



State Requirements for Submission of Engineering Reports and Plans for Industrial Wastewater Treatment Facilities

This guidance document is intended primarily for new facilities and major modifications of treatment facilities. If you have a minor project on an existing wastewater treatment facility, contact your Department of Ecology permit manager for the engineering report requirements.

General considerations

In the state of Washington, wastewater treatment systems must be approved before construction is begun (RCW 90.48.110).

Chapter 173-240 Washington Administrative Code (WAC) Submission of Plans and Reports for Construction of Wastewater Facilities is the principle regulation describing standards for the submission of engineering reports and plans for wastewater treatment facilities. This regulation requires an analysis of all known, available and reasonable treatment methods (AKART) for the wastewater. Ecology has determined that all known, available and reasonable treatment methods include opportunities for source control, especially for toxic pollutants, as an alternative or component of the wastewater treatment process.

The regulation also requires an evaluation of the impact of each proposed alternative on the receiving water (ground water, surface water, and sediments), considering both the characteristics of the receiving water and the pertinent laws, regulations, and guidelines in effect at the time of proposal.

Based on these assessments, the proponent should propose a discharge point, a treatment method and a design. When interpretations or judgments are necessary in the absence of guidance, base them on your professional best judgment. Ecology staff are available to assist you and we encourage you to seek our help.

We recommend that the process follow its traditional and logical sequence. That is, prepare and get approval of the complete engineering report, then proceed with design details. WAC 173-240-060(2) states: "The engineering report shall be sufficiently complete so that plans and specifications can be developed from it without substantial changes." Engineering reports that do not meet these requirements may be returned without the benefit of formal review.

Other applicable regulations, design requirements, or guidance documents are listed below. The state regulations and Ecology documents are available from the Department of Ecology (Publications, PO Box 47600, Olympia, WA 98504-7600) unless another source is given in parentheses following the title of the document.

Federal Regulations and EPA documents are available from the EPA Region 10 Publications Office (tel. 360 553-5049). The source of other documents is listed in parentheses following the name of the document.

Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems (Ecology Publication 93-36)

Chapter 173-201A WAC - Water Quality Standards for Surface Waters of the State of Washington. (11/20/06)

Chapter 173-200 WAC - Water Quality Standards for Ground Waters of the State of Washington.

National Toxics Rule, 40 CFR, Part 131. This rule promulgates human health criteria for surface waters of the state of Washington.

Chapter 173-204 WAC Sediment Management Standards.

Guidance and support for implementing the water quality standards includes:

Permit Writer's Manual. Dept. of Ecology Publication 92-109, currently available on the Internet at <http://www.ecy.wa.gov/pubs/92109.pdf>

Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

Implementation Guidance for the Ground Water Quality Standards, Dept. of Ecology Publication 96-02.

Sediment Source Control Standards User Manual, 1993. (Available from Department of Ecology, Sediment Management Unit, PO Box 7600, Olympia, WA 98504-7600)

Ecology has a statewide surface water ambient monitoring program. Data is available at <http://www.ecy.wa.gov/database.html>

Spreadsheets for calculating water quality criteria and effluent limits are available on the internet: <http://www.ecy.wa.gov/programs/wq/permits/guidance.html>

Report Submittals

Please submit one preliminary review copy and two copies of final engineering reports and plans and specifications (11x17) to Ecology. One approved copy will be returned to the owner.

If you have any questions, please contact Ecology's Water Quality Program in the appropriate regional office. Contact information can be found at:

<http://www.ecy.wa.gov/programs/wq/overview.html#contacts>

Engineering report requirements for industrial wastewater treatment facilities

Generally, three separate submittals are required for the construction of wastewater treatment facilities (WAC 173-240 110 (3)): engineering report, plans and specifications, and operation and maintenance manual.

An engineering report is required (Section -110 (3)(a)) for the construction or modification of an industrial wastewater facility. This plan should address all the applicable items given in 173-240-130 and also discuss the options available for zero discharge and source control of pollutants. This document is to be “sufficiently complete so that plans and specifications can be developed from it without substantial change.” A substantial change is a change in the selected treatment process, the design criteria and unit process sizing, the project location, the environmental impact of the project, or an increase in the total project cost (design, construction, operation, or maintenance costs). An engineering report should address all waste streams from the facility including stormwater discharges. An engineering report for land treatment of wastewater WAC 173-240-130(p) should meet the requirements of *Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems* (Ecology Publication 93-36), and *Implementation Guidance for the Ground Water Standards* (Ecology Publication 96-02)

Ecology may waive the three-step process for submission of engineering documents upon request. Granting this waiver is conditional upon some demonstration that the project manager is familiar with the process of designing wastewater treatment processes and understands the technology, water quality, and economic tests for selecting acceptable wastewater treatment. The waiver is an exemption from detailed review and approval of engineering reports but is not an exemption from the engineering report process. Ecology expects the engineering report, plans and specifications, and operation and maintenance manual to be completed. The **conceptual plans** submitted to Ecology when a waiver is granted should be a summary document. It should include a characterization of the wastewater, the treatment options examined, the costs of each treatment option, the preferred treatment option, the residual pollutant concentrations after treatment, a schematic of the treatment process, and a demonstration the effluent after treatment will meet receiving standards (surface water, ground water) or discharge standards (BCT, BAT, AKART, pretreatment).

Section 173-240-120 review standards

The main consideration of the Department of Ecology is that a good plan has been put together to control the discharge of pollutants. This includes technology-based and water quality-based requirements as specified in federal and state law. The Department expects engineering reports will conform to standard engineering practice. Ecology’s process for meeting technology and water quality requirements is given in the Permit Writer’s Manual.

In the following text, the actual regulation language is in italics. Only those sections that require clarification are discussed.

Section 173-240-130

- (1) *The engineering report for an industrial wastewater facility shall be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Two copies of the report shall be submitted to the department for approval.*

An engineering report's conclusions, recommended facility and unit process sizing for the facility must be in adequate detail so that a different engineer would be able to prepare the final construction plans and specifications. The design criteria for the plant (and for each intermediate phase for phased projects) and sizing of the unit processes and major support units must be included. There must be adequate detail so that an accurate estimate of the final construction costs can be made.

"Sufficiently complete" means the report shall contain enough design information that an engineer who was not involved in writing the report can produce construction drawings that will result in the construction of the facility envisioned by the report writer without any need for process change or more than minor unit sizing modifications.

"Substantial change" was defined above. A substantial change will require an amendment to the approved engineering report.

"Adequate detail" means that there is suitable attention given in the report to the individual elements and components that make up the whole proposed project.

- (2) *The engineering report shall include the following information together with any other relevant data as requested by the department:*

- (a) *Type of industry or business.*

Include the SIC code which best fits your industry or business

- (b) *The kind and quantity of the finished product.*

Technology-based effluent limits for many industries are based on the quantity of product.

- (c) *through (e)*

These sections request information on the quality and quantity of the wastewater, chemicals used in the wastewater treatment process and the design and sizing calculations of the treatment units. All waste streams including stormwater should be included in this analysis. The detailed sizing calculations and design criteria used for sizing the selected alternative treatment systems shall agree with appropriate engineering guidelines (include references). Any deviation from the accepted design criteria must be justified. The basic hydraulic and pollutant loading data to be used for sizing the treatment systems is developed here and used in the sizing calculations. The proponent should address item (v) here also, and discuss the treatment options that are available to treat this type of wastewater, the costs, and other considerations that led to the selection of the preferred treatment option. This discussion should include the options of zero discharge and source control of pollutants to reduce treatment size and cost. The alternatives considered must be ranked (with their reasons) according to their ability to meet the receiving water quality standards, costs, and other objectives of the engineering report.

From this group of ranked alternatives, the final alternatives that meet the report's objectives must be selected to be further developed and evaluated. Further evaluation includes environmental impact, applicability to available site(s), cost effectiveness (capital cost and present worth cost), ease of operation, and other criteria. A final alternate recommended for implementation should rank as first in this further evaluation. The selection of the recommended alternate includes a discussion of why the other alternates were not selected.

(f) A discussion of the suitability of the proposed site for the facility.

This is part of the alternative evaluation process in (c) through (e). When the site is evaluated, the topography, flood potential, impacts to existing wetlands, soils suitability for construction, zoning, and proximity to residential areas must be evaluated.

Flood analysis should not be limited to determining whether a site is in a Federal Emergency Management Agency (FEMA) flood insurance zone. The flooding potential of any drainage way passing through or near the site must be evaluated for site flooding potential. The existence of wetlands on a proposed site must be shown on the site map. Mapping the extent of wetlands may require the use of a wetlands specialist. During the planning stage, there should be enough soils analyses done at the final alternate sites so that the ability of the soils to structurally support the proposed structures or provide the wastewater treatment required is known to a reasonable level of security (e.g., enough soils analyses need to be done so that during design or construction a "changed site condition" clause does not have to be invoked because the soils are unable to do the job required.)

(g) A description of the treatment process and operation, including a flow diagram.

The flow diagram for each of the final alternates considered must be both a schematic flow diagram showing all wastewater liquid and solids flow paths and a scaled site layout (showing the site topography) that shows that the proposed treatment units will actually fit on the land available.

The hydraulic profile(s) must be developed in detail for the selected alternate. The hydraulic profile must be done for at least the high plant flow and high receiving water flow/elevation and low plant flow conditions. Hydraulic profiles for other critical flow conditions should also be included.

(j) Physical provision for oil and hazardous material spill control and/or accidental discharge prevention.

This section should address physical features such as grading and structural features such as secondary containment and oil/water separators. Best management practices for pollution prevention such as the placement of drip pans and tank filling procedures should be placed in the operation and maintenance manual.

(k) Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the waste discharge permit, where applicable.

The expected concentration and variability of pollutants given in this section may form the basis of technology-based effluent limits in the absence of effluent guidelines.

- (l) *A description of the receiving water, location of the point of discharge, applicable water quality standards, and how water quality standards will be met outside of any applicable dilution zone. (see WAC 173-201A-100)*

The name, location (river mile, latitude/longitude, waterway segment number, township/range, etc.), and water quality classification of the proposed receiving water shall be given. Any existing receiving water data (monitoring stations reporting to STORET, CRMS, USGS reports, National Oceanic Atmospheric and Administration (NOAA) reports, Federal Energy Regulatory Commission (FERC) license reports, data collected for this report, etc.) must be summarized. Data collected for this report shall be included in an appendix to the report.

For freshwater streams and rivers, the 7Q10 (7 day - 10-year recurrence low flow) flow must be determined and given in the report. This is the flow typically used for critical condition and for determining the size of mixing zones in streams and rivers. For salt water and estuaries, current velocity, appropriate salinity, density, and temperature profile conditions must be determined and given in the report. This is then used to design and evaluate the size and shape of allowable mixing zones. The highest expected background concentrations at the time of lowest dilution should also be evaluated. For some pollutants, the critical condition may occur at some other flow.

There must be an evaluation of toxic chemicals that may be in the effluent (This includes an analysis of toxic pollutants—priority pollutants—when indicated). The applicable numerical water quality criteria (aquatic life, human health, and sediment) must be evaluated along with a decision of which criteria are limiting for this discharge (see Permit Writer's Manual). The National Pollutant Discharge Elimination System (NPDES) permit may contain requirements for monitoring of the effluent for whole effluent toxicity (WET). Identification of the various chemicals that may be present in the discharge and the species present in the receiving water may affect the need or frequency of WET testing.

If the effluent will have fecal coliform bacteria and will be discharged to salt water, the impact of bacterial discharges on shellfish beds (certification or decertification) must be evaluated.

For discharges to land, the ground water quality, gradient by season, flow rate, depth to the vadose zone by season, and depth of ground water must be determined. This will likely require at least 12 months of ground water monitoring. Monitoring can be done through existing wells (if adequate) or by installing project specific monitoring wells. Hydrogeologic studies in the vicinity of the discharge may be acceptable.

- (m) *Detailed outfall analysis.*

This is part of the information to be covered to comply with 3(e) above. A detailed outfall analysis is a determination of the optimum location and diffuser design required to meet the water quality standards (including aquatic life and human health criteria as defined in WAC 173-201A and the National Toxics Rule) at the boundaries of a permitted dilution zone. This should be accomplished by the use of a computer analysis using the most appropriate model(s) applicable to the situation (see Permit Writer's Manual for further guidance). Field data shall be collected as necessary to calibrate the model and to develop site-specific data (such as eddy diffusivity) that cannot be reasonably assumed. The analyses should be made of all conceivable critical situations. The low flow to be used shall be the 7Q10 flow or other regulated low flow.

The outfall and diffuser shall be considered as a basic unit of the treatment system and included in the data for 3(g) above.

- (p) *Where discharge is through land application, including seepage lagoons, irrigation, and subsurface disposal, a geohydrologic evaluation of such factors as:*
 - (i) *Depth to ground water and ground water movement during different times of the year;*
 - (ii) *Water balance analysis of the proposed discharge area;*
 - (iii) *Overall effects of the proposed facility upon the ground water in conjunction with any other land application facilities that may be present.*

These requirements are explained in more detail in Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems (Ecology Publication 93-36) and a land application project proponent should consult this document when preparing an engineering document.

- (q) *A statement (expressing sound engineering justification through the use of pilot plant data, results for other similar installations and/or scientific evidence from the literature) that the effluent from the proposed facility will meet applicable permit effluent limitations and/or pretreatment standards.*

In the absence of a draft permit for the facility, water quality-based and technology-based effluent limits may be determined from guidance in the Permit Writer's Manual. Calculation of these effluent limits is for your use in determining the level of treatment required. Approval of the engineering report does not mean that these limitations will be used in the facility's permit.

- (r) *A discussion of the method of final sludge disposal selected and any alternatives considered with reasons for rejection.*

If your treatment process generates sludge, the engineering report must include an evaluation of sludge quantities generated and potential disposal or utilization options, including regional sludge disposal and utilization options. The discussion should include compliance with applicable laws and regulations and Ecology Minimal Functional Standards, local permits, etc. Guidance on the content of a sludge management plan is available from other sources.

A solids mass balance for the treatment plant is a part of the process of developing and comparing both the sludge treatment and wastewater treatment alternatives. A ranking of the various sludge handling alternatives considered and selection of the best alternative must be made. The reasons for not selecting the other alternatives must be given. A listing of the actions necessary to implement the selected sludge-handling alternative must be given. The selection of a sludge treatment and disposal process is part of the alternatives analysis referred to in 2(c) through (e) above.

- (s) *A statement as to who will own, operate, and maintain the system after construction.*

The staffing needs of each final treatment alternate considered must be made in order to properly compare the costs of the alternates. The EPA staffing guidelines for municipal treatment plants are an acceptable estimating tool.

- (t) *A statement regarding compliance with any applicable state or local water quality management plan or any such plan adopted pursuant to the Federal Water Pollution Control Act as amended.*

This need be only a brief paragraph stating which plan is being followed. These plans are plans like a federal 303(e) plan, 208 basin plan, or a state drainage basin plan (372-68 WAC).

- (x) *A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.*

A SEPA determination is required for approval of an engineering report. You may contact the Department of Ecology before submittal of the engineering report to arrange for approval of the conceptual plan and then proceed with application of the local permits. In this case, the local permitting authority becomes the lead SEPA agency. If no local permits are required, the Department of Ecology will be the lead agency. In this case, the engineering report should include a copy of the SEPA checklist.

If NEPA is required (for federally funded projects), an environmental assessment or reference to an applicable Federal Environmental Impact Statement (FEIS) and final NEPA action must be appended in the engineering report.

- (y) *Additional items to be included in an engineering report for a solid waste leachate treatment system....*

If the facility does not directly land, dispose of the solid waste this may simply be a statement of the method of solid waste disposal.

Additional requirements

Items that are not specifically required in this section, but shall be included in an engineering report are:

1. A listing of all permits that are required for construction of the project (required in SEPA checklist).
2. WAC 173-240-160 Requirement for Professional Engineer.
The Department of Ecology may waive the requirement for a professional engineer to design an industrial wastewater treatment system. This waiver is usually granted only for non-mechanical, small volume, and low concentration on-site systems.

Selecting an engineering consultant

1. Remember that you are responsible for the product. You will benefit from a good planning effort.
2. Choose the most qualified professional you can find.
3. Competence is more important than price. A relatively small amount of money apparently saved in planning can be quickly lost in unnecessary implementation cost or in poor performance of the finished project.
4. Check references. The most important thing to look for in the selection process is the successful experience in this kind of work of the particular person who will be doing the work. References should be obtained and contacted. Include all clients for similar work in the recent past, not just selected ones.
5. Put out a request for qualifications first, prior to a request for proposals. This will narrow the field with the least expense to the prospective consultant and with the least trouble to your company.
6. Look at all feasible alternatives. Watch out for those who may have a "canned" or predetermined solution and would develop a report from there backwards. We are particularly watchful for this kind of circumvention of the intent of a bona fide open-minded planning process.
7. Consider the advantages of obtaining an unbiased, second opinion. For example, hire one engineer to represent your company's interest on an on-going basis and select another qualified consultant for each major project.
8. Use EPA's "Contracting for Professional Services" (EPA-430/9-82-005) to assist in the selection process and in preparation of the contract.
9. Familiarize yourself with the requirements of Chapter 173-240 of the Washington Administrative Code, *Submission of Plans and Reports for Construction of Wastewater Facilities*.
10. Contact the Department of Ecology for assistance in defining the scope of the project and explaining the submittal process.

To ask about the availability of this document in a format for the visually impaired, call the Water Quality Program at 360-407-6401. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.