

Chapter 5.

CSO Regulatory Requirements

Combined sewer overflow discharges at Denny Way are covered by King County's National Pollutant Discharge Elimination System (NPDES) permit for the West Point Wastewater Treatment Plant. NPDES permitting of combined sewer overflow (CSO) facilities involves an interplay among the provisions of 33 U.S.C. 1251 *et seq.*, the federal Clean Water Act, the Revised Code of Washington (RCW), the Washington Administrative Code (WAC), and the USEPA's CSO Control Policy. In addition, any new facilities will have to comply with the CSO control schedule provisions of the existing permit and with the terms of the settlement among the City of Seattle, King County, and the National Oceanic and Atmospheric Administration (NOAA). This chapter will briefly summarize the pertinent provisions of each of those enactments and documents and describe how each will impact the design of the Denny Way/Lake Union facilities.

5.1. Clean Water Act Requirements

The 1972 amendment to the federal Water Pollution Control Act, popularly known as the "Clean Water Act," marked the beginning of a national legislative effort to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The stated goal of the Clean Water Act was to eliminate discharge of pollutants into navigable waters by 1985. That goal was to be achieved by means of a grant program to finance community wastewater treatment plants and a permit program that would forbid discharge of pollutants into waterways without first obtaining an NPDES permit. The permit sets limits on the volume and concentration of pollutants that can be legally discharged by municipalities and industries. The administrator of the USEPA was authorized to promulgate regulations to implement the Clean Water Act.

The act's no-discharge goal was not reached by 1985. However, the Clean Water Act forms the basis and framework for the water quality regulatory program that exists today. Two principles embodied in the act are especially important in understanding the present regulatory framework for water pollution control. These two principles are:

- Wastewater must be treated with the best technology that is economically achievable, regardless of the condition of the receiving water.
- Effluent limits are based on treatment technology, but more stringent limits may be imposed if the technology-based limits do not prevent violations of water quality standards in the receiving water.
- These two requirements are referred to as the technology-based requirements and the water quality-based requirements. The two requirements are central to both federal and state water pollution control regulation.

For municipal wastewater treatment systems generally, the technology-based permit requirement includes secondary treatment prior to discharge. CSOs are exempt from the secondary treatment requirement because biological treatment does not handle flows of such variable and intermittent nature. The technology-based requirements for CSO control facilities vary with system, location, and waste loads.

5.2. USEPA CSO Control Policy Requirements

The USEPA published its National CSO Control Strategy on September 8, 1989, and then elaborated on that strategy with its Combined Sewer Overflow Control Policy (here referred to as the “CSO control policy”), published April 11, 1994. The CSO control policy is intended to implement the Clean Water Act as that act applies to combined sewer overflows.

5.2.1. Control Policy Objectives

The objectives of the CSO control policy are:

1. To ensure that if CSOs occur, they occur only as a result of wet weather.
2. To bring all wet weather CSO discharge points into compliance with the technology-based and water quality-based requirements of the Clean Water Act.
3. To minimize water quality, aquatic biota, and human health impacts from CSOs.

The CSO control policy requires that municipalities with CSOs should begin immediately to model and monitor in order to characterize their sewer systems, to demonstrate implementation of the nine minimum CSO controls, and to develop a long-term CSO control plan.

Selection and implementation of actual control measures should be based on site-specific considerations, including the sewer system characteristics as understood from the system characterization.

5.2.2. Nine Minimum Controls

The nine minimum CSO controls that every municipality with a combined sewer system must implement are as follows:

1. Proper operation and maintenance (O&M) programs for the sewer system and CSO outfalls.
2. Maximum use of the collection system for storage.
3. Review and modification of industrial pretreatment requirements.
4. Maximization of flow to a secondary treatment plant for treatment.
5. Prohibition of CSOs during dry weather.

6. Control of solids and floatable materials in CSOs.
7. A pollution prevention program.
8. Public notification to ensure that the public receives adequate notice of CSO occurrences and impacts.
9. Monitoring program to effectively characterize CSO impacts and the efficacy of CSO controls.

Implementation of the nine minimum controls should be completed as soon as practicable, but no later than January 1, 1997. Enforcement of implementation is to be accomplished by including the implementation requirements and timetable in the municipality's applicable NPDES permit. Compliance with the technology-based requirements of the Clean Water Act must include implementation of the nine minimum controls. For some systems, implementation of the nine minimum controls would constitute compliance with the technology-based requirements of the Clean Water Act. King County's Phase I NPDES permit requires implementation of all of the nine minimum control elements by December 31, 2000.

5.2.3. Long-Term CSO Control Plan

Municipalities with CSOs are responsible for developing and implementing long-term CSO control plans that will ultimately result in compliance with the requirements of the Clean Water Act. The minimum elements of a long-term plan are described below.

1. Characterization, modeling, and monitoring of the combined sewer system. The permittee must begin with a thorough knowledge of its sewer system, the response of the system to precipitation events, the characteristics of overflows, and the water quality impacts that result from overflows.
2. Public participation. In developing a long-term CSO control plan, the permittee will actively involve the affected public in the selection of CSO control measures.
3. Consideration of sensitive areas. A long-term control plan should give the highest priority to controlling overflows to sensitive areas including waters with populations of threatened or endangered species and their habitat, waters with primary contact recreation, and shellfish beds.
4. Evaluation of alternatives. The CSO control plan should include a reasonable range of alternatives. For example, the controls considered might be adequate to achieve zero overflows per year; an average of one to three, four to seven, and eight to twelve overflow events per year. Or the plan could evaluate controls that achieve 100 percent, 90 percent, 85 percent, 80 percent, and 75 percent capture for treatment. The selected alternative should meet all requirements of the Clean Water Act, including the technology-based and water quality-based requirements. The CSO control policy offers two approaches to meeting water quality-based requirements. These two approaches are:

- *Presumption approach.* A program is presumed to meet the water quality-based requirements of the Clean Water Act if it limits overflows to an average of not more than four events per year (NPDES authorities may authorize up to two additional overflows per year, making a total of six), or if the program eliminates or captures 85 percent by volume of the combined sewage collected, or if the program results in removal of a mass of pollutants that would be eliminated under that 85 percent capture criterion. To be considered treated, in addition to limiting the number of overflows or providing for their capture, the overflows should receive at least primary clarification, solids and floatables disposal, and disinfection of effluent to meet water quality standards and protect human health and designated uses. “Primary clarification” means a process by which at least 35 percent of suspended solids are removed.
 - *Demonstration approach.* A permittee may demonstrate that a selected program is adequate to meet water quality-based requirements by showing that discharges will meet water quality standards and provide reasonably attainable, maximum pollution reduction benefits, and that the planned program is designed to allow cost-effective expansion or retrofitting, should monitoring show that the selected measures are inadequate to meet water quality standards or protect designated uses.
5. Cost/performance considerations. The permittee should develop appropriate cost/performance curves to demonstrate the cost/benefit relationship over the range of alternatives selected in Element No. 4 above. This will permit a traditional “knee-of-the-curve” analysis to help guide selection of appropriate controls.
 6. Operational plan. The O&M program should be revised to incorporate the controls developed as part of the long-range plan. The operational plan should ensure that such flows receive treatment to the greatest extent practicable for any flows discharged.
 7. Maximization of treatment at the existing secondary treatment plant.
 8. Implementation schedule, including a financing plan.
 9. Postconstruction compliance monitoring program.

The long-term CSO control plan contemplated by the federal policy is a system wide plan, essentially identical with the *1988 CSO Control Plan* prepared by Metro and updated by King County in 1995. By preparing the *1988 CSO Control Plan*, the long-term control planning requirement of the federal policy has been met, significantly in advance of the time frame called for in the USEPA policy. This Denny Way/Lake Union CSO Control Project involves implementation of a part of that long-term control plan.

5.3. Washington's Water Pollution Control Law

The State of Washington adopted its own clean water act in 1987. Chapter 90.48 of the Revised Code of Washington (RCW) deals with water pollution control. Section 90.48.010 describes Washington policy with respect to water pollution control to be as follows:

It is declared to be the public policy of the State of Washington to maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wildlife, birds, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington.

The key substantive provision of the chapter is section 90.48.080, which provides:

It shall be unlawful for any person to throw, drain, run, or otherwise discharge into any waters of this state . . . any organic or inorganic matter that shall cause or tend to cause pollution of such waters. . . .

The Washington State Department of Ecology (Ecology) is given jurisdiction to control and prevent water pollution within the state (90.48.030 RCW) and to promulgate rules and regulations necessary to carry out the provisions of the chapter and the public policy expressed above (90.48.035 RCW).

When Congress granted NPDES permit authority to the states (thereby authorizing them to implement the provisions of the federal Clean Water Act), Washington was among the first states to accept the authority granted.

5.4. Ecology Water Pollution Control Regulations

Ecology has adopted a number of regulations pertaining to municipal waste discharges, including regulations pertaining to combined sewer overflows (WAC Chapter 173-245). This section describes the various provisions of the Washington Administrative Code (WAC) that apply to municipal wastewater discharges. These sections include WAC chapters 176-220 (NPDES permitting), 173-245 (construction and operation of CSO facilities), 173-201A (water quality standards), and 173-204 (sediment standards).

5.4.1 NPDES Permit Program

The principal enforcement mechanism of the federal Clean Water Act is the National Pollutant Discharge Elimination System permit. The federal act authorized the states to develop their own programs for implementing the NPDES program and issuing permits. Ecology responded by adopting WAC Chapter 173-220. The purpose of that chapter, as found in section 173-220-010, is stated as follows:

The purpose of this chapter is to establish a state individual permit program, applicable to the discharge of pollutants and other wastes and

materials to the surface waters of the state, operating under state law as part of the [NPDES] created by section 402 of the Federal Water Pollution Control Act. Permits under this chapter are designed to satisfy the requirements for discharge permits under both section 402(b) of the Federal Water Pollution Control Act and chapter 90.48 [of the RCW].

The NPDES permit issued by Ecology, as a federal permit issued by a state agency, is intended to ensure compliance with both federal and state water pollution control laws. In issuing permits, Ecology uses the same approach of requiring compliance with both technology-based and water quality-based requirements as found in the Clean Water Act. WAC section 173-220-130 provides that any permit issued by Ecology shall insure compliance with all of the following:

- (a) All known and available and reasonable methods of treatment . . . including effluent limitations established under sections . . . of the Federal Water Pollution Control Act.
- (b) Any more stringent limitation, including those necessary to:
 - (I) Meet water quality standards

In writing any NPDES permit, the Ecology permit writer will make permit conditions conform to both state law and regulations and to federal law, regulations, and policy, including the CSO control policy. A copy of any NPDES permit issued by Ecology must be sent to the USEPA regional administrator for Region X (WAC 173-220-160) to ensure proper compliance with the federal policy.

5.4.2. Regulation of CSO Facilities

The WAC provisions with the greatest potential impact to the Denny Way/Lake Union CSO Control Project are found in Chapter 173-245. That chapter governs the construction and operation of CSO reduction facilities.

Section 173-245-015 requires that:

- (1) All CSO sites shall achieve and at least maintain the greatest reasonable reduction, and neither cause violations of applicable water quality standards nor restrictions to the characteristic uses of the receiving water, nor accumulation of deposits which: (a) exceed sediment criteria standards or (b) have an adverse biological effect.

Chapter 173-245 contains a number of definitions important to understanding CSO control requirements. The phrase “greatest reasonable reduction” is defined in Section 173-245-020 (22) to mean control of each CSO “such that an average of one untreated discharge may occur per year.” Based on that definition, the difference between an untreated discharge and a treated discharge is important. Section 173-245-040 describes CSO treatment alternatives as those providing at least primary treatment. WAC 173-245-020 (16) defines “primary treatment” to mean any process that removes at least fifty percent of the total suspended solids from the waste stream, and discharges less than 0.3 milliliters per liter per hour (mL/L/hr) of settleable solids.

While both state and federal regulations require primary treatment of CSOs, two differences are apparent: primary treatment under the Washington regulations requires a higher degree of solids removal than under the federal regulations (50 percent versus 35 percent), and the state regulations attempt to limit discharge of settleable solids, while the federal regulations do not. Thus, the state requirements for CSO treatment are more stringent than the federal requirements. Nothing in the Clean Water Act precludes a state from imposing more restrictive requirements than those imposed by federal law and regulation, so the state regulatory scheme does not violate federal law or policy.

An important issue for municipalities planning for CSO control involves how to set limits for intermittent and variable flows. How is compliance to be measured? Are discharges to be looked at on a per event basis? Or is the limit to be viewed on some sort of average basis? Conceivably, the requirement could be imposed on a monthly or annual basis, using an arithmetic average or geometric mean calculation. The method of determining compliance is of great significance for CSO treatment facility planners, designers, and operators.

CSO flows are qualitatively different from dry weather wastewater flows in that they are intermittent and more variable in terms of both flow volumes and waste loads. CSO waste load concentrations not only vary greatly between events but over time within the same events. While a continuously operating wastewater treatment plant can be designed on the basis of average flows, CSOs are, by their very nature, peak flows. Indeed, as noted at page 4-6 in the USEPA's draft *Combined Sewer Overflows: Guidance for Long-Term Control Plan*, "the concept of 'average flow' does not have as much significance to a CSO control facility compared with a POTW [publicly-owned treatment works]." Because of that important difference, the federal CSO Control Policy, in requiring primary clarification of CSOs, defines primary clarification as at least 35 percent removal of suspended solids. That 35 percent level is in contrast with primary treatment performance of 50 to 60 percent solids removal for a primary clarifier designed to operate on a continuous basis. The USEPA has found, in effect, that it is not reasonable to expect a facility intended to treat peak flows to achieve the same performance as a facility designed to operate on a continuous basis, handling more or less steady flows. Ecology is grappling with these qualitative differences between CSO treatment and dry weather treatment.

In addition to primary treatment, WAC 173-245-040-(2)(b)(iv) provides that on-site CSO treatment includes offshore submerged discharge of the treated effluent and may include a disinfection requirement as well. Under what conditions disinfection may be required is not spelled out in the regulation. However, the water quality-based requirements for CSO control do provide guidance as to whether and what kind of disinfection requirements are likely to be imposed for the Denny Way/Lake Union project facilities.

5.4.3. Water Quality Standards

The water quality standards for Washington state surface waters are found in Chapter 173-201A of the WAC. The regulatory purpose of the chapter "is to establish water quality standards . . . consistent with public health and public enjoyment thereof, and

the propagation of fish, shellfish and wildlife, pursuant to 90.48 RCW and the policies and purposes thereof” (WAC 173-201A-101).

The substantive provisions of the chapter are found in section 173-201A-030, which establishes water use and criteria classes, and section 173-201A-070, the antidegradation policy. The classification section establishes water quality criteria and recognized beneficial uses applicable to each of five surface water classes. The antidegradation section provides that “existing beneficial uses shall be maintained and protected, and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed.”

The Denny Way/Lake Union project would likely discharge untreated CSOs or treated wastewater effluent into Elliott Bay, just offshore from the existing Denny Way regulator station. WAC 173-201A-140 classifies the waters in that area as Class A (excellent). The applicable water quality criteria under WAC 173-201A-030(2) for Class A marine waters are as follows:

Water quality of this Class A must meet the requirements for all characteristic uses, including:

- Water supply (in fresh water).
- Fish and shellfish including salmon and shellfish rearing, spawning, and harvesting.
- Wildlife habitat.
- Recreation (primary contact recreation, sport fishing, boating and aesthetic enjoyment).

Water quality criteria for Class A waters include:

- Fecal coliform levels shall both not exceed a geometric mean value of 14 colonies per 100 milliliters (mL), and not have more than 10 percent of all samples obtained exceed 43 colonies per 100 mL.
- Dissolved oxygen must exceed 6.0 mg/l.
- Total dissolved gas must not exceed 110 percent of saturation.
- Temperature cannot exceed 16 degrees Celsius (C) or 0.3 degrees C over background.
- pH must be within the range of 7.0 to 8.5.
- Turbidity must not exceed 5 NTU over background turbidity.
- Toxic material concentrations must be below the point where they represent a potential for adverse impact on characteristic water uses, human health, or the most sensitive biota.
- Aesthetic values shall not be impaired.

The fecal coliform limits, toxic materials restriction, and aesthetic restrictions are of greatest concern to CSO control facility planners. In order to reduce the fecal coliform in discharges to meet the limitations, some form of chlorination may be required. Chlorine is toxic, however, and residual levels of chlorine must not exceed levels that cause conditions detrimental to fish, shellfish, and other marine organisms. WAC 173-201A-0040(3) sets the limit for residual chlorine at 13 micrograms per liter ($\mu\text{g}/\text{L}$) at the acute mixing zone boundary (a 1-hour average concentration, not to be exceeded more than once every three years) and $7.5 \mu\text{g}/\text{L}$ at the chronic mixing zone boundary (a 4-day average concentration not to be exceeded more than once every three years).

The provision in the water quality standards concerning mixing zones (section 173-201A-100) is of great importance to Denny Way facility designers. When any pollutant not found (or found in lower concentrations) in the receiving water is discharged, the pollutant will begin to disperse within and be diluted by the receiving water. A mixing zone is an area surrounding the end of a submerged outfall pipe where water quality standards may be exceeded. As applied to Elliott Bay, a chronic mixing zone extends 200 feet plus the depth of the water over the outfall discharge port in every direction from the discharge port. An acute mixing zone is defined as extending ten percent as far from the outfall discharge port as the chronic mixing zone radius. Some toxic materials (e.g., residual chlorine, as noted in the preceding paragraph) have different limits for the acute and chronic mixing zone boundaries. The significance for Denny Way of a mixing zone is that the standard need not be met at the end of the outfall pipe. As long as the fecal coliform criterion of 14 colonies per 100 mL is met at the edge of the chronic mixing zone, the coliform count at the point of discharge may exceed the limits. Dilution modeling provides a means of calculating the degree of dilution that will occur within the mixing zone, making it possible to compute the maximum permissible concentration of fecal coliforms that can be found at the point of discharge without producing a violation.

5.4.4. Sediment Standards

As noted in Section 5.4.2, CSO sites may not cause accumulation of deposits that exceed sediment criteria or standards. The long-term goal of the chapter is stated in section 173-204-410 as reducing and eventually eliminating adverse effects on biological resources and human health from sediment contamination.

WAC Chapter 173-204 establishes sediment standards. Section 173-204-420 specifies sediment quality criteria for Puget Sound that may not be exceeded, and section 173-204-120 provides that existing beneficial uses (of the benthic environment) must be protected, and no degradation which would interfere with those uses will be allowed. The regulations, while requiring adherence to sediment quality criteria, also recognize that goal may not always be attainable. The result of that regulatory conflict is the authorization of sediment impact zones. A sediment impact zone is an area where the specific sediment quality standards may be exceeded in conjunction with an authorized discharge permit. In authorizing a sediment impact zone, Ecology must find that the discharge is in the public interest and may require that best management practices be employed or that all known, available, and reasonable technology (frequently referred

to as “AKART”) be applied to minimize the adverse impact of the discharge on sediments. The sediment impacts of a proposed discharge should be determined from sediment modeling using the CORMIX or WASP models. The sediment modeling results will be compared with results from the County's water quality assessment, currently underway.

5.5. Other Regulatory Requirements

In addition to federal and state laws and regulations, planners and designers of facility components of the Denny Way/Lake Union CSO Control Project must be aware of commitments made to agencies in prior documents and/or permits and as the result of judicial proceedings.

5.5.1. 1996 West Point NPDES Permit

In the *1988 CSO Control Plan*, Metro pledged 75 percent volume reduction of CSOs by the end of year 2005, and the *1995 CSO Update* to the *1988 Plan* specifically described an interim storage project at Denny Way that would accept overflows from the Dexter regulator station and City of Seattle overflows to Lake Union, and still reduce total overflows at Denny Way to less than 50 percent of the 1988 baseline overflow of 405 million gallons. That project was referred to as the Phase 3 project. The County also pledged a subsequent project at Denny Way that would meet the one untreated discharge event per year criterion of WAC 1733-245-015. The *1995 CSO Update* was prepared and filed as a requirement for King County's renewal of the NPDES permit for the West Point Treatment Plant (NPDES Permit No. WA-002918-1). That date was included as a milestone in the West Point permit document. No milestone date for the one event per year project was established in the *1995 Update*. The present Denny Way/Lake Union CSO Control Project will be completed and provide one untreated discharge event per year control by the Phase 3 interim project milestone date.

5.5.2. NOAA Settlement and the Elliott Bay/Duwamish Restoration Program

King County and the City of Seattle have agreed with the federal government to improve marine sediment quality in Puget Sound and to clean up sediments contaminated in the past by CSO and storm water discharges. This cleanup is being accomplished through the Elliott Bay/Duwamish Restoration Program (EBDRP). The EBDRP was established by the U.S. Departments of Commerce and Interior, the Washington State Department of Ecology, the Muckleshoot Indian Tribe, the Suquamish Indian Tribe, the City of Seattle, and King County through a 1991 consent decree following a lawsuit against the City of Seattle and Metro, initiated by the National Oceanic and Atmospheric Administration (NOAA) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. System wide planning for CSO control must take the consent decree into account to the extent that individual CSO control projects impact sediment and habitat restoration projects of the EBDRP.

Under the consent decree, King County and the City of Seattle agreed to establish a fund for habitat restoration and cleanup of contaminated sediments. A panel of

participating governments responsible for implementing the requirements of the consent decree produced a draft concept document that describes the process developed for the Elliott Bay/Duwamish Restoration Program. The program is a cooperative, intergovernmental program established to help restore and replace natural resources injured by pollution in Elliott Bay and the lower Duwamish River. The panel has identified and prioritized potential sediment cleanup and habitat development projects.