Fact Sheet

for the

Irrigation System Aquatic Weed Control National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit

(Permit Number WAG – 991000)

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

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SUMMARY

The Washington State Department of Ecology (Ecology) has tentatively determined to re-issue a general permit for the application of pesticides to control aquatic weeds in irrigation water conveyance systems. Monitoring is required in certain situations. Any short term toxicity to aquatic organisms is allowed under the terms of the permit and the water quality modification provisions to perform essential activities that promote effective water delivery. The proposed terms, limitations and conditions contained herein are tentative and may be subject to change, subsequent to public comments and testimony provided at public hearings.

The proposed terms, limitations, and conditions contained herein are tentative and may be subject to change, subsequent to public comments received by Ecology and testimony provided at public hearings. This permit does not authorize a violation of the surface water quality standards, or any other applicable state or federal regulations. Ecology may require any person seeking coverage under this permit to obtain coverage under an individual permit instead. Any application of pesticide to surface waters of the state requiring NPDES permit coverage found not covered under either the general permit or an individual permit may be considered to be operating without a discharge permit and subject to potential enforcement action.

In Headwaters, Inc. v. Talent Irrigation District, the Ninth Circuit Court held that applying an herbicide to navigable waters of the United States did not exempt the irrigation district from having to obtain an National Pollutant Discharge Elimination System (NPDES) permit regardless of whether or not the irrigation district had applied the herbicide in accordance with the label requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

In September 2005, the Ninth Circuit Court issued a decision in Fairhurst vs. Hagener. The Fairhurst decision did not reverse the Talent decision, but did conclude that an NPDES permit is not required if a pesticide is intentionally applied to waters of the United States in accordance with a FIFRA label and with no residue or unintended effect. Neither the Court nor the Environmental Protection Agency (EPA) has offered any guidance regarding which applications would result in no residue or unintended effect.

In February 2006, the Pollution Control Hearings Board (PCHB) issued a final order in case #05-101, Northwest Aquatic Ecosystems vs. Ecology, WTC. This case focused on a number of issues, one of which was whether or not an applicator must obtain an NPDES permit for the use of federally registered pesticides. The Board ruled that:

> "Northwest Aquatic also renewed its summary judgment argument that the Board should rule NPDES permit coverage is not needed for the application of aquatic pesticides, when they are applied in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Northwest Aquatic bases this argument on the recent federal court decision in Fairhurst v. Hagener, 422 F.3d 1146 (9th Cir. 2005). The Board ruled on summary judgment that the Fairhurst decision does not provide a blanket exemption for the application of aquatic pesticides. Identified conditions must be met before a pesticide can be considered outside the category of a pollutant under the Clean Water Act. The

> pesticide must: (1) be applied for a beneficial purpose, (2) be applied in compliance with FIFRA, (3) produce no pesticide residue, and (4) produce no unintended effects. Fairhurst, 422 F.3d at 1150.
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> Northwest Aquatic failed to provide any evidence specifically addressing how the use of diquat and endothall on the proposed sites would meet the four factors identified in Fairhurst. In the absence of such evidence, Fairhurst provides no basis for the Board to conclude a NPDES permit is not required for the proposed pesticide applications."

On November 21, 2006, EPA issued a final rule entitled "Application of Pesticides to Waters of the United States in Accordance with FIFRA." This rule replaces the draft interpretive statement EPA issued in 2003 concerning the use of pesticides in or around waters of the United States. The rule states that any pesticide meant for use in or near water that is applied in accordance with the EPA-issued FIFRA label, is not a pollutant under the Clean Water Act. Therefore, such applications are not subject to NPDES permitting. The rule has been appealed and will be heard in the coming months by U.S. District Court.

After EPA issued the rule, Ecology met with stakeholders to seek input on how Ecology should regulate the use of pesticides until the rule appeal concludes. Ecology also provided the public with a three week comment period. Stakeholders affiliated with each of the seven affected permits (mosquito, noxious weed, aquatic plant and algae, irrigation, oyster growers, fish management, and invasive moth) sent comments to Ecology. The majority of comments requested that Ecology continue issuing joint NPDES/state permits to regulate aquatic pesticide applications.

A pesticide applied to the water is a form of pollution according to state law. To apply a pesticide to the water, state law requires that the applicator obtain a short-term modification of the water quality standards from Ecology. Currently, a permit provides the only legal vehicle for implementing that modification. State law only defines two types of permits for surface water discharges – NPDES (federal) and State Waste Discharge (state). Until 2001, Ecology issued modifications using an administrative order. This process was challenged in court and is not a viable regulatory option at this time.

Ecology decided that Washington will continue to use NPDES permits to control the use of aquatic pesticides in and around Washington state waters until the federal courts make a decision on the appeal of the EPA rule. These permits help the state protect human health and the environment by:

- Ensuring pesticides with the lowest risk are used.
- Reducing amounts of pesticides applied.
- Tracking pesticide use.
- Requiring public notifications and postings when waters are treated.
- Monitoring levels of pesticides in the water after treatment.

Ecology believes that these permits provide the best protection of water quality, human health, and the environment at this time. Ecology has taken steps to minimize the regulatory and administrative burden on permittees while ensuring that the permits comply with federal and state laws and court decisions. Ecology will continue to follow the court proceedings surrounding the EPA rule and respond accordingly.

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INTRODUCTION

This fact sheet is a companion document that provides the basis for issuance of the Irrigation System Aquatic Weed Control National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit. Ecology is proposing to issue this permit, which will allow discharge of wastes from aquatic pesticide applications and from non-chemical methods to control aquatic weeds in surface waters of the State of Washington, which are also waters of the United States, pursuant to the provisions of chapters 90.48, 90.52, and 90.54 Revised Code of Washington (RCW) and the Federal Water Pollution Control Act (FWPCA) as amended. This fact sheet explains the nature of the proposed discharges, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical basis for these decisions.

The Federal Clean Water Act (FCWA, 1972, and later modifications (1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the State of Washington on the basis of Chapter 90.48 RCW which defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The establishment of a general permit for irrigation system aquatic weed control is appropriate due to the similar environmental fate of each permitted pesticide, the uniform discharge conditions of all pesticide applications, the statewide scope of irrigation system aquatic weed control, and the significant reduction of resources necessary for permit handling. However, individual permits will still be considered in those instances where a proposed activity requires more detailed guidance, or when an individual applicator so desires and Ecology approves.

The regulations adopted by the State include procedures for issuing general permits (Chapter 173-226 WAC), water quality criteria for surface waters (Chapters 173-201A WAC), and sediment management standards (Chapter 173-204 WAC). A permit must be issued prior to the discharge of wastes to waters of the state. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-226-110) for issuing a general permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the draft permit, public hearings, comment periods, and public notice of issuance are all required before the general permit is issued (WAC 173-226-130). The fact sheet, application for coverage, and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

After the public comment period has closed, Ecology will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of Ecology’s response. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

BACKGROUND INFORMATION

In May, 1996, the Talent Irrigation District (TID) in southern Oregon applied the pesticide acrolein to an irrigation canal. A leaking waste gate resulted in the discharge of treated water into Bear Creek where a fish kill occurred.

Headwaters, Inc. and Oregon Natural Resources Council filed a Clean Water Act citizen suit against the Talent Irrigation District (TID) for applying aquatic pesticide into a system of irrigation canals. Reversing a district court's opinion, the Ninth Circuit in a March 12, 2001 decision held that application of the pesticide in compliance with the labeling requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) did not exempt TID from having to obtain an NPDES permit, and that the irrigation ditches were "waters of the United States" under the Clean Water Act.

FIFRA, as administered by the EPA, requires that all persons who apply pesticides classified as restricted use be certified according to the provisions of the act or that they work under the supervision of a certified applicator. Commercial and public applicators must demonstrate a practical knowledge of the principles and practices of pest control and safe use of pesticides, which will be accomplished by means of a "core" examination. In addition, applicators using or supervising the use of any restricted use pesticides purposefully applied to standing or running water (excluding applicators engaged in public health related activities) are required to pass an additional exam to demonstrate competency as described in the code of federal regulations as follows:

> "Aquatic applicators shall demonstrate practical knowledge of the secondary effects which can be caused by improper application rates, incorrect formulations, and faulty application of restricted pesticides used in this category. They shall demonstrate practical knowledge of various water use situations and the potential of downstream effects. Further, they must have practical knowledge concerning potential pesticide effects on plants, fish, birds, beneficial insects and other organisms which may be present in aquatic environments. Applicants in this category must demonstrate practical knowledge of the principles of limited area application." (40 CFR 171.4)

Aquatic weeds, such as rooted aquatic macrophytes, reduce storage capacity in reservoirs, block screens and intakes on pumps, interfere with hydroelectric production, distort canal design features (increase sedimentation, decrease channel flow, etc.), degrade recreational uses, and reduce water quality and wildlife habitat value. In general, designed capacity of irrigation canals in the West has not accounted for flow resistance caused by aquatic vegetation (Pitlo and Dawson 1993) although recent work provides the empirical basis for such design considerations (Kouwen 1992, Abdelsalam et al. 1992).

Lack of a comprehensive botanical survey and the use of common names, which can vary from district to district, limit description of the problem species in irrigation canals. From the limited botanical surveys conducted, two plants are likely to account for most of the aquatic plant problems in irrigation districts in the northwest, Sago pondweed (*Potamogeton pectinatus*) and Canadian pondweed (*Elodea canadensis*). Other non-native species, such as Brazilian elodea (*Egeria densa*), Eurasian watermilfoil (*Myriophyllum spicatum*), and Curly-leaf pondweed (*Potamogeton crispus*) also create flow blockage in irrigation systems in the state. Bartley et al. (1974) reported that Potamogeton species are the most common nuisance plants in western irrigation canals.

1. Aquatic Weed Management

There are approximately 97 irrigation districts and irrigation water companies comprising of over one million acres represented by the Washington State Water Resource Association. The irrigation districts are created and regulated under Chapter 87 RCW - Irrigation District Laws and Chapter 90 - Water Laws. Irrigation water supply companies are private non-profit water suppliers. The Ellensburg Water Company, created in 1885 before irrigation law was established is an example of a private non-profit water supplier. Each irrigation district employs its own Washington State licensed applicator(s). Each licensed applicator must have an aquatic pesticides endorsement. A licensed applicator can supervise unlicensed applicators as long as they are within calling and sight distance. Numbers of applicators (licensed and unlicensed) vary according to the size of the irrigation district.

Applications can start shortly after the irrigation season begins (typically mid-March) and ends before the end of the irrigation season (late October or early November). Depending on the size of the system, needs for delivery, and environmental factors, pesticide applications can occur as often as every two weeks but usually occur once a month. Some of the smaller systems may only require one or two treatments per season.

Depending on the quality of the water, early in the season when light levels are lower and air and water temperatures are lower, moss and green algae growths may need treatments. As light levels and air and water temperatures increase (late May – early June), blue-green algae and aquatic plant growth rates dramatically increase.

2. Aquatic Weed Management Methods

There are several methods to control weeds in irrigation systems. Five pesticides are the subjects of this general permit: acrolein, xylene, copper, sodium carbonate peroxyhydrate, and fluridone. Other pesticides are not as effective or have unwanted effects outside the irrigation supply system. Other non-pesticide methods are available and also discussed in this fact sheet. The other methods include physical removal of weeds such as hand pulling, chaining, backhoe, mechanical harvesting, manipulation of water levels, sediment removal, canal lining, shading, piping, and herbivorous fish.

Acrolein

Acrolein (acrylaldehyde, 2-propenal) is an aliphatic, α,β-unsaturated aldehyde that occurs naturally as a product of combustion and as a metabolite. Acrolein is a pungent, colorless, highly volatile liquid used as a molluscicide and herbicide, as a fixative in histochemical investigations, and as an intermediate in the production of numerous chemicals and reagents, including acrylic acid and DL-methionine (an essential amino acid used to supplement poultry and cattle feed) (Ghilarducci and Tjeerdema 1995). In 1983, approximately 98 percent of all production went to the manufacture of acrylic acid and DL-methionine (Ghilarducci and Tjeerdema 1995). Approximately 54,000 tons were produced industrially in the United States in 1992 (Anonymous 1992, as cited in Ghilarducci and Tjeerdema 1995). The main source of acrolein and the principal mode of human exposure, however, is through incomplete combustion in residential fireplaces, manufacturing, photochemical oxidation of airborne hydrocarbons, and cigarette smoke. The compound is also produced naturally in metabolic processes in soils (formation of humic substances) and in food (dehydration of glycerol) (Ghilarducci and Tjeerdema 1995). In a study of human exposure to acrolein, the greatest measured concentrations in typical ambient air occurred in heating animal and vegetable cooking oils (57.6 - 103.6 mg/m^3), near automobile exhaust (0.13 to 50.6 mg/m^3), and in a coffee roasting outlet (0.59 mg/m^3) (references in Table 4 of Ghilarducci and Tjeerdema 1995).

In 2004, 38,100 gallons of acrolein were applied to irrigation waters under the NPDES permit.

Acrolein is a cell toxicant of high reactivity. The compound is capable of spontaneous polymerization, which must be inhibited by hydroquinone. The chemical characteristics of acrolein, in particular the induced polarity caused by electronegative carbonyl oxygen atom, allows the molecule to react with nucleophilic reagents that contain sulfhydryl groups, such as free cysteine or cysteine-containing proteins. Thus, the compound can react with proteins and nucleic acids and induce cross-linkages and macromolecular rearrangements that result in tissue damage (Ghilarducci and Tjeerdema 1995).

Acrolein is highly toxic. The reported 60-day no-observable-effect-level is as low as 11.4 µg/L (WHO 1992, as cited in Ghilarducci and Tjeerdema 1995). Westerdahl and Getsinger (1988) reported that fish are killed when exposed to concentrations greater than 1 mg/L. Concentration-dependent histopathological effects on coho salmon gills, kidneys, and liver were found with exposures ranging up to 100 µg/L, and 100 percent lethality at 75 µg/L within 144 hours (Lorz et al. 1979). To protect freshwater animals from adverse effects, USEPA recommends a water quality limit of 1.2 µg/L for a 24-hr. average and a maximum of 2.7 µg/L; to protect human health from ingestion of treated water and organisms, the maximum concentration is 6.5 µg/L (Sittig 1980). Registered use concentrations are 1-15 mg/L (Dave Blodget, Baker Petrolite, personal communication, 4 Dec. 1997). Acrolein is not carcinogenic and shows little embryotoxic and teratogenic behavior (Ghilarducci and Tjeerdema 1995)

Plants treated with acrolein become flaccid and disintegrate within a few hours of exposure. Phytotoxicity is temperature dependent (Ashton and Crafts 1973). Bartley and Gangstad (1974) reported that for aquatic plant control, acrolein is applied full strength (95%) directly to the water using metering equipment calibrated to produce a rate not greater than 15 mg/L. In larger canals, applications are often made at 0.1 mg/L over a 48-hour period. Current labels do not allow for applications over 8 hours. In smaller canals the same quantity of materials is applied over a shorter period. The amount of material used is directly related to the volume of water treated. Smaller canals use smaller volumes of chemicals. The amount used is also related to the level of weed growth. The length of time for the treatment, and hence the concentration, varies from 15 minutes to 8 hours and depends on the system conditions such as water velocity.

Acrolein is relatively non-persistent. The half-life in aquatic systems ranges from less than one to approximately four days (Callahan et al. 1979, Bowmer and Higgins 1976, WSSA 1994). The acrolein distributor, Baker Petrolite, conducted extensive field studies, including those done in support of registration. Those studies indicate a half-life in irrigation systems of 6 to 10 hours. Volatilization is of major importance in loss from aquatic systems (Ghilarducci and Tjeerdema 1995), however, it is not the only mechanism. Another fate process is hydration. Upon hydration, β-hydroxypropionaldehyde is produced and is easily biotransformed (Reinert and Rodgers 1987). Half-life in water is not a function of the aerobic or anaerobic condition. Photolysis, hydrolysis, oxidation, and sorption are not considered significant fate processes (Callahan et al. 1979, Mabey 1981).

In irrigation systems, acrolein is applied subsurface at the upstream end of the portion of the canal being treated. The herbicidal activity is a function of the length of the treated water plug, the concentration of chemical, temperature, and flow rate. Because of its high toxicity, and short contact time, acrolein is highly efficacious in irrigation systems (Bowmer and Smith 1984). The compound is a contact herbicide, however, and repeated applications through the growing season are often required to maintain flow.

Xylene

Xylene (1,2-, 1,3-, and 1,4-dimethyl benzene) is an aromatic solvent registered for aquatic weed control for use in programs of the Bureau of Reclamation, Department of the Interior, and cooperating water user organizations.

Xylene is insoluble in water and must be applied with an emulsifier. Xylene is an effective contact herbicide at concentrations as low as 200 mg/L (Otto 1970). In 2004, 16,000 gallons of xylene was applied to irrigation waters under the NPDES permit.

Xylene is highly toxic to aquatic organisms. The 96-hr LC_{50} for rainbow trout was estimated to be 12 mg/L, with 100 percent mortality at 16.1 mg/L, and “anesthetic-like” effects after 2-hour exposure to 3.6 mg/L. Chronic (56 days) exposure to concentrations as low as 0.36 mg/L caused significant off-flavor in rainbow trout fillets. The no-effect level was established at 7.1 mg/L for a two-hour exposure. At treatment concentration, the emulsifier, Emcol AD-410, is much less toxic to rainbow trout than xylene (Walsh et al. 1975).

Xylene persistence in water is low. The predominant fate process is volatilization (Daniels et al 1975, cited in Reinert and Rodgers 1987). Other factors that contribute to loss of xylene from irrigation water include: breaking or disruption of the emulsion and absorption by plants (Frank and Demint 1970).

In humans and other mammals, xylene exposure at levels greater than those that occur during treatment can result in a variety of central and peripheral nervous system effects (Gandarias et al. 1995). There is no evidence that xylenes are mutagenic or carcinogenic (EHIS 1993).

Xylene is an effective herbicide in irrigation systems because of its phytotoxicity and minimal residual effects on crop plants. High toxicity to fish and other aquatic organisms, however, necessitates a high level of applicator competence and attention.

Copper

Copper was first used as an algaecide in the nineteenth century and is still widely used to control algae and higher aquatic plants (Murphy and Barrett 1993). Recently, chelated copper complexes have been produced that are effective in water with widely varying chemistry and less toxic to fish than copper salts, such as copper sulfate. Chelating compounds include ethylenediamine, alkanolamine, and triethanolamine. The ethylenediamine complex is most effective on rooted, aquatic plants (Anderson et al. 1987, 1993) and the alkanolamine and triethanolamine complexes are used as algaecides (WSSA 1994).

In 2004, the equivalent of 43,000 pounds of elemental copper was applied to irrigation waters under the NPDES permit. This number includes the use of 860 gallons of chelated copper and 169,000 pounds of copper sulfate.

Copper is a required nutrient for plants and is important in a number of physiologically important compounds and processes; however, copper phytotoxicity occurs at high concentrations (Epstein 1972, Mengel and Kirkby 1987, Marschner 1986). Toxicity relates to the ability of copper to displace other metal ions, particularly iron, from physiologically important centers.

Since it is an elemental metal, copper is persistent in the environment. Copper ion is highly reactive, and tends to adsorb to clays and dissolved organic carbon in the water to form inorganic and organic complexes (WSSA 1994). The majority of copper applied to an aquatic system will eventually sorb to the sediments. The soluble copper ion is considered the toxic form and is bioavailable to most species (Reinert and Rodgers 1987). Complexed and adsorbed species are considered nontoxic (USEPA 1980, as cited in Reinert and Rodgers 1987), although fish-kills and loss of invertebrates in some lakes have been attributed to long-term copper application for algae control that led to extremely high sediment copper concentrations (Hanson and Stafan 1984).

Copper efficacy is a function of temperature and pH. Copper is more effective at high temperatures and under acid or neutral conditions. At high pH, copper reacts with dissolved carbonates and is precipitated as copper carbonate. Efficacy of chelated formulations is less susceptible to water chemistry and less toxic to fish (Murphy and Barrett 1993). In water with low alkalinity (50-100 mg/L $CaCO_3$), ethylenediamine-complexed copper controls most common aquatic weeds at 0.75 to 1 mg/L.

Low-rate, long-exposure copper treatments may be effective in control of some aquatic plants. In some irrigation canals copper is applied as a continuously metered supply at concentrations ranging from 0.005 to 0.02 mg/L for periods of days or weeks (Gangstad 1986, as cited in Murphy and Barrett 1993). Copper is sometimes used in irrigation canals to kill epiphytic algae prior to acrolein treatment. Such pretreatment increases the efficacy of acrolein for aquatic weed control.

Sodium Carbonate Peroxyhydrate

Sodium Carbonate Peroxyhydrate is a granular chemical which is the active ingredient in certain algaecide and fungicide products. The end product containing this active ingredient acts as an oxidizing agent and thus kills the target algal and fungal pests. The product is used outdoors for treating ornamental plants, turf grasses, and terrestrial landscapes. It is used, as well, for treatments in commercial greenhouses, garden centers and plant nurseries, including their storage areas.

Sodium Carbonate Peroxyhydrate is a granular substance made by combining sodium carbonate and hydrogen peroxide. The following is its mode of action: When water is present, the compound breaks down into hydrogen peroxide and sodium carbonate. The hydrogen peroxide oxidizes and thus kills the target pests. After contact, the hydrogen peroxide breaks down harmlessly into water and oxygen.

Tests with sodium carbonate peroxyhydrate show minimal to mild toxicity for oral and dermal exposure. Dermal irritation also occurred. There was severe irreversible eye damage. The substance is not considered a dermal sensitizer. Exposure to the general population would be minimal. Workers are required to wear appropriate protective equipment to protect themselves, especially their eyes, from exposure to this corrosive substance.

When the pesticide is applied in accordance with directions on the label, no harm is expected to birds, other terrestrial animals, freshwater fish, or freshwater invertebrates. In the case of non-target plants, no harm is foreseen if the label directions are followed. Precautionary statements are present on the label to prevent exposure to non-target insects, including honey bees.

Fluridone

Fluridone is a systemic herbicide. It was discovered in the mid-1970s and was soon shown to be effective for the control of submersed plants. This herbicide was registered by the EPA for use in water in 1986. Fluridone is a carotenoid pigment inhibitor; loss of carotenoids in plants allows ultraviolet light to destroy chlorophyll, thus killing the plant by starving it.

Fluridone is used for the control of various submersed plants, and some floating-leaved plants, duckweed and salvinia. It does not control algae. Fluridone application rates for plant control are much lower than are those for other herbicides: µg/l (parts per billion) compared to mg/l (parts per million). However, contact time required to control target weeds is measured in weeks or months rather than hours or days. Fluridone concentrations in the water must remain for 45-80 or more days for optimum long term control of hydrilla. This aquatic herbicide is available as liquid and as slow- and fast-release pellet formulations.

Imazapyr

Imazapyr is a systemic, non-selective, pre- and post-emergent herbicide used for the control of terrestrial annual and perennial grasses, broad-leaved herbs, woody species, and riparian and emergent aquatic species. It is registered for use on a variety of agricultural, commercial, and residential use sites, including corn, forestry sites, rights-of-way, fence rows, hedge rows, drainage systems, outdoor industrial areas, outdoor buildings and structures, domestic dwellings, paved areas, driveways, patios, parking areas, walkways, various water bodies (including ponds, lakes, streams, swamps, wetlands, and stagnant water), and urban areas.

Imazapyr is formulated as a liquid, a wettable powder (including water soluble bags), and a granular. Application methods include aerial, groundboom, boat, and tractor-drawn spreader. Applications to smaller areas may be made with handheld equipment, including low-pressure handwand sprayers, backpack sprayers, sprinkling cans, and handgun sprayers. Application rates range from 0.014 lbs ai/acre on corn, to 1.5 lbs ai/acre on non-cropped areas and aquatic sites.

Upon direct application, or indirect release into surface water, photolysis is the only identified mechanism for imazapyr degradation in the environment. The half-life of imazapyr is approximately 3 to 5 days in surface water. The major identified metabolites were pyridine hydroxy-dicarboxylic acid, pyridine dicarboxylic acid, and nicotinic acid. Under laboratory aerobic aquatic conditions, the aerobic aquatic metabolism half-lives for hydroxy-dicarboxylic acid and pyridine dicarboxylic acid were in the range of 3 to 8 days in two different sediment/water systems. Metabolites hydroxy-dicarboxylic acid and pyridine dicarboxylic acid are expected to be more polar, thus more rapidly excreted than imazapyr, and no more toxic than the parent compound. Additionally, pyridine hydroxy-dicarboxylic acid is considered to be less stable than the parent compound. Nicotinic acid is a possible neurotoxin at high dose levels, but there is no concern for low exposures. Nicotinic acid (also called Niacin and referred to as Vitamin B3) is considered an essential nutrient. Imazapyr is not expected to bioaccumulate in aquatic organisms because it exists as an anion at typical environmental pHs.

Hand-pulling

Hand-pulling has been effective in control of some aquatic weeds in small canals and nearshore areas (Sculthorpe 1967, Shibayama 1988, Thamasara 1989), and less effective in others (Varshney and Singh 1976, as cited in Wade 1993). A number of tools have been developed to assist in hand-harvesting of aquatic weeds, including scythes, cutter bars, and mechanized hand-held cutters (Robson 1974, Cooke et al. 1993, McComas 1993). While hand-pulling is the most common method used for small scale aquatic plant management (Madsen 1997), the cost and difficulty of manual labor is often prohibitive and the efficacy limited when plant biomass is substantial and the infestation widespread (Wade 1993). Miles (1976, cited in Wade 1993) estimated the cost of manual control in a 20-m section of canal was more than three times the cost of using a tractor-mounted flail. A diver-operated dredge has proven effective, but expensive, in removing scattered plants in lakes (Madsen 1997).

Hand-pulling has some environmental impacts. Hand-pulling increased suspended sediment concentration by over 1600 percent and produced seven times as many plant fragments in the canal. Re-suspended sediments can adversely impact water quality. In addition, high sediment loads in irrigation water can clog emitters used to increase efficiency of irrigation water use.

Several factors influence the cost and efficiency of hand-pulling for aquatic vegetation management. Physical factors such as channel width, depth, and current velocity affect the rate at which people can move around in the channel. Vegetation density influences the rate of vegetation removal, and worker fatigue can quickly reduce efficiency. For hand-pulling to be a viable option for vegetation management in canals it will likely be in small areas where other techniques cannot be employed. Canal flow should be reduced as much as possible to increase efficiency and safety of hand-pulling.

Chaining

Dragging a chain attached to tractors on either side of the canal was a common technique for aquatic plant removal prior to the use of herbicide alternatives (Wade 1993, Armellina et al. 1996). Chaining dislodges plant material that must be removed from the canal manually or by mechanical means. Plant material that is not collected may contribute to the dispersal of the plants and more extensive weed infestation.

As with many control techniques, timing of the treatment influences efficacy. Like other harvesting operations, rapid re-growth necessitates repeat treatment. Treatments that result in inhibition of propagule formation may have more long-term efficacy (Armellina et al. 1996), although all disturbance-based control methods probably have low efficacy against disturbance-tolerant species, such as many problem aquatic weeds (Sabbatini and Murphy 1996). Chaining for removal of canal vegetation also requires a roadbed on both sides of the canal, which may limit its applicability in many systems.

Excavator/backhoe

Plants may be physically removed from canals with a backhoe, dragline, or similar excavating equipment. Significant drawbacks in the use of an excavator for aquatic weed control in canals include damage to the canal profile and bottom seal and production of abundant plant fragments and turbidity.

Mechanical removal of aquatic vegetation with a backhoe was not highly effective in the Talent Irrigation District in 1997. Removal efficiency was highly variable because sediment suspension limited the operator’s ability to see the plants in the canal. Suspended sediment concentrations increased by 150 times, and plant fragment generation increased by 100 times during backhoe operation. In addition, two weeks following treatment plant biomass was greater than before treatment, suggesting that mechanical removal would have to be repeated frequently.

Mechanical harvesting

Several types of mechanical harvesters have been developed for cutting and removing weeds from lakes and canals. These machines typically include a height-adjustable cutter bar and a basket or conveyor for collecting the cut plants. Floating machines that operate in lakes and reservoirs often have an integrated barge for transporting the cut plants to shore for off-loading. Machines that operate from the bank for use in canals are typically tractor-mounted, hydraulically controlled booms with cutter bars and baskets for collecting the cut plants. When risk of downstream dispersal of problem plants is low, choppers or cutters that leave the plant material in the canal may be more cost-effective than harvesters (Sabol 1987).

Mechanical harvesters must be able to remove approximately two tons of plant material for every mile of canal economically and effectively. In most cases, multiple harvests in a growing season will be required to control aquatic plants (Madsen et al. 1988, Thamasara 1989). Canals to be harvested must be accessible via maintenance road; and not blocked by trees, bridges, fences, and other obstructions. While plants may be piled on the maintenance road in some instances, plant disposal may be necessary near residences to avoid odor problems. Transportation of cut plants adds substantially to the costs of harvesting.

Mechanical harvesting impacts fish and wildlife when the animals are harvested along with the plants (Mikol 1985, Serafy and Harrell 1994), and it may cause a shift in the aquatic plant community (Best 1994). Machines that chop plants without removing them from the water may also destroy wildlife living in the canal. Timing of the harvest operations to seasonality in plant physiology may enhance the efficacy of harvesting (Kimbel and Carpenter 1981, Perkins and Sytsma 1987) by reducing re-growth rates.

Water level where irrigators have control

Submersed aquatic plants are dependent upon water for physical support, and lack of a cuticle makes them particularly susceptible to desiccation. Drawdown and exposure has been used to effectively control some aquatic plant species. Drawdown is particularly effective in winter when sediments freeze. Some aquatic plants are adapted to fluctuating water levels (Sculthorpe 1967), and species vary in their response to drawdown (Cooke et al. 1993). Species with propagules that are resistant to desiccation, such as Sago pondweed, may survive exposure through water level drawdown. Seed germination in some species is enhanced by desiccation (Stanifer and Madsen 1997).

Timing of water level manipulation and understanding of the lifecycle of the problem species is critical to efficacy of water level manipulation for aquatic plant management. Early flooding of a California irrigation canal, for example, stimulated precocious germination of Variable-leaf pondweed (*Potamogeton gramineus*) winter buds. Subsequent drying of the canal prior to the irrigation season resulted in a reduction of *P. gramineus* and increase in spikerush biomass in the canal for several years (Spencer and Ksander 1996).

Sediment removal

Dredging to remove nutrient rich sediment can provide long-term control of aquatic plant growth. Excavation to depths below the light compensation point or to a substrate that does not support plant growth is critical to the success of dredging for aquatic plant control. Aquatic plants are tolerant of extremely low light intensities, and deepening to increase light limitation is probably not feasible in irrigation systems. However, if low-nutrient sediments or sediments that do not permit rooting and attachment of aquatic plants can be exposed through dredging, permanent and effective plant control may be achieved (Cooke et al. 1993, Madsen 1997). Potential negative impacts of dredging for aquatic plant control in irrigation districts include: increased turbidity and suspended sediment in the water, which may impact efforts to conserve water through drip irrigation; damage to canal seal and increased loss through seepage; and changes in the gradient and flow characteristics of the canal.

Canal lining

Earthen canals provide a good substrate for aquatic plant growth. Lining the canals with geotextile material or concrete, poured in place or sprayed, would reduce availability of rooting substrate and reduce plant problems. Sediment deposition in the lined canal, however, may quickly negate benefits. Concrete-lined canals typically crack and require ongoing maintenance, and commonly have weed problems (Fred Nibling, USBOR, personal communication).

A new bituminous geotextile material for canal lining may provide a relatively inexpensive, long-term solution to aquatic weed growth in canals (L. Busch, USBOR, personal communication). In addition to reducing aquatic vegetation management costs, canal lining also reduces seepage losses from canals and is an important water conservation tool. Evaluation of this alternative is not yet complete.

Shading

Aquatic plants, like all plants, require light for photosynthesis. Submersed aquatic plants, however, are well adapted to the low-light conditions that result from light scatter and absorption by water and suspended materials in water. Decline of rooted aquatic plants in systems with high turbidity caused by suspended sediment (Johnstone and Robinson 1987; Engel and Nichols 1994) and phytoplankton (Phillips et al. 1978; Hough et al. 1991) has been attributed to light inhibition.

A number of techniques may be used to reduce light availability for aquatic plants, including dyes, shade fabrics, canal bank vegetation, and piping. Light absorbing dyes, such as Aquashade, are commonly used in closed (no outflow) systems, but is not registered for use in flowing systems. The shading effect of bank vegetation has been reported to impact aquatic plant growth (Dawson 1978, Dawson and Haslam 1983, and Pieterse and van Zon 1982, cited in Wade 1993).

Covering the canal with shading material stretched over a framework of metal or plastic may be less expensive initially than pipe for control of aquatic plant growth. An even less expensive alternative may be to train existing canal bank vegetation, e.g., blackberries, to grow over a metal framework to provide shade. Relative to piping water, however, canal covers would have a high maintenance cost and short lifespan.

Shading the canal may produce additional benefits as well as some drawbacks. An ancillary benefit of shading the canal would be a decrease in water lost through evaporation. Use of vegetation to shade the canal, however, may increase water loss through evapotranspiration and entail a maintenance cost associated with tree trimming and fallen branch removal. Root growth into canal banks may also compromise canal bank integrity and increase water loss through seepage.

Piping

The ultimate shading technique for aquatic plant control is to entirely cover the canal with light-blocking material or to pipe the water. Because of the radius of turns required, adequate right-of-way may not be available for pipe installation in large canals. In smaller canals, however, piping water may provide a long-term (25 years) solution to aquatic weed problems. Use of pipe for water delivery depends upon canal slope and canal size. Pipe diameters up to 36 inches may be economically installed in existing canal beds, and provide capacity for 15 to 20 cfs. Pipe installation has the added benefit of eliminating seepage and evaporation losses and provides the highest level of water conservation.

Stormwater flows may reduce the practicality of pipe for water delivery. For example, some canals are used for stormwater management during winter, and the pipe size necessary for irrigation water delivery may not be adequate for handling stormwater flows. Restricted stormwater flows may causes flooding upstream of piped canal sections. Where possible, stormwater flow should be directed to natural water courses and diverted from irrigation canals. Diversion of stormwater would facilitate use of pipe for water delivery and reduce sediment deposition in canals; thereby increasing water conservation, minimizing the availability of aquatic plant rooting substrate, and reducing the requirement for aquatic plant management efforts with the associated environmental risks.

Fish, grass carp

Several fish species have been considered as biological control agents for aquatic vegetation. Van Zon (1976) listed 29 species that are phytophagous, feeding primarily on phytoplankton or macrophytes. In practice, however, only one species, the grass carp (*Ctenopharyngodon idella*), has been used for large scale aquatic weed control (van der Zweerde 1993). The grass carp, which is a member of the Cyprinidae or minnow family, is a voracious feeder. Small fish may consume a daily ration of aquatic plants equal to several times their body weight per day (Opuszynski 1972, cited in California Dept. Fish and Game 1989). Larger fish may consume a ration equal to their body weight (Leslie et al. 1996, Stocker 1996).

The biology and physiology of grass carp contribute to their effectiveness for aquatic plant control. Grass carp have a short gut, for an herbivore, which allows them to process and eliminate consumed plants quickly (Leslie et al. 1996). Grass carp are essentially 100 percent herbivorous at lengths greater than 3 cm. Although animal prey is not sought by larger fish, animals will be consumed when they are presented in the absence of plants, and inadvertently when they are attached to consumed plants (van der Zweerde 1993).

Grass carp grow rapidly (up to 29 g/day) under uncrowded conditions with abundant food and optimal temperatures (Shelton et al. 1981, Sutton and van Diver 1986, cited in Leslie et al. 1996). In temperate regions, feeding begins at 3 to 9 C, with consumption and growth are typically greatest between 21 and 26 C. Regional acclimation may result in varying temperature optima (Leslie et al. 1996). Plant consumption is reduced at dissolved oxygen concentrations lower than 4 mg/L (Rottmann 1977).

Although rather indiscriminate in their feeding, and not a biocontrol agent in the classical sense (sensu Doutt 1967; Roush and Cate 1980; Pietersee 1993, DeLoach 1997), grass carp do exhibit preferences for certain aquatic plant species. Plant preference depends upon the age, size, physiological state of the fish, and on environmental conditions. Small grass carp select small or soft plants, such as duckweeds, filamentous algae, and softer pondweeds. Larger fish still prefer softer plants (although algae are less preferred) but will accept more fibrous plants (Opuszynski 1972, Rottaman 1977).

Site differences influence palatability of plants. Grass carp preference for a species may differ among plants collected from different sites. In one study (Bonar et al. 1990), consumption was positively correlated with plant calcium and lignin content, and negatively correlated with iron and cellulose. Plant nutrient content is, in turn, determined by site characteristics (Hutchinson 1975). These site difference are likely responsible for the sometimes contradictory results of feeding preference studies (Bowers et al. 1987, Chapman and Coffey 1971, Pine et al. 1989, Pauley et al. 1994).

Grass carp are endemic to the large rivers of Asia from the Amur River in Siberia south. All fish introduced into the U.S. are warm-water acclimated fish of Chinese origin (Pauley et al. 1994). Grass carp were first introduced into the U.S. in 1963 and the first documented stocking for weed control occurred in 1970 in Arkansas (Bailey and Boyd 1972, cited in Leslie et al. 1996). Since then, grass carp have been widely distributed in the U.S. for aquatic weed control.

Escape and establishment of reproductive populations of grass carp into river systems (Brown and Coon 1991, Webb et al. 1994, Raibley et al. 1995, Elder and Murphy 1997), and growing concern about the potential environmental impacts of the fish, stimulated some states to ban grass carp. Research on production of mono-sex fish and sterile hybrids provided unsatisfactory results (Leslie et al. 1996). In the 1980s, however, fish culturists were successful in inducing triploidy in grass carp using heat-shock (Thompson et al. 1987) or hydrostatic pressure-shock (Cassini and Caton 1986) of fertilized grass carp eggs. Triploid grass carp are functionally sterile (U.S. Fish and Wildlife Service 1988).

Diploid grass carp are illegal in West Coast states. Beginning in 1990, Washington permitted the introduction of triploid fish into lakes and ponds for aquatic weed control with requirements for containment (Pauley et al. 1994).

Grass carp were introduced into California to manage hydrilla in the Imperial Irrigation District (IID) in Southern California. Prior to grass carp introduction, costs for aquatic weed management in the IID were $250,000 to $400,000 per year. These costs did not include labor costs of individual farmers required to maintain pipe, pumps, etc. free of plant fragments. The pre-grass carp program was primarily mechanical, and included management of only the worst problems and provided only enough control to maintain flow in the system. The grass carp management program costs approximately $250,000 per year (1992 dollars) to provide plant-free water flow in 2,575 km of canal (approximately $97/km) (Stocker 1996).

3. Endangered Species

EPA has implemented The Endangered Species Protection Program to identify all pesticides whose use may cause adverse impacts on threatened/endangered species and to implement mitigation measures that will mitigate identified adverse impacts. When an adverse impact is identified this program will require use restrictions to protect endangered/threatened species at the county level. These use restrictions will be specified on the product label or through the distribution of a county specific Endangered Species Protection Bulletin specified on the product label.

REGULATORY POLLUTION REDUCTION REQUIREMENTS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations are set by regulation or developed on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992). The more stringent of these two limits must be chosen for each of the parameters of concern.

1. Technology-Based Water Quality Protection Requirements

Sections 301, 302, 306, and 307 of the FWPCA established discharge standards, prohibitions, and limits based on pollution control technologies. These technology-based limits are "best practical control technology" (BPT), "best available technology economically achievable" (BAT), and "best conventional pollutant control technology economically achievable" (BCT). Compliance with BPT/BAT/BCT may be established using a "best professional judgment" (BPJ) determination.

The state has similar technology-based limits which are described as: "all known, available and reasonable methods of control, prevention, and treatment" (AKART) methods. AKART is referred to in state law under RCW 90.48.010, RCW 90.48.520, RCW 90.52.040 and RCW 90.54.020. The federal technology-based limits and AKART are similar but not equivalent. AKART: (1) may be established for an industrial category or on a case-by-case basis; (2) may be more stringent than Federal regulations; and (3) includes not only treatment, but also BMPs such as prevention and control methods (i.e. waste minimization, waste/source reduction, or reduction in total contaminant releases to the environment). Ecology and the EPA concur that, historically, most discharge permits have determined AKART as equivalent to BPJ determinations.

The pesticide application industry has been regulated by EPA under the terms of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Uses of pesticides are regulated by label use requirements developed by EPA. In developing label use requirements, EPA requires the pesticide manufacturer to register each pesticide and provide evidence that the pesticide will work as promised and that unacceptable environmental harm will be minimized. The standards for environmental protection are different between the CWA and FIFRA.

It is the intent of this general permit to authorize aquatic weed control in a manner that also complies with federal and other state requirements.

All water quality related permits issued by the department must incorporate requirements to implement reasonable prevention, treatment and control of pollutants. Since following FIFRA label requirements is currently a practice in place, it is reasonable to expect this practice to continue.

The legislature established in the Washington Pesticide Control Act that prevention of pollution in this case is reasonable in the context of an Integrated Vegetation Management Plan. IVMPs require the investigation of all control options, but do not require non-chemical pest controls as the preferred option. The goal of IVMPs is to establish the most effective means of control whether biological, chemical, non-chemical, or a combination. Most aquatic weed control strategies are such a combination. It is reasonable to require IVMP under the provisions of AKART as best management practices in WAC 173-226-070(1).

Treatment of the pollutants addressed in this permit is difficult due to the diffuse nature and low concentrations that exist after the pesticides have become waste. The Talent decision established that aquatic pesticides become waste in the water after the pesticide has performed its intended action and the target organisms are controlled. Treatment of waters where pesticide residues threaten to cause unacceptable environmental harm may be needed in some situations, but not routinely.

2. Water Quality Based Requirements

The aquatic weed control activities affect surface waters of the state. These waters are protected by chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington. The purpose of these standards is to establish the highest quality of state waters, through the reduction or elimination of contaminant discharges to the waters of the state. This purpose is reached, in part, by compliance with the limitations, terms and conditions of the general permit.

The aquatic weed control activities are required to meet the State water quality standards for surface waters as given in chapter 173-201A WAC. The designated uses surface waters include, but are not limited to, the following: aquatic life uses, recreation uses, water supply uses, and other miscellaneous uses.

RCW 90.48.035 authorizes establishment of water quality standards for waters of the State. The State has implemented water quality standards in chapter 173-201A WAC. All waste discharge permits issued pursuant to NPDES or SWD regulations are conditioned in such a manner that all authorized discharges shall meet State water quality standards. Standards include antidegradation requirements which state that beneficial uses shall be protected.

Antidegradation Tier I

The water quality standards have antidegradation requirements. The Tier I requirements can be found in WAC 173-201A-310.

Discharges from aquatic weed control activities may contain pollutants which, in excessive amounts, have a reasonable potential to cause, or contribute to, violations of State water quality due to the presence of materials toxic to aquatic life. The Department has deemed that, when properly applied and handled in accordance with the terms and conditions of the general permit, aquatic weed control activities will comply with State water quality standards, will maintain and protect the existing characteristic beneficial uses of the surface waters of the State, and will protect human health. New information regarding previously unknown environmental and human health risks may cause reopening of the general permit.

No mixing or dilution zone shall be authorized to the Permittee for any discharge to natural surface waters under this general permit. The short term water quality modification provisions of the permit will allow the discharges authorized by the general permit to cause a temporary diminishment of some beneficial uses while the water body is altered to restore flow capacity. The short term modification will be short in that the actual impairment will be short lived, while the overall availability of authorization extends through the term of the permit. The permit conditions and the integrated pest management plan satisfy the regulatory requirement for a long term plan that allows short term modifications to extend for five years.

This general permit does not authorize activities that have a reasonable potential to cause a violation of state water quality standards (WAC 173-201A) within the irrigation system so long as the activities are allowed under the short term water quality modification. Activities covered under this permit are allocated a temporary zone of impact on beneficial uses, but the impact must be transient, and must allow for full restoration of water quality and protection of beneficial uses upon project completion. The conditions of this permit constitute the requirements of a short term water quality modification.

This general permit provides the authority to discharge the listed aquatic pesticides and not any authority to discharge other pollutants which may be present in the irrigation system. Impacts not directly associated with discharge of pesticides will be addressed using other regulatory tools.

The reasonable potential to cause a violation of water quality standards requires that a limit be placed on the discharge at the points of compliance. For fluridone and imazapyr, conditions in the permit require virtually no-discharge at the point of compliance. Numeric limits were derived for acrolein, xylene, and copper. The resultant limits are as follows:

Table 1 – Numeric Limits for Pesticides

Parameter	*Maximum instantaneous concentration*
Copper, dissolved	25 μg/l
Acrolein	21 μg/l
Xylene	5.1 mg/l
The maximum daily limitation is defined as the highest allowable discharge at any time.	

Acrolein Limit

The acrolein limit is based on a level established to protect freshwater organisms from adverse toxic effects due to chronic exposure by the state of Oregon (OAR Chapter 340). Washington State has no established water quality criteria for acrolein but requires that concentrations of toxic substances without specific criteria that are protective of aquatic organisms be determined from available relevant information.

The data available on acrolein shows that acute toxicity (48-h LC50) for *Daphnia spp.* is 57 and 80 μg/l (Macek, et al. 1976, and U.S. EPA, 1978). The LC50 for bluegill sunfish at 96-h is 100 and 90 μg/l (Louder & McCoy, 1962, and US EPA, 1978). The LC50 for largemouth bass at 96-h is 160 μg/l (Louder & McCoy, 1962).

The data shows that acute toxicity to freshwater aquatic life occur at concentrations as low as 68 μg/l, and would occur at lower concentrations among those species that are more sensitive than those tested in previous studies.

The data shows that chronic toxicity would occur at 21 μg/l, and would occur at lower concentrations among those species that are more sensitive than those tested in previous studies.

Copper Limit

The copper limit is based on the water quality criteria established in Washington State water quality standards, WAC 173-201A. The copper criterion is dependent on the hardness of the water. The acute cropper criterion is $\leq (0.960)(e^{(0.9422[\ln(\text{hardness})] - 1.464)})$. It is a one-hour average concentration not to be exceeded more than once every three years on the average. The criteria are for the dissolved fraction of copper.

Ecology analyzed hardness data from eight irrigation districts in 2004 and 2005. That analysis found average hardness values ranging from 17 mg/L to 184 mg/L.

Table 2 – Average hardness values (mg/L) for irrigation districts from 2004-2005

District	Minimum Value	Average Value	Maximum Value	n
Cascade	42	79	135	30
Columbia	17	102	133	84
ECBID	68	184	440	131
Kittitas	14	37	220	49
Naches Selah	22	29	40	48
Quincy	48	129	350	142
SCBID	11	150	230	252
Wenatchee	10	17	24	46
Grand Total	**10**	**122**	**440**	**782**

Using the formula for the copper criterion, these average hardness values would correspond to acute criteria ranging from 3.3 µg/L to 30.2 µg/L. The overall average based on all data would correspond to a criterion of 20 µg/L.

Table 3 – Average hardness values (mg/L) and corresponding acute and chronic copper criteria (µg/L)

District	Average Hardness	Acute Criterion	Chronic Criterion
Cascade	79	13.6	9.3
Columbia	102	17.4	11.6
ECBID	184	30.2	19.1
Kittitas	37	6.6	4.8
Naches Selah	29	5.4	4.0
Quincy	129	21.6	14.1
SCBID	150	24.9	16.0
Wenatchee	17	3.3	2.5
Grand Total	**122**	**20**	**13.4**

Xylene Limit

Results from recent Parametrix studies (2004) showed an EC50 of 11.5 mg/l after only two hours of exposure for rainbow trout. The 48-h LC50 is 24.3 mg/l for rainbow trout (for xylene plus the emulsifier). The 48-h LC50 for *Daphnia magna* was 5.1 mg/l (Parametrix, 2004).

Point of Compliance

The point of compliance means the location where water treated with pesticides enters surface water bodies that existed prior to the creation of reclamation and irrigation projects.

In addition, for Amon Wasteway, Snipes Creek Wasteway, Sulphur Creek Wasteway, and Crab Creek, the point of compliance shall be at or above the following locations:

1. Amon Wasteway where it exits the golf course at Gage Road (approximately latitude 46.22715, longitude -119.26024).

2. Snipes Creek Wasteway at the Benton 29.32 Lateral (near McCreadie Road) (approximately at latitude 46.25630, longitude -119.67406).
3. Sulphur Creek Wasteway at Sheller Road (approximately at latitude 46.33167, longitude -119.98021).
4. Crab Creek at Red Rock Coulee / DCC1 wasteway (approximately at latitude 46.84693, longitude -119.58673).

A permittee may choose to use the points of compliance specified in S4.A and not the points of compliance specified in S4.B, if the permittee does all of the following requirements:

1. Notifies Ecology by March 1, 2008 of its intent to do so.
2. Submits a plan by November 1, 2008 detailing how it will meet the requirements of S4.C3 and S4.C4.
3. Submits to Ecology by November 1, 2011 a report detailing fish and other aquatic life uses in the waterbody identified in S4.B. The report shall contain a comprehensive analysis of all of the uses of the waterbody during the permittee's entire irrigation season. The permittee shall ensure that appropriately trained personnel use currently accepted data collection practices to perform all work for the report.
4. Submits to Ecology by November 1, 2011 an economic and engineering analysis detailing what changes to the current pesticide application practices or irrigation practices would have to occur to meet the permit requirements at the points of compliance identified in S4.B.

The permittee may move its point(s) of compliance upstream of the point described in S4.A or S4.B for easier access for monitoring or for other reasons. The permittee shall notify Ecology in writing before moving a point of compliance.

These four locations were added because there is documented salmonid presence at these locations. These four locations are the upper extent of documented salmonid presence for these waterways. The raw data used to determine documented presence of salmonids is included in Appendix D. For the purposes of determining presence of salmonids, Ecology required:

- Documentation of salmonid presence (either salmon or steelhead),
- More than one fish found at the site, and
- Sufficient geographical information to determine the location of the data.

Antidegradation Tier II

The Tier II requirements can be found in WAC 173-201A-320. Tier II requires that any degradation caused by a source is found in advance to be both necessary and the overriding public interest.

The supplementary guidance for implementing the Tier II Antidegradation Rules (July 18, 2005) exempts certain activities from Tier II analyses. It states that "A Tier II analysis is not required in association with activities regulated under a short-term modification (WAC 173-201A-410) such as what would occur with construction and maintenance activities or the periodic use of herbicides to control of noxious aquatic plants."

Antidegradation Tier III

As of the issuance date of this permit, there are no Tier III waters in the state. If a Tier III water body was designated in the water quality standards in the future, a new discharge to that water body would need to obtain an individual permit and meet the requirements of WAC 173-201A-330.

3. Sediment Quality

Generally, copper is adsorbed quickly to particles in the water column that settle out to the sediments. In lake systems, these rates of adsorption can be very high and persistent. However, this may not be the case for rapidly flowing systems such as irrigation canals. When Farmers Ditch Irrigation Canal was treated continuously at rates of 0.19, 0.05 or 0.5 mg/L, 60 percent of the applied copper remained adsorbed to the ditch bottom sediments. At the end of the treatment season, sediment concentrations of copper were generally below 50 mg/l.

During treatment of the Roza Main Canal with copper sulfate, copper did not significantly settle into the bottom sediments. Even though sediment concentrations rose after a single slug treatment, they returned to background levels within about seven to eight days. This may be due to release of copper from sediments due to hydrolysis. Also, copper may also be removed from the area by scouring action of the flowing water (Nelson et al, 1969). However, daily treatments of the East 14.7 Lateral Canal for 4.5 months at a 1 lb Cu/ft3 resulted in an increase of sediment copper concentrations from 20 mg/L to approximately 120 mg/L.

There is no good evidence that the copper in the sediments re-dissolves or is simply transported downstream by the water currents. If it does re-dissolve then it may eventually be transported into receiving waters where it is available biologically to in-stream biota. If it stays adsorbed and is transported downstream, then high-copper sediments may be deposited into the downstream water systems. If it is dredged out during the off-season, then it can be effectively removed from the system.

Ecology has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that Ecology may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

We do not have enough information to conclude whether or not there is reasonable potential to violate the Sediment Management Standards. When freshwater sediment criteria are established, the department will review the concentrations of copper in sediments due to copper treatments in irrigation supply systems.

OTHER INFORMATION

1. Eligibility and Geographic Area of Coverage

This permit applies to the control of aquatic weeds in waters of the state within irrigation systems and at the point of compliance. Irrigation water suppliers whose system is capable of discharging to or intersecting with points of compliance, whether unintentionally or by design, are required to be covered under this permit or another NPDES permit.

The majority of irrigation water delivery systems occur in the Yakima, Wenatchee, Okanogan, Spokane, Touchet, and Walla Walla River drainages and the three Columbia Basin Project irrigation districts make up the majority of the acres irrigated in the state. Attachment C lists the Washington State irrigation districts.

2. Integrated Pest Management and Best Management Practices

The permit requires industry to continue examining alternatives to reduce the need for aquatic pesticides. The following practices have been used in similar activities:

1) All errors in application and spills are reported to the proper authority.
2) Informing the public of planned spray activities.
3) Applying a decision matrix concept to the choice of the most appropriate formulation.
4) Staff training in the proper application of pesticides and handling of spills.
5) The applicators must follow the pesticide label requirements and be knowledgeable about human health risks and mitigation processes as outlined in the MSDS.
6) The irrigation district must develop and follow an IVPM plan accepted by Ecology.
7) The irrigation districts will be required to monitor treated waters during the season. Monitoring can result in a better management of pesticide applications, avoidance of excessive applications, and also reduced amounts of the pesticides.

3. Monitoring

Monitoring requirements are specified in Condition S6 of the permit. WAC 173-226-090 provides Ecology the authority to specify appropriate monitoring requirements.

4. Reporting and Recordkeeping

WAC 173-226-090 provides Ecology the authority to specify any appropriate reporting and recordkeeping requirements to control discharges to waters of the state.

5. Lab Accreditation

With the exception of certain parameters, the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, Accreditation of Environmental Laboratories.

6. Small Business Economic Impact Analysis

The general permit requires compliance with federal and state laws and regulations and places no disproportionate burden on small business. The monitoring is flexible and meeting pesticide label requirements is already required under FIFRA. Complying with water quality standards is required by state and federal law. Most irrigation districts in the state are public entities.

7. Permit Modifications

Ecology may modify this permit to impose new or modified numerical limitations, if necessary to meet Water Quality Standards for Surface Waters, Sediment Quality Standards, or Water Quality Standards for Ground Waters, based on new information obtained from sources such as inspections, effluent monitoring, or Ecology approved engineering reports. Ecology may also modify this permit as a result of new or amended state or federal regulations.

8. When Coverage is Effective

Ecology bases the conditions for coverage under this general permit on state regulations found in WAC 173-216 and WAC 173-226.

Ecology will not issue coverage until at least 60 days following the receipt of a completed application for coverage. In the event that Ecology receives relevant comments on the Application for Coverage, Ecology may need to work with the applicant prior to issuing permit coverage. In this instance, obtaining permit coverage may require more than 60 days.

Ecology derived the requirements for public notice when applying for coverage under the general permit from state regulation, WAC 173-226-130.

9. Responsibility to Comply With Other Requirements

Ecology has established, and will enforce, limits and conditions expressed in the general permit for the discharge of waste streams containing various pesticides registered for use by the EPA and the Washington State Department of Agriculture (WSDA). EPA and WSDA will enforce the use, storage and disposal requirements expressed on pesticide labels. The Permittee must comply with both the pesticide label requirements and the general permit conditions. The general permit does not supersede or preempt Federal or State label requirements or any other applicable laws and regulations. General permit Condition G15 reminds the Permittee of this fact.

10. Additional Permit Information

Condition S6.C

Analytically tracking treatments at the point of compliance meets the requirements of this condition. For example, if a facility takes samples at a point of compliance every hour for 24 hours and is able to track when the peak concentration of pesticide arrives and departs, this sampling meets the requirements of this condition for that point of compliance.

Condition S6.B4

Condition S6.B4 allows for no monitoring if the permittee meets the requirements of this special situation. This condition is based on travel time studies conducted by permittees. The studies were analyzed to determine how long after a peak arrives at a location it takes for no pesticide residue (or dye simulating a pesticide) to be detected. After that amount of time, plus a margin of safety, no monitoring is required for canals/spillways that are reopened (see condition S6.B4 for details).

The analysis of twelve travel time studies showed that waiting two travel times would result in no detectable pesticides at a particular location. For example, if it takes 8 hours for the peak pesticide concentration to reach location X, after an additional 8 hours (16 hours total), no detectable pesticides should be present.

Table 4 summarizes results from the thirteen studies. As the table shows, the maximum amount of time found in the study for no detectable pesticides to be found was 1.8 times the travel time. Adding a margin of safety of 0.2 to the maximum result yields the two travel time standard found in condition S6.B4.

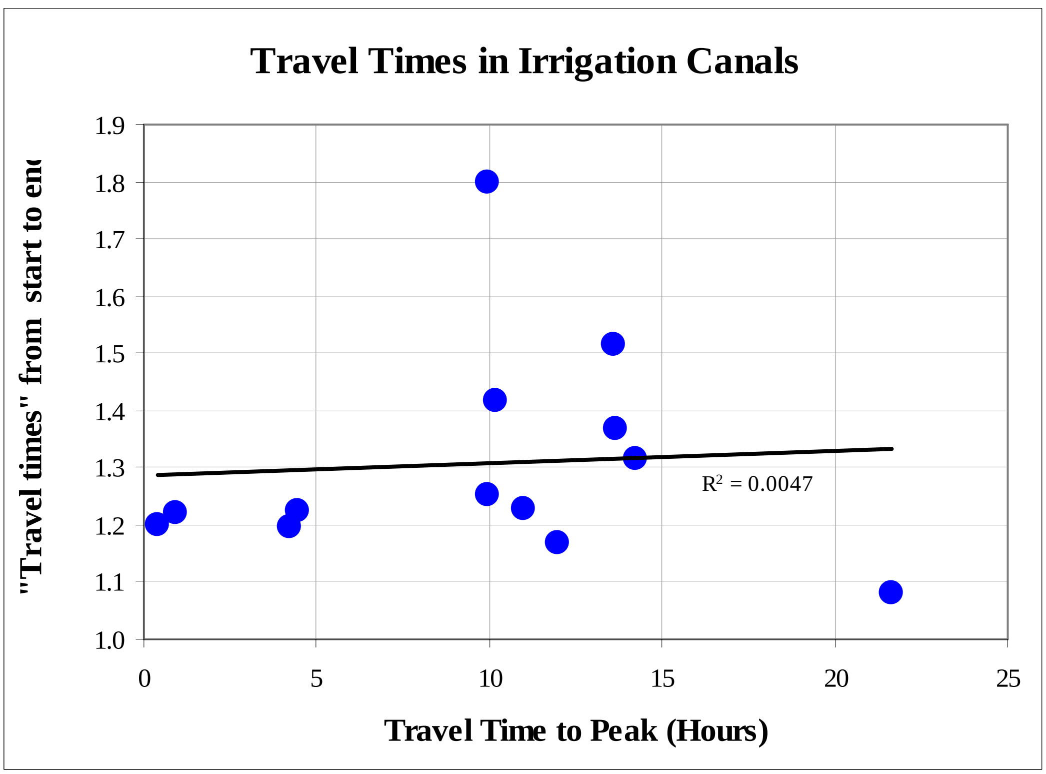
Table 4 – Time travel studies

District	Location	Total travel times until no pesticide or dye was detected
Roza Irrigation District	Roza Canal MP 37.2 on 06-20-06 @ 14:37	1.1
Wenatchee Reclamation District	Wenatchee RD on September 20, 2006	1.17
Sunnyside Valley Irrigation District	SVID Sunnyside Canal MP 17.70	1.20
Roza Irrigation District	WW5 @ Blockhouse Bridge below Roza Canal	1.2

Roza Irrigation District	Snipes Creek Wasteway @ Benton #2 Siphon	1.2
Sunnyside Valley Irrigation District	SVID Granger Drain Site 24	1.22
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on July 17	1.23
Sunnyside Valley Irrigation District	SVID Matheson HW	1.25
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Sept 11	1.32
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Apr 22	1.37
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on Aug 14	1.42
South Columbia Basin Irrigation District	Potholes East canal Mile 32 on June 19	1.51
Wenatchee Reclamation District	Wenatchee RD on September 20, 2006	1.80

As Figure 1 shows, the amount of travel times it takes before finding no detectable levels of pesticides is independent of the actual length of the travel time.

Figure 1—Travel Times in Irrigation Canals



11. General Conditions

General conditions are based directly on State and Federal law and regulations and are included in all aquatic pesticide general permits.

General conditions are based directly on state and federal law and regulations and have been standardized for all NPDES permits issued by the Ecology. Some of these conditions were developed for different types of discharges. Many of these conditions are not directly applicable to the application of pesticides.

12. Recommendation for Permit Issuance

The general permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. Ecology proposes that the general permit be issued for five (5) years.

APPENDIX A – PUBLIC OPPORTUNITY TO COMMENT

A Public Notice of Draft was published in the State Register on November 7, 2007. Public hearings on the draft General Permit will be held on:

December 10, 2007, 6:30 p.m. Benton PUD Auditorium 2721 West 10th Ave Kennewick, Washington	December 11, 2007, 6:30 p.m. Hal Holmes Center 209 N. Ruby St. Ellensburg, Washington

A short workshop to explain proposed changes and answer questions will be held immediately preceding the hearings.

Interested persons are invited to submit comments regarding the proposed issuance of the General Permit. Comments on the general permit may be delivered at the public hearings as either written or oral testimony. Written comments may also be submitted to the Ecology office at the address below:

Andrew Kolosseus
Washington State Department of Ecology
Water Quality Program
PO Box 7600
Olympia, WA 98504-7600

All comments must be submitted by January 11, 2008 to be considered in the final permit determination. A responsiveness summary will be prepared and available for public review. It will be sent to all parties who submitted comments by the deadline.

The proposed and final general permit, fact sheet, application form, and other related documents are on file and may be inspected and copied between the hours of 8:00 a.m. and 4:30 p.m., weekdays at the following Ecology locations:

Washington State Department of Ecology Central Regional Office 15 West Yakima Avenue, Suite 200 Yakima, WA 98902 (509) 454-7298 TDD (509) 454-7673 FAX (509) 575-2809 Contact: Ray Latham	Washington State Department of Ecology Eastern Regional Office North 4601 Monroe, Suite 202 Spokane, WA 99205 (509) 456-2874 TDD (509) 458-2055 FAX (509) 456-6175 Contact: Ken Merrill

Washington State Department of Ecology
Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452
(425) 649-7133
TDD (435) 649-4259
FAX (425)649-7098

Washington State Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
(360) 407-6300
TDD (360) 407-6306
FAX (360) 407-6305

APPENDIX B -- DEFINITIONS

"Administrator" means the administrator of the EPA.

“Antidegradation Policy” is as stated in WAC 173-201A-070.

"Authorized representative" means:

1. If the entity is a corporation, the president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operation facilities, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. If the entity is a partnership or sole proprietorship, a general partner or proprietor, respectively; and

3. If the entity is a federal, state or local governmental facility, a director or the highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or his/her designee.

The individuals described in paragraphs 1 through 3, above, may designate another authorized representative if the authorization is in writing, the authorization specifies the individual or position responsible, and the written authorization is submitted to the Department.

"Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State and their sediments. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Certified applicator" means any individual who is licensed as a commercial pesticide applicator, commercial pesticide operator, public operator, private-commercial applicator, demonstration and research applicator, or certified private applicator, or any other individual who is certified by the director to use or supervise the use of any pesticide which is classified by the EPA or the director as a restricted use pesticide.

"Code of Federal Regulations (CFR)" means a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. Environmental regulations are in Title 40.

"Composite sample" means the combined mixture of not less than four (4) "discrete samples" taken at selected intervals based on an increment of either flow or time. Volatile pollutant discrete samples must be combined in the laboratory immediately prior to analysis. Each discrete sample shall be of not less than 200 ml and shall be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for Examination of Water and Wastewater.

"Conveyance" means a mechanism for transporting water or wastewater from one location to another location including, but not limited to, pipes, ditches, and channels.

"Department" means the Washington State Department of Ecology.

"Detention" means the collection of water into a temporary storage device with the subsequent release of water either at a rate slower than the collection rate, or after a specified time period has passed since the time of collection.

"Director" means the director of the Washington State Department of Ecology or his/her authorized representative.

"Discharger" means an owner or operator of any "facility", "operation", or activity subject to regulation under Chapter 90.48 RCW.

"Discrete sample" means an individual sample which is collected from a waste stream on a one-time basis without consideration to flow or time, except that aliquot collection time should not exceed fifteen (15) minutes in duration.

"Effluent limitation" means any restriction established by the local government, the Department, and EPA on quantities, rates, and concentrations of chemical, physical, biological, and/or other effluent constituents which are discharged from point sources to any site including, but not limited to, waters of the state.

"Environmental Protection Agency (EPA)" means the U.S. Environmental Protection Agency or, where appropriate, the term may also be used as a designation for a duly authorized official of said agency.

"Erosion" means the wearing away of the land surface by movements of water, wind, ice, or other agents including, but not limited to, such geological processes as gravitational creep.

"Existing operation" means an operation which commenced activities resulting in a discharge, or potential discharge, to waters of the state prior to the effective date of the general permit for which a request for coverage is made.

"Facility" means the actual individual premises owned or operated by a "discharger" where process or industrial wastewater is discharged.

"FWPCA" means the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.), as now or as it may be amended.

"General permit" means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger.

"Gpd" means gallons per day.

"Grab sample" is synonymous with "discrete sample".

"Ground water" means any natural occurring water in a saturated zone or stratum beneath the surface or land or a surface water body.

“Hazardous waste" means those wastes designated by 40 CFR Part 261, and regulated by the EPA.

"Individual permit" means a discharge permit for a single point source or a single facility.

"Industrial wastewater" means water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feedlots, poultry house, or dairies. The term includes contaminated storm water and also, leachate from solid waste facilities.

“Irrigation System” means a controlled system consisting primarily of manmade canals, ditches, and ponds designed and operated for the delivery or management of water for irrigation purposes.

"mg/L" means milligrams per liter and is equivalent to parts per million (ppm).

"New operation" means an operation which commenced activities which result in a discharge, or a potential discharge, to waters of the state on or after the effective date of an applicable general permit.

"NPDES" means the National Pollutant Discharge Elimination System under section 402 of FWPCA.

"Operation" is synonymous with "facility".

"Party" means an individual, firm, corporation, association, partnership, copartnership, consortium, company, joint venture, commercial entity, industry, private corporation, port district, special purpose district, irrigation district, trust, estate, unit of local government, state government agency, federal government agency, Indian tribe, or any other legal entity whatsoever, or their legal representatives, agents, or assignee.

"Permit" means an authorization, license, or equivalent control document issued by the Department to implement Chapter 173-200 WAC, Chapter 173-216 WAC and/or Chapter 173-226 WAC.

"Person" is synonymous with "party".

"pH" means the logarithm of the reciprocal of the mass of hydrogen ions in grams per liter of solution. Neutral water, for example, has a pH value of 7 and a hydrogen-ion concentration of 10^{-7}. pH is a measure of a substance's corrosivity (acidity or alkalinity).

"Point source" means any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

"Pollutant" means any substance discharged, if discharged directly, would alter the chemical, physical, thermal, biological, or radiological integrity of the waters of the state, or would be likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to any legitimate beneficial use, or to any animal life, either terrestrial or aquatic. Pollutants include, but are not limited to, the following: dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, pH, temperature, TSS, turbidity, color, BOD_5, TDS, toxicity, odor and industrial, municipal, and agricultural waste.

"Priority pollutant" means those substances listed in the federal 40 CFR Part 423, Appendix A, or as may be amended.

"Process wastewater" means water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product.

"Reasonable times" means any time during normal business hours; hours during which production, treatment, or discharge occurs; or times when the Department suspects occurrence of a violation.

"Regional administrator" means the regional administrator of Region X of the EPA or his/her authorized representative.

"Retention" means the collection of water into a permanent storage device, with no subsequent release of water.

"Severe property damage" means substantial physical damage to property, damage to the pretreatment facilities or treatment/disposal facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays or losses in production.

"Shall" is mandatory.

"Significant" is synonymous with "substantial".

"Significant process change" means any change in a facility's processing nature which will result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or violate the terms and conditions of this general permit, including but not limited to, facility expansions, production increases, or process modifications.

"Site" means the land or water area where any "facility", "operation", or "activity" is physically located or conducted, including any adjacent land used in connection with such facility, operation, or activity. "Site" also means the land or water area receiving any effluent discharged from any facility, operation, or activity.

"Small business" has the meaning given in RCW 43.31.025(4).

"Standard Industrial Classification (SIC) Code" means a classification pursuant to the *Standard Industrial Classification Manual* issued by the U.S. Office of Management and Budget.

"State" means the State of Washington.

"Substantial" means any difference in any parameter including, but not limited to, the following: monitoring result, process characteristic, permit term or condition; which the Department considers to be of significant importance, value, degree, amount, or extent.

"Surface waters of the state" includes lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands, and all other surface waters and water courses within the jurisdiction of the state of Washington.

"Total suspended solids (TSS)" means total suspended matter that either floats on the surface of, or is in suspension in water or wastewater, expressed in mg/L.

"Toxic amounts" means any amount, i.e., concentration or volume, of a pollutant which causes, or could potentially cause, the death of, or injury to, fish, animals, vegetation or other desirable resources of the state, or otherwise causes, or could potentially cause, a reduction in the quality of the state's waters below the standards set by the Department or, if no standards have been set, causes significant degradation of water quality, thereby damaging the same.

"Toxics" means those substances listed in the federal priority pollutant list and any other pollutant or combination of pollutants listed as toxic in regulations promulgated by the EPA under section 307 of the FWPCA (33 U.S.C. 1317 et seq.), or the Department under Chapter 173-200 WAC, Chapter 173-201A WAC, or Chapter 173-204 WAC.

"µg/L" means micograms per liter and is equivalent to parts per billion (ppb).

"Unirrigated" means any lands having not been irrigated within 10 days prior to, or within 60 days after the application of any waste stream.

"Upset" means an exceptional incident in which a discharger unintentionally and temporarily is in a state of noncompliance with permit effluent limitations due to factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation thereof.

"Wastewater" means liquid-carried human wastes or a combination of liquid-carried waste from residences, business buildings, or industrial establishments.

"Waters of the state" means all waters defined as "surface waters of the state" and all waters defined as "waters of the state" in RCW 90.40.020.

"Water quality" means the chemical, physical, biological characteristics of water, usually in respect to its suitability for a particular purpose.

“Water Quality Preservation Area (WQPA)” means waters which have been designated as high quality waters based upon one or more of the following criteria:

1. Waters in designated federal and state parks, monuments, preserves, wildlife refuges, wilderness areas, marine sanctuaries, estuarine research reserves, and wild and scenic rivers;
2. Aquatic habitat having exceptional importance to one or more life stage of a candidate of listed priority species, established by the state Department of Fish & Wildlife, or a federally proposed or listed threatened or endangered species;
3. Rare aquatic habitat, ecological reference sites, or other waters having unique and exceptional ecological or recreational significance.

"Water quality standards" means the state of Washington's water quality standards for ground waters of the state (Chapter 173-200 WAC) and the state of Washington's water quality standards for surface waters of the state (Chapter 173-201A WAC).

In the absence of other definitions as set forth herein, the definitions as set forth in 40 CFR Part 403.3 shall be used for circumstances concerning the discharge of wastes.

APPENDIX C – LIST OF PERMITEES

The following entities have applied for coverage under this general permit (the corresponding city is in parentheses):

1. Cascade Irrigation District (Ellensburg)
2. Columbia Irrigation District (Kennewick)
3. East Columbia Basin Irrigation District (Othello)
4. Ellensburg Water Company (Ellensburg)
5. Kennewick Irrigation District (Kennewick)
6. Kittitas Reclamation District (Ellensburg)
7. Naches-Selah Irrigation District (Selah)
8. Quincy-Columbia Basin Irrigation District (Quincy)
9. Roza Irrigation District (Sunnyside)
10. Selah-Moxee Irrigation District (Moxee)
11. South Columbia Basin Irrigation District (Pasco)
12. Sunnyside Valley Irrigation District (Sunnyside)
13. Union Gap Irrigation District (Wapato)
14. Wenatchee Reclamation District (Wenatchee)
15. Westside Irrigating Company (Ellensburg)
16. Yakima-Tieton Irrigation District (Yakima)

In addition to these 16 entities, other irrigation districts in the state that may apply for coverage under the permit include:

Aeneas Lake Irrigation District (Tonasket)
Agnew Irrigation District (Carlsborg)
Ahtanum Irrigation District (Yakima)
Alta Vista Irrigation District (Okanogan)
Artesian Irrigation District (Walla Walla)
Badger Mountain Irrigation District (Kennewick)
Beehive Irrigation District (Wenatchee)
Benton Irrigation District (Benton City)
Black Sands Irrigation District (Moses Lake)
Blalock Irrigation District #3 (Walla Walla)
Blalock Orchard District #12 (Walla Walla)
Brewster Flat Irrigation District (Brewster)
Bridgeport Bar Irrigation District (Brewster)
Bridgeport Irrigation District #1 (Bridgeport)
Buena Irrigation District (Zillah)
Burbank Irrigation District #4 (Pasco)
Carnhope Irrigation District (Spokane)
Chelan Falls Irrigation District (Chelan)
Chelan River Irrigation District (Chelan)
Cline Irrigation District (Sequim)

Columbia Water & Power District (Paterson)
Consolidated Irrigation District #14 (College Place)
Consolidated Irrigation District #19 (Greenacres)
Eastside Irrigation District #6 (Touchet)
Entiat Irrigation District (Entiat)
Franklin County Irrigation District #1 (Pasco)
Gardena Farms Irrigation District #13 (Touchet)
Grandview Irrigation District (Grandview)
Greater Wenatchee Irrigation District (East Wenatchee)
Green Tank Irrigation District #11 (Walla Walla)
Hearn Irrigation District (Dayton)
Helensdale Reclamation District (Malott)
Highland Irrigation District (Sequim)
Hutchinson Irrigation District (Spokane)
Hydro Irrigation District (Walla Walla)
Icicle Irrigation District (Cashmere)
Isenhart Irrigation District (Chelan)
Kiona Irrigation District (Benton City)
Lake Chelan Reclamation District (Manson)
Lowden Irrigation District #2 (Lowden)
Lower Squilchuck Irrigation District (Wenatchee)
Lower Stemilt Irrigation District (Wenatchee)
Methow Valley Irrigation District (Twisp)
Millerdale Irrigation District (Wenatchee)
Moab Irrigation District #20 (Newman Lake)
Model Irrigation District (Spokane)
Moses Lake Irrigation & Rehabilitation District (Moses Lake)
Mud Creek Irrigation District #7 (Lowden)
Naches-Union Irrigation District (Yakima)
North Dales Irrigation District (Dallesport)
North Spokane Irrigation District #8 (Spokane)
Okanogan Irrigation District (Okanogan)
Orchard Avenue Irrigation District #6 (Spokane)
Orchard Irrigation District #10 (Walla Walla)
Oroville-Tonasket Irrigation District (Oroville)
Palisades Irrigation District (East Wenatchee)
Pasadena Park Irrigation District #17 (Spokane)
Peshastin Irrigation District (Cashmere)
Sequim Dungeness Valley Water Users (Sequim)
Sequim Prairie Tri Irrigation Company (Sequim)
South Naches Irrigation District (Nahes)
Stemilt Irrigation District (Wenatchee)
Terrace Heights Irrigation District (Yakima)
Touchet Valley Irrigation District #16 (Waitsburg)
Trentwood Irrigation District #3 (Spokane)
Vera Water and Power (Veradale)
Walla Walla Water & Power District #18 (Walla Walla)
Wenatchee Heights Reclamation District (Wenatchee)

Wenatchee-Chiwawa Irrigation District (Leavenworth)
West End Irrigation District (Dayton)
White Salmon Irrigation District (White Salmon)
Whitestone Reclamation District (Loomis)
Wolf Creek Reclamation District (Winthrop)
Yakima Reservation Irrigation District (Yakima)
Zillah Irrigation District (Zillah)

APPENDIX D – DATA USED TO DETERMINE DOCUMENTED PRESENCE OF SALMONIDS

Note: On the electronic version of this fact sheet, Appendix D is a separate file.