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Part B: High Rate Land Treatment of Wastewater

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9. Rapid Infiltration Land Application Permitting Guidance

In 1996, the *Interpretive Supplement* was published within a comprehensive guidance document entitled *Handbook for Land Application of Municipal and Industrial Wastewater*. Guidelines were established for slow rate land application systems. Rapid infiltration (RI) systems are allowed under the *Wastewater Land Application Rules*, but with the promulgation of the *Ground Water Quality Rule* and other technical questions, additional guidance is needed to assist permit writers and the regulated community in understanding criteria for designing and permitting rapid infiltration systems.

9.1 Guidance and Regulations for Rapid Infiltration

EPA identified rapid infiltration systems in the mid-70s, as effective alternative treatment for municipal wastewater. Design criteria and methods are presented in the U. S. Environmental Protection Agency (EPA) documents, *Process Design Manual: Land Treatment of Municipal Wastewater*, 1981, and *Process Design Manual: Land Treatment of Municipal Wastewater, Supplement on Rapid Infiltration and Overland Flow, 1984*. These documents have generally been applied in designs for Idaho rapid infiltration systems.

From the *Wastewater-Land Application Permit Rules* (IDAPA 58.01.17), Rapid Infiltration Systems are to be permitted:

- 200.15. Definition: Rapid Infiltration System. A wastewater treatment method by which wastewater is applied to land in an amount of twenty (20) to six hundred (600) feet per year for percolation through the soil. Vegetation is not generally utilized by this method. (4-1-88)
- 600.06. Rapid Infiltration Systems. The following minimum treatment requirements are established for land application of wastewater. (4-1-88)
    a. Suspended solids content of wastewater, which includes organic and inorganic particulate matter shall not exceed a thirty (30) day average concentration of one hundred (100) mg/l. (4-1-88)
    b. Nitrogen (total as N) content of wastewater shall not exceed a thirty (30) day average concentration of twenty (20) mg/l. (4-1-88)

9.2 Site Specific Permitting Considerations

There are three (3) ground water/surface water scenarios encountered when considering the regulation of rapid infiltration systems.

Scenario 1: Rapid infiltration systems having surface water impacts only. These systems are generally found very close to natural surface waters. Any local ground water discharges to the surface water entirely. There are no ground water uses between the basin and the receiving water. *Water Quality Standards and Wastewater Treatment Requirements*, IDAPA 58.01.02, apply. A *National Pollutant Discharge Elimination System* (NPDES) permit would be the most appropriate permitting mechanism. If EPA is unable or unwilling to issue a NPDES permit, a *Wastewater Land Application Permit* should be issued that adequately protects the surface water. Consideration should be given to surface water monitoring upstream and downstream for parameters of concern, vadose zone monitoring to determine degree of treatment, and monitoring the wastewater as it enters the basin.

Scenario 2: Rapid Infiltration systems having ground water impacts only. Most ground water eventually discharges to surface water, however, if the affected surface water is more than 1,320 feet from the rapid infiltration system, the system would be assumed to have ground water influences only and be included in this scenario. Additionally, if there is any diversion or reasonable potential diversion of the ground water, it would be included in this scenario. In this case, the *Ground Water Quality Rule*, IDAPA 58.01.11, governs the impacts to the ground water. A Wastewater Land Application Permit should be issued. Ground water monitoring wells are required to determine impacts.

Scenario 3: Rapid Infiltration systems impacting both ground water and surface water. In this scenario it may be necessary to issue an NPDES permit and a Wastewater Land Application Permit. Elements of Scenario 1 and Scenario 2 would be incorporated into the Wastewater Land Application Permit and NPDES permits. If EPA issues an NPDES permit, it may be possible to include monitoring and permit limits for ground water concerns in the NPDES permit.

Existing facilities: Certain existing facilities that have NPDES permits were not required to obtain a Wastewater Land Application Permit. These facilities should be evaluated to determine which Scenario would be appropriate. If they are determined to be Scenario 1, DEQ will rely on the NPDES Permit process. Most likely these facilities would not be Scenario 2 since an NPDES permit presumes some surface water impact, but they might fall into the Scenario 3 scenario. If this is the case, the facility is required to obtain a Wastewater Land Application Permit unless the NPDES permit can be modified to satisfy wastewater land application issues. Since there is some time required for application preparation, permit processing, and construction, a consent order may be the appropriate mechanism to enable the facility to evaluate their situation and comply with the regulations. The Director may issue a waiver to the facility to exempt them from obtaining a Wastewater Land Application Permit, as provided in the Act.

9.3 References

EPA. U.S. Environmental Protection Agency. October 1981. Process Design Manual - Land Treatment of Municipal Wastewater, 625/1-81-013.

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Part C: Other Reuse

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12. Other Regulatory Requirements Associated With Wastewater Land Application Facilities

This handbook focuses on applying wastewater to the land surface and the permit program that manages this land use activity. However, while issuance of a wastewater-land application permit is essential, it is also important for permittees and their consultants to be aware of other relevant environmental considerations associated with a given wastewater-land application site and system to knowledgeably plan and anticipate issues of concern.

An overview of the "big environmental picture" associated with a land application system involves many interrelated issues, such as protection of public health and public safety, prevention and resolution of nuisances, protection of ground water quality, and conservation of ground and surface water supplies to name a few. Most issues or potential sources of contamination are managed by programs that may either be: (1) regulatory, or those based on numerical standards, narrative standards, rules, permits or other mandated features, or (2) non-regulatory, or those based on guidance, management strategies, education and technical assistance or other voluntary efforts suited to the potential source(s) of contamination.

The wastewater-land application permit is just one of several that need to be considered by each company before doing business in Idaho. In addition to the wastewater-land application permit, each permittee should consider the full complement of applicable state and local rules and regulations for the jurisdiction in which their wastewater-land application facility is located. While the Department of Environmental Quality (DEQ) wastewater-land application permit assures the WLAP permittee that the wastewater-land application treatment system has been approved for operation, the WLAP permit is not intended to imply compliance with other local and state rules or regulations.

A list of relevant environmental considerations has been compiled as an informational tool for the WLAP applicant and permittee. This list includes local, state and federal requirements and is not intended to be exhaustive for every location in the state or to distinguish which requirements apply to new facilities versus modifications on existing facilities, but rather provides general information to help direct the permittee to the appropriate contact agencies.

12.1 Domestic Sewage Disposal

Sanitary wastes or domestic sewage wastes generated by a facility can be included with the industrial waste stream and land applied. If combined with industrial wastewater, the sanitary wastes must be addressed as part of the wastewater-land application system permit. Combined sanitary and industrial waste streams typically have to meet the buffer zone distances for municipal wastewater.

If the sanitary wastes are disposed of separately from the wastewater-land application treatment system, then the method of treatment determines the contact agency. If an individual or community subsurface sewage disposal system (septic tank/drainfield) is

the treatment method of choice, then the local District Health Department should be contacted for permitting requirements. Application must also be made and a replacement permit issued by the District Health Department in the event of a subsurface sewage system failure.

If an above ground sewage disposal system, such as a lagoon or connection into a municipal sewage plant, is the treatment method of choice, then DEQ should be contacted.

12.2 Plan and Specification Reviews

Idaho Code 39-118 states that all plans and specifications for the construction of new sewage systems, sewage treatment plants or systems, other waste treatment or disposal facilities, public water supply systems or public water treatment systems or for modification or expansion to existing sewage treatment plants or systems, waste treatment or disposal facilities, public water supply systems or public water treatment systems, shall be submitted to and approved by DEQ before construction begins. This review can be coordinated through the land application permit process for new systems.

12.3 Non-Contact Cooling Water

The Wastewater-Land Application Permit Regulations' definition for wastewater (IDAPA 58.01.17.200.19) specifically excludes non-contact cooling water as a component of wastewater and as such, non contact cooling water is not included in the wastewater loading conditions of the WLAP permit. However, a permit to discharge non-contact cooling water to surface water is required by the *National Pollutant Discharge Elimination System* (NPDES) Program administered by EPA. Non-contact cooling water may be used as a supplemental source of irrigation water and as such may be applied to some or all of the same fields as the wastewater is being land applied. Non-contact cooling water may also be discharged into shallow or deep underground injection wells in accordance with the *Rules for Construction and Use of Injection Wells* as administered by the Department of Water Resources (IDAPA 37.03.03).

12.4 Water Appropriations and Allocations

Long term use of water supplies requires receipt of specific water rights from the Idaho Department of Water Resources. Water rights should be obtained for every domestic or irrigation well. Established water rights may benefit a facility or permittee, particularly if competing uses for the same water becomes an issue at some point in time. If irrigation water is derived from a reservoir and canal (surface water) system rather than ground water wells, then the water rights reside with the owner or owners' designee for a privately owned surface water system or, with the Bureau of Reclamation for a federal reclamation irrigation project. The Bureau of Reclamation or private owner contracts with the irrigation district(s) for the water stored in the reservoir and the irrigation districts then contracts with individual property owners. Magic Reservoir or Mackay

Reservoir are two examples of privately owned reservoir systems, while Cascade Reservoir is an example of a federally administered project.

Many wastewater-land application sites and systems also need a source of fresh water to supplement the wastewater being applied for crop production. If supplemental water is needed for the system, then documentation of an established water right should be submitted with the wastewater-land application permit application.

12.5 Disposal of Truck Wash Sand & Grit Sumps, Grease Traps and Other Miscellaneous Small Volume Waste/Wastewater

Wastes generated by truck washing operations or maintenance shops typically originate from sand and grit sumps, which need periodic cleaning and disposal. Likewise, grease and other floatable wastes are often separated from the main waste stream and collected in a grease trap, which needs routine maintenance and cleaning. This type of small volume waste may be addressed as part of the wastewater land application permit if desired by the permittee. When combined as part of the wastewater land application permit, the permittee is responsible for submitting pertinent information on any miscellaneous small volume waste or wastewater as part of the WLAP permit application materials to DEQ.

If the miscellaneous small volume waste/wastewater is disposed of separately from the wastewater-land application treatment system, then often those wastes are physically pumped from some type of holding area into a watertight tank truck or equivalent and transported to a location off site approved for treatment and disposal.

12.6 Sludge Management

Municipal sludge must be managed according to 40 CFR Part 503-*Standards for the Use and Disposal of Sewage Sludge*. Requirements reflecting these rules are a part of every NPDES permit issued by EPA to a publicly owned wastewater treatment plant. Municipalities should be in contact with DEQ for approval of sludge treatment and disposal methods.

Industrial sludge is exempted from the requirements of 40 CFR Part 503. Instead, industrial sludge is managed in accordance with the *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02.650) administered by DEQ or by the District Health Departments if the industrial sludge meets the definition of a non municipal solid waste.

12.7 Discharges to Surface Waters

The National Pollutant Discharge Elimination System (NPDES) program was established by Section 402 of the Clean Water Act. An NPDES permit is required for any direct discharge to surface (navigable) waters of the state or waters of the United States from new or existing sources.

Since EPA has permitting authority for the NPDES program in Idaho, the EPA Idaho Operations Office in Boise should be contacted for permitting information on any type of point source discharge from a facility. EPA then coordinates with DEQ for regional input on each NPDES permit issued.

12.8 Designated Special Resource Waters or Sole Source Drinking Water Aquifers

On January 1, 1995, the Spokane Valley-Rathdrum Prairie Aquifer was designated as a special resource *ground* water in Idaho. A special guidance document has been developed that has specific recommendations for wastewater-land application treatment systems on this aquifer. The *Special Supplemental Guidelines for Spokane Valley-Rathdrum Prairie Aquifer Wastewater Land Application* can be found in Section 12.11.1. This guidance is intended to work in conjunction with the Wastewater-Land Application Permit Regulations and other guidance.

Existing permitted facilities, or entities anticipating applying for a WLAP permit that will be located over the Spokane-Valley Rathdrum Prairie Aquifer, should direct questions to DEQ's North Idaho Regional Office in Coeur d'Alene at (208) 769-1422.

12.9 Ongoing Education

To maximize ground water protection while achieving and maintaining the most efficient and cost effective wastewater-land application treatment system requires ongoing education. It is important that the public and regulated community is informed about the reasons for preventing contamination, the activities of a land application system that may lead to ground water contamination and ways to prevent ground water contamination from a specific and unique land application site. An informed public and regulated community are more likely to work together to prevent contamination voluntarily and without the need for as much regulatory oversight.

Participating in educational opportunities should help to inform and enhance networking for both industry and the state. Currently, classes and conferences on issues related to the land application of wastewater are available from a variety of sources, including DEQ and as well as contractors. Other educational opportunities exist through the individual or joint efforts of DEQ and the regulated community such as bringing technical expert(s) in periodically to teach classes or seminars on Land Application of Wastewater or related topics such as how land application activities can impact ground water or finding the balance between resource protection, economic development and societal needs.

12.10 References

IDHW-DEQ. Idaho Department of Health and Welfare, Division of Environmental Quality. January 1995. Special Supplemental Guidelines: Spokane Valley-Rathdrum Prairie Aquifer Wastewater Land Application. 18 pages.

12.11 Supplemental Materials

12.11.1 Wastewater Land Application Sites Overlying Designated Special Resource Water

The Ground Water Rule, IDAPA 58.01.11.006, establishes policies to protect ground water quality, maintain beneficial uses, differentially protect ground water, and establish numerical and narrative ground water quality standards. IDAPA 58.01.11.300.01a designates the Spokane Valley – Rathdrum Prairie Aquifer as a sensitive resource. IDAPA 58.01.11.150.02 (Table 1) prescribes the highest level of protection for this aquifer category.

12.11.1.1 Land Application of Wastewater Over the Spokane Valley-Rathdrum Prairie Aquifer

Wastewater-land application systems overlying designated sensitive resource water may require additional considerations prior to permit issuance to assure the integrity of the special resource water remains intact. These considerations include but are not limited to: an in-depth evaluation of the nutrient transport to the sensitive resource water if the land application system recharges the sensitive resource water, background information on limiting nutrients in the sensitive resource water, and a design approach for limiting the nutrient transport to the sensitive resource water. This includes calculation of the nitrogen and phosphorus balance and calculation of loss to ground water.

To date, the sensitive resource water designation has rarely been used for ground water. However, extensive work has and is continuing to be done in North Idaho on land application systems overlying the SpokaneValley-Rathdrum Prairie Ground Water Aquifer.

12.11.1.2 Guideline Development

The CH_2M-Hill "Rathdrum Prairie Land Application Feasibility Study" was published in November 1990. Based on the information from this feasibility study, a pilot project was conducted and a report (Hayden Land Application Pilot Study) published in June 1994 by CH_2M-Hill and J. A Riley. The information from these two reports and the status of the Spokane Valley-Rathdrum Prairie as a state designated sensitive resource water, and a federally designated sole source drinking water aquifer, resulted in EPA providing grant monies for the development of guidelines. The guidelines are to specifically address the land application of wastewater over the Spokane Valley-Rathdrum Prairie Aquifer. The guidelines were developed by a Technical Advisory Group in cooperation with DEQ's North Idaho Regional Office.

Special Supplemental Guidelines

Spokane Valley-Rathdrum Prairie Aquifer
Wastewater Land Application

January, 1995

Idaho Department of Health and Welfare
Division of Environmental Quality

Spokane Valley-Rathdrum Prairie Aquifer Wastewater Land Application
Special Supplemental Guidelines

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Spokane Valley-Rathdrum Prairie Aquifer Wastewater Land Application Special Supplemental Guidelines

CONTENTS (continued)

Part 1: The Spokane Valley-Rathdrum Prairie Aquifer

THE SPOKANE VALLEY-RATHDRUM PRAIRIE AQUIFER

This document sets guidelines for managing one of the pollution sources of the Spokane Valley-Rathdrum Prairie Aquifer: municipal wastewater. The guidelines establish conditions under which secondarily-treated municipal wastewater can be spray irrigated over the aquifer in Idaho without causing contamination to the groundwater.

The Spokane Valley-Rathdrum Prairie Aquifer lies below the surface of about 325 square miles of north Idaho and eastern Washington, and is the sole source of drinking water for the region's 400,000 people. The aquifer is composed of glacial outwash soils, making it extremely permeable, high in groundwater velocity and susceptible to contamination. Unfortunately, the vulnerability of the resource has been proven with detections of nitrates, industrial solvents and pesticides in public water supply wells. Despite many protection efforts, a few water supply wells have had to be abandoned.

Coeur d'Alene Lake and the Spokane River contribute about one-third of the flow of the aquifer. The Hayden, Spirit, Twin, Hauser and Blanchard lake watersheds make up most of the additional flow crossing the state line. At the Idaho/Washington border, total flow is estimated to be 750 cubic feet per second or 485 million gallons per day. The movement of water particles ranges from less than a foot to almost 50 feet per day, as it flow west from Idaho into Washington. The depth to the water table varies from 400 feet to only 50 feet at some points in Washington.

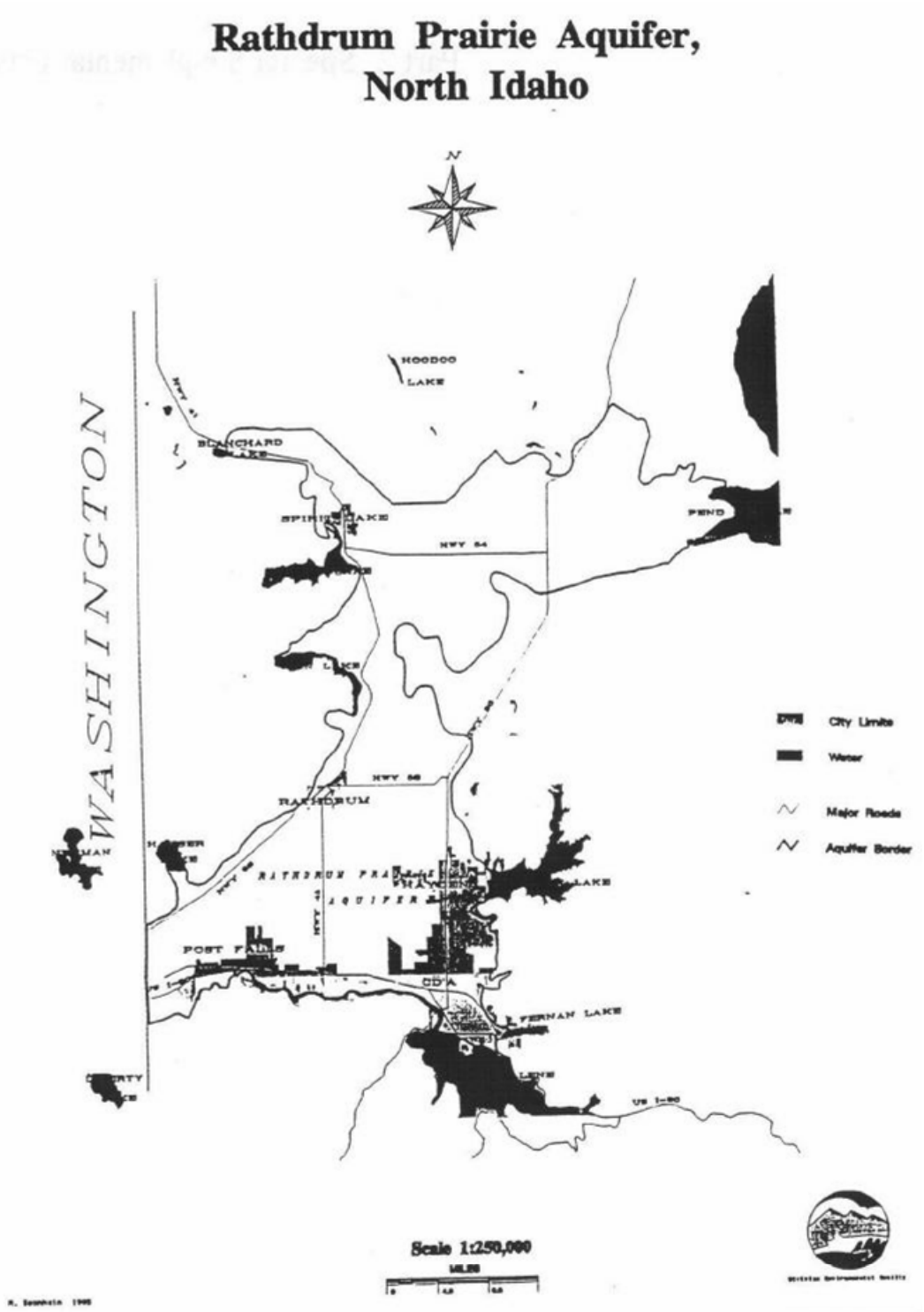
In 1978 the Spokane Valley-Rathdrum Prairie Aquifer was declared a "sole source" drinking water supply pursuant to Section 1424e of the Safe Drinking Water Act. This designation requires all projects receiving any federal funding to implement aquifer protection measures. In addition, it proclaimed the significance of this groundwater resource to the region as well as provided support for local protection efforts.

An aquifer protection project, administered in Idaho by the state Department of Health and Welfare, Division of Environmental Quality (DEQ) and the Panhandle Health District, has been in place for many years. The overriding premise for the protection project is this: Prevent contamination before it occurs. The goal is to avoid contamination and remediation, which can be extremely costly. To do this, the project has programs which can be divided into three main categories: 1) Managing pollution sources; 2) Promoting public awareness; and 3) Coordinating and cooperating with other public agencies.

The Special Supplemental Guidelines for land application over the Rathdrum Aquifer fall into the category of "managing pollution sources." Studies in the 1970s found that 60 percent of all aquifer pollutants were from sub-surface septic systems and 30 percent were from stormwater. The remaining 10 percent resulted from chemical and petroleum products.

To address the problem of septic discharges, the Panhandle Health District in 1977 adopted a regulation limiting new construction to one house per five acres over the aquifer. Higher housing densities are allowed in Sewage Management Areas (SMA). The health district enters into legally binding agreements cities and sewer districts over the aquifer to establish boundaries for SMAs. The cities agree to provide sewer to the higher density developments.

Since 1977, sewer construction has helped to mitigate aquifer contamination. There are now three municipal wastewater treatment plants treating the area's sewage and discharging effluent to the Spokane River. However, the river is reaching its assimilative capacity. The land application guidelines were developed to give the growing cities over the Rathdrum Aquifer another option for sewage disposal, while still maintaining high quality drinking water for the region's residents.


Rathdrum Prairie Aquifer,
North Idaho
N
WASHINGTON
HOODOO LAKE
BLANCHARD LAKE
PEND
HWY 54
HWY 53
RATHDRUM
POST FALLS
COEUR D'ALENE
FERNAN LAKE
City Limits
Water
Major Roads
Aquifer Border
Scale 1:250,000
MILES

Part 2: Special Supplemental Guidelines

I. Introduction

A. Intent and Goals

This document is an appendix to the ***Interpretive Supplement to the "Guidelines for Land Application of Municipal and Industrial Wastewater, March, 1988"*** (***Supplement***) prepared by the Permits and Enforcement Bureau, Division of Environmental Quality, Idaho Department of Health and Welfare. The intent of this document is to present specific guidelines for the design and operation of wastewater land application facilities located over the Spokane Valley-Rathdrum Prairie Aquifer (Rathdrum Aquifer). The goal of this document is to provide an environmentally sound wastewater treatment and disposal alternative for communities near and over the Rathdrum Aquifer. This document will be reviewed and revised on a regular basis.

B. Special Resource Water and the Idaho Water Quality Standards

The Rathdrum Aquifer is designated a Special Resource Water under the ***Idaho Water Quality Standards and Wastewater Treatment Requirements***. Special Resource Waters are specific segments or bodies of water recognized as needing intensive protection to preserve outstanding characteristics or to maintain current beneficial use. The ***Idaho Water Quality Standards and Wastewater Treatment Requirements*** (IDAPA 58.01.02.299.01) specifically states:

> "The waters of the Spokane Valley-Rathdrum Prairie Aquifer, as described by the US Environmental Protection Agency in its designation as a 'sole source' aquifer under Section 1424(e) of the Safe Drinking Water Act, must not be lowered in quality, as relates to appropriate beneficial uses, as a result of a point source or non-point source activity unless it is demonstrated by the person proposing the activity that such change is justifiable as a result of necessary economic or social development." (1-30-80)

In 1990 the Idaho Division of Environmental Quality (DEQ) selected a consultant to study application of secondary treated municipal wastewater to the land surface located above the Rathdrum Aquifer. The completed report entitled ***Rathdrum Prairie Land Application Feasibility Study*** was cautiously optimistic that land application is an environmentally sound alternative for wastewater treatment over the Rathdrum Aquifer. Although the report stated that potential contaminants may be present in the wastewater, it suggested that a properly designed, sited and operated system could minimize contaminant migration, producing minimal ground water degradation.

In 1993 the Idaho Division of Environmental Quality (DEQ) commissioned a consultant to report on a wastewater land application pilot study over the Rathdrum Aquifer. This cooperative project between DEQ, the Hayden Area Regional Sewer Board and Spokane County was conducted to demonstrate land application

technology and to obtain environmental data to improve the accuracy of the impact assessment and, ultimately, to determine the feasibility of using land application over the Rathdrum Aquifer as a permanent solution to wastewater treatment and disposal. The result of this work, the ***Hayden Land Application Pilot Study***, provides the information necessary to comply with the water quality regulations for initially establishing best management practices specific to land over the Rathdrum Aquifer.

C. Acknowledgements: Rathdrum TAC and the CH_2M-Hill Report

These supplemental guidelines are based on work conducted between 1990 and 1994 as a cooperative effort between the Hayden Area Regional Sewer Board (HARSB), the Division of Environmental Quality (DEQ), Spokane Water Quality Management Program and select individuals who served on a Technical Advisory Committee (TAC). A consulting firm, CH_2M-Hill, prepared the feasibility study, subcontracted site monitoring to Dr. John Riley, and presented the final data interpretation and report in cooperation with Dr. Riley.

The Hayden Area Regional Sewer Board (HARSB) purchased the center pivot irrigation equipment for applying wastewater and provided the piping to the pilot study field. DEQ and Spokane County, through EPA grant awards, funded the consultant to monitor and report on the pilot study site. The pilot study site was operated as a cooperative effort in the 1992 and 1993 growing seasons. At the direction of the TAC, the final pilot study report, including conclusions and recommendations, was published in June 1994. All consulting work was completed by CH_2M-Hill and its subconsultant, Dr. John Riley. The HARSB and its consultant, Kimball Engineering, are recognized for their efforts and contributions in helping make this project possible.

The Technical Advisory Committee was created in May 1991 to provide guidance to DEQ regional office staff in crop selection, center pivot system operation, soil moisture monitoring, and numerous other technical areas. Frequency of meetings depended on the amount of site activity and varied from monthly, at the start of the project, to about twice a year in late 1993 and 1994. The technical advice and direction from the TAC made the project a success. The members of the Technical Advisory Committee are acknowledged below. Their help has been greatly appreciated.

Rathdrum Aquifer Land Application Technical Advisory Committee Members

Dick Jacquot (Farmer on Land Application Site) - Kootenai County Soil Conservation District
Ken Babin - Panhandle Health District
David Brown and Kim Golden - USDA, Soil Conservation Service
Vickie Parker-Clark - University of Idaho Cooperative Extension Service
Stan Miller - Spokane County Public Works
Jonathan Williams - US EPA, Region X
Jim Kimball and Mike Wilson - Kimball Engineering (Hayden Area Regional Sewer Board)

Dale Arnold - City of Spokane, Environmental Programs Department
Dr. John Riley - Consulting Hydrogeologist (Consultant)
Larry Comer - Welch, Comer Engineers (Kootenai Perspectives Representative)

D. Pilot Study Report Conclusions and Recommendations

CH_2M-Hill's report, ***Hayden Land Application Pilot Study***, presented the following conclusions and recommendations:

Conclusions

1. Land application of treated effluent has occurred over the Rathdrum Prairie Aquifer under carefully managed conditions with limited increases for monitored constituents in vadose zone water.

2. Irrigation scheduling using daily soil moisture measurements can be used to minimize migration of nutrients past the root zone.

3. Nutrients can be applied with wastewater effluent with little or no observable migration beyond the root zone of the crops.

4. The tradeoffs between crop production and fertilizer use should be evaluated for each site considering the potential for nutrient migration and the need to establish and maintain vigorous crops.

5. Crop selection is critical to the successful operation of a land application system.

Recommendations

1. Limit the hydraulic loading rate to the mean monthly crop water requirement.

2. Limit nitrogen to crop nitrogen requirements.

3. Select deep rooting crops with high uptake rates.

4. Apply effluent with an irrigation system that is well maintained and efficient in distributing water evenly across the site.

5. Assess the site soils, hydrology, and climate.

6. Prepare a management plan that integrates effluent management with suitable agricultural best management practices (BMPs).

7. Phosphorus should also be monitored, but annual application rates need not be limited to agronomic rates.

8. To determine acceptability of loading rates beyond the agronomic rates recommended, additional studies are needed.

II. Wastewater Land Application

A. Types of Wastewater Land Application Allowed

Slow rate wastewater land application systems located over the Rathdrum Aquifer are allowed when designed and operated in accordance with these guidelines. "Slow rate" application is a controlled distribution of wastewater to the land surface by spraying or surface spreading to support plant growth. Treatment is accomplished through physical, chemical and biological processes occurring in the plant/soil matrix. Overland flow and rapid infiltration land application systems are not allowed over the Rathdrum Aquifer.

B. Application Season

The season for wastewater land application over the Rathdrum Aquifer will be limited to the period when the specific crop water requirement exceeds the average monthly precipitation. Climatic conditions in the Rathdrum Prairie area generally restrict land application to the period: May 1 to October 31. The hydraulic requirements of specific crops may further shorten the application season.

C. Precipitation and Climate

The Rathdrum Prairie area is generally subhumid with warm, dry summers and cold, wet winters. The average annual precipitation is about 26 inches in the Coeur d'Alene area; but significant local variation is present, particularly west across the prairie near the state line where reported annual precipitation is about 20 inches.

When designing a land application facility, effective precipitation, rather than precipitation values, should be used. "Effective precipitation" is a calculated value (see the ***Supplement***) that represents the precipitation during the crop-growing season that is available to meet the consumptive water requirements of the crop.

D. Crop Selection

The site crop is a critical element of a successful land application system over the Rathdrum Aquifer, and each land application system should have a Crop Management Plan. The Crop Management Plan should include:

1. Selection criteria should be related to soil parameters and management capacities. Deep rooting crops are recommended. Possible crops include alfalfa, grass hay, small grains, turf grass, and poplar trees. Consultation with agronomic experts, such as the County Extension Service, is recommended.

2. Harvest schedule should be established and related to wastewater production and storage. For example, the harvesting practice for bluegrass precludes application from about mid-June until mid-August, making this an unsuitable

sole crop for a municipal land application site where flows are constant or higher in the summer or when sufficient wastewater storage is unavailable.

3. Hydraulic requirements for each crop should be included. Limited crop hydraulic information may be found in the ***Supplement***.

4. Nutrient requirements for each crop should be established. Since wastewater cannot provide enough nutrients for crop sustainability, supplemental nutrients should be provided. Studies have shown that frequent application of low fertilizer concentrations during the active plant growing periods are more effective than large, infrequent fertilization in limiting nutrient migration through the soil profile. Fertilizer type, application rate and application frequency should be established in the Crop Management Plan; and any changes should be reviewed and approved by DEQ.

5. Rotation schedule for each crop should be provided, when applicable.

6. Pest control strategy for each crop should be established. Pesticide type, application rate and application frequency should be established in the Crop Management Plan; and any changes should be reviewed and approved by DEQ.

E. Application Rates

The total application of water from all sources on wastewater land application sites located over the Rathdrum Aquifer is limited to the crop water requirement. The water used to satisfy the crop water requirement, also called the crop evapotranspiration, may include: precipitation, irrigation water (ground water and/or surface water), and treated wastewater.

crop water requirement = precipitation + irrigation water + treated wastewater

For wastewater land application sites located over the Rathdrum Aquifer, the hydraulic loading rate is identical and equal to the crop water requirement. The actual daily application volumes may vary daily and are affected by crop type, plant growth cycle, precipitation, evaporation, and available water capacity of the soil.

1. Design application rates: For initial design, the wastewater application rate will be the estimated crop water requirement minus the effective precipitation based on a 5 to 10 year precipitation recurrence. The results of a statistical analysis of precipitation in the Coeur d'Alene area from 1950 through 1993 (taken from an unpublished 1994 DEQ document "Coeur d'Alene Precipitation Analysis and Recommended Precipitation Values for Wastewater Land Application on the Rathdrum Prairie") are provided in the following table:

Recommended Design Precipitation Values for Rathdrum Prairie Sites
(based on 1950 - 1993 Coeur d'Alene area data)

Month	Average Precipitation	Design Precipitation	Recurrence Period
May	1.99"	3.15"	6.7 years
June	2.00"	3.04"	5.4 years
July	0.86"	1.65"	6.1 years
August	1.24"	2.32"	6.3 years
September	1.11"	1.79"	6.1 years

2. Supplemental irrigation: Since 5 to 10 year recurrence precipitation values are used to compute design wastewater application rates, in most years supplemental irrigation of the crop will be needed to insure vital plant growth. Supplemental irrigation can be treated wastewater, agricultural irrigation water, or a combination of the two.

3. Daily application rates: For daily operations, soil moisture instrumentation will be used to determine application rates and frequency. Soil moisture instrumentation will be installed on the site and will be monitored daily during the application season. The initial soil moisture threshold is 10 centibars, and wastewater application is allowed only when the soil moisture value (in centibars) as measured by the site instrumentation is equal to or drier than the threshold. Wastewater will not be applied when the soil moisture value (in centibars) as measured by the site instrumentation is wetter than the threshold value, except during periods of extreme climatic conditions. Threshold values wetter than 10 centibars may be approved by DEQ if satisfactory scientific evidence is presented that the lower values will not increase wastewater movement past the root zone.

4. Extreme climatic conditions: During months when precipitation exceeds the 5 to 10 year recurrence design precipitation values, wastewater may be applied at the design rate even if the soil moisture levels are high or saturated soil conditions are present.

F. Nutrient Loadings

1. Nitrogen will be limited to the crop nitrogen requirements. For most crops, nitrogen sources are wastewater and fertilizers. The nitrogen application rate should include a fraction above crop uptake to allow for losses that occur in the soil. The fraction should be based on soil and soil water testing, but may initially be 10%-20%. Since nitrate is more

mobile than other forms of nitrogen, if it is used, then soil moisture monitoring should be used to schedule irrigation and limit conditions that enhance leaching.

2. Phosphorous should also be monitored, but phosphorous application rates are not limited to the crop requirements. Most soils have a generous, but not unlimited, capacity to absorb phosphorous and limit its mobility. However, since this capacity is finite, the soil phosphorous level should be monitored to ensure the soil capacity is not exceeded.

G. Higher Application Rates

To determine acceptability of wastewater application rates beyond the rates recommended, additional studies are needed. The extent of the studies will depend on loading rates, nutrient forms, site specific conditions, and management objectives. For example, the form and concentration of nitrogen plays a significant role in evaluating application rates. Application of effluent at rates above monthly hydraulic rates may be practical if nitrogen is in the form of ammonia. However, because of concerns regarding leaching of synthetic organics and other environmental contaminants without sufficient treatment, an extensive study may be justified. These studies may include:

- More extensive and frequent effluent monitoring
- Unsaturated zone monitoring below the root zone
- Ground water monitoring
- Crop suitability

Application rates beyond the recommended values may be acceptable if additional technical information and studies are provided that substantiate aquifer protection.

H. Commercial/Industrial Wastewater

Land application of commercial or industrial wastewater on the Rathdrum Prairie is not allowed. Exceptions may be granted only if the constituents and concentration levels in the industrial/commercial wastewater do not vary significantly from treated municipal wastewater.

III. Site Selection Criteria

A. General

The evaluation of a site as a potential wastewater land application area requires consideration of a number of related site specific elements. An unacceptable evaluation on just one site element is sufficient to eliminate that site from consideration. Although the major site characteristics are discussed in this section, other site specific elements should also be considered and evaluated as warranted.

B. Soil

Not all soils over the Rathdrum Aquifer are suitable for land application of wastewater. Excessively stony and drained soils, such as the Garrison very stony silt loam, show poor potential for land application treatment of wastewater and should be avoided. Water holding capacity of the soil is a critical factor in applying wastewater without carrying nutrient load below the root zone. Soils that are excessively drained often do not have the capacity to hold the wastewater load long enough for the plants to extract nutrients. The result is poor crop production and excessive leaching.

Sites with soil classifications having good soil moisture holding capacity will be considered for permitting. A soil survey of the proposed site that includes test borings and soil classifications should be performed by a qualified soil scientist. Past cropping history of the site will also give an insight into the soil type and water holding capacity. Therefore, this information should also be submitted with an application.

C. Buffer Zones

The buffer zone for wastewater land application sites over the Rathdrum Aquifer will be as specified in the ***Supplement***, Table 3 - Municipal Wastewater Buffer Zone Treatment Sites. The development potential near potential land application sites will be considered: sites in "rural" areas that have a potential of being adjacent to "suburban or residential" uses will be evaluated for buffer zones according to the other uses.

D. Land Use

Land use suitability determination for a wastewater land application site is the responsibility of local government. Anyone proposing a wastewater land application project over the Rathdrum Aquifer should inform the responsible planning and zoning department and obtain preliminary zoning approval prior to submitting an application to DEQ. Wastewater land application projects may be allowed in an agricultural or rural zoning, but such projects in other zone classifications may require a conditional use permit and may require a public hearing. Public meetings to present the proposed land application project to neighbors and the community are recommended.

E. Wellhead Protection

The well head protection zone for wastewater land application sites over the Rathdrum Aquifer will be as specified in the ***Supplement***, Buffer Zones - Wellhead Protection. Drinking water wells closer than 100 feet to the land application site are not allowed. Wells between 100 feet and ¼ mile from the land application site are considered within the influence zone of the site and should be evaluated according to the ***Supplement*** by a qualified hydrogeologist or professional engineer with appropriate expertise.

IV. Wastewater Lagoons

A. General

Wastewater treatment systems near the Rathdrum Aquifer may be classified into two categories: single outfall systems and multiple outfall systems. Single outfall systems, such as Spirit Lake, use land application exclusively and, therefore, should completely contain all treated wastewater for treatment and disposal during the application season. Multiple outfall systems, such as Hayden, use an outfall to surface water during the non-growing season. Wastewater lagoon design for either system type should be based on a detailed monthly water balance.

B. Single Outfall Systems

Single Outfall Systems should have storage lagoon volume to completely store treated wastewater for the 6 - 7 month period when land application is not allowed. A detailed lagoon water balance should be created for this system that considers: precipitation, evaporation, seasonal wastewater variances, and temporary growing season application cessation.

C. Multiple Outfall Systems

Multiple Outfall Systems should have two storage lagoons systems: operations lagoons and seasonal lagoons. Operations lagoon storage should be provided for temporary growing season application cessation due to weather conditions or harvest schedules. This lagoon volume should be based on an analysis of the climate and the crop, but it should accommodate at least one week of wastewater flow during the application season. Seasonal lagoon storage should be provided for periods in the fall and spring when neither surface water discharge nor land application is allowed. This storage lagoon volume should be based on an analysis of average climatic and environmental conditions.

D. Lagoon Criteria

Wastewater lagoons often contain millions of gallons of partially treated sewage that is a potential ground water contamination source. Wastewater lagoons located over the Rathdrum Aquifer should be designed and maintained to a higher standard than lagoons in other areas due to the adverse affects a leaking lagoon would have to the aquifer. All lagoons should meet the leakage criteria (500 gallons per day per acre for most lagoons) found in the Recommended Standard for Wastewater Facilities published by the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers (10 State Standards). The following criteria will be used for lagoons located over the Rathdrum Aquifer:

1. Small lagoons and temporary lagoons: Small lagoons are lagoons with a design volume less than 500,000 gallons. Temporary lagoons are lagoons that store wastewater for less than two months annually. Small lagoons and temporary lagoons should be constructed with a synthetic liner (60 mil polyethylene or equal), and they should be leak tested at least

once every five years.

2. Large lagoons and storage lagoons: Large lagoons are non-temporary lagoons with a design volume greater than 500,000 gallons. Storage lagoons are lagoons that store wastewater for more than two months annually. Large lagoons and storage lagoons should be constructed with a synthetic liner (60 mil polyethylene or equal), and they should have a second level of protection approved by DEQ that includes, but is not limited to, the following:

    a) a system that continuously monitors lagoon seepage, or
    b) a double liner system, or
    c) additional liner strength and reliability (such as extra thickness)

V. Monitoring and Sampling

A. General

Monitoring and sampling are essential elements of managing land application sites over the Rathdrum Aquifer to ensure that land application activities are not affecting the aquifer water quality. A monitoring and sampling program is unique to each land application site, but the program should include:

1. wastewater effluent sampling
2. soil moisture monitoring
3. soil water sampling
4. soil sampling
5. ground water monitoring and sampling

All monitoring and sampling will be in accordance with the *Water and Soil Monitoring* section of the ***Supplement***.

B. Wastewater Effluent Sampling

The analytical parameters for wastewater effluent sampling will be in accordance with the ***Guidelines for Land Application of Municipal and Industrial Wastewater*** and will include, but not be limited to: TDS, COD, BOD_5, TSS, total coliform, pH, phosphorous, TKN, ammonia nitrogen and nitrate nitrogen. The frequency of sampling is dependent on the consistency of the effluent constituents, but in no case will the frequency be less than once per year during the land application season.

Complete wastewater characterization is a necessary element of a properly designed and operated land application system. Although many potentially toxic constituents receive some degree of treatment (volatilization and biogradation of organics) or are retained in the soils (heavy metals), some toxic elements may have a detrimental effect on the crops, livestock or the ground water. The land applied wastewater should not create phytotoxicity and food chain contamination. Regular testing for cadmium, copper, zinc, nickel, and other potentially toxic constituents may be necessary.

Wastewater facilities that have industrial or commercial contributions should have an active and effective pretreatment program.

C. Soil Moisture Monitoring

Soil moisture will be used to determine the irrigation schedule, and soil moisture data will be used to manage crop vitality. A tensiometer or soil moisture sensor clusters will be installed in accordance with the monitoring plan, and soil moisture data will be recorded daily during the application season. A soil moisture based irrigation strategy may allow more effluent application in drier years. (See this document, Section II, Paragraph E.3. *Daily Application Rates*)

D. Soil Water Sampling

Soil water sampling will be in accordance with the *Water and Soil Monitoring* section of the ***Supplement***. At least two lysimeter sampling points will be used at each sampling station: within the root zone and immediately below the root zone.

E. Soil Sampling

Soil sampling will be in accordance with the *Water and Soil Monitoring* section of the ***Supplement***. In addition to the analytical parameters specified in the ***Supplement***, phosphorous will also be sampled and monitored.

F. Ground Water Sampling and Testing

Each land application site will have a ground water monitoring plan. Ground water sampling and analytical parameters will be in accordance with the ***Supplement***. Each site will have at least three ground water monitoring wells: one up gradient and two down gradient of the ground water flow. Before land application commences on a site, sampling and testing will determine the existing background levels of the sampling parameters. The land application management goal is: no detectable increase in wastewater related constituents in the ground water as determined by the monitoring program.

VI. Operations and Maintenance

A. General

A successful land application system requires diligent operations and maintenance. Individuals who manage the site should have expertise and knowledge of agricultural practices as well as wastewater treatment processes. According to the pilot study report, wastewater land application over the Rathdrum Aquifer can comply with the intent of the Special Resource Water designation only **under carefully managed conditions**.

B. Management Plan

Each land application site should have a management plan that integrates effluent management with suitable agricultural best management practices. The plan should address specific program elements that include: effluent, nutrients, crop selection, crop vitality, soil moisture, chemical fertilizers, and pesticides. A higher level of chemical fertilizer management than employed in normally accepted agricultural practices may be necessary to limit nutrient migration below the root zone.

C. Daily Soil Moisture Monitoring and Irrigation

A daily reading of soil moisture at several places on a land application site will allow integration of crop needs and wastewater application. A soil moisture reading that indicates soil saturation needs to be established for each land application site. (See this document, Section II, Paragraph E.3. *Daily Application Rates*.) Irrigation based on soil moisture will allow higher application rates than average in some of the drier or warmer growing seasons.

D. Crop Production and Fertilizers

The primary function of a wastewater land application site is the treatment of wastewater. While a viable and healthy crop is necessary for optimum wastewater treatment, chemical fertilizers that are commonly used to promote crop production can become the primary nutrient source for aquifer degradation. Fertilizer application should be balanced -- sufficient to produce good plant growth but insufficient to produce a detectable nutrient level below the plant root zone.

E. Disinfection

Wastewater disinfection will be as specified in the ***Supplement*** as related to buffer zone requirements.

F. Irrigation Systems

The irrigation system should be well maintained and efficient in distributing the water evenly across the site. The goal for irrigation efficiency is 75-90%. The irrigation system should be operated to reduce spray drift.

Part 3: Miscellaneous Information

Terms and Definitions

agronomic - Activities relating to field crop production and soil management. "agronomic rate" as related to land application means the amount of water or

nutrients that can be utilized by a crop over time.

beneficial use - Any of the various uses which may be made of the waters of Idaho including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

BOD_5 (Biochemical Oxygen Demand) - A measure of the dissolved oxygen in wastewater used by microorganism in the biochemical oxidation of organic matter over a 5 day period. It is often used to determine the efficiency of wastewater treatment facilities.

centibar - A unit of pressure equal to 1/100th of a bar (1 bar = 10^6 dynes per square centimeter). In soil monitoring, a measurement of soil moisture with decreasing values corresponding to increasing soil moisture.

COD (Chemical Oxygen Demand) - A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater.

DEQ - The Idaho Department of Health and Welfare acting through the Division of Environmental Quality (DEQ).

lysimeter - A device for measuring and collecting the water percolating through soil.

nutrient - Chemicals such as nitrogen, potassium and phosphorus that are needed by plants in the soil for satisfactory plant and crop growth.

TDS (Total Dissolved Solids) - Small solid particles in water or wastewater (generally 1 micron or less in diameter) that are not removed by filtering or settling.

tensiometer - An instrument for measuring moisture content of soil.

TKN (Total Kjeldahl Nitrogen) - The nitrogen content of a material that is analyzed by a Kjeldahl method. This method measures the sum of free ammonia plus organic nitrogen.

TSS (Total Suspended Solids) - Solids in water or wastewater (generally 1 micron or more in diameter) that can be removed by filtering or settling.
uptake rate - The amount of water or nutrients used by plants over time.

vadose zone - The unsaturated area in the soil above the water table.

Wastewater Land Application Permit Program

Wastewater land application in Idaho is regulated by state law and is administered by the Division of Environmental Quality through a permit. This Wastewater Land Application Permit (WLAP) sets forth the general requirements as

well as the site specific requirements for each permitted facility. Presently, Idaho has over 100 permitted wastewater land application sites.

An application for WLAP may be obtained through the DEQ regional office in Coeur d'Alene. Prior to submittal of the application packet, applicants are encouraged to schedule a pre-application meeting with DEQ staff. An initial application for a permit can take six months to process through the regulatory and administrative steps. Permits are issued for a five year period and are renewable.

Additional Information Sources

Wastewater Land Application Permit Program:

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Editor's note:
These contacts have been updated as of September 2007.

Rathdrum Prairie Aquifer Project

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Glossary

Term	Definition
Aerosol	A gaseous suspension of fine solid or liquid particles.
Agricultural Activity/Agriculture	Any activity conducted on land or water for the purpose of producing an agricultural commodity, including crops, livestock, trees, and fish.
Agronomic Rate	The application rate of nutrients and moisture required to achieve anticipated or documented crop yields for a specific region. The agronomic rate may be estimated by published information or determined from actual field measurements.
Agronomic Uptake	The amount of nutrients or salts harvested from a land application field or system.
Applicable Requirements	Any state, local or federal statutes, regulations or ordinances to which the facility is subject.
Aquic	Saturated at least part of the time; reducing conditions in the soil prevail.
Aquifer	"A geological unit of permeable saturated material capable of yielding economically significant quantities of water to wells and springs."(IDAPA 58.01.11.007.02)
Aridic	Soil dry most of the time.
Available Water Capacity	Moisture content of soil between field capacity and wilting point that is available for crop use. Use soil survey or site specific information to determine.
Bacteria	A group of universally distributed, rigid, essentially unicellular microorganisms. Bacteria usually appear as spheroid, rodlike or curved entities, but occasionally appear as sheets, chains, or branched filaments.
Beneficial Use	Any of the various uses which may be made of the water of Idaho, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The bendficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use.
Beneficial Uses of Ground Water	Various uses of ground water in Idaho including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, aquacultural water supplies and mining. A beneficial use is defined by actual current uses or future uses of the ground water.
Best Available	Any system, process, or method which is available to the public for

Method	commercial or private use to minimize the impact of point and nonpoint source contaminants on ground water quality.
Best Management Practice	A practice or combination of practices determined to be the most effective and practical means of preventing or reducing contamination to ground water and/or surface water from nonpoint and point sources to achieve water quality goals and protect the beneficial uses of the water.
Best Practical Method	Any system, process, or method that is established and in routine use which could be used to minimize the impact of point or nonpoint sources of contamination on ground water quality.
Biochemical Oxygen Demand (BOD)	The measure of the amount of oxygen necessary to satisfy the biochemical oxidation requirements of organic materials at the time the sample is collected; unless otherwise specified, this term will mean the five (5) day BOD incubated at twenty (20) degrees C.
Board	The Idaho Board of Environmental Quality.
Buffer Distances (Zones)	The distances between the actual point of reuse of reclaimed wastewater and other uses such as wells, adjoining property, inhabited dwellings, and other features.
Calcareous	Consisting of or containing calcium carbonate (CaCO3).
Capture Zone	A capture zone, or zone of contribution as it is sometimes called, is the area surrounding a pumping well that encompasses all areas and land use activities that supply ground water recharge to the well (EPA 1991).
Carryover Soil Moisture	Moisture stored in soils within root zone depths during the winter, at times when the crop is dormant, or before the crop is planted. This moisture is available to help meet the consumptive water needs of the crop.
Chemical Oxygen Demand (COD)	A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater. It is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test. It does not differentiate between stable and unstable organic matter and thus does not necessarily correlate with biochemical oxygen demand.
Class A Effluent	Class A effluent is treated municipal reclaimed wastewater that must be oxidized, coagulated, clarified, and filtered, or treated by an equivalent process and adequately disinfected. For comprehensive Class A Effluent criteria and permitting requirements refer to IDAPA 58.01.17, “Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater.”
Coagulation	In water and wastewater treatment, the destabilization and initial aggregation of colloidal, finely divided suspended matter and/or bacterial cells by the addition of a floc-forming chemical or by biological processes.
Coliform-group Bacteria	A group of bacteria predominantly inhabiting the intestines of man or animal, but also found in nature. It includes all aerobic and facultative anaerobic, gram-negative, nonspore-forming bacilli that ferment lactose with production of gas. This group of "total" coliforms includes E. Coli which is considered the typical coliform of fecal origin.
Confined Aquifer	A geological formation in which water is isolated from the atmosphere

	by an overlying less permeable geologic formation. Confined ground water is generally subject to pressure greater than atmospheric; thus, the water level rises above the top of the aquifer.
Consumptive Irrigation Requirement	The depth of irrigation water, exclusive of precipitation, stored soil moisture, or ground water, that is required consumptively for crop production.
Consumptive Use	Consumptive use, often called evapo-transpiration is the amount of water used by the vegetative growth of a given area in transpiration and building of plant tissue and that evaporated from adjacent soil or intercepted precipitation on the plant foliage in any specified time. If the unit of time is small, consumptive use is usually expressed as acre inches per acre or depth in inches, whereas, if the unit of time is large, such as a growing season or a 12-month period, it is usually expressed as acre feet per acre or depth in feet.
Consumptive Water Requirement	The amount of water potentially required to meet the evapo-transpiration needs of vegetative areas so that plant production is not limited from lack of water.
Contamination	The direct or indirect introduction into ground water of any contaminant caused in whole or in part by human activities.
Crop Root Zone	The zone that extends from the surface of the soil to the depth of the deepest crop root and is specific to a species of plant, group of plants or crop.
Denitrification	The reduction of oxidized nitrogen compounds (such as nitrates) to nitrogen gas.
DEQ	The Idaho Department of Environmental Quality
Director	The Director of the Department of Environmental Quality or the Director's designee.
Disinfection	A method of reducing the pathogenic or objectionable organisms by means of chemicals or other acceptable means.
Disinfected Wastewater	Wastewater in which pathogenic organisms have been destroyed by chemical, physical or biological means.
Downgradient Boundary	The boundary where wastewater-land application ceases perpendicular to the flow of ground water beneath the wastewater-land application site.
Effective Rainfall	Precipitation falling during the growing period of the crop that is available to meet the consumptive water requirements of crops. It does not include such precipitation as is lost to deep percolation below the root zone nor to surface runoff.
Effluent	(1) Wastewater or other liquid, treated or untreated, flowing from a reservoir, basin, treatment plant or part thereof. (2) Any wastewater discharged from a treatment facility.
EPA	The United States Environmental Protection Agency.
Evaporation Rate	The quantity of water evaporated from a given water surface per unit of time. It is usually expressed in millimeters (inches) depth per day, month or year.
Fault	A break or fracture in the earths crust along which, relative movement of rocks on either side of the plane of the fracture has occurred.

Field Capacity	The moisture percentage, on a dry weight basis, of a soil after rapid drainage has taken place following an application of water, provided there is no water table within capillary reach of the root zone. This moisture percentage usually is reached within two to four days after an irrigation, the time interval depending on the physical characteristics of the soil.
Filtration	The process of passing a liquid through a filtering medium (which may consist of granular material, such as activated carbon, sand, magnetite, diatomaceous earth, finely woven cloth, unglazed porcelain or specially prepared paper) for the removal of suspended or colloidal matter.
Flocculation	In water and wastewater treatment, the agglomeration of colloidal and finely divided suspended matter after coagulation by gentle stirring by either mechanical or hydraulic means. In biological wastewater treatment where coagulation is not used, agglomeration may be accomplished biologically.
Flood Irrigation	Irrigating soils by means of surface application of water in basins.
Food Crops	Any crops intended for human consumption.
Frozen Soil	0o C or less in the upper 6 inches of soil.
Ground Water	Any water of the state which occurs beneath the surface of the earth in a saturated geological formation of rock or soil
Ground Water Compliance	A collection of environmental monitoring sites typically identified as the downgradient boundary of the area that wastewater is physically being applied to or as identified by DEQ on a case-by-case basis. The collection of monitoring points is where biological, chemical and radiological parameters must comply with appropriate water quality standards.
Growing Season	That period of time during the year when climatic factors are typically conductive to crop growth, and a crop is normally planted, cultivated and harvested.
Hazardous Waste	A material or combination of materials, which, because of its quantity, concentration or characteristics (physical, chemical or biological), presents an actual or potential hazard to human health or the environment if not properly treated, stored, disposed of or managed.
Heavy Metals	Metals which exist naturally or can be introduced to the earth and water which can adversely affect human health and the environment. Includes, but not limited to arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, selenium, silver and zinc.
Hydraulic Loading	The amount of water applied to the land surface.
Hydraulic Loading Rate	The rate at which water, whether supplemental irrigation water or wastewater, is applied to a wastewater-land application site. Precipitation, although included in water balance calculations, is not considered to be an applied hydraulic load.
Industrial Wastewater	Any wastewater discharged from an industrial treatment facility that does not contain sanitary waters.
Infiltration	The process whereby a liquid enters the soil or other filtering medium.
Infiltration Capacity	The flux of water which the soil profile can absorb through its surface when it is maintained in contact with water at atmospheric pressure.

Irrigation Efficiency	The percentage of applied irrigation water that is stored in the and available for consumptive use by the crop. When the water is measured at the headgate, it is called farm-irrigation efficiency; when measured at the field, it is gnated as field-irrigation efficiency; and when measured at the point of diversion, it be called project-efficiency.
Irrigation Water Requirement	The net irrigation water requirement divided by the irrigation efficiency.
Land Application	The application of municipal or industrial wastewater to land for the purpose of land treatment.
Land Application Facility or Facility	Any structure or system designed or used to treat wastewater through application to the land surface.
Land Treatment	The use of land, soil, and crops for treatment of municipal or industrial wastewater.
Leaching Requirement	The fraction of the irrigation water that must be leached through the root zone to control soil salinity at any specified level.
Loading	The amount of organic matter, water, and nutrients applied to land in wastewater. See Nutrient Loading.
Municipal Wastewater	(1) Waste water that contains sewage. (2) Unless otherwise specified, sewage and associated solids, whether treated or untreated, together with such water that is present. Also called domestic wastewater. Industrial wastewater may also be present, but is not considered part of the definition.
Natural Background Conditions	No measurable change in the physical, chemical, biological, or radiological conditions existing in a water body without human sources of pollution within the watershed.
Net Irrigation	The amount of irrigation water that is delivered to a land application site after all application losses are considered. Application losses include wind drift and evaporation. This does not consider evapotranspiration.
Net Irrigation Requirement	The depth of irrigation water, exclusive of precipitation, stored soil moisture, or ground water, that is required consumptively for crop production and required for other related uses. Such uses may include water required for leaching, frost protection, etc.
New Activity	Any significant change in operation or construction of the wastewater treatment system which may impact the waters of the state.
Non Public Drinking Water System (Well)	Includes an individual domestic well, or any domestic well that serves 2 through 14 connections or less than 25 people. It is any system that is not defined as a public drinking water system.
Non-Contact Cooling Water	Water used to reduce temperature which does not come into direct contact with any raw material, intermediate product, waste product (other than heat) or finished product.
Non-Growing Season	That period of time during the year when climatic factors are typically not conductive to crop growth, and a crop is not normally planted, cultivated or harvested.
Nuisance	Anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.
Nutrients	The major substances necessary for the growth and reproduction of aquatic plant life, consisting of nitrogen, phosphorus, and carbon

	compounds.
Nutrient Loading	The amount of plant nutrients applied to soil in wastes, either solid or liquid.
Nutrient Loading Rate	The rate at which nutrients, such as nitrogen, potassium and phosphorus, are applied to a wastewater-land application site.
Operating Personnel	Any person who is employed, retained, or appointed to conduct the tasks associated with the day-to-day operation and maintenance of a public wastewater system. Operating personnel shall include every person making system control or system integrity decisions about water quantity or water quality that may affect public health.
Overland Flow	A method of wastewater treatment by land application where wastewater is applied to gently sloping, relatively impermeable soils planted with vegetation. Treatment is accomplished by physical, chemical and biological processes as the wastewater flows through the vegetative cover.
Pathogen	A causative agent of disease.
Peak Period Consumptive Use	Peak period consumptive use is the average daily rate of use of a crop occurring during a period between normal irritations when such rate of use is at a maximum.
Percolation	The flow or trickling of a liquid downward through a contact or filtering medium. The liquid may or may not fill the pores of the medium.
Permeability	Also known as Hydraulic Conductivity, it is the capacity of a porous medium to transmit water. It is expressed as the volume of water that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.
Permit	Written authorization by the Director to modify, operate, construct or discharge to a reclamation and reuse facility.
Permittee	The person to whom the reclamation and reuse permit is issued.
Person	An individual, corporation, partnership, association, state, municipality, commission, political subdivision of the state, state agency, federal agency, special district, or interstate body.
Pesticides	Chemicals used to destroy specific organisms that cause disease, hinder food production or affect other commercial activities. The most widely used pesticides are synthetic compounds derived from petrochemicals and include insecticides, herbicides and fungicides.
pH	"Power of the Hydrogen Ion" (S. Sorenson, 1909). Defined as the negative logarithm of the hydrogen ion concentration: $pH = -Log10[H+]$. Hydrogen ion concentration is expressed in moles/liter (i.e. M). (M&H)
Point of Compliance	That point in the reclamation and reuse facility where the reclaimed wastewater must meet the requirements of the permit. There may be more than one (1) point of compliance within the facility depending on the constituents to be monitored.
Point Source	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 to surface waters of the state. This term does not include return flows from irrigated agriculture, discharges from dams and hydroelectric generating facilities or any source or activity considered a nonpoint source by definition.
Political Subdivision	The state of Idaho, or any corporation, instrumentality or other agency thereof, or any incorporated city, or any county, school district, water and/or sewer district, drainage district, special purpose district or other corporate district constituting a political subdivision of the state, any quasi-municipal corporation, housing authority, urban renewal authority, other type of authority, any college or university, or any other body corporate and political of the state of Idaho, but excluding the federal government. (Idaho Code).
Pollution	The presence in a body of water (or soil or air) of a substance in such quantities that it impairs the water's usefulness or renders it offensive to the senses of sight, taste or smell. In general, a public health hazard may be created, but in some instances, only economic or aesthetics are involved as when waste salt brines contaminate surface waters or when foul odors pollute the air. (definition from Glossary 1)
Potable Water	A water which is free from impurities in such amounts that it is safe for human consumption without treatment.
Pretreatment	Any process or activity conducted for the purpose of removing or reducing wastewater constituents prior to or in preparation for ultimate treatment.
Primary Effluent	Raw wastewater that has been mechanically treated by screening, degritting, sedimentation and/or skimming processes to remove substantially all floatable and settleable solids.
Primary Treatment	Wastewater treatment processes or methods that serve as the first stage of treatment intended for removal of suspended and settleable solids by gravity sedimentation providing no changes in dissolved or colloidal matter.
Process Food Crop	Any crop intended for human consumption that has been changed from its original form and further disinfection occurs.
Public Drinking Water System (Well)	Includes wells supplying 15 or more connections or 25 or more individuals daily for at least 60 days out of the year. Public drinking water supply wells are identified as either Community Systems or Transient or Non-Transient Non Community Systems depending on whether individuals are served regularly more than or less than 6 months of the year.
Rapid Infiltration	A method of wastewater treatment by land application where wastewater is applied to relatively permeable soils allowing a high rate of infiltration and treatment of larger volumes of water over a small land surface area. Treatment is accomplished by physical, chemical and biological processes as the water percolates through the soil profile.
Rapid Infiltration System	A wastewater treatment method by which wastewater is applied to land in an amount of twenty (20) to six hundred (600) feet per year for percolation through the soil. Vegetation is not generally utilized by this method.
Raw Food Crop	Any crop intended for human consumption which is to be used in its original form.

Recharge	The process of adding water to the zone of saturation.
Recharge Waters	Water that is specifically utilized for the purpose of adding water to the zone of saturation.
Reclaimed Wastewater	Wastewater that is used in accordance with the rules IDAPA 58.01.17.
Reclamation	The treatment of municipal or industrial wastewater that allows it to be reused for beneficial uses. Reclamation also includes land treatment for wastewater that utilizes soil or crops for partial treatment.
Reclamation and Reuse Facility or Facility	Any structure or system designed or used for reclamation or reuse of municipal or industrial wastewater including, but not limited to, industrial and municipal wastewater treatment facilities, pumping and storage facilities, pipeline and distribution facilities, and the property to which the reclaimed wastewater is applied. This does not include industrial in-plant processes and reuse of process waters within the plant.
Restricted Public Access	Preventing public entry within one thousand (1,000) feet of the border of a facility by site location or physical structures such as fencing. A buffer strip less than one thousand (1,000) feet may be accepted if aerosol drift is reduced.
Reuse	The use of reclaimed wastewater for beneficial uses including, but not limited to, land treatment, irrigation, aquifer recharge, use in surface water features, toilet flushing in commercial buildings, dust control, and other uses.
Rural Area/Industrial Area	An area whose land use is predominantly rural or industrial, having scattered inhabited dwellings.
Saline	A nonsodic (nonsodium) soil containing sufficient soluble salts to impair its productivity.
Saturated Zone	A zone or layer beneath the earths surface in which the interconnected pore spaces of rock and sediments are filled with water.
Secondary Treatment	Processes or methods for the supplemental treatment of wastewater, usually following primary treatment, to affect additional improvement in the quality of the treated wastes by biological means of various types which are designed to remove or modify organic matter.
Sewage	The water-carried human wastes from residences, buildings, industrial establishments and other places.
Slow Rate Irrigation	A method or wastewater treatment by land application which involves controlled distribution of wastewater to the land surface by spraying or surface spreading to support plant growth. Treatment is accomplished through physical, chemical and biological processes occurring in the plant/soil matrix.
Sludge	The semi-liquid mass produced by treatment of water or wastewater.
Sodium Adsorption Ratio (SAR)	An expression of the degree to which sodium will be adsorbed by soils from a solution in equilibrium with the soil. As the SAR increases above 10, soil permeability decreases.
Special Resource Water	Those specific segments or bodies of water which are recognized as needing intensive protection to preserve outstanding or unique characteristics; or to maintain current beneficial use.

Spray Irrigation	Means of wastewater application by spraying it from orifices in piping.
State	The state of Idaho.
Subsurface Irrigation	A planned irrigation system which provides for the efficient distribution of irrigation water below the surface of the ground without causing erosion or water loss. Some examples include, low pressure, trickle application below ground surface, underground pressurized pipelines, or controllable seepage based on limiting crop and depth to ground water. (USDA SCS FOTG, 430, 441, & 443).
Suburban/ Residential Area	An area whose land use is predominantly suburban or residential. An otherwise rural or industrial area having a housing subdivision in close proximity to the WLAP site would be classed as a suburban/residential area.
Surface Irrigation	Application of water by means other than spraying such that no aerosols are produced.
Surface Water Body	All surface accumulations of water, natural or artificial, public or private, or parts thereof which are wholly or partially within, which flow through or border upon the state. This includes, but is not limited to, rivers, streams, canals, ditches, lakes, and ponds. It does not include private waters as defined in Section 42-212, Idaho Code.
Suspended Solids	(1) Solids that are in water, wastewater or other liquids, and which are largely removable by laboratory filtering. (2) The quantity of material removed from wastewater in a laboratory test, as prescribed in Standard Methods for the Examination of Water and Wastewater, American Public Health Association, Washington, DC, and referred to as nonfilterable residue.
Time Distribution of Flows	A measurement of the volume of wastewater distributed over a specified area during a specified time period. Typical unit of measure is inches per acre per week.
Total Dissolved Solids (TDS)	(1a) The total concentration of dissolved constituents in solution, usually expressed in milligrams per liter. (1b) The total concentration of dissolved material in water [as] ordinarily determined from the weight of the dry residue remaining after evaporation of the volatile portion of an aliquot of the water sample (Hem, 1985). (1c) The total dissolved (filterable) solids as determined by use of the method specified in Appendix I "Wastewater Analysis". (USGS, 1989. Federal Glossary of selected terms; subsurface; Water Flow and Solute Transportation. Department of the Interior). (2) A measure of inorganic TDS in wastewater is important in order to calculate total salt loading to a site and predict down-gradient ground water concentrations. Estimates of inorganic TDS can be made by subtracting VDS from TDS to obtain Non-Volatile Dissolved Solids (NVDS). Major ions may also be summed to estimate this parameter.
Total Kjeldahl Nitrogen (TKN)	The nitrogen content of a material that is analyzed by a Kjeldahl method. This method measures the sum of free ammonia plus organic nitrogen.
Treatment	A process or activity conducted for the purpose of removing pollutants from wastewater.
Treatment Facility	Any physical facility or land area for the purpose of collecting, treating, neutralizing or stabilizing pollutants including treatment

	plants; the necessary collecting, intercepting, outfall and outlet sewers; pumping stations integral to such plants or sewers; disposal or reuse facilities; equipment and furnishing thereof; and their appurtenances. For the purpose of these rules, a treatment facility may also be known as a treatment system, a wastewater system, wastewater treatment system, wastewater treatment facility, or wastewater treatment plant.
Turbidity	A measure of the interference of light passage through water, or visual depth restriction due to the presence of suspended matter such as clay, silt, nonliving organic particulates, plankton and other microscopic organisms. Operationally, turbidity measurements are expressions of certain light scattering and absorbing properties of a water sample. Turbidity is measured by the Nephelometric method.
Udic	Soil moist, but not wet, most of the time.
Vadose Zone	The unsaturated area above the water table.
Wastewater	Unless otherwise specified, industrial waste, municipal waste, agricultural waste, and associated solids or combinations of these, whether treated or untreated, together with such water as is present but not including sludge, or non-contact cooling water.
Wastewater Lagoon	Manmade impoundments for the purpose of storing or treating wastewater.
Wastewater System Operator	The person who is employed, retained, or appointed to conduct the tasks associated with routine day to day operation and maintenance of a public wastewater treatment or collection system in order to safeguard the public health and environment.
Wastewater Treatment System	All phases of wastewater treatment including any pretreatment equipment and the land application facility.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to fish and wildlife, or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Table	The upper surface of ground water or that level below which the soil is saturated with water.
Waters and Waters of the State	All the accumulations of water, surface and underground, natural and artificial, public and private, or parts thereof which are wholly or partially within, which flow through or border upon the state.
Watershed	The land area from which water flows into a stream or other body of water which drains the area.
Wellhead	The physical structure, facility, or device at the land surface from or through which ground water flows or is pumped from subsurface, water-bearing formations.
Wellhead Protection Area	The surface and subsurface area surrounding a wellhead or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field.
Wellhead Setback Area	An area immediately surrounding a wellhead in which potential sources of contamination are controlled or restricted.

Wilting Point	The wilting point is the moisture percentage, also on a dry weight basis, at which plants can no longer obtain sufficient moisture to satisfy moisture requirements and will wilt permanently unless moisture is added to the soil profile.
Xeric	Mediterranean: Wet winters, dry summers.

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