics, ecology and other aspects of fisheries and aquaculture. The studies conducted at this facility assist both commercial and conservation aquaculture in the state and region. Studies on adult Chinook salmon and disease control are anticipated activities to be conducted during this permit.

### C. Discharge

The University of Idaho aquaculture laboratory uses treated and conditioned groundwater for use in the laboratory. This supply water is mixed with recycled water that has been disinfected with ozone to control the organic contamination that may occur in the water system. The combined flow is then distributed to the fish tanks in the laboratory. It is estimated that seventy to seventy-five percent of the total flow volume (500 gpm) will be recirculated and the remaining total flow volume will be discharged as wastewater. The wastewater is chlorinated prior to being discharged into the existing University of Idaho effluent irrigation system.

The University of Idaho currently has a land application permit, issued by the Idaho Division of Environmental Quality (IDEQ), that allows water from the irrigation system lagoons to be land applied from June through September, depending on irrigation requirements. The irrigation lagoons accept treated wastewater from the aquaculture laboratory and the City of Moscow Wastewater Treatment Plant (MWWTP). The aquaculture laboratory effluent is discharged to one lagoon and the treatment plant effluent is discharged to the other. The laboratory effluent is either mixed with the treatment plant effluent for land application or discharged to Paradise Creek.

The following pollutants are present in the facility's effluent and discussed in section III of this Fact Sheet:

- Ammonia
- Biochemical Oxygen Demand (BOD)
- Dissolved Oxygen (DO)
- Fecal Coliform Bacteria
- Floating, Suspended or Submerged Matter
- Formaldehyde
- pH
- Temperature
- Total Phosphorus (TP)
- Total Residual Chlorine (TRC)
- Total Suspended Solids (TSS)

#### D. Permit History

The first NPDES permit issued to the University of Idaho aquaculture laboratory became effective in June 1992. An application for permit reissuance was received in June of 1997. Since the state of Idaho was in the process of developing a Total Maximum Daily Load (TMDL) for Paradise Creek, EPA administratively extended their permit until the Paradise Creek TMDL was completed. The EPA approved the Paradise Creek TMDL (IDEQ, 1998) in February of 1998 and the wasteload allocations (WLAs) were used in developing the permit limits for this facility.

## II. RECEIVING WATER

### Paradise Creek, Idaho

University of Idaho aquaculture laboratory effluent will be discharged to Paradise Creek through outfall 001, located at latitude 46°43'52" and longitude 117°2'2". Paradise Creek is located in the Palouse River hydrologic basin. The creek flows from its headwaters on Moscow Mountain, through the City of Moscow, Idaho, ultimately joining the South Fork of the Palouse River in Pullman, Washington. The annual flow of the creek is characterized by low flows during the summer and fall seasons and peak flows during the winter and spring seasons. The peak flow is due to high precipitation in December and January and winter snowpack melts until May or June. In the summer, flow reaches zero, reducing the stream to a series of small pools separated by stretches of dry creek-bed. At those times, the flow in Paradise Creek is due to the effluent discharges from the MWWTP and the University of Idaho aquaculture laboratory. Intermittent flows have also been recorded from November to March due to freezing and thawing of the creek.

The Idaho water quality standards designate cold water biota, secondary recreation and agricultural supply as beneficial uses for Paradise Creek. Since Paradise Creek is an interstate water, it also must meet Washington’s water quality standards (WDOE, 1997) at the state border. The Washington water quality standards classify Paradise Creek as a Class A water to be protected for domestic, industrial, and agricultural water supply, stock watering, primary contact recreation, aesthetic enjoyment, wildlife habitat, and salmonid and other fish spawning, rearing, migration and harvesting. The EPA has stated that Paradise Creek does not support domestic water supply, salmonid spawning and rearing, and primary contact recreation beneficial uses (EPA, 1993).

Permitted point sources of pollution in Paradise Creek include the MWWTP and University of Idaho’s aquaculture laboratory. The primary nonpoint sources of pollutants are non-irrigated croplands, grazing lands, land development (construction activities), urban runoff, roads and forest land harvest activities. Storm water discharge systems and several other discrete sources are included with the more traditional nonpoint sources for loading analysis due to a lack of data and methodology for separate evaluation.

In 1994, Paradise creek was identified as water quality limited from its headwaters to the Washington State border for the following pollutants: ammonia, nutrients, sediment, habitat modification, pathogens, flow alteration, and temperature. Therefore, the state of Idaho was required by the CWA to develop a TMDL management plan for Paradise Creek.

The approved TMDL plan of February 1998 documents the natural background conditions of the water body and determines the amount of a pollutant the water body can combine without violating the State’s water quality standards. This combined amount is the TMDL that is distributed to known point sources and nonpoint sources, including a margin of safety and natural background conditions. The distribution of a pollutant TMDL for a point source facility is termed the wasteload allocation (WLA). The WLAs for the University of Idaho aquaculture laboratory are as follows:

| PARAMETER                    | WASTELOAD ALLOCATION       |
|------------------------------|----------------------------|
| Total Suspended Solids (TSS) | 5 tons/yr                  |
| Total Phosphorus (TP)        | 0.2 lbs                    |
| Fecal Coliform Bacteria      | 7.64 x 10 <sup>8</sup> cfu |
| Temperature                  | 18°C (instantaneous)       |
| Ammonia (April - October)    | 1.4 lbs                    |
| Ammonia (November - March)   | 2.4 lbs                    |

In addition to the TMDL, the Paradise Creek Restoration Project has provided a cooperative effort to improve water quality in Paradise Creek through watershed restoration and nonpoint source pollution prevention projects (IDEQ, 1998).

### III. EFFLUENT LIMITATIONS

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the CWA provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations in determining which conditions to include in the permit.

#### A. Summary of Draft Permit Limitations

In the permit application, the University of Idaho aquaculture laboratory identified the following pollutants as being present in their discharge: Ammonia, BOD, Fecal Coliform, Formaldehyde, pH, TP (as P), TRC, and TSS. In addition to discussing the limitation of these parameters, federal regulations at 40 CFR 122.44(d)(vii)(B) require EPA to incorporate effluent limits based on WLAs from the Idaho's watershed management plan into NPDES permits.

The TMDL for Paradise Creek identified the following pollutants as being limited for this facility: TSS, TP, Fecal Coliform, Temperature, and Ammonia. The derivation of these limits will be described in detail in section III B, below. In translating the WLA into permit limits, EPA followed the procedures in the Technical Support Document (TSD)(EPA, 1991).

The first step in developing limits is to determine the time frame over which the WLAs apply. In general, the period over which a criterion applies is based on the length of time the target organism can be exposed to the pollutant without adverse effect. For example, aquatic life criteria generally apply as one-hour averages (acute criteria) or four-day averages (chronic criteria). Finally, the WLAs are statistically converted to average weekly and monthly average permit limits.

Table III-1 presents the University of Idaho's aquaculture laboratory effluent limitations for the draft permit. For comparison purposes, the table also shows the effluent limitations of the current permit.

| TABLE III-1: EFFLUENT LIMITATIONS          |          |                 |              |                |              |                |              |                |              |
|--|----------|-----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|
| PARAMETER                                  | UNITS    | MONTHLY AVERAGE |              | WEEKLY AVERAGE |              | MAXIMUM DAILY  |              | MINIMUM DAILY  |              |
|  |          | CURRENT (1992)  | DRAFT (1998) | CURRENT (1992) | DRAFT (1998) | CURRENT (1992) | DRAFT (1998) | CURRENT (1992) | DRAFT (1998) |
| Dissolved Oxygen (DO)                      | mg/L     | ---             | ---          | ---            | ---          | ---            | ---          | 8.0            | 8.0          |
| Formaldehyde <sup>1</sup>                  | mg/L     | ---             | 1.9          | ---            | ---          | 2.0            | 2.0          | ---            | ---          |
|  | lbs/day  | ---             | 4.2          | ---            | ---          | 3.7            | 3.7          | ---            | ---          |
| Fecal Coliform Bacteria <sup>2</sup>       | #/100 mL | 100             | 100          | 200            | ---          | ---            | ---          | ---            | ---          |
| Total Residual Chlorine (TRC) <sup>3</sup> | mg/L     | ---             | 0.009        | ---            | ---          | ---            | 0.018        | ---            | ---          |
|  | lbs/day  | ---             | 0.015        | ---            | ---          | ---            | 0.030        | ---            | ---          |
| Ammonia (Apr 1-Oct 31)                     | mg/L     | ---             | 1.7          | ---            | ---          | ---            | 2.5          | ---            | ---          |
|  | lbs/day  | ---             | 2.8          | ---            | ---          | ---            | 4.2          | ---            | ---          |
| Ammonia (Nov 1-Mar 31)                     | mg/L     | ---             | 2.9          | ---            | ---          | ---            | 4.3          | ---            | ---          |
|  | lbs/day  | ---             | 4.8          | ---            | ---          | ---            | 7.2          | ---            | ---          |
| pH   | s.u.     | ---             | ---          | ---            | ---          | ---            | 8.5          | ---            | 6.5          |
| Temperature                                | °C       | ---             | ---          | ---            | ---          | ---            | 18           | ---            | ---          |
| Total Phosphorus (TP) <sup>4</sup>         | mg/L     | ---             | 0.136        | ---            | ---          | ---            | 0.235        | ---            | ---          |
|  | lbs/day  | ---             | 0.23         | ---            | ---          | ---            | 0.39         | ---            | ---          |
| Total Suspended Solids (TSS)               | mg/L     | ---             | 15           | ---            | ---          | ---            | 22           | ---            | ---          |
|  | lbs/day  | ---             | 25           | ---            | ---          | ---            | 37           | ---            | ---          |

1 "No discharge" shall be reported on the discharge monitoring report (DMR) when formaldehyde is not added to the process by the facility.

2 Based on a geometric mean of all samples taken in that month.

3 Shall be below detectable limits prior to discharge based upon the DPD method. Final compliance evaluation limit is 0.020 mg/L (0.033 lbs/day).

4 Phosphorus limit is applicable from May 15 to October 15.



B. Water Quality Criteria

The following Idaho water quality criteria are applicable to pollutants of concern for Paradise Creek:

|   |   |
|---|---|
| IDAPA 16.01.02.051.01                   | Antidegradation   |
| IDAPA 16.01.02.060                      | Mixing Zone   |
| IDAPA 16.01.02.200.03                   | Deleterious Materials   |
| IDAPA 16.01.02.200.05                   | Floating, Suspended, or Submerged Matter                        |
| IDAPA 16.01.02.200.06                   | Excess Nutrients  |
| IDAPA 16.01.02.200.07                   | Oxygen-Demanding Materials                                      |
| IDAPA 16.01.02.200.08                   | Sediment  |
| IDAPA 16.01.02.250.02.a                 | Total Residual Chlorine   |
| IDAPA 16.01.02.250.01.b                 | Secondary Contact Recreation (fecal coliform bacteria)          |
| IDAPA 16.01.02.250.02.c                 | Cold Water Biota (Dissolved Oxygen, Temperature, and Turbidity) |
| IDAPA 16.01.02.250<br>Tables III and IV | Ammonia Criteria  |

The following Washington water quality criteria are applicable to pollutants of concern for Paradise Creek:

|                     |  |
|---------------------|--|
| WAC 173-201A-030(2) | Dissolved Oxygen, Temperature, Fecal Coliform, and Turbidity |
|---------------------|--|

The Paradise Creek TMDL addresses both Idaho and Washington water quality standards as they apply to Paradise Creek. Therefore, the limits established by the Paradise Creek TMDL are water quality-based limits for the purposes of this permit.

C. Mixing Zone

The Idaho water quality standards allow twenty-five percent (25%) of the receiving water volume to be used for dilution. However, Paradise Creek flow volumes are not large enough to support an adequate mixing zone during the low flow seasons of the year, therefore, end-of-pipe discharge limits are applied to the aquaculture laboratory effluent.

In accordance with Idaho water quality standards, only the IDEQ may authorize mixing zones. If the State does not authorize a mixing zone in its 401 certification, the permit limits will be re-calculated for the final permit to ensure compliance with the standards at the point of discharge.

D. Evaluation of Effluent Limitations

1. Biochemical Oxygen Demand, 5-day (BOD<sub>5</sub>).

The Idaho water quality standards do not specifically limit BOD<sub>5</sub>, however, the State standard does require that surface waters of the United States within Idaho shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition. Data collected from the facility indicates that the maximum BOD<sub>5</sub> concentration in their effluent is 5.3 mg/L, which would decrease dissolved oxygen (DO) in the receiving water by undetectable amounts. Since the limited data available indicates that Idaho water quality standards have not been violated, no limit for BOD<sub>5</sub> is imposed on the facility. However, EPA seeks to confirm that the Idaho water quality standard for oxygen-demanding materials is being met by this facility and has required the monitoring of BOD<sub>5</sub> in the facility's effluent.

No limit for BOD<sub>5</sub> is proposed in the draft permit.

2. Dissolved Oxygen (DO).

The Idaho water quality standards for cold water biota give a DO limit of 6 mg/L. Washington water quality standards give a DO limit of 8.0 mg/L for Class A waters. The more limiting case applies, therefore, Washington water quality standards for DO will be applied to this facility. Data collected from the facility between May and September of 1993 indicate that the facility will be able to meet the Washington standard.

The draft permit is proposing that DO is >8.0 mg/L in the permittee's effluent.

3. Fecal Coliform Bacteria.

Fecal coliform is a non-pathogenic indicator species whose presence suggests the likelihood that pathogenic bacteria are present. Idaho water quality standards require that fecal coliform bacteria shall not exceed 800 colonies/100 mL at any time, 400 colonies/100 mL in more than ten percent of the total samples taken over a thirty day period, and a geometric mean of 200 colonies/100 mL based on a minimum of five samples taken over a thirty day period.

Washington water quality standards require that fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than ten percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL. Since the Washington standards are more stringent, they were used in the development of the Paradise Creek TMDL and the waste load allocations. The aquaculture laboratory waste load allocation determined by the Paradise Creek TMDL is  $7.64 \times 10^8$  colonies per day. This allocation is based on 140 gpm design flow and a discharge limit of 100 colonies per 100 mL (100/100 mL).

Self-monitoring by the University of Idaho detected no fecal coliform presence in discharge water from the aquaculture laboratory. Therefore, the facility will be able to meet the WLA from the Paradise Creek TMDL.

The draft permit is proposing a fecal coliform limit of average monthly limit of 100 colonies per 100 mL based on a geometric mean of all samples taken in that month.

4. Floating, Suspended or Submerged Matter.

The Idaho water quality standards require surface waters of the State to be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This requirement was a condition of the current permit and will be retained in the proposed permit.

5. Formaldehyde.

The facility sometimes adds formaldehyde as a fungicide to a concentration of 2-5 ppm (Hutchison, 1997). Formaldehyde has not been used at the site since July 1994. Future discharges of formaldehyde depends on the nature

of the research conducted at the facility. When formaldehyde is used, land application of the aquaculture laboratory effluent cannot occur and the effluent is discharged to Paradise Creek.

In the current permit, the daily maximum limit for formaldehyde is based on acute toxicity tests with fresh water invertebrate. The tests indicate that the LC<sub>50</sub> (the lethal concentration where 50 percent of the test organisms die) for formaldehyde was reported to be 2.0 mg/L for *Daphnia* sp.. Since no new data on acute toxicity has been found, the acute limit will remain at 2.0 mg/L.

When the facility performed their Whole Effluent Toxicity (WET) analysis in 1992, spiked samples were also submitted to the lab and concurrent testing was performed. The testing indicated a formaldehyde chronic NOEC (the no observed effect concentration is the highest concentration of toxicant, in terms of percent effluent, to which the test organisms are exposed that causes no observable adverse effect) of 1.9 mg/L. Since this was based upon one analysis, further testing will be required of the facility if formaldehyde is added to their effluent.

The draft permit is proposing the following limits for formaldehyde: 2.0 mg/L (4.3 lbs/day) daily maximum and 1.9 mg/L (4.2 lbs/day) monthly average. "No discharge" shall be reported on the DMR when formaldehyde is not added to the effluent by the facility.

6. Nutrients.

Idaho water quality standards require that surface waters of the United States within Idaho shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. Nutrients consist of phosphorus, nitrogen and carbon compounds. The Paradise Creek TMDL addresses the nutrients of ammonia and phosphorus and provided waste load allocations for these pollutants. At present, it is not clear whether nitrogen or phosphorus is a limiting nutrient because concentrations of both elements in Paradise Creek are well above the accepted saturation levels.

a. Ammonia (as Nitrogen).

Idaho and Washington criteria for unionized ammonia are based on calculations that take into account water temperature and pH. Since the more limiting criteria is applied in the development of effluent limitations, Washington State criteria for unionized

ammonia were utilized in the development of the Paradise Creek TMDL limits. Since the TMDL limits for ammonia were established, Washington State has updated their criteria for ammonia. Therefore, the limits in the draft permit were based upon the updated Washington State ammonia criteria.

Self-monitoring of the facility's effluent indicates that ammonia levels were 0.3 mg/L or less for all samples reported. This gave a receiving water concentration (RWC) of 1.14 mg/L, which was near the chronic criterion (Cdc) of 1.2 mg/L (April through October) and 2.1 mg/L (November through March). Since the RWC was near the Cdc and the TMDL for Paradise Creek requires ammonia limitation, effluent limitations for total ammonia are imposed on the facility. However, the ability of the facility to meet the imposed limits will not require a reduction of ammonia by the facility.

The draft permit is proposing the following limits for Ammonia: 2.5 mg/L maximum daily and 1.7 mg/L monthly average from April 1 through October 31, and 4.3 mg/L maximum daily and 2.9 mg/L monthly average from November 1 through March 31.

b. Total Phosphorus (TP).

Paradise Creek has excessive amounts of TP and orthophosphate (PO<sub>4</sub>). The Paradise Creek TMDL has considered an interim natural background concentration level of TP to be 0.136 mg/L. Self-monitoring of the facility's discharge shows a maximum concentration of 0.13 mg/L TP, which is just below the interim TP concentration. Since the discharge from this facility does not normally occur during the winter season (October 15 through May 15), the TP load to Paradise Creek during this time period is zero.

The draft permit is proposing a TP average monthly limit of 0.136 mg/L (0.23 lbs/day), daily maximum limit of 0.235 mg/L (0.39 lbs/day) from May 15 to October 15, and no discharge from October 15 to May 15.

7. Other Drugs, Chemicals, or Medications.

The discharge of any drugs, chemicals, or medications in toxic amounts is prohibited pursuant to Section 101(a)(3) of the CWA and the Idaho water

quality standards, which prohibits the discharge of toxic pollutants in toxic amounts.

8. pH.

The Idaho water quality standards for protection of aquatic life gives an allowable pH range of 6.5 to 9.5 standard units. However, Washington water quality standards for Class A waters (freshwater) gives an allowable pH range of 6.5 to 8.5. Since Washington standards are more stringent, they apply to the facility's effluent.

The draft permit proposes an allowable pH range of 6.5 to 8.5 standard units.

9. Temperature.

The Paradise Creek in-stream temperature target is 18 °C maximum instantaneous. The target is based on current state of Washington water quality standards for Class A water bodies and is applied at the state line due to interstate requirements. Load capacity is presented in terms of temperature (measurable heat load).

The inflow temperature to the facility is generally low (i.e., 13.1 °C max) and the change in temperature due to the brief circulation through the ponds is  $\pm 0.5$  °C. This temperature is well below the temperature targets for Paradise Creek, thus, the facility will be able to meet this requirement.

The draft permit is proposing a daily maximum temperature limit of 18 °C.

10. Total Residual Chlorine (TRC).

Chlorine is used to disinfect the facility effluent. Residual chlorine compounds in the effluent can be toxic to aquatic life. As a condition of the facility's current permit, the IDEQ required the facility to meet a "no detectable level" for TRC.

The detection limit for chlorine is 0.010 mg/L for the DPD method cited in 40 CFR 136. The detection limit is the minimum concentration that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The minimum level (ML) is defined as the lowest concentration that gives recognizable signals and an acceptable calibration point.

When the effluent limit falls below the method detection limit (MDL), EPA Region 10 has adopted guidance in which: 1) the water quality based effluent limits are incorporated into the permit, 2) the ML will be used as the compliance evaluation level, and 3) in the absence of a promulgated ML, an interim ML should be used. The interim ML can be derived most effectively as a multiple of the MDL. In this case, the interim ML is 3.18 times the published MDL (EPA guidance, 1996). Thus, the interim ML is 0.032 mg/L for total residual chlorine. The interim ML for non-metals is rounded to the nearest multiple of 1, 2, 5, 10, 20, 50.....(EPA memo, 1993). Therefore, 0.020 mg/L is the final compliance evaluation level for TRC.

The draft permit is proposing an average monthly limit of 0.009 mg/L (0.015 lbs/day) and a maximum daily TRC limit of 0.018 mg/L (0.030 lbs/day). However, the final compliance evaluation level will be 0.020 mg/L (0.033 lbs/day).

11. Total Suspended Solids (TSS).

The Idaho water quality standards do not specifically limit TSS and there are currently no limits of TSS specified within the aquaculture laboratory permit. However, the Paradise Creek TMDL developed a WLA of 5 tons/year for the facility based on a recommended concentration of 15 mg/L and the facility design flow rate of 140 gpm.

Self-monitoring was conducted by the University of Idaho aquaculture laboratory, as required in their current permit, and the data indicate that concentrations of TSS leaving the facility are always below 10 mg/L. Actual concentrations lower than 10 mg/L were not measured. Assuming a discharge at the maximum discharge rate of 140 gpm and a 10 mg/L average concentration, an upper estimate of the current TSS load is 3 tons/year. This is 60 percent of the facility's current load allocation.

The draft permit is proposing a TSS average monthly limit of 15 mg/L (25 lb/day) and maximum daily limit of 22 mg/L (37 lbs/day).

E. Antidegradation

In proposing to reissue this permit, EPA has considered Idaho's antidegradation policy. This provision states that "the existing instream water uses and the level of water quality necessary to protect the existing uses will be maintained and protected." This policy is designed to protect existing water quality when the existing quality is better than that required to meet the standard and to prevent

water quality from being degraded below the standard when existing quality just meets the standard. The draft permit will result in decreases in the authorized pollutant loadings to Paradise Creek. Therefore, the draft permit will not result in degradation of water quality and is consistent with Idaho's antidegradation policy.

#### IV. EFFLUENT MONITORING REQUIREMENTS

In addition to providing water quality-based limits, monitoring requirements must be included in the permit to determine compliance with effluent limitations (section 308 of the CWA and 40 CFR Part 122.44[i]). Additional monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. The permittee is responsible for conducting the monitoring and for reporting results to EPA.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Table IV-1 presents the monitoring requirements for the draft permit. For comparison purposes, the table also shows the monitoring requirements of the current permit. Where the requirements differ, a discussion will be provided in the table notes.



| TABLE IV-1: MONITORING FREQUENCY REQUIREMENTS  |                       |                     |
|--|-----------------------|---------------------|
| PARAMETER  | CURRENT PERMIT (1992) | DRAFT PERMIT (1998) |
| Biochemical Oxygen Demand, 5-Day (BOD <sub>5</sub> ) <sup>1</sup>  | 2/month               | 1/quarter           |
| Dissolved Oxygen (DO)  | 2/month               | 2/month             |
| Fecal Coliform Bacteria  | 2/month               | 2/month             |
| Flow   | weekly                | 1/week              |
| Formaldehyde   | 1/week                | 1/week <sup>2</sup> |
| Nitrate as N <sup>1</sup>  | 2/month               | 1/quarter           |
| pH   | 2/week                | 2/week              |
| Temperature <sup>3</sup>   | NR <sup>4</sup>       | 1/week              |
| Total Ammonia as N <sup>1</sup>  | 2/month               | 1/quarter           |
| Total Residual Chlorine (TRC)  | 1/week                | 1/week              |
| Total Phosphorus (TP) as P   | 2/month               | 2/month             |
| Total Suspended Solids (TSS) <sup>3</sup>  | NR <sup>4</sup>       | 1/quarter           |
| <p>1. Monitoring frequency was reduced due to low statistical probability of effluent limit violation. In all instances, the ratio of long term effluent average to monthly average limit was less than 75%. Statistical analysis was performed in accordance with <i>Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies</i> (April 1996).</p> <p>2. Required only when facility is adding formaldehyde to process.</p> <p>3. Monitoring of this parameter is required due to the Paradise Creek TMDL (December 24, 1997).</p> <p>4. NR means Not Required.</p> |                       |                     |

## V. SPECIAL CONDITIONS

### A. Quality Assurance Project Plan (QAPP)

Under 40 CFR Part 122.41(e), the permittee is required to ensure adequate laboratory controls and appropriate quality assurance procedures in order to properly operate and maintain all facilities which it uses. In their current permit, the facility was required to develop a QAPP that would assist in planning for the collection and analysis of samples in support of the permit and in explaining data anomalies when they occur. EPA reviewed and approved the QAPP submitted August 24, 1992. The proposed permit requires the facility to review their plan at least every five years and update the QAPP, if applicable.

B. Best Management Practices (BMPs)

It is the national policy that, whenever feasible, pollution should be prevented or reduced at the source, that pollution which cannot be prevented should be recycled in an environmentally safe manner, that pollution which cannot be prevented or recycled should be treated in an environmentally safe manner, and that disposal or release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner (Pollution Prevention Act of 1990, 42 U.S.C. § 13101 et seq.). This policy and 40 CFR Part 122.44(k) form the basis for the draft permit requirement that the permittee develop and implement a BMPs operating plan.

BMPs are practices that are designed to minimize the volume of pollutants that must be treated. In developing its BMPs operating plan, the permittee will analyze all processes and activities at the facility to determine the potential for a release of pollutants due to that activity and ways to minimize that potential.

The draft permit requires that the permittee develop a plan and implement BMPs within 180 days after receiving authorization to discharge under this permit. Additionally, the BMP operating plan must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants.

C. Whole Effluent Toxicity (WET)

In their current permit (issued in 1992), the University of Idaho was required to conduct two chronic toxicity tests within 90 days of permit issuance (May 18, 1992). The tests were to be conducted on the *Pimephales promelas* (fathead minnow) and the *Ceriodaphnia dubia* (water flea). The facility conducted one chronic toxicity test for each species that was performed July 28 through August 4, 1992 and received by EPA September 16, 1992.

In the submitted toxicity analysis, three separate tests were conducted: one with the effluent, and two concurrent tests using effluent spiked with formalin (10 and 20 ppm). The results of the test indicate that the effluent was not toxic ( $TU_c=1.0$ ) for the *Ceriodaphnia dubia*, but was toxic to the *Pimephales promelas* ( $TU_c=8.0$ ). The tests also revealed when  $>4.83$  mg/L formalin were added to the effluent, toxicity would occur with the *Ceriodaphnia dubia*. However, it would take  $>7.96$  mg/L formalin to cause toxicity with the *Pimephales promelas*.

These results indicate that the effluent is more toxic to the *Pimephales promelas*, but the formalin is more toxic to the *Ceriodaphnia dubia*. Due to this relationship, the toxicity in the effluent is not from the addition of formalin, however, the

definite cause cannot be determined from this analysis. Moreover, the type and quantity of the other pollutants found in this discharge seem unlikely to cause toxicity in the permittee's effluent. Therefore, further WET analysis is needed to determine if the effluent is toxic to the *Pimephales promelas*.

The draft permit is proposing that two chronic WET analyses using the *Pimephales promelas* will be required, the first test will be conducted in May 1999 and second test will be conducted in May 2000. The results of the test shall be submitted with the June DMR in the year the analysis was conducted.

## VI . OTHER LEGAL REQUIREMENTS

### A. Endangered Species Act (ESA)

Section 7(a) and (c) of the ESA requires federal agencies to request a consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding potential effects an action may have on endangered species. Therefore, EPA requested a listing of threatened and endangered species in the vicinity of the University of Idaho aquaculture laboratory from NMFS and USFWS.

A letter from USFWS dated February 23, 1998, indicated that discharge from this facility is unlikely to adversely impact any species listed under the ESA. In a letter dated January 29, 1998, NMFS stated that there were no anadromous fish in the receiving water, Paradise Creek. However, NMFS indicated that the Snake River steelhead (*Oncorhynchus mykiss*), and designated critical habitat for fall chinook salmon occur downstream from Paradise Creek, in the Palouse river below Palouse Falls.

EPA has reviewed the effect that the aquaculture laboratory effluent pollutants would have on these species and determined that the issuance of this permit would not be likely to adversely affect the Snake River steelhead nor the critical habitat for the fall chinook salmon.

### B. State Certification

Since this permit authorized discharge to Idaho State waters, the provisions of Section 401 of the CWA apply. Section 401 of the CWA requires that states certify that federally issued permits are in compliance with state law. No permits can be issued until the requirements of this section are satisfied.

EPA is requesting Idaho State officials to review and provide appropriate certification to this draft NPDES permit pursuant to 40 CFR Part 124.53.

Furthermore, in accordance with 40 CFR Part 124.10(c)(1), public notice of the draft permit has been provided to the state of Idaho agencies having jurisdiction over fish, shellfish, and wildlife resources.

C. Permit Expiration

This permit will expire five years from the effective date of the permit.

D. Facility Changes or Alterations

The facility is required to notify EPA of any planned physical alteration or operational change to the facility in accordance with 40 CFR 122.41(1). This requirement has been incorporated into the proposed permit to insure that EPA and IDEQ are notified of any potential increases or changes in the amount of pollutants being discharged. This will allow evaluation of the impact of the pollutant loading on the receiving water.

VII. REFERENCES

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control*. U.S. Environmental Protection Agency, Office of Water, EPA/505/2-90-001, March 1991.

EPA. 1993. *Guidance Manual for Developing Best Management Practices (BMP)*. U.S. Environmental Protection Agency, Office of Water, EPA/833/B-93-004, October 1993.

EPA. 1993. *Paradise Creek Waterbody Assessment - Draft*. U.S. Environmental Protection Agency, Boise, Idaho.

EPA. 1993. *Status of Detection Level Strategies*, U.S. Environmental Protection Agency, memo September 9, 1993.

EPA. 1996. *U.S. EPA NPDES Permit Writer's Manual*. U.S. Environmental Protection Agency, Office of Water, EPA/833/B-96-003, December 1996.

EPA. 1996. *EPA Region 10 Guidance for WQBELs Below Analytical Detection/Quantification Level*.

IDAPA. 1996. Idaho Administrative Procedures Act 16, Title 01, Chapter 02: *Water Quality Standards and Wastewater Treatment Requirements*.

IDEQ. 1998. *Paradise Creek TMDL: Water Body Assessment and Total Maximum Daily Load*. Idaho Division of Environmental Quality (IDEQ), February 12, 1998.

Hutchison, F. 1997. University of Idaho Safety Office. Personal Communication.

WDOE. 1997. Washington Administrative Code Chapter 173-201A: *Water Quality Standards for Surface Waters of the State of Washington*. Washington Department of Ecology (WDOE), November 25, 1992, Rev. December 19, 1997.

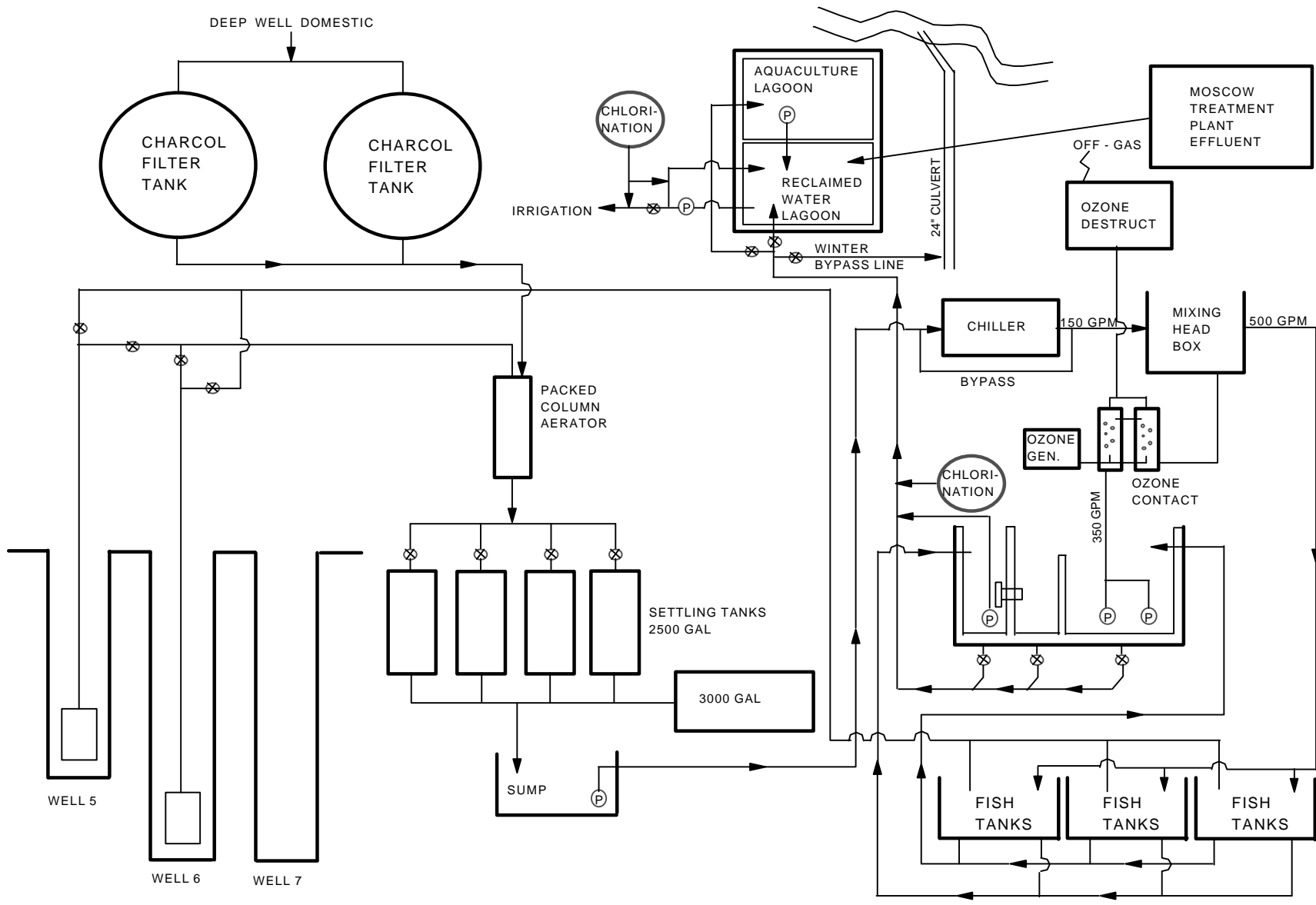
## VIII. ACRONYMS

|                  |   |
|------------------|---|
| BMPs             | Best Management Practices                         |
| BOD              | Biochemical Oxygen Demand                         |
| BOD <sub>5</sub> | Biochemical Oxygen Demand, five-day               |
| °C               | Degrees celcius                                   |
| Cda              | Acute criterion                                   |
| Cdc              | Chronic criterion                                 |
| CFR              | Code of Federal Regulations                       |
| cfu              | Colony forming units                              |
| CWA              | Clean Water Act                                   |
| DMR              | Discharge Monitoring Report                       |
| DO               | Dissolved Oxygen                                  |
| DPD              |   |
| EPA              | U.S. Environmental Protection Agency              |
| ESA              | Endangered Species Act                            |
| gpm              | Gallons per minute                                |
| IDAPA            | Idaho Administrative Procedures Act               |
| IDEQ             | Idaho Division of Environmental Quality           |
| lbs              | Pounds  |
| LC <sub>50</sub> | Lethal concentration where 50% test organisms die |
| MDL              | Method Detection Limit                            |
| mg/L             | Milligrams per liter                              |
| mL               | Milliliter  |
| ML               | Minimum Level                                     |
| MWWTP            | Moscow Waste Water Treatment Plant                |
| N                | Nitrogen  |
| NMFS             | National Marine Fisheries Service                 |
| NOEC             | No observed effect concentration                  |
| NPDES            | National Pollutant Discharge Elimination System   |
| NR               | Not Required                                      |
| OW               | Office of Water                                   |
| P                | Phosphorus  |
| PO <sub>4</sub>  | Orthophosphate                                    |
| QAPP             | Quality Assurance Project Plan                    |
| RWC              | Receiving water concentration                     |
| sp.              | Species   |

|                 |  |
|-----------------|--|
| TMDL            | Total Maximum Daily Load               |
| TP              | Total Phosphorus                       |
| TRC             | Total Residual Chlorine                |
| TSD             | Technical Support Document (EPA, 1991) |
| TSS             | Total Suspended Solids                 |
| TU <sub>c</sub> | Chronic Toxic Units                    |
| USFWS           | U.S. Fish and Wildlife Service         |
| WAC             | Washington Administrative Code         |
| WET             | Whole Effluent Toxicity                |
| WLA             | Waste Load Allocation                  |
| WQBEL           | Water quality based effluent limit     |
| yr              | year                                   |

**APPENDIX A**

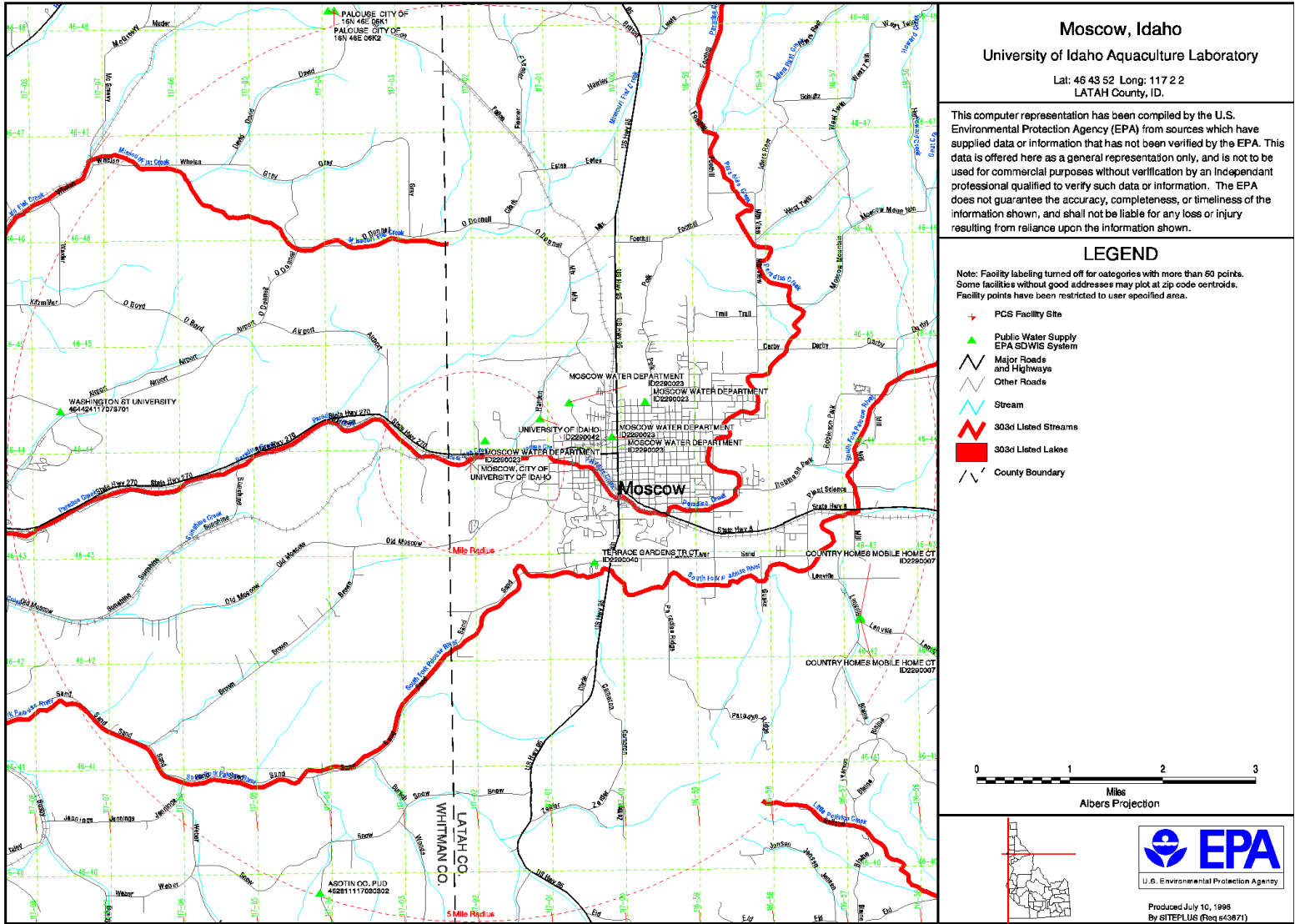
**Process Flow Diagram**





# **APPENDIX B**

## **Map**



# **APPENDIX C**

## **Calculations**

## 1. TOTAL PHOSPHORUS

The target organisms for total phosphorus are aquatic vegetation that respond to high phosphorus concentrations with excess growth. This results in eutrophication in the receiving water. The period over which this occurs is uncertain, however, EPA believes that applying the WLA as a monthly average is appropriate.

In this case, the averaging period for the pollutant is monthly, hence, no conversion is necessary and the monthly average permit limits are equal to the WLAs. Derivation of the daily maximum permit limit from the monthly average limit is based in part on the coefficient of variation (CV) for the effluent at the facility. Since the University has less than ten data points for this parameter, the TSD recommends using a default CV of 0.6.

### A. Average Monthly Limit

The Paradise Creek TMDL provided the University of Idaho aquaculture laboratory with a WLA of 0.2 lbs. Based on the WLA, the average monthly limit is 0.136 mg/L (assuming that the flow is 140 gpm).

### B. Maximum Daily Limit

The maximum daily limit is calculated by using the following relationship:

$$\frac{MDL}{AML} = \frac{\exp[z_m \sigma - 0.5\sigma^2]}{\exp[z_a \sigma_n - \sigma_n^2]}$$

where

$$\sigma_n^2 = \ln(CV^2/n + 1) = 0.166$$

$$\sigma^2 = \ln(CV^2 + 1) = 0.307$$

CV = the coefficient of variation of the effluent concentration = 0.6

n = the number of samples per month = 2

$z_m$  = the percentile exceedance probability for the MDL (99%) = 2.326

$z_a$  = the percentile exceedance probability for the AML (95%) = 1.645

$$\frac{MDL}{AML} = \frac{3.11}{1.80} = 1.73$$

$$MDL = 1.73 * 0.136 \text{ mg/L} = 0.235 \text{ mg/L}$$

C. Average Monthly Loading

The allowable monthly loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\begin{aligned}\text{Loading} &= (\text{AML}) * (\text{design flow}) * (\text{conversion factor}) \\ \text{Loading} &= (0.136 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 0.23 \text{ lbs/day}\end{aligned}$$

D. Daily Maximum Loading

The allowable daily maximum loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\begin{aligned}\text{Loading} &= (\text{MDL}) * (\text{design flow}) * (\text{conversion factor}) \\ \text{Loading} &= (0.235 \text{ mg/L}) * (0.20 \text{ mgd}) * (8.34) = 0.39 \text{ lbs/day}\end{aligned}$$

2. TOTAL SUSPENDED SOLIDS (TSS)

Total suspended solids is a relational measure of turbidity in a receiving water. The target organisms for turbidity are aquatic life. Studies conducted in Paradise Creek by the Washington Department of Ecology (Joy, 1987) indicate that the total suspended solids:turbidity relationship in Paradise Creek is about 2:1. Based on this relationship, the total suspended solids shall not exceed 100 mg/L instantaneous, or more than 50 mg/L for more than 10 consecutive days (*Paradise Creek TMDL, Water Body Assessment and Total Maximum Load*). IDEQ believes the application of the WLA for TSS as a monthly average is appropriate.

Then, the WLA for TSS is statistically converted to an average monthly limit and a maximum daily limit. In this case, the averaging period for the pollutant is monthly so no conversion is necessary and the monthly average permit limit is equal to the WLA. Derivation of the maximum daily limit from the monthly average limit is based in part on the coefficient of variation (CV) for the effluent. Since the University has less than ten data points for this parameter, the TSD recommends using a default CV of 0.6.

A. Average Monthly Limit

The Paradise Creek TMDL provided the University of Idaho aquaculture laboratory with a WLA of 5 tons/yr. Based on the WLA, the average monthly limit is 15 mg/L (assuming the flow is 140 gpm).

B. Maximum Daily Limit

The maximum daily limit is calculated by using the following relationship:

$$\frac{MDL}{AML} = \frac{\exp[z_m \sigma - 0.5\sigma^2]}{\exp[z_a \sigma_n - \sigma_n^2]}$$

where

$$\sigma_n^2 = \ln(CV^2/n + 1) = 0.307$$

$$\sigma^2 = \ln(CV^2 + 1) = 0.307$$

CV = the coefficient of variation of the effluent concentration = 0.6

n = the number of samples per month = 1

$z_m$  = the percentile exceedance probability for the MDL (99%) = 2.326

$z_a$  = the percentile exceedance probability for the AML (95%) = 1.645

$$\frac{MDL}{AML} = \frac{3.11}{2.13} = 1.46$$

$$MDL = 1.46 * 15 \text{ mg/L} = 22 \text{ mg/L}$$

#### C. Average Monthly Loading

The allowable monthly loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\text{Loading} = (AML) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading} = (15 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 25 \text{ lbs/day}$$

#### D. Daily Maximum Loading

The allowable daily maximum loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\text{Loading} = (MDL) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading} = (22 \text{ mg/L}) * (0.20 \text{ mgd}) * (8.34) = 37 \text{ lbs/day}$$

### 3. AMMONIA

The target organism for ammonia is aquatic life. The aquatic life criteria for ammonia apply as a one-hour average (acute criterion) and a four-day average (chronic criterion). The following tables reproduce the procedures recommended in the TSD for derivation of water quality-based effluent limitations for toxicants. This procedure translates water quality criteria to “end-of-pipe” effluent limits.

A. Average Monthly Limit and Maximum Daily Limit

| Determine Unionized Ammonia Criteria |           |      |            |      |                        |      |          |      |       |
|--------------------------------------|-----------|------|------------|------|------------------------|------|----------|------|-------|
| Season                               | Ambient T |      | Ambient pH |      | Salmonid Present (Y/N) |      | Salmonid |      | Cdc   |
|                                      | (deg. C)  |      |            |      | Y                      | N    | FTa      | FTc  |       |
| Apr - Oct                            | 22.3      | 7.56 | Y          | 1.00 | 1.41                   | 1.35 | 16.52    | 0.19 | 0.025 |
| Nov - Mar                            | 13.6      | 7.47 | Y          | 1.56 | 1.56                   | 1.48 | 18.53    | 0.11 | 0.019 |

| Variable | Criteria   | Value/Equation  | Criteria         | Value/Equation |
|----------|--|---|------------------|----------------|
| TCAPa    | Salmonid absent                                    | 25  | Salmonid present | 20             |
| TCAPc    | Salmonid absent                                    | 20  | Salmonid present | 15             |
| FT       | $0 < \text{pH} < \text{pH}_{\text{CAP}}$           | $10^{[0.03(20-T)]}$   |                  |                |
| FT       | $\text{TCAP} < \text{pH} < \text{pH}_{\text{CAP}}$ | $10^{[0.03(20-\text{TCAP})]}$                                   |                  |                |
| FPH      | $6.5 < \text{pH} < 8.0$                            | $(1 + 10^{-(7.4-\text{pH})}) / 1.25$                            |                  |                |
| FPH      | $8 < \text{pH} < 9$                                | 1   |                  |                |
| RATIO    | $6.5 < \text{pH} < 7.7$                            | $[20.25 * 10^{-(7.7-\text{pH})}] / [1 + 10^{-(7.4-\text{pH})}]$ |                  |                |
| RATIO    | $7.7 < \text{pH} < 9$                              | 13.5  |                  |                |
| Cdc      |  | $0.80 / [(FT)/(FPH)(RATIO)]$                                    |                  |                |
| Cda      |  | $0.52 / [(FT)/(FPH)(2)]$  |                  |                |

## REASONABLE POTENTIAL CALCULATIONS FOR TOTAL AMMONIA

| Variable      | Description                                   | Units | Value  | Equation/Notes                                   |
|---------------|---|-------|--------|--|
| Qe            | effluent flowrate                             | mgd   | 0.2    | (design for POTWs; average for industry)         |
| Qu (7Q10)     | min. upstream flowrate                        | mgd   | 0.00   | (equals 7Q10 for state of WA)                    |
| Qu (1Q10)     | min. upstream flowrate                        | mgd   | 0.00   | Qe + Qu (7Q10)                                   |
| Qd (c)        | downstream flowrate                           | mgd   | 0.20   | Qe + Qu (1Q10)                                   |
| Qd(a)         | downstream flowrate                           | mgd   | 0.20   |  |
| Ce            | max. effluent concentration                   | mg/L  | 0.3    |  |
| Cu            | ammonia upstream concentration                | mg/L  | 0      | (insufficient data available)                    |
| CV            | coefficient of variation                      |       | 0.6    | (default value)                                  |
| RPM           | TSD Table 3-1 Reasonable Potential Multiplier |       | 3.8    | n=6  |
| %MZ           | Chronic mixing zone<br>Acute mixing zone      |       | 0<br>0 |  |
| qu (chronic)  | upstream flowrate for chronic mixing zone     | mgd   | 0.00   | %MZc * Qu(7Q10)                                  |
| qd (chronic)  | downstream flowrate for chronic mixing zone   | mgd   | 0.20   | Qe + qu (chronic)                                |
| qu (acute)    | upstream flowrate for acute mixing zone       | mgd   | 0.00   | %MZa * Qu(1Q10)                                  |
| qd (acute)    | downstream flowrate for acute mixing zone     | mgd   | 0.20   | Qe + qu (acute)                                  |
| RWC (chronic) | chronic receiving water concentration         | mg/L  | 1.140  | [qu(chronic) * Cu + Qe * Ce] * RPM / qd(chronic) |
| RWC (acute)   | acute receiving water concentration           | mg/L  | 1.140  | [qu(acute) * Cu + Qe * Ce] * RPM / qd(acute)     |



|   | Nov - Mar | Apr-Oct |
|---|-----------|---------|
| 1. Intermediate Calculations                          |           |         |
| pKa   | 9.61      | 9.33    |
| Fraction Of Total Ammonia Present As Un-ionized       | 0.7213%   | 1.6756% |
| 3. Un-ionized Ammonia Criteria                        |           |         |
| Acute (1-hour) Un-ionized Ammonia Criterion (mg N/L)  | 0.093     | 0.158   |
| Chronic (4-day) Un-ionized Ammonia Criterion (mg N/L) | 0.015     | 0.021   |
| 4. Total Ammonia Criteria                             |           |         |
| Acute Total Ammonia Criterion (mg N/L)                | 12.9      | 9.4     |
| Chronic Total Ammonia Criterion (mg N/L)              | 2.1       | 1.2     |

| AMMONIA CRITERIA |   |       |       |
|------------------|---|-------|-------|
| Variable         | Description                             | Units | Value |
| Cdc              | allowable chronic aquatic life criteria | mg/L  | 1.2   |
| Cda              | allowable acute aquatic life criteria   | mg/L  | 9.4   |
|                  |   |       | 12.9  |

Since the RWC (chronic) is near the Cdc, a water quality-based limit is required.

### EFFLUENT LIMITATION CALCULATION

Apr-Oct    Nov-Mar

| Variable             | Description  | Units | Value      | Value      | Equation                                  |
|----------------------|--|-------|------------|------------|---|
| WLA a                | acute waste load allocation (WLA=Ce)                             | mg/L  | 942        | 12.86      | $Cd(acute) * Cda - qu(acute) * Cu/Oe$     |
| WLA a mult. (99th %) | daily acute waste load allocation multiplier (TSD Table 5-1)     |       | 0.321      | 0.321      |   |
| LTA a                | acute long term average  | mg/L  | 303        | 4.13       | $WLAa * WLAa mult.$                       |
| WLA c                | chronic waste load allocation                                    | mg/L  | 1.24       | 2.13       | $Cd(chronic) * Cdc - qu(chronic) * Cu/Oe$ |
| WLA c mult. (95th %) | monthly chronic waste load allocation multiplier (TSD Table 5-1) |       | 0.644      | 0.644      |   |
| LTA c                | chronic long term average  | mg/L  | 0.80       | 1.37       | $WLAc * WLAc mult.$                       |
| LTA mult. (MDL)      | TSD Table 5-2 (99th %)   |       | 3.11       | 3.11       |   |
| <b>MDL</b>           | <b>maximum daily limit</b>                                       | mg/L  | <b>2.5</b> | <b>4.3</b> | <b>LTA * LTA mult. (MDL)</b>              |
| LTA mult. (AML)      | TSD Table 5-2 (95th %)   |       | 2.13       | 2.13       |   |
| <b>AML</b>           | <b>average monthly limit</b>                                     | mg/L  | <b>1.7</b> | <b>2.9</b> | <b>LTA * LTA mult. (AML)</b>              |

B. Average Monthly Loading

The allowable monthly loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\text{Loading} = (\text{AML}) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading (April 1 - October 31)} = (1.7 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 2.8 \text{ lbs/day}$$

$$\text{Loading (November 1 - March 31)} = (2.9 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 4.8 \text{ lbs/day}$$

C. Daily Maximum Loading

The allowable daily maximum loading is based upon a design flow of 140 gpm (Hutchison, 1997) as follows:

$$\text{Loading} = (\text{MDL}) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading (April 1 - October 31)} = (2.5 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 4.2 \text{ lbs/day}$$

$$\text{Loading (November 1 - March 31)} = (4.3 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 7.2 \text{ lbs/day}$$

4. TOTAL RESIDUAL CHLORINE

The target organism for total residual chlorine is aquatic life. The aquatic life criteria apply as a one-hour average (acute criterion) and a four-day average (chronic criterion).

Step 1

The acute and chronic criteria are converted to acute and chronic waste load allocations. Since there is no mixing zone, the WLA is equal to the criterion. Therefore,

$$\text{WLA}_{\text{acute}} = 19 \text{ } \mu\text{g/L}$$

$$\text{WLA}_{\text{chronic}} = 11 \text{ } \mu\text{g/L}$$

Step 2

The acute and chronic WLAs are then converted to Long Term Average concentrations (LTAA and LTAc) using the following equations:

$$\text{LTAA} = \text{WLA}_{\text{acute}} \exp[0.5\sigma^2 - z\sigma] = 6.1 \text{ } \mu\text{g/L}$$

where

$$\sigma^2 = \ln(\text{CV}^2 + 1)$$

$$z = 2.326 \text{ for 99th percentile probability basis}$$

$$\text{CV} = \text{coefficient of variation} = 0.6$$

$$LTAc = WLA_{\text{chronic}} \exp[0.5\sigma^2 - z\sigma] = 5.8 \mu\text{g/L}$$

where

$$\sigma^2 = \ln(CV^2/4 + 1)$$

$z = 2.326$  for 99th percentile probability basis

CV = coefficient of variation = 0.6

### Step 3

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTAA and LTAc is used to derive the effluent limitations. Therefore, EPA is using the chronic criterion of 5.8  $\mu\text{g/L}$  in the development of the permit limitations.

### Step 4

The TSD recommends using the 95<sup>th</sup> percentile for the average monthly limit and the 99<sup>th</sup> percentile for the maximum daily limit. To derive the maximum daily limit and the average monthly limit for chlorine, the calculations would be as follows:

$$MDL = LTAc * \exp[z\sigma - 0.5\sigma^2]$$

where

$$\sigma^2 = \ln(CV^2 + 1)$$

$z = 2.326$  for 99<sup>th</sup> percentile probability basis

CV = 0.6

$$MDL = 5.8 * 3.11 = 18 \mu\text{g/L}$$

$$AML = LTAc * \exp[z\sigma - 0.5\sigma^2]$$

where

$$\sigma^2 = \ln(CV^2/n + 1)$$

$z = 1.645$  for 95<sup>th</sup> percentile probability basis

CV = 0.6

$n =$  number of sampling events per month = 4

$$AML = 5.8 * 1.55 = 9.0 \mu\text{g/L}$$

### Step 5

To derive the maximum daily load and the average monthly load for chlorine, the calculations would be as follows:

### Maximum Daily Loading

$$\text{Loading} = (\text{MDL}) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading} = (0.018 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 0.030 \text{ lbs/day}$$

### Average Monthly Loading

$$\text{Loading} = (\text{AML}) * (\text{design flow}) * (\text{conversion factor})$$

$$\text{Loading} = (0.009 \text{ mg/L}) * (0.20 \text{ mgd}) * 8.34 = 0.015 \text{ lbs/day}$$