National Pollutant Discharge Elimination System Industrial Stormwater Permit Evaluation Report
No. 1200-Z

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October 2018, Final Action

Final Action
Renew the 1200-Z and 1200-COLS National Pollutant Discharge Elimination System Stormwater General Permits, and in the process combine them into a single permit, the 1200-Z.

Additionally, DEQ assigned coverage to two facilities that held 1200-ZN permits and any facilities on the 1200-COLSB permit to the 1200-Z general permit. The 1200-ZN general permit, implemented during the 2012 renewal cycle, and the 1200-COLSB general permit, effective Oct. 1, 2016, served as "bridge permits" so DEQ could extend coverage to new applicants and provide protective conditions and guidance while completing the renewal process.

Permit Category
1200-Z Industrial Stormwater General Permit. This permit replaces the 1200-Z permit effective July 1, 2012; and the 1200-COLS permit effective Oct. 1, 2011. Final action was taken October 2018.

Activities Covered Under the Permit
The permit covers a broad range of industries throughout Oregon that discharge stormwater to rivers, streams and other surface waters. There are about 800 facilities registered under the 1200-Z general permit. The permit regulates various pollutants from industrial activities that may be discharged in stormwater during rain and snowmelt events.

Source Location
Statewide

Coverage and Eligibility
The effective date of the permit is August 1, 2017. The effective date of the reissued permit is October 22, 2018. The permit is a general permit that is issued in accordance with OAR 340-045-0033 where activities involve similar types of operations, similar types of wastes and similar monitoring conditions. The permit covers industrial activities that have a potential to discharge pollutants to rivers and streams, or conveyance systems that eventually discharge to rivers and streams.

Columbia Riverkeeper and Northwest Environmental Defense Center and Oregon Industrial Stormwater Group filed administrative and judicial petitions for reconsideration of the National Pollutant Discharge Elimination System Permit No. 1200-Z Industrial Stormwater General Permit, dated August 1, 2017. After months of negotiation a settlement agreement was reached which includes reissuance of the permit upon reconsideration.

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Background

1.1 What did DEQ Renew?

DEQ renewed the 1200-Z and 1200-COLS National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permits, and in the process combined them into a single permit, the 1200-Z. DEQ also assigned coverage to the remaining 1200-ZN facilities and 1200-COLSB facilities.

1.2 Regulatory Context

The federal Clean Water Act, CWA, provides that discharges from point sources to waters of the United States are prohibited, unless in compliance with a NPDES permit (CWA 301(a)). In 1987, the CWA was amended to establish a framework for regulating municipal and industrial stormwater discharges under the NPDES program (CWA 402(p)). In 1990, the U.S. Environmental Protection Agency (EPA) adopted regulations requiring NPDES permits for discharges of stormwater to surface waters from certain categories of industries (55 Fed. Reg. 47990, codified at 40 Code of Federal Regulation (CFR) 122.26). In 1992, EPA revised the monitoring requirements for industrial stormwater discharges (57 Fed.Reg (11394-01; 40 C.F.R. 122.44(i)(2), (4)-(5)). In 1999, EPA adopted additional stormwater regulations, known as Phase II (64 Fed.Reg. 68722-52). The Phase II regulations, provide, among other things, for exclusions from NPDES permits for "industrial activities that have "no exposure" to stormwater. "

According to 40 CFR 122.2, "discharge of a pollutant" is defined as:

> (a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source," or
>
> (b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a state, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any "indirect discharger."

When sheet flow is exposed to industrial activities or significant materials and discharges to a water of the state, EPA requires that these discharges also be regulated under DEQ's NPDES 1200-Z permit. Concentrating the sheet flow may be required to obtain a sample.

Permit History

DEQ is an EPA approved water quality permitting program state and is responsible for implementing these regulations and issuing NPDES permits. In 1991, DEQ adopted a series of NPDES General Stormwater Discharge Permits that applied to different industrial sectors. In 1997, DEQ consolidated these sector specific general permits and issued a statewide Industrial Stormwater General Permit (1200-Z permit) that covers a broad range of industries throughout the state. In 1999, DEQ issued the 1200-COLS permit for discharges to the Columbia Slough to coincide with the issuance of the Total Maximum Daily Load (TMDL) for the watershed.

These permits expire every five years.

1.3 Summary of Key Changes

DEQ's changes incorporated into to the 1200-Z industrial permit were in response to EPA's input, water quality standards updates, DEQ and agent's regional inspections and comments from stakeholders.

DEQ's goal in the revised 1200-Z was to write clear and concise conditions aimed at uniform implementation throughout the state. This is a similar approach EPA used while drafting the 2015 MSGP, which does not include additional narrative technology-based effluent limits but rather provides a greater level of specificity so registrants' requirements are now more clear and transparent on existing categorical conditions.

DEQ followed this approach. The key changes include the following:

- Combined the 1200-Z and 1200-COLS into a single industrial permit.
- Added Table 2 in the permit: additional industrial activities covered for the Columbia Slough and Portland Harbor.
- Eliminated Tier II corrective action reports, now all monitoring exceedances trigger a Tier I report. Renamed Tier II Report from Revised Stormwater Pollution Control Plan, and also renamed Tier II Mass Reduction Waiver from Tier II Waiver.
- Lowered benchmarks for TSS to 30 mg/L in the Columbia Slough and the Portland Harbor.
- Calculated copper benchmark based on the Biotic Ligand Model.
- Reassessed the zinc and lead benchmarks based on risk based water quality model.
- Assessed the technical achievability of the metal benchmarks.
- Based on monitoring results from current permits cycles, additional pollutant monitoring for Cadmium, Chromium, Nickel, Mercury and PCB were discontinued.
- Provided for electronic submission for Discharge Monitoring Reports, DMR, and reporting requirements during the permit term.
- Added precision to sample collection. Clarified representative sampling and required sheet flow or shallow concentrated flows to be channeled, collected, analyzed and controlled.
- Included requirements for terminating coverage.

1.4 Additional Noteworthy Changes

The term "outfall" was replaced with "discharge point." This is consistent with EPA's 2015 industrial stormwater permit and Washington State Department of Ecology's permit language.

Table 1 and Sector E have been modified for clarity and accuracy. Wood preserving, SIC code 2491 is now eligible for coverage and the 1200-A industrial permit will now cover all industrial sectors included in SIC codes, 2951 and 3272, including mobile asphalt and concrete batch plants.

If Tier II corrective action is triggered, facilities must size and implement treatment of mass load reduction measures at all substantially similar discharge points. Sampling must resume at these discharge points after Tier II corrective action implementation.

Many of the timelines requiring an action "within" a defined amount of time has been changed to "no later than."

More information on these requirements as well as other changes are provided in the appropriate sections of this report below.

1.5 October 2018, Changes as a result of reissuance on reconsideration

Errors were corrected and key changes include the following:

- Impairment monitoring frequency changed from two times a year to four times a year.

- When monitoring exceeds an impairment pollutant reference concentration, Tier I reports must be submitted no later than 60 days after receiving monitoring results.
- Numeric Effluent Guideline Limitations sampling is semi-annually, increasing from once a year.
- Discharge Monitoring Reports must be submitted quarterly.
- Representative Sampling language reflects EPA's MSGP.

1.6 Local Municipalities That Serve as DEQ's Agent

DEQ authorizes local public agencies under a Memorandum of Agreement to act as its agent and implement the permit on DEQ's behalf. The following local municipalities currently act as DEQ's agent for the 1200-Z permit: City of Portland, City of Eugene and Clean Water Services which includes all or parts of the cities of Beaverton, Cornelius, Forest Grove, Hillsboro, Sherwood, Tigard and Tualatin.

The agents typically conduct the following activities: application and stormwater pollution control plan review, inspections, monitoring data review, stormwater and wastewater monitoring, and verification and approval of no-exposure certifications. Throughout the permits, DEQ uses the language "DEQ or agent" to reflect this partnership. If a facility is operating in an agent's jurisdiction, they must submit the materials to the agent rather than DEQ, with the exception of permit transfers. Also, the agent will evaluate permit compliance for facilities within their jurisdictions.

1.7 Antidegradation Review

Tier 1 antidegradation review is required to ensure that existing uses of waterbodies are protected. Benchmarks in the permit are established to ensure that water quality standards are met in receiving waters and designated beneficial uses are protected. If, during the time of permit assignment, DEQ receives information that existing uses differ from designated beneficial uses in the receiving water, DEQ has the option of imposing more stringent benchmarks to ensure that existing uses are protected. Since implementing this approach on a facility-by-facility basis under a general permit is impractical, DEQ could require the permit applicant to apply for an individual permit.

A new discharger to an impaired water cannot contribute to the impairment. To ensure this, DEQ requires new applicants that may discharge to an impaired water without a TMDL to:

- Prevent all exposure to stormwater of the pollutant(s) for which the waterbody is impaired; or
- Document that the pollutant(s) for which the waterbody is impaired is not present at the site; or
- Demonstrate that the discharge is not expected to cause or contribute to an exceedance of the water quality standard for which the waterbody is impaired.

If a new discharger is unable to meet the above conditions, discharge must cease or coverage can be obtained under an individual permit.

A new discharger to an impaired water with a TMDL that was approved on or before May 1, 2017, and establishes wasteload allocation for industrial stormwater must comply with the conditions of the TMDL. DEQ may require additional monitoring, site controls or compliance schedules to prevent industrial stormwater from exceeding the wasteload allocation(s) in the TMDL.

Benchmarks in DEQ's industrial stormwater general permit have become more stringent over time. The effects of lowering benchmarks and the effectiveness of the industrial stormwater general permit can be seen in plots of discharge concentrations over time presented in the Stormwater Discharge Data Review section. DEQ considers that use of less than 10% of assimilative capacity in a receiving water is considered *de minimis* and not a lowering of water quality and is thus not subject to a Tier 2 antidegradation review. If an assignment of new permit coverage would result in use of greater than 10% of assimilative capacity for any pollutant, DEQ may require a Tier 2 antidegradation review or may require more stringent benchmarks to ensure that there is no lowering of water quality.

Finally, there are a relatively consistent number of facilities operating under the permits at any time. Table 1 presents the number of facilities as of July 1, of each year. There has been an average of 687 permitted facilities, with a difference of ± 2.25% of the average, operating under the 1200-Z since July 2012, the effective date of the current 1200-Z permit. There has been an average of 133 permitted facilities, with a difference of ± 2.25% of the average, operating under the 1200-COLS permit since July 2012, two months prior to the effective date of the current 1200-COLS permit. Since July 2011, the number of facilities under each permit has not varied over ± 3.5% of their respective averages.

Table 1: Number of Permits 2012 – 2016

Permit Year	No. of Permits (1200-Z)	No. of Permits (1200-COLS)
2012	712	128
2013	688	134
2014	685	137
2015	676	133
2016	673	134

Permit Coverage and Exclusions from Coverage

The cover page describes the sources that are eligible to obtain coverage under the permit. The language was changed from "sources that are required to obtain coverage under this permit" to "sources covered under this permit." The change is consistent with other DEQ general permits and reflects the option of a facility to elect coverage under an individual permit rather than a general permit. The cover page also includes the expiration date of the permit that will not exceed five years from the date of issuance.

Pursuant to 40 CFR 122.26(b)(14)(i - ix, xi), certain "stormwater discharges associated with industrial activities" are eligible for coverage under the 1200-Z permit. "Stormwater discharges associated with industrial activities" was defined broadly in the federal regulations to cover a wide variety of industrial facilities. Table 2 (Table 1 in the permit) provides a list of 29 categories of industrial activities and Standard Industrial Classification (SIC) codes that are eligible for permit coverage, if a facility discharges stormwater to surface waters or to a conveyance system that discharges to surface waters of the state.

The permit registrant must assess all areas with industrial activity, even those areas that may discharge sheet flow.

2.1 Industrial Sectors and Activities Covered

In Table 2 below, Sources Covered (Table 1 in the permit), DEQ deleted Note 1 text explaining exemptions regarding petroleum bulk stations and terminals. This text was replaced by the simpler language used in EPA's 2015 industrial stormwater permit. Table 2 (Table 1 in the permit) also excludes primary SIC codes 2951 and 3273 from coverage under the 1200-Z, as coverage is required under the 1200-A general permit. These codes and the corresponding requirements remain in Sector E for co-located SIC code operations only. DEQ's 1200-A general permit will align with the changes to Table 2 (Table 1 in the permit) and expand coverage from just asphalt and concrete batch plants to the full industrial groups: asphalt paving and roofing materials, 2951, and concrete, gypsum and plaster products under 3273. Mobile asphalt and concrete batch plants will remain covered under the 1200-A general permit. DEQ does not intend to have primary industrial activities registered under the 1200-A and 1200-Z general permits.

EPA's MSGP includes sector-specific requirements that allow wood preserving facilities to become eligible for coverage under their MSGP for stormwater discharges. DEQ evaluated using the same approach in Oregon. Oregon's wood preserving facilities are covered by individual permits which contain stormwater benchmarks and effluent limits that are more stringent than the sector-specific requirements in EPA's MSGP, which are incorporated in the 1200-Z in Schedule E. Due to anti-backsliding requirements, these benchmarks and effluent limits cannot be reduced or eliminated, unless DEQ can demonstrate that they are no longer needed to provide environmental protection. However, since many wood preserving/treaters have improved their practices and site pollution prevention procedures to use less harmful chemicals, DEQ will no longer categorically exclude wood preservers, SIC code 2491, from being eligible for coverage based on future application submittals. Individual permit holders will be evaluated on a case-by-case basis for eligibility under the 1200-Z general permit.

Table 2: Types of Industrial Sources Covered Under this Permit

Types of Industrial Sources Covered Under this Permit (Table 1 in the permit)
Facilities with the following primary Standard Industrial Classification (SIC) codes: 10 Metal Mining 12 Coal Mining 13 Oil and Gas Extraction 20 Food and Kindred Products 21 Tobacco Products 22 Textile Mill Products 23 Apparel and Other Finished Products Made From Fabrics and Similar Material 24 Lumber and Wood Products, Except Furniture (Activities with SIC 2411 Logging that are defined in 40 CFR §122.27 as silvicultural point source discharges are covered by this permit.) 25 Furniture and Fixtures 26 Paper and Allied Products 27 Printing, Publishing and Allied Industries 28 Chemicals and Allied Products Manufacturing and Refining (excluding 2874: Phosphatic Fertilizers) 29 Petroleum Refining and Related Industries (excluding 2951, covered by 1200-A) 30 Rubber and Miscellaneous Plastics Products 31 Leather and Leather Products 32 Glass, Clay, Cement, Concrete and Gypsum Products (excluding 3273, covered by 1200-A) 33 Primary Metal Industries 34 Fabricated Metal Products, Except Machinery and Transportation Equipment 35 Industrial and Commercial Machinery and Computer Equipment 36 Electronic and Other Electrical Equipment and Components, Except Computer Equipment 37 Transportation Equipment 38 Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks 39 Miscellaneous Manufacturing Industries 4221 Farm Product Warehousing and Storage 4222 Refrigerated Warehousing and Storage 4225 General Warehousing and Storage 5015 Motor Vehicle Parts, Used 5093 Scrap and Waste Materials
Facilities with the following primary SIC codes that have vehicle maintenance shops (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication), equipment cleaning operations, or airport deicing operations: 40 Railroad Transportation 41 Local and Suburban Transit and Interurban Highway Passenger Transportation 42 Trucking and Courier Services, Except Air (excluding 4221, 4222, and 4225) 43 United States Postal Service 44 Water Transportation 45 Transportation by Air 5171 Petroleum Bulk Stations and Terminals, except petroleum sold via retail method.
Steam Electric Power Generation including coal handling sites
Landfills, land application-sites and open dumps
Hazardous Waste Treatment, storage and disposal facilities
Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage, recycling, and reclamation of municipal or domestic sewage (including land dedicated to the disposal of sewage sludge that are located within the confines of the facility) with the design flow capacity of 1.0 mgd or more, or required to have a pretreatment program under 40 CFR §403.

DEQ added coverage requirements from the 1200-COLS permit and requirements associated with the federal Portland Harbor Superfund cleanup into the permit coverage section of the combined permit. EPA listed the area between river miles 1.9 to 11.8 of the Willamette River as the Portland Harbor Superfund site in 2000, due to contaminated sediment through the reach. Geographical reference points demarking the Portland Harbor reach of the river are from the tip of Sauvie Island to the Broadway Bridge.

On-going evaluation of contaminant loading related to sediment remediation, City of Portland outfall investigations and upland source control project work, indicate that recontamination of remediated sediment and delayed natural recovery in both the Columbia Slough and Portland Harbor are likely without reductions in loading through stormwater discharges.

In 2006, DEQ solicited input from EPA, DEQ, City of Portland and the Lower Willamette Group as part of its Joint Source Control Strategy and developed a strategy for ensuring that stormwater discharges to Portland Harbor would not re-contaminate remediated river sediment. One concept was for DEQ to develop a Portland Harbor-specific stormwater permit with loading analyses, risk assessment-based compliance points and performance standards. DEQ does not have the current or projected resources to develop and administer a new Portland-Harbor specific permit. However, in keeping with the 2005 Memorandum of Understanding and EPA/DEQ Joint Source Control Strategy and EPA's January 2017 Portland Harbor Record of Decision, DEQ must demonstrate that on-going stormwater discharges do not contribute to or cause recontamination of the Superfund sediment remedy or pose unacceptable risk to in-water receptors in Portland Harbor. In addition, because most industrial facilities discharging to Portland Harbor already have permit coverage under the 1200-Z general permit or an individual permit, a new Portland Harbor-specific permit would be largely redundant. For these reasons, DEQ determined that expanding the 1200-Z general permit to include sites that conduct the same industrial pollutant causing activities as sites with SIC codes that require regulation and lowering the Total Suspended Solids (TSS) benchmark (discussed in Section 2.2.3 of this report) for all permitted sites discharging to Portland Harbor is the best approach.

The approach for including a Portland Harbor-specific geo-region was modeled after the approach taken in the Columbia Slough, another waterway with contaminated sediment undergoing remediation and needing protection from recontamination. The 1200-COLS general permit was issued in 1999 to coincide with issuance of an EPA-approved TMDL for the Columbia Slough. Subsequently, the 1200-COLS general permit contained Table 3: Additional Industrial Activities Covered (Table 2 in the permit), which was intended to capture additional industrial sources that may contribute to the impairment of the Columbia Slough, as described in the Columbia Slough TMDL. This table has been included in the 1200-Z general permit for continued application to sources discharging to the Columbia Slough and enhanced to also cover additional industrial activities for discharges to Portland Harbor. The intent of this table is to capture additional industrial sources, which may not be covered under the existing SIC code triggers, to prevent their contribution to impairments or recontamination of sediment following implementation of in-water sediment remedies. Extensive upland source control investigation and permit monitoring in Portland Harbor and the Columbia Slough confirm the presence of the same contaminants in stormwater discharged from sites that conduct these activities as the contaminants impairing water and sediment in Portland Harbor and the Columbia Slough. DEQ estimates that the additional activities requirement will impact up to 30 sites that currently are not registered under the permit located in the Portland Harbor area. The City of Portland's Bureau of Environmental Services will continue to act as DEQ's agent for these new and renewing facilities. Some of the sites may be able to achieve a No Exposure Certification in lieu of coverage under this permit.

Table 3: Additional Industrial Activities Covered that Discharge to Columbia Slough and Portland Harbor

Discharges to Columbia Slough and Portland Harbor (Table 2 in the permit)
Maintenance of vehicles, machinery, equipment, and trailers (including repairs, servicing, washing, testing and painting)
Storage of vehicles, machinery, equipment (including disposal/refuse containers stored by a disposal/refuse contractor/vendor), and trailers (including rental, sales, wrecked vehicles, fleet, and general storage)
Materials storage (including raw materials; bulk fuels, chemicals, detergents, and plastic pellets; finished materials; lumber and food products; wholesale gravel, sand, and soil stockpiles; and bulk liquids other than water)
Waste handling (including recycled product storage, composting, tires, and bulk hazardous waste)
Commercial animal operations (such as kennels, race tracks, and veterinarians not covered under a Confined Animal Feeding Operation permit)
Fuel distribution and sales (including bulk stations, fuel oil dealers, manned and unmanned retail stations, fleet fueling, mobile fueling, and truck stops)
Any former activity that resulted in significant materials (as defined in Schedule D) remaining on-site

2.2 Additional Information

The prohibition against discharges to underground injection control systems was changed to a prohibition against discharges of non-stormwater discharges to underground injection control systems. This change was made to be consistent with current practice; because DEQ encourages infiltration of stormwater, and because some discharges of stormwater (such as roof drains) are considered low risk unless the runoff contains contaminants.

Other minor corrections were made between Table 2 (Table 1 in the permit) and Sector E to correct SIC code listings.

2.3 New Discharger to Impaired Waters

If a facility should have obtained coverage under this permit for the discharge and failed to do so they are considered a new discharger if the discharge commenced after August 13, 1979 (40 CFR 122.2).

Every two years, DEQ is required to assess water quality and report to the U.S. EPA on the condition of Oregon's waters. DEQ prepares an Integrated Report that meets the requirements of the federal CWA for Sections 305(b) and 303(d). CWA Section 303(d) requires identifying waters that do not meet water quality standards and where a Total Maximum Daily Load – commonly referred to as a "TMDL" - needs to be developed. TMDLs are established pollutant load limits for impaired waterbodies.

The Integrated Report includes an assessment of each waterbody where data are available, and the list of waters identified under Section 303(d) as water quality limited and needing a TMDL.

Waters may be added to the 303(d) list (Category 5) based on evaluation of new data, application of new or revised water quality standards, or information showing water quality has declined. Waters may be removed from the 303(d) list when TMDLs or other control measures have been established that are expected to improve water quality, when data show water quality has improved, and in some cases when water quality standards are revised.

Oregon's 2012 303(d) list was submitted to EPA in November 2014 and is partially approved. The approved 2012 303(d) list is now Oregon's effective list of impaired water and can be used for CWA

purposes. EPA has taken a partial disapproval action on Oregon's 2012 303(d) list. EPA will be seeking public comment on waters we are proposing for addition to their 303(d) list. The comment period was extended until April 3, 2017. DEQ will use the integrated report effective May 1, 2017, to establish impairment monitoring requirements.

New dischargers applying for coverage to an impaired water without a TMDL, based on the 303(d) list (Category 5) must demonstrate they will not cause or contribute to a violation of water quality standards prior to coverage under this permit. A discharge to an impaired water occurs when industrial stormwater discharges directly flow or indirectly flows through a conveyance system into a segment of water that has been identified as not meeting water quality criteria for a pollutant. It is the responsibility of the new discharger to determine the discharge point where industrial stormwater will enter a waterbody. Once the information is submitted to the regulatory authority, DEQ or their agent must decide if the applicant can be assigned to this permit and document which conditions below applies. A new discharger to a segment of water impaired without a TMDL (Category 5) must meet one of following conditions prior to obtaining coverage under this permit:

- Prevent all exposure to stormwater of the impaired parameters;
- Document that the impaired parameters are not present at the site; or
- Demonstrate that the discharge is not expected to cause or contribute to an exceedance of the water quality standard for the impaired parameters.

If an applicant is unable to meet the first three bullets, then they must obtain coverage under an individual discharge permit or cease discharge.

For the purpose of this permit, impairment parameters, EPA-approved 303(d) list (Category 5) that is in effect on May 1, 2017, will remain the same until the next general permit renewal. The date prior to issuance of the general permit was selected to allow DEQ to begin preparing permit assignment and coverage letters as soon as possible. This will enable more timely assignment of coverage than was possible during previous renewals. New dischargers can determine applicable impairment pollutants by reviewing the EPA-approved 303(d) list (Category 5) that is in effect on May 1, 2017. The May 1 effective date will also apply to EPA-approved TMDLs with industrial stormwater wasteload allocations. Changing from using the 303(d) list or approved TMDL data at the time of permit assignment keeps a consistent approach across DEQ water quality permits of establishing monitoring requirements at the time of permit issuance. Any additional requirements will be identified in permit assignment letters and will be based on TMDLs approved as of May 1, 2017.

When a TMDL establishes an industrial stormwater wasteload allocation, new applicants may only be granted coverage under the general permit after DEQ or agent has made an affirmative determination that there is sufficient remaining wasteload allocations or reserve capacity in the impaired waterbody to support a new industry. This determination may require coverage under an individual discharge permit or additional monitoring, site controls or compliance schedule in order to be covered under the general permit and be consistent with the EPA-approved TMDL.

Regulations governing impaired waters and TMDLs are in the Code of Federal Regulations. Issued in 1992, the regulations stipulate that states are to continue to identify waters that require TMDLs and ascertain the pollutants causing or expected to cause the impairment based on readily available data and information. States establish a priority ranking to put in place plans for establishing a total pollutant load and parse out the load from point (the wasteload allocation) and nonpoint sources. While developing a TMDL, industrial stormwater source impacts are evaluated. Currently the Columbia Slough is the only TMDL that has established a wasteload allocation for industrial stormwater discharges. There may be instances where a general permit is not appropriate and an individual permit is needed.

The permit includes the current exemptions if a waterbody is impaired or has a TMDL for biological communities (and no pollutant, including indicator or surrogate pollutants, is specified as causing the impairment), temperature, hydrologic modifications, and impaired hydrology.

2.4 New Application for Permit Coverage

This permit requires new applicants to submit one paper copy and one electronic PDF copy of the application and the stormwater pollution control plan to DEQ or agent at least 60 calendar days before the planned activity.

If a facility was previously under an individual permit or is changing its process to a new primary SIC code, the registrant must submit a new application and fee and a new stormwater pollution control plan to account for changes such as nature of pollutants and any sector specific requirements. Prior to granting coverage, DEQ will provide a 30-day public review period on the applicant's plan.

References to Table 3: Additional Industrial Activities Covered (Table 2 in the permit) were added to require application submission by dischargers to the Columbia Slough and Portland Harbor that are currently conducting any of these activities that are exposed to stormwater, and are operating without permit coverage. Those identified unpermitted facilities in the Portland Harbor or Columbia Slough will receive written correspondence from DEQ or agent and must submit a complete application no later than 60 calendars days from written notification.

2.5 Renewal Process

Portions of the current permits that addressed fourth-year benchmark evaluations and natural background that occurred during the 1200-COLS general permit that expired in 2011 and the 1200-Z general permit that expired in 2012 are no longer applicable, and were deleted.

For all facilities for which renewal applications have been received, coverage will be assigned in writing when the application is approved. DEQ will notify registrants once coverage is granted under the new permit and facilities will have until December 29, 2017, to submit an updated stormwater pollution control plan unless a later date is approved in writing by DEQ or agent. Once the permit is issued facilities will be assured of the conditions and will have approximately four to five months to complete and submit an updated plan.

This section addressed 1200-Z and 1200-COLS facilities that have yet to install their Tier II treatment or mass reduction infiltration measures. This applies to all permit registrants that exceeded the geometric mean of the benchmarks in the monitoring year 2015/2016, with installation deadline after the expiration of the current permit, June 30, 2017. The Tier II revised plan deadline for these facilities was December 31, 2016, with implementation due by June 30, 2018.

Because these facilities will only have one monitoring year to evaluate the selection, design and installation of the Tier II corrective actions, only Tier I investigation and reporting is required. DEQ will exempt this small number of facilities from additional treatment or mass reduction measures for the specific pollutant(s) that may still be exceeding the geometric mean of the benchmark. This exemption applies to the 2017-2022 permit cycle. Tier I investigation requires all facilities to review selection, design, installation and implementation of control measures and take corrective action to achieve benchmarks. For this small number of facilities treatment measures must be evaluated and ensure they are operating as designed. DEQ does not anticipate Tier II facilities will continue to exceed pollutant levels; but if the same pollutant exceeds during the 2018/2019 geometric mean evaluation, additional treatment is not required.

2.6 Electronic Submittal

Beginning after December 21, 2020, or when directed by DEQ, the permit registrants must submit reports, including all applications and Land Use Compatibility Statement (LUCS) to DEQ electronically. The permit registrant must sign and certify all electronic submissions in accordance with the requirements within Schedule F in accordance with 40 CFR 122.22.

2.7 Name Change or Transfer of Permit Coverage

Paper and electronic submission requirements were revised in the same manner as new application requirements (above). All name change or transfer forms are sent directly to DEQ, not our agents. If a new owner intends to change industrial process at the site to a new primary SIC code, the owner must submit a new application and is not eligible for a transfer.

2.8 "No Exposure" Conditional Exclusion from Permit Coverage

This section has been updated for clarity. In addition, EPA's guidance is cited to help facilities understand the exclusion. Facilities with unsealed zinc or copper roofing materials are not eligible for the "no exposure" exclusion in Oregon. Consistent with 40 CFR 122.26(g)(4)(iii)(C), significant materials from past industrial activities was added as an element that must not be exposed. Federal regulations 40 CFR 122.26 (g)(2) includes a list of industrial materials and activities which do not require a storm resistant shelter to qualify for this exclusion. This conditional exclusion from obtaining coverage is available on a facility-wide basis only, and may not be applied to individual discharge points or portions of a facility. The five year time period is based on the date the form is submitted to DEQ or agent and does not coincide with the renewal of the permit. Also, the permit language increases the amount of time DEQ or agent has to respond from 30 days to 60 calendar days. If a facility does not receive a written response in this amount of time the certification will be deemed approved.

2.9 Authorized Non-Stormwater Discharges

The authorized non-stormwater discharge language was changed to correspond with EPA's MSGP. No new non-stormwater discharges were authorized, but under "Fire-Fighting Activities" the federal permit uses the phrase "emergency/unplanned" to distinguish between discharges from training activities. During training operations the storm system should be closed to prevent discharge into waters of the state. Under fire hydrant flushing, the 1200-Z general permit also includes maintenance activities.

Landscape watering and irrigation drainage has been combined into one category and the reference to proper application of pesticides, herbicides and fertilizers has been removed. The Department of Agriculture regulates the sale and use of these products. DEQ issued the 2300-A general permit to regulate certain pesticide applications. Vehicle wash water as well as routine external building wash down and pavement wash water remain authorized non-stormwater discharges. Washing, particularly power washing and vehicle washing may contain significant quantities of oil and grease, suspended solids, heavy metals and organics. Vehicle washing language restricts washing to exterior of vehicle and less than 8 vehicles per week. The permit no longer references the 1700-A discharge permit, as it has expired. DEQ may not assign coverage under an expired general permit. Once the 1700-A wash water permit is reissued, facilities which do not meet the *de minimis* allowance for washing less than 8 vehicles per week would be eligible for coverage. The same restrictions apply when washing any surface including: no use of organic solvents, soaps, hot water, and washing any dirt or spills prior to cleaning. Many local municipalities have pollution prevention outreach materials regarding washing. Washington Department of Ecology's, *Vehicle and Equipment Washwater Discharges, Best Management Practices Manual*, November 2012 is a good resource.

2.10 Limitations on Coverage

This section states alternative options for NPDES coverage and limitation on coverage. The current permit did not use the word stormwater when referring to discharge. Clarifying language was added to include the word "stormwater" discharge under the limitation on coverage section permit.

In order to avoid conflict with the anti-backsliding provisions of the CWA, transfer from an individual permit to the 1200-Z will only be allowed where both of the following conditions are met:

- The individual permit did not contain numeric water quality-based effluent limitations developed for the stormwater component of the discharge; and
- The permittee includes any specific BMPs for stormwater required under the individual permit in their stormwater pollution control plan.

Implementation of a comprehensive stormwater pollution control plan for the entire facility (as opposed to selected outfalls in an individual permit) and compliance with all other conditions of the 1200-Z is deemed to be at least as stringent a technology-based permit limit as the conditions of the individual permit. This assumption is only made where the individual permit did not contain any specific water quality-based effluent limitations on stormwater discharges such as stormwater contained high levels of zinc and the individual permit contained a zinc limit developed to ensure compliance with the State water quality criteria.

Schedule A - Technology Based Effluent Limitations

Schedule A of the permit contains the following requirements:

Technology Based Effluent Limitations
- Narrative Technology Based Effluent Limitations
- Numeric Technology Based Effluent Limitations
- Control Measures for Technology Based Effluent Limitations

Water Quality Based Effluent Limitations
- Water Quality Standards
- Discharge to Impaired Waters

Stormwater Pollution Control Plans

Stormwater Discharge Benchmarks

Corrective Action for Impairment and Benchmark Exceedances
- Tier I Corrective Actions
- Tier II Corrective Actions

This structure has changed slightly from the current permits. Following the structure of EPA's MSGP, the permit does not contain new categories of narrative technology based effluent limits; however, changes were made in minimizing exposure, good housekeeping, maintenance, spill prevention and response procedures and employee training.

3.1 Narrative Technology Based Effluent Limits (TBEL)

3.1.1 Description of Narrative Technology Based Limits

The EPA is responsible for establishing effluent limitation guidelines for all sectors of industrial activities covered under this permit. These can be expressed in either numeric guidelines or narrative technology based guidelines. All NPDES permits are required to contain technology based effluent limitations, or TBELS (40 CFR §§122.44(a)(1) and 125.3; CWA sections 301(b)(1)(A); 301(b)(2)(A); and 301(b)(2)(E)). The CWA requires that discharges from existing facilities at a minimum meet the technology based effluent limitations in the permit.[1] Depending on the discharge, these technology based limits are Best Practicable Control Technology currently available for conventional, toxic, and non-conventional pollutants (BPT), Best Conventional Pollutant Control Technologies for conventional pollutants (BCT) and Best Available Technology economically achievable for toxic pollutants (BAT).[2] Consistent with the EPA's MSGP, the permit contains narrative and numeric technology based effluent limits that taken as a whole constitute the required levels of technology based control for the pollutants that may be discharged in industrial stormwater.

The permit follows EPA's approach to control measures consistent with the CWA and regulations for implementation of control measures contained in 40 CFR 122(k)(4). Section 402(a)(2) of the CWA states: "The administrator shall prescribe conditions for such permits to assure compliance with the requirements in paragraph (1) . . . including conditions on data and information collection, reporting and such other requirements as he deems appropriate." (Section 402(a)(1) includes effluent limitation requirements.)[3]

[1] EPA 2008 MSGP Factsheet, page 35
[2] EPA 2008 MSGP Factsheet, page 36
[3] EPA 2015 MSGP Factsheet, page 22

This statutory provision is reflected in the CWA implementing regulations, which state that best management practices, i.e., control measures, can be included in permits when "[t]he practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA." 40 CFR 122.44(k)(4).[4]

The regulatory framework above requires each facility to select, design, install, implement and maintain control measures or best management practices outlined in an individually tailored stormwater pollution control plan, with the goal of reduction or elimination of pollutants from stormwater discharges. This approach requires permit registrants to minimize pollutants, including the exposure of raw, final and waste materials to precipitation. Neither DEQ nor EPA generally mandate the specific controls a facility must select, design, install and implement. This permit provides flexibility to registrants so they may choose technologically available and economically practicable control factors most suited to each specific industry and facility.

Consistent with EPA's MSGP, the narrative technology-based effluent limits in the permit are enforceable. If a facility fails to meet a narrative TBEL, as described in the stormwater pollution control plan, it is a violation of the permit. For example, the narrative TBEL for minimizing exposure requires permit registrants to locate industrial materials and activities inside or protect them with storm-resistant coverings to the extent technologically available and economically practicable and achievable. This TBEL has not changed, but minor changes to other narrative technology-based effluent limits are described below.

3.1.2 Changes to Narrative Technology Based Effluent Limits

Permit registrants are required to meet the following narrative TBELs: (1) minimize exposure, (2) oil and grease, (3) waste chemicals and material disposal, (4) erosion and sediment control, (5) debris control, (6) dust generation and vehicle tracking of industrial materials, (7) housekeeping, (8) spill prevention and response, (9) preventative maintenance, (10) employee education and (11) non-stormwater discharges. Minimal edits were made to the Schedule A, technology based effluent limitations section; however, Schedule A.7 under stormwater pollution control plans expands on requirements to the plan based on the TBEL section.

The requirement to store all hazardous substances within berms or other secondary containment was amended to explicitly specify "petroleum/oil liquids, and other chemical solid or chemical liquid materials known to have potential to contaminate stormwater." This was done because EPA inspectors observed inadequate containment during EPA inspections of Oregon industrial facilities and concluded the current permit language was unclear which liquids require secondary containment.

Unless permitted under a wash water NPDES or Water Pollution Control Permit (WPCF), discharge of wash water is recommended to drain to a closed-loop system, infiltrate into a vegetated area or may be discharged only if it complies with the restrictions outlined in authorized non-stormwater discharge condition 8 of the permit. EPA suggested we adopt some of its language to ensure wash water is managed indoors or in bermed areas disposed into sanitary sewer. Discharge of wash water often requires pre-authorization from the local sanitary district.

The requirement to control exposed areas under Erosion and Sediment Control TBEL was expanded to include past and significant materials remaining from past industrial activity. This was done to better address contaminants on sites, which are not from current operations but may be impacting otherwise well managed current operations. Improved cross-program coordination with DEQ's cleanup program is anticipated in order to prevent migration of contaminants to surface waters due to stormwater contact

[4] EPA 2015 MSGP Factsheet, page 23

with exposed contaminated soils. This new condition may impact some known cleanup sites and orphan sites for re-development, as well as unknown discovered contamination. The federal definition of stormwater associated with industrial activity (40 CFR 122.26(b)(14) intends to control pollutants from areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.

The requirement to minimize dust generation and off-site tracking of industrial materials was amended to include discharge of soil and other industrial particulates to minimize pollutants from leaving the site.

The employee education requirement was expanded to reflect EPA's MSGP and now includes a list of the personnel that must be trained. Based on inspections, DEQ also added the requirement that when key personnel change, training on the stormwater pollution control plan must take place no later than 30 calendar days once new staff is re-assigned. All training must be documented and kept on-site to confirm proper staff have completed education no later than 30 calendar days of hire or upon change in duties for key designated staff and annually thereafter. Not all employees are required to be trained; however, those who are responsible for monitoring and inspections, BMP installation and maintenance, storage and handling of chemicals, and those responsible for taking corrective actions as required under the permit must be trained on the permit and the facility's stormwater plan.
A comprehensive education program must include:

- permit compliance;
- stormwater control measures used to achieve narrative TBELS;
- monitoring, inspections, reporting and documentation of these conditions; and
- spill response and good housekeeping practices.

3.2 Numeric Technology Based Effluent Limits

Runoff containing urea and from airfield pavement deicing with 1,000 or more annual non-propeller aircraft departures is the only addition to the numeric effluent limit table. Language was taken from EPA's MSGP. In addition, clarifying that an exceedance of a numeric effluent limit is a permit violation was added. Numeric effluent limits were new to the current permits, and unlike benchmark exceedances, sample results which exceed a numeric limit is a violation of the permit. This section references the corrective action requirements in B.9., to assist permit registrants' understanding of effluent limit guidelines compliance.

Asphalt emulsion numeric effluent limits in Table 4 are applicable only if a facility has a co-located SIC code of 2951. If a facility has a primary SIC code of 2951, coverage under the 1200-A is required.

Table 4: Numeric Effluent Limits based on Effluent Limit Guidelines

Regulated Activity	40 CFR Part/Subpart	Effluent Limit
Runoff from asphalt emulsion facilities (co-located SIC code only, 2951 covered under the 1200-A)	Part 443, Subpart A	See Schedule E.D.2
Runoff from material storage piles at cement manufacturing facilities	Part 411, Subpart C	See Schedule E.E.5
Runoff from hazardous waste landfills	Part 445, Subpart A	See Schedule E.K.3
Runoff from non-hazardous waste landfills	Part 445, Subpart B	See Schedule E.L.7
Runoff from coal storage piles at steam electric generating facilities	Part 423, Subpart E	See Schedule E.O.5
Runoff containing urea from airfield pavement deicing at existing and new primary airports with 1,000 or more annual non-propeller aircraft departures	Part 449, Subpart S	See Schedule E.S.7

3.3 Control Measures for Technology Based Effluent Limits

3.3.1 Authority to include Narrative Technology Based Effluent Limits in the Permits

The TBELs in the permit are expressed as narrative limits. Numeric effluent limitations are not always feasible for industrial stormwater discharges as such discharges pose challenges not presented by the vast majority of NPDES-regulated discharges. Stormwater discharges can be highly intermittent, they are usually characterized by very high flows occurring over relatively short time intervals, and they carry a variety of pollutants whose source, nature and extent varies. This is in contrast to process wastewater discharges from a particular industrial or commercial facility where the effluent is more predictable and can be more effectively analyzed to develop numeric effluent limitations. The variability of effluent and efficacy of appropriate control measures makes setting uniform effluent limits for stormwater extremely difficult. There is a high level of variability among stormwater discharges, in terms of flow rates, volume and levels of pollutants, since the volume and quality of stormwater discharges associated with industrial activity depend on a number of factors such as the industrial activities occurring at the facility, the nature of precipitation, and the degree of surface imperviousness. Thus, it is generally not feasible for EPA or DEQ to calculate numeric effluent limitations, with the limited exception of certain effluent limitations guidelines that have already been established through EPA rulemaking. Therefore, EPA and DEQ have determined that it is not feasible to calculate numeric, technology-based limitations for many of the discharges covered under this general permit and, based on the authority of 40 CFR 122.44(k), has chosen to adopt non-numeric technology-based effluent limitations.

3.3.2 Technologically Feasible

EPA has determined that the technology-based benchmarks, numeric effluent limits, and non-numeric effluent limits in the 2015 MSGP, taken as a whole, constitute BPT for all pollutants, BCT for conventional pollutants, and BAT for toxic and nonconventional pollutants that may be discharged in industrial stormwater. The BAT/BPT/BCT effluent limits in the 2015 MSGP are expressed as specific pollution prevention requirements for minimizing the pollutant levels in the discharge. EPA added greater clarity and specificity in some of the effluent limits because in the past EPA's MSGP were written in very general terms, leaving operators wide latitude in interpreting what constituted compliance, which led to widely varying levels of stormwater program effectiveness. EPA continues to

assert that the combination of pollution prevention and structural management practices required by these limits are the best technologically available and economically practicable and achievable controls, as well as the most environmentally sound way to control the discharge of pollutants in stormwater runoff from industrial facilities.[5]

Definitions of minimize and feasible were added to this section of the permit to better inform the selection of control measures and BMPs. Facilities must select, design, install, implement and maintain all control measures, BMPs and passive and/or active treatment to manufacturer's specification to ensure the control of pollutants. A new requirement that the stormwater pollution control plan include maintenance schedules and frequency of housekeeping measures, such as sweeping or catch basin cleaning, was added.

3.4 Water Quality Based Effluent Limitations

3.4.1 Water Quality Standards

Facilities are required to ensure that stormwater discharge does not cause or contribute to an excursion of instream water quality standards in OAR 340-041, including the narrative criteria and aquatic life and human health criteria. DEQ expects that a facility's compliance with the technology-based limits through the careful selection, design, installation, and implementation of effective control measures as well the monitoring and corrective actions requirements in the permit generally will result in discharges that are controlled as necessary to meet applicable water quality standards.

The language below summarizes this section from the 2011 permit evaluation report as the requirement did not change.

Water quality samples collected from the facility's discharge along with samples at upstream and downstream locations in the receiving waterbody are required to establish that a permit registrants' discharge caused or contributed to a water quality standards exceedance. If the permit registrant becomes aware or DEQ determines that the discharge causes or contributes to a water quality standards exceedance, the permit registrant is required to take immediate corrective actions no later than 24-hours of discovering the violation to evaluate the cause of the exceedance. No later than 30 calendar days of discovering the violation, permit registrants must evaluate the effectiveness of the control measures on-site and identify in a report corrective actions to ensure that the discharge does not cause an exceedance of water quality standards in the future. These corrective actions must be summarized in a Water Quality Standards Corrective Action report that is submitted to DEQ or the Agent.

If the permit registrant determines that revisions to their stormwater pollution control plan are necessary based on the corrective action review, the permit registrant must submit a revised plan to DEQ or DEQ's agent with the report. These corrective actions must be implemented no later than 60 calendar days, unless additional time is approved by DEQ or the agent.

At any time DEQ may require permit registrant to implement additional control measures or require permit registrants to obtain coverage under an individual permit if a discharge causes or contributes to an exceedance of water quality standards. Language was edited to acknowledge that DEQ or agent may impose additional monitoring, site controls or compliance schedules, as well as require individual permit coverage, if a discharge causes or contributes to an exceedance of water quality standards. In cases where DEQ or agent impose additional controls, the permit registrant must revise the requirements and their stormwater pollution control plan. DEQ will post a 30 calendar day public review and comment period on the revised plan.

[5] EPA 2015 MSGP Factsheet, page 21

3.5 Discharges to Impaired Waters

This section applies to facilities that were registered under the current 1200-Z, 1200-ZN, 1200-COLB or 1200-COLS general permits. DEQ changed the section for a new discharger to an impaired waters under permit coverage and exclusion from coverage, to provide that impairments are based on EPA-approved 303(d) list (Category 5) that is in effect on May 1, 2017. Furthermore, DEQ or agent will identify facilities' impairment monitoring requirements in their permit assignment letters based on EPA-approved 303(d) list (Category 5) that is in effect on May 1, 2017.

The Columbia Slough TMDL is the only EPA-approved TMDL with wasteload allocations for industrial stormwater discharges. The permit reflects compliance with the terms and conditions the Columbia Slough TMDL for pollutants approved by EPA on November 25, 1998.

DEQ has established aquatic life criteria for the majority of the toxic pollutants. However, there are approximately ten toxic pollutants without aquatic life criteria and DEQ will use the human health criteria for these pollutants. In instances where the quantitation limit is above the water quality criteria, the quantitation limit will be used as the reference concentration. Permit registrants that discharge to impaired waters will monitor for impairment pollutants that have standard analytical methods (see 40 CFR Part 136). Some impairment pollutants are expressed in the form of an indicator or surrogate (for example, E.coli is a subset of fecal coliform which are indications of fecal contamination) so the permit registrant will monitor for the indicator or surrogate pollutant. Consistent with EPA's MSGP, if the impairment pollutant is suspended solids, turbidity or sediment, permit registrants must monitor for Total Suspended Solids (TSS). Also, DEQ is not requiring facilities to monitor for impairment pollutants if: (a) biological communities are impaired but no pollutant is specified as causing the impairment; or (b) the impairment is related to hydrologic modifications, impaired hydrology, or temperature.

To determine the appropriate required impairment pollutant that must be monitored, DEQ will identify the Category 5 impairment pollutant for the receiving waterbody of a discharger on the 303(d) list. The reference concentration for Category 5 impairment pollutants will be the acute aquatic life criterion listed in Oregon Administrative Rules 340-041-8033, Table 30: Aquatic Life Water Quality Criteria for Toxic Pollutants for that pollutant. If no acute criterion is listed for an impairment pollutant in Table 30, the chronic life criterion will be used. If there is no acute or chronic life criterion for the pollutant, the human health criterion for consumption of water + organism in OAR 340-041-8033, Table 40: Human Health Water Quality Criteria for Toxic Pollutants, will be used.

In the event an impairment parameter is identified on the 303(d) list in the specific river mile of the receiving waterbody for a discharger, and it does not appear in the above referenced column in OAR 340-041-8033 Tables 30 and 40, monitoring for this parameter will not be required.

Similar to the waiver condition, the permit allows discontinued impairment monitoring based on non-detect data result. The permit also requires existing dischargers to document in the SWPCP procedures and evidence showing impaired pollutants are not exposed to stormwater when applying for this exemption to monitoring. Part of the 2018, settlement agreement, DEQ will convene and host meetings to discuss impairment monitoring. Between 2018, and 2022, when the permit expires, permit registrants may discontinue impairment monitoring when three or more past samples indicate discharge is below the detection limit of a reference concentration. Since all existing discharges have monitoring data, documenting no exposure to impairments must be confirmed by monitoring data. All documents and monitoring must be submitted to DEQ or agent for approval prior to suspending impairment monitoring. Monitoring must resume if changes in operation may impact the nature of stormwater discharge characteristics.

In addition, when a TMDL includes a wasteload allocation for a parameter specific to industrial stormwater discharge, DEQ will include such requirements in the permit assignment letter and require a

SWPCP revision. The wasteload allocations will be expressed in any EPA-approved TMDL as outlined in the TMDL documents.

3.6 Preparation and Implementation of the Stormwater Pollution Control Plan

As with many places within the permit, a change made to this section replaces "within 30 days" with "no later than 30 calendar days." The stormwater pollution control plan must be developed and registrants must maintain site specific control measures designed to meet all applicable limits in Schedule A. Permit registrants are required to keep their plan up-to-date and follow all design, installation, implementation and maintenance specification and frequency.

3.6.1 Stormwater Pollution Control Plan Required Elements

Title page requirements now include: (1) plan date; (2) EPA permit number; (3) primary and co-located SIC code; and (4) contact email(s). The EPA permit number is listed on registrants' permit coverage documents and when DEQ shifts to electronic reporting this number will be used and not DEQ's file number. Due to inspection experiences, it is important the SIC code applicable to the drainage areas and associated discharge points be noted in the SWPCP, since it has been found that parts of the site's industrial activities may vary.

Identification of all discharge points was added to the required map elements of the stormwater pollution control plan. The term discharge location and outfall has been replaced with discharge points throughout the permit. DEQ intends to address with the permit all point source discharges, as well as any other dispersed flows off-site, such as channeled sheet flow into a waterway or conveyance systems. This was done to capture all potential discharges of exposed industrial stormwater, as required by EPA. The concept is to regulate all stormwater pollution potential under the federal CWA and therefore, the permit registrant must assess all potential industrial stormwater discharge points that do not infiltrate. The EPA's *Industrial Stormwater Monitoring and Sampling Guide* (March 2009), and the State of Washington Department of Ecology's *Stormwater Sampling Manual* (December 2015) are both good resources for techniques on channeling and sampling sheet flow. To avoid having to monitor sheet flow discharges, permittees can prevent the discharge and ensure infiltration or achieve certification for no exposure.

A new requirement of using standard naming convention of three numeric digits must be implemented for all discharge and monitoring points to accommodate EPA's NetDMR/eReporting system. Previously, DEQ allowed facilities to name outfalls and monitoring points with any naming convention. However, the EPA NetDMR system will not accommodate any naming convention other than three numeric digits. Therefore, new applicants must name discharge and monitoring points with three-digits, beginning with "001" and increasing sequentially. For current permit registrants, DEQ expects to provide instructions at the time of NetDMR registration and will likely include an addendum table in the stormwater pollution control plan template to help registrants convert existing names to the new, required three-digit identifier.

To be consistent with EPA and to help ensure that stormwater pollution control plan maps are complete as well as increase awareness of potential pollutant sources at certain industrial sites, the site map must include the following materials and activities when exposed to precipitation, if applicable:

- fueling stations;
- vehicle and equipment maintenance and/or cleaning areas;
- loading/unloading areas;
- locations used for the treatment, storage, or disposal of wastes;
- liquid storage tanks;
- processing and storage areas;
- immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility;

- transfer areas for substances in bulk;
- machinery; and
- locations and sources of run-on to your site from adjacent property.

A requirement to include the locations, description and any available characterization information on known or discovered significant materials from past industrial practices was added to assist in ensuring these areas are controlled, covered or removed when they contribute contaminants to stormwater discharges.

There were a few other subtle mapping element changes including, "outline of the drainage area for each discharge point, indicating if any discharge points are 'substantially similar' and not being monitored," and complete description of the type of spill prevention and cleanup materials in each location.

A requirement was added within the site description elements of the stormwater pollution control plan to identify regular hours of operation specific to each site. This was done to better tailor monitoring requirements to specific operational hours. "Regular business hours of operation" means those time frames when the facility is engaged in active primary production process, with personnel that have completed the required stormwater pollution control plan training for collecting monitoring samples and monthly inspections. A definition of regular business hours of operation has been added to Schedule D.

The spill prevention and response procedures were changed. In response to inspections, DEQ's intention is to address the need for on-site coordination between unpermitted tenants covered under this permit and permit registrants pertaining to significant materials management. Examples where this coordination would be required are airports, business parks and large industrial campuses. The definition of significant material remains in Schedule D.

Preventative maintenance section added a requirement that the stormwater pollution control plan must include the schedule or frequency for maintaining all control measures and waste collection. The plan must outline any treatment or source control in response to corrective action and permit registrants must follow a defined effective maintenance program.

Operations and maintenance plans were also added as a required element of the stormwater pollution control plan for active and passive stormwater treatment systems, as well as all mass reduction measures or Low Impact Development. This was done to help ensure proper function and maintenance for treatment elements with sophisticated or proprietary components or thresholds that must be met for system efficacy. Just as maintaining treatment system components for optimal performance, Low Impact Development features must be maintained and cleaned to retain infiltration rates and capacity.

3.6.2 Stormwater Pollution Control Plan Requirement Revisions

DEQ is requiring that permit registrants only submit a revised stormwater pollution control plan to DEQ under the following circumstances:

- Change in site contact;
- Part of a corrective action or inspection;
- Changes to the site or control measures that may significantly change the nature of pollutants present in stormwater discharge; or significantly increase the pollutant(s) levels, discharge frequency, discharge volume or flow rate, or
- Changes to the monitoring locations or discharge points.

3.7 Benchmarks

Benchmarks are target concentrations that are intended to assist facilities in determining whether their pollution control measures are adequate to protect water quality. A benchmark exceedance does not

necessarily indicate that a discharge is causing or contributing to a violation of instream water quality standard, but does require an evaluation of control measures and follow-up corrective actions.

3.7.1 Stormwater Discharge Data Review

Stormwater discharge data collected by facilities were examined to assess the effectiveness of the permit program. Trends in discharge concentration were examined based on annual median concentrations and on the percent of samples over the current benchmark. In addition, trends were examined based on the 75th percentile concentration. The 75th percentile concentration provides a measure of the high end of the data distribution, if the 75th percentile concentration are below the benchmark then it can be assumed that most facilities have been able to achieve the benchmark.

Generally, the data indicates a decreasing trend in concentrations for the statewide benchmarks. The issuances of monitoring waiver can influence both the median concentration, percent of samples over the benchmark and the 75th percentile concentration.

Water quality improvements and decreasing trends associated with implantation of Tier II corrective actions could not be identified during this permit time. This is likely due to the implementation deadline, as most facilities were required to implement Tier II corrective actions by either June 30, 2016, or June 30, 2017.

Furthermore, when evaluating the trend data, it is likely that very few facilities had implemented Tier II requirements during the 2014/15 monitoring year. Therefore, this data does not show the effects of Tier II requirements on discharge concentrations.

DEQ reviewed the data received by DEQ and DEQ agents for both the 1200-Z and 1200-COLS permits.

3.7.2 1200-Z permit

DEQ is retaining the 1200-Z benchmark values from the current permit for pH, total oil and grease, and E. coli.[6] DEQ is also retaining the sector-specific benchmark and will no longer require monitoring for the additional pollutants category.

DEQ made the following changes to the benchmarks in the permit:

- DEQ lowered some of the metals benchmark values. The copper benchmark(s) was reevaluated based on the newly adopted aquatic life criterion for copper which requires use of the biotic ligand model based on evaluation of eleven different water quality parameters rather than the hardness based calculations used in previous renewal processes. Changes to the zinc and lead benchmarks are based on a reassessment of the risk based water quality model.
- Additionally, the reevaluation of the metal benchmarks included a technology based assessment (see discussion on these changes below).
- The TSS benchmark value for those facilities that discharge to Portland Harbor Superfund site was reduced from 100 mg/L to 30 mg/L to prevent recontamination of the Portland Harbor Superfund site (see discussion on this change below).

3.7.3 1200-COLS permit

DEQ retained the 1200-COLS benchmarks values for pH, total oil and grease, E. coli, BOD5 and total phosphorus.[7] DEQ is retained the sector-specific benchmark and will no longer require monitoring for the additional pollutants category.

[6] The description and basis for the unchanged benchmarks can be found in the 1997 and 2002 NPDES Permit Evaluation Reports for the 1200-Z permit.

The benchmark assessment of the metals and the changes for total suspended solids is discussed below:

- DEQ did not change to the metals benchmark values. Assessment of the copper benchmark based on the biotic ligand model proposed a value that exceeded the technology based assessment. The reassessment of the zinc and lead benchmarks based on risk based water quality model proposed benchmark values that exceeded the benchmark established in the previous permit, therefore, no changes were made (see discussion on these changes below).
- The TSS benchmark value for those facilities that discharge to Columbia Slough was reduced from 50 mg/L to 30 mg/L to support in-water remediation and to prevent sediment recontamination.

3.7.4 Sector Specific Benchmarks and Additional Pollutants

DEQ retained the sector-specific benchmarks but will no longer require monitoring for the additional pollutants category.

The expired 1200-Z and 1200-COLS permits included monitoring requirements for cadmium, nickel, chromium, mercury, and PCBs. Purposes of this monitoring included:

- Evaluating whether it is appropriate to use copper, lead and zinc as indicator pollutants for a broader suite of metals that may be present in industrial stormwater;
- Assessing the extent to which these pollutants are present in industrial stormwater discharges; and
- Informing permit development.

To assess potential indicator pollutants, DEQ evaluated correlations among copper, lead, zinc, total suspended solids, cadmium, nickel, chromium, and mercury. Although some correlation was observed, correlations were not strong enough to reliably predict the concentration of one pollutant based on another pollutant. Therefore, the indicator pollutant concept was not further pursued.

3.7.5 TSS Benchmark

3.7.5.1 Lower TSS Benchmark for Portland Harbor

On January 6, 2017, EPA released the Record of Decision for cleanup of the Portland Harbor Superfund site. Active remediation will include dredging, capping and enhanced natural recovery, followed by a decade long monitored natural recovery. As the lead for upland source control in Portland Harbor, DEQ's plan for addressing on-going stormwater discharges, in coordination with EPA, includes expanding the permit to additional sites and reducing the TSS benchmark for additional industrial sites that discharge stormwater into Portland Harbor. This is intended to support monitored natural recovery and to prevent recontamination of remediated sediment and unacceptable risk to in-water receptors. EPA's MSGP requires additional review and conditions for discharge to contaminated sediment sites, including a 30 mg/L TSS benchmark. Similarly, Washington Department of Ecology's 2015 Industrial Stormwater General Permit includes a 30 mg/L benchmark/effluent limit for TSS for discharges to contaminated sediment areas to address EPA and state requirements for preventing sediment recontamination. Having first instituted a 30 mg/L TSS benchmark in 2010 for 303(d) sediment impaired waterways, Ecology evaluated results of this benchmark reduction over more than five years. Ecology found that stormwater discharges at or below 30 mg/L TSS do not cause or contribute to a violation of Washington's sediment management standards, especially when required BMPs/controls are applied. In addition to Washington's evaluation, data from discharges within Portland Harbor, the Columbia Slough and nationally demonstrates that reducing TSS commonly results in reduced contaminant loading,

[7] The description and basis for the unchanged benchmarks can be found in the 1997 and 2002 NPDES Permit Evaluation Reports for the 1200-Z permit.

particularly for hydrophobic contaminants that associate with fine particles, like metals, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, chlorinated pesticides and dioxins/furans.

Achieving the lower TSS benchmark of 30 mg/L may be onerous for some1200-Z permit registrants due to the magnitude of reduction. However, DEQ developed empirical evidence that the 70 mg/L benchmark reduction will be achievable. To create a tool for evaluating stormwater discharges from industrial sites, DEQ compiled and ranked concentrations of 12 contaminants commonly detected in industrial stormwater, including TSS, measured between 2006 and 2016 at 25 industrial sites that discharge to Portland Harbor. Of more than 540 measurements of TSS, 360 (approximately 70 percent) were at or below 50 mg/L and nearly 60 percent were at or below 30 mg/L. Additionally, analysis of 2014-15 data submitted by 64 registrants in Portland Harbor indicate that 84 percent of the 50 reporting sites consistently achieved TSS of 30 mg/L or less. A mix of commonly applied best management practices and more sophisticated treatment systems are employed at sites achieving these results in the Portland Harbor.

The TSS reductions are anticipated to be achievable using commonly applied BMPs, although some enhancements over current practice may be needed at the sites not currently achieving 30 mg/L or less. In addition, reducing TSS commonly results in reduced contaminant loading, particularly for hydrophobic contaminants that associate with fine particles, like metals, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, chlorinated pesticides and dioxins/furans. These are also the contaminants driving sediment remediation in Portland Harbor and the Columbia Slough. Rather than developing and implementing benchmarks for all of the contaminants of concern in the Portland Harbor reach of the Lower Willamette River and the Columbia Slough, it is more efficient to reduce permitted discharges of TSS because this is also anticipated to reduce discharges of sediment associated contaminants.

3.7.5.2 Lower TSS Benchmark for Columbia Slough

In 1999, as part of TMDL implementation, the 1200-COLS permit included a TSS benchmark of 50 mg/L for discharges to the Columbia Slough. In addition to suspended solids being a pollutant itself, reducing TSS was also intended to help reduce loads of sediment and associated pollutants in order to meet TMDL goals of reduced fish tissue contaminant concentrations and prevent sediment recontamination in the Columbia Slough. DEQ's 1200-COLS Fact Sheet from 1999 describes development of a TSS benchmark. The fact sheet presents conclusions from evaluation of literature and modeling of association of organic pollutants (PCBs, pesticides and dioxins) with TSS and the largest contribution of PCBs to the Slough being through stormwater solids. This work justified setting a Slough-specific TSS benchmark that was 80 mg/L lower than the statewide benchmark at the time.

Over the past 17 years, up to 134 permit registrants have met the benchmark or applied more robust best management practices and treatment under corrective action to achieve TSS pollutant loads under the benchmark. Analysis of the 2014-15 data submitted by 102 1200-COLS permit registrants indicates that 82 percent consistently achieved TSS of 30 mg/L or less. There were 24 waivers, meaning these facilities consistently met 50 mg/l and therefore were not required to continue monitoring TSS. The remaining 18 percent typically achieved the annual geometric mean of 50 mg/L, but did not consistently achieve 30 mg/L or less.

Since 1999, DEQ sampled sediment throughout the Slough, evaluated stormwater discharges and contaminant loading from numerous private and municipal outfalls and completed several sediment remediation projects with recontamination evaluations. Information from these actions confirms the early TMDL assumptions that the Slough is a stormwater-driven waterway – meaning that inputs of both water and sediment to the Slough come from the nearly 700 stormwater outfalls and are not diluted by flushing of water and sediment inputs from a cleaner source upstream. Therefore, discharges of solids and the associated contaminants, even at reduced levels from permitted sites over the past 17 years,

continue to contaminate the Slough sediment and water column and further reductions are needed to prevent recontamination of remediated areas.

A further reduction of 20 mg/L after three permit cycles is a reasonable application of the maximum extent practicable goal for discharges, toward the goal of further minimizing contaminant loading and recontamination potential. The precedent for a 30 mg/L TSS benchmark by EPA and Washington Department of Ecology and the demonstrated benefits of reducing multiple pollutants associated with particulates is described above in the Portland Harbor section of this report.

Efforts to ensure benchmarks are being met in the Columbia Slough geographic region include:

- Analysis of contaminant load reductions using discharge monitoring data;
- On-going, long-term monitoring by the City of Portland under their Municipal Separate Storm Sewer System (MS4) permit requirements and an Intergovernmental Agreement on cleanup of the Columbia Slough;
- On-going discrete in-water and upland site cleanup activities.

Table 5 below identifies the applicable benchmarks for pH, TSS, total oil and grease, E. coli, BOD and total phosphorus for the different regions in the permit.

Table 5: Benchmarks for pH, TSS, total oil and grease, E. coli, BOD5 and total phosphorus

Parameter	Units	Portland Harbor	Columbia Slough	Columbia River	Regional
pH	s.u.	5.5 – 9.0	5.5 – 8.5	5.5 – 9.0	5.5 – 9.0
Total Suspended Solids	mg/L	30	30	100	100
Total Oil & Grease	mg/L	10	10	10	10
E. coli	counts/100 ml	406*	406	406*	406*
BOD5	mg/L	--	33	--	--
Total Phosphorus	mg/L	--	0.16	--	--

*The benchmark for E. coli applies only to active landfills and sewage treatment plants

3.7.6 Copper Benchmark Modeling

DEQ developed water quality based benchmarks for copper, lead, and zinc, by using a modeling method based on the approach used by Herrera Environmental Consultants for the Washington Department of Ecology's Industrial Stormwater General Permit. Monte Carlo simulations were used in the model to incorporate uncertainty and environmental variability in estimating the probability of exceeding water quality standards for a range of effluent concentrations. This methodology incorporates the aquatic life criterion for copper adopted by DEQ in January 2017, which requires use of the biotic ligand model or "BLM." For the current permits, the copper water quality criterion was based on hardness. Therefore, hardness was used as an input to the model, and copper water quality criteria were calculated for a range of hardness values. The same approach was used to address the BLM-based copper water quality criterion.

3.7.6.1 Assessment of geo-regions

To accommodate regional differences in water hardness, the state was separated into seven geo-regions based on USGS ecoregions as illustrated in Figure 1. Five of the geo-regions identified were the Cascades, Coastal, Columbia River, Eastern, and Willamette Valley. In addition, benchmark modeling was performed for the Portland Harbor (that is, the lower 12 miles of the Willamette River) and the Columbia Slough. Data from 2008-2016 was used in this renewal process to ensure that large enough data sets existed for each geo-region.

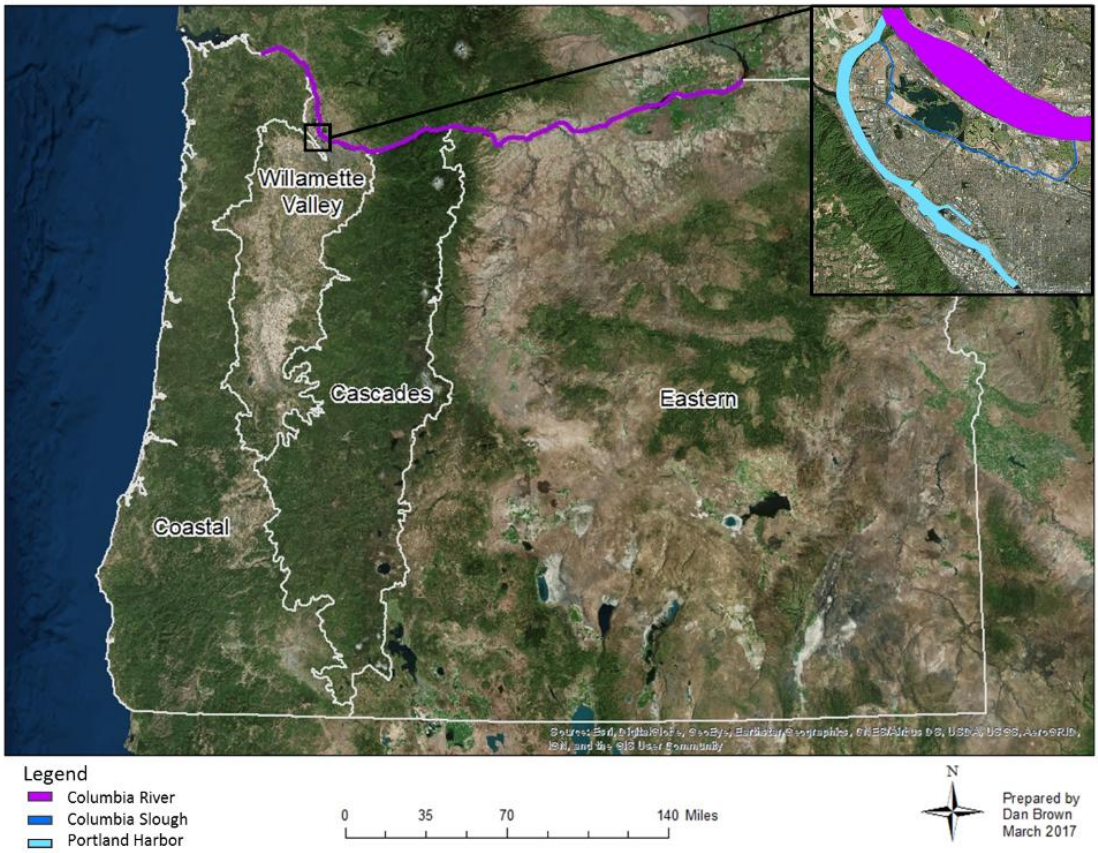


Figure 1: Map of the seven geo-regions used in the copper water quality criteria development

3.7.6.2 Data Sources or Site Selection and Data Acquisition

Sites were previously selected based on where industries are or may be located, which could potentially include sites located downstream of industrial facility outfalls. For this permit renewal evaluation, a list of potential sampling sites was compiled from DEQ's Element and LASAR databases as well as the National Water Quality Monitoring Council's Water Quality Portal, which queries data from the USGS, EPA and the National Water Quality Monitoring Council databases. Additional data for the Columbia Slough and Portland Harbor geo-regions were provided by the City of Portland. This effort resulted in over 15,500 potential sites.

Remote mountain streams and sites impacted by saline water from the coast were removed. In addition, sites were removed based on their proximity to an industrial facility outfall. Such sites were identified by the site description or by mapping site locations against the most recent NPDES facility layer in ArcGIS. This vetting process resulted in just over 2,000 sites with the parameters necessary for this analysis that were not in close proximity to an industrial facility outfall. Once the final site list was established, sites were separated into the correct geo-region based on location and parameters for the copper, lead and zinc benchmarks. All data collected between 2008 and 2016 from sites in the final site list were used in these analyses. Non-detect data was excluded from these analyses so as not to bias the distribution fitting procedure.

3.7.6.3 Data Description

During development of Oregon's copper water quality criterion, four inputs to the BLM model were identified as having the most influence on the BLM calculation. These "influential parameters" were temperature, pH, dissolved organic carbon, and conductivity. The remaining parameters (alkalinity, calcium, sodium, magnesium, potassium, chloride and sulfate) have less influence on the calculation of

the water quality criterion. Values for these less influential parameters were estimated using equations based on conductivity.

Probability distributions were developed for receiving water copper concentration, temperature, pH, dissolved organic carbon and conductivity. In-stream copper concentrations were calculated using the equation in Appendix 1. As in the previous benchmark modeling, a constant dilution factor of five was used. In-stream concentrations were then compared to the copper criteria from the BLM at effluent concentrations ranging from 0 to 30 µg/L at 2 µg/L increments and adjusted to higher effluent concentrations, if necessary. This process was repeated for 10,000 iterations to account for variability in environmental conditions. The benchmark was estimated at copper concentrations in stormwater effluent that corresponded to a 10% probability of exceeding the appropriate water quality standard.

3.7.6.4 Model Results

Table 6 identifies the modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for copper in each geo-region.

Table 6: Modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for copper.

Geo-region	Copper (mg/L)
Cascades	0.004
Coastal	0.011
Columbia River	0.050
Columbia Slough	0.017
Eastern	0.038
Portland Harbor	0.020
Willamette Valley	0.011

The water quality criteria for copper based on the BLM is higher than the previous water quality standard based on hardness in some areas, and lower in other areas. This is because the BLM model is a significant change from the hardness-based criteria. This is an expected outcome of the revised water quality standard. For further information, please see the technical report detailing the modeling process in Appendix 1, Industrial Stormwater Benchmark Model Development for Copper, Lead and Zinc.

3.7.7 Lead and Zinc Benchmark Modeling

The in-stream concentrations for lead and zinc were calculated using the same equation as copper. The dilution factor was also the same. Rather than using the BLM software to calculate the criteria, DEQ has established formulas for hardness-dependent freshwater metals criteria for lead and zinc as a part of the Aquatic Life Water Quality Criteria for Toxic Pollutants Table 30 (PDF). Table 7 contains the acute criterion equations for lead and zinc.

Table 7: Hardness-dependent acute aquatic life water quality criteria

Equations for lead and zinc where, "ln" is the natural logarithm and "exp" is a mathematical constant that is the base of the natural logarithm (~2.71828).

Parameter	Equation
Lead	$Pb = \exp^{(1.273*[\ln(Hardness)]+(-1.460))}$
Zinc	$Zn = \exp^{(0.8473*[\ln(Hardness)]+0.884)}$

The in-stream concentrations and acute criteria were calculated in the same spreadsheet and the calculations were performed for each of the 10,000 randomly generated lead and zinc values. The in-stream concentrations were initially calculated at effluent concentrations from 0-30 µg/L, at 2 µg/L increments, and adjusted to higher effluent concentrations, if necessary. As with the copper analysis, this created a probability distribution of receiving water lead and zinc concentrations. The benchmarks for lead and zinc were estimated at lead and zinc concentrations in stormwater effluent that corresponded to a 10% probability of exceeding the appropriate water quality standard.

3.7.7.1 Model Results

Table 8 displays the modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for lead and zinc in each geo-region.

Table 8: Modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for lead and zinc

Geo-region	Lead (mg/L)	Zinc (mg/L)
Cascades	0.019	0.048
Coastal	0.040	0.102
Columbia River	0.146	0.274
Columbia Slough	0.218	0.368
Eastern	0.036	0.092
Portland Harbor	0.054	0.151
Willamette Valley	0.013	0.038

For further information, please see the technical report detailing the modeling process in Appendix 1, Industrial Stormwater Benchmark Model Development for Copper, Lead and Zinc.

3.7.8 Technology Based Approach for the metal benchmark

In 2012, DEQ developed a technology based benchmark to increase the likelihood that facilities will succeed in meeting the new copper benchmark, using treatment technologies that are affordable, feasible, and readily available.[8] Thus, the purpose of the technologically achievable analysis is to identify a consistently achievable and justifiable benchmark that can be reached at a reasonable cost by Oregon industrial facilities. The methodology assesses BMP study data and then compares it to Oregon DMR data to determine what are reasonable and attainable stormwater discharge concentrations for industrial stormwater permit registrants.

3.7.8.1 Approach

Data from the International Stormwater BMP Database[9] were used to assess treatment capabilities by media filter treatment BMPs. DEQ analyzed data from passive media filtration BMPs (such as media filters, sand filters, and layered media) rather than active treatment BMPs (such as electrocoagulation or chemical treatment system) that may not be economically feasible for many facilities. Summary statistics for each study were extracted from the database.

This analysis evaluates what might happen if an industrial facility without treatment were to install treatment. That is, an industrial facility stormwater discharge becomes treatment system influent and the treatment system effluent becomes the final stormwater discharge. The treatment system influent

[8] NPDES Waste Discharge Permit Evaluation Report, Industrial Stormwater General Permits Nos. 1200-Z and 1200-COLS, undated, circa 2012, pp29-30

[9] The International Stormwater BMP Database is located at http://www.bmpdatabase.org.

concentration from each study corresponds to the industrial facility stormwater discharge concentration. DEQ used the average industrial facility stormwater discharge concentration from each facility to represent the typical stormwater discharge from the facility. Therefore, the treatment system influent concentration should also be represented by a statistic that is a measure of the center of the data. Thus, DEQ selected the median treatment system influent concentration to represent the influent concentration of each facility. On the other hand, this analysis seeks to identify a treatment system effluent concentration that can be obtained by most facilities. If the median treatment system effluent concentration were used, this would result in a benchmark that only about half of the industrial facilities would be able to achieve. Therefore, the 75th percentile of treatment system effluent concentrations was used as the post-treatment concentration, to increase the likelihood that most industrial facilities will be able achieve the benchmark.

For each metal, DEQ developed a regression between the median treatment system influent concentration and the 75th percentile effluent concentration. DEQ also calculated and plotted the upper and lower 90% confidence lines for the regressions. The data, regressions, and upper and lower 90% confidence levels of the regression are plotted in Figures 2 through 4. The upper 90% confidence line can be interpreted as a post-treatment level that can reasonably be obtained for a particular industrial facility stormwater discharge concentration. For example, an industrial facility stormwater discharge with 80 µg/L copper concentration, if treated by passive filtration, can reasonably be expected to reach a post-treatment concentration of 60 µg/L (Figure 2).

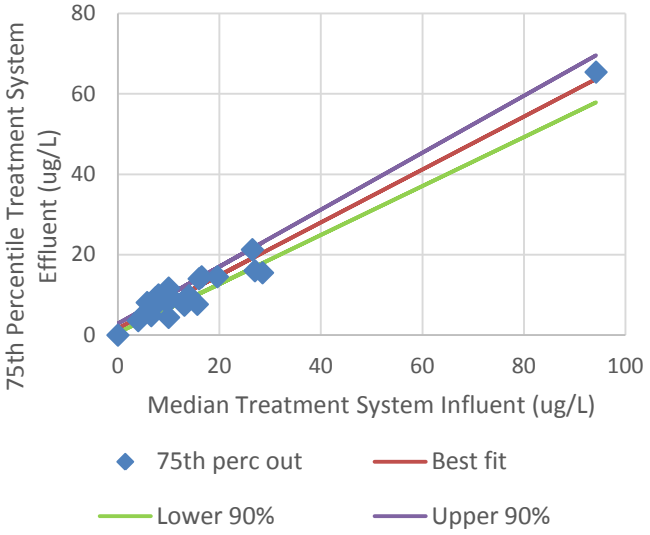


Figure 2: Copper treatability regression

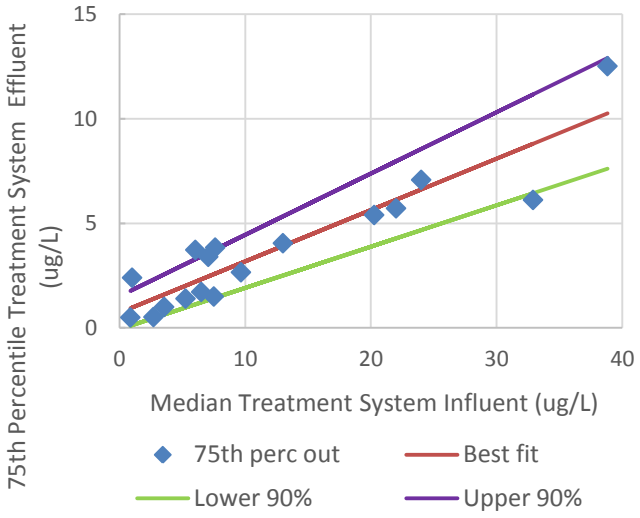


Figure 3: Lead treatability regression

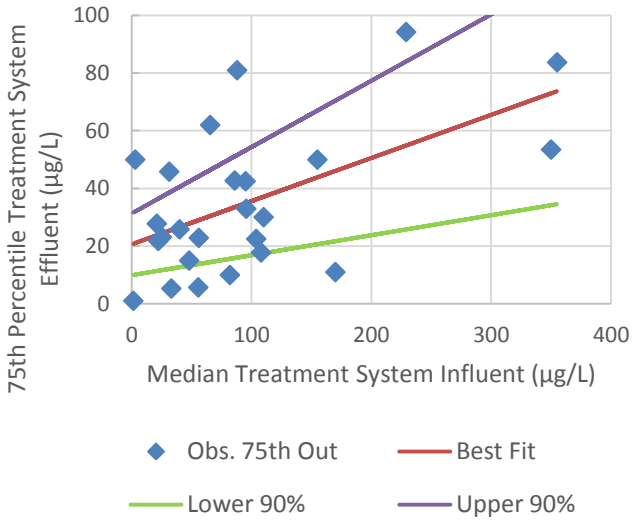


Figure 4: Zinc treatability regression

DEQ examined 2011 through 2016 discharge monitoring report data submitted by the facilities under the current 1200-Z and 1200-COLS permits to assess relevant industrial facility stormwater metals discharge concentrations to use in the analyses. DEQ calculated the average discharge for each facility, for the entire period. DEQ then selected industrial facility stormwater discharge concentrations in the upper 75th to 90th percentile to represent concentrations that would be treated. The upper range of concentrations was selected to assess what facilities with relatively high concentrations can achieve. The expectation is that facilities with lower concentrations will be able to achieve the benchmark. For the upper end of the range, 90th percentile level was selected instead of the maximum. This was done because facilities with unusually high stormwater discharge concentrations will probably need to do some initial work to bring zinc concentrations down before treatment. In addition, selecting the 90% level helps prevent setting the technologically achievable benchmark at a level that is too conservative (too high).

Finally, the industrial stormwater effluent range is compared to the treatment system regression to determine the technologically achievable benchmark. Below, this process is described using copper as an example (See Figure 5).

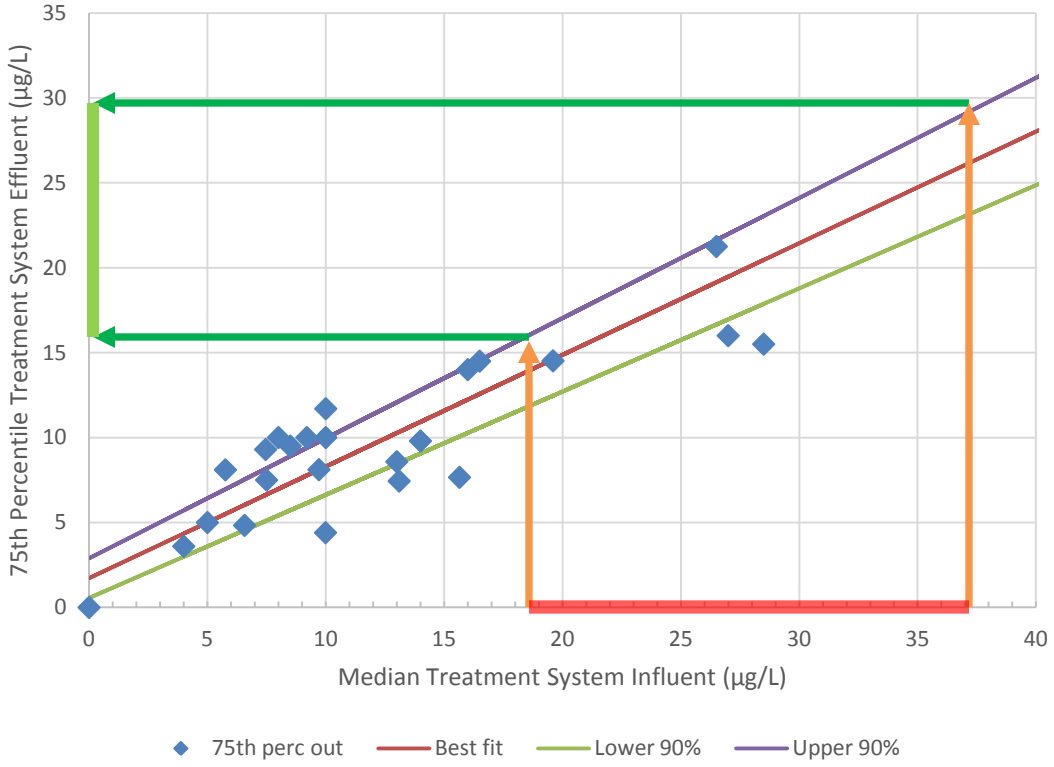


Figure 5: Determining the technologically achievable benchmark for copper.

In practice, it is simpler and more accurate to use the equation for the upper 90% confidence line to calculate treatment effluent concentrations that correspond to the industrial facility stormwater discharge concentrations.

The final results of the technologically achievable analysis are presented in Table 9 below.

Table 9: Modeled technologically achievable benchmarks for copper, lead and zinc

Metal	Discharge Range (mg/L)	Treatability Range (mg/L)	Technologically Achievable Benchmark (mg/L)
Copper	0.019-0.038	0.016-0.030	0.020
Lead	0.010-0.017	0.0045-0.0064	0.005
Zinc	0.188-0.353	0.074-0.112	0.090

3.7.9 Final Benchmarks

DEQ's model for the metal benchmarks identified values that would exceed the benchmarks in the prior 1200-Z and 1200-COLS general permits.

DEQ will not propose any new benchmarks that are less stringent than those in the current permits.

Adjusting for technologically achievable results, Table 10 provides a summary of the limitations identified thus far.

Table 10: Benchmarks by Geo-region

Geo-region	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
Cascades	0.020[1]	0.019	0.120[3]
Coastal	0.020[1]	0.040	0.102
Columbia River	0.020[2]	0.040[2]	0.120[2]
Columbia Slough	0.020[1]	0.060[2]	0.240[2]
Eastern	0.020[2]	0.036	0.120[3]
Portland Harbor	0.020	0.040[2]	0.120[2]
Willamette Valley	0.020[1]	0.013	0.120[3]

[1] Indicates the benchmark value is based on the modeled technologically achievable evaluation.
[2] Indicates the benchmark value exceeded the benchmark value in the current permit.
[3] Indicates the benchmark value for which no further reduction was applied from prior permit.

Due to significant investment in treatment deployed with the goal of achieving the zinc benchmark by numerous facilities throughout the state, DEQ elected to retain the prior permits' zinc benchmark value of 0.12 mg/L as a regional target. This is based on the following:

- The prior permit was the first 5-year cycle requiring Tier II corrective action and a combination of additional source control and treatment measures.
- Between the 2007 permit cycle and the 2012 permit cycle, the zinc benchmark was lowered by 80 percent.
- As zinc was by far the pollutant for which most facilities installed passive and active treatment to address exceedances, a further reduction would not allow these facilities the ability to determine the effectiveness of their new treatment systems.

The zinc benchmark will also be considered in the next renewal process.

DEQ developed water quality based benchmarks for copper, lead, and zinc using the modeling method previously discussed. The decision to model the five geo-regions was twofold, firstly to be consistent with the newly established water quality criterion for copper in Oregon and secondly to accommodate regional differences in water hardness. Additionally, benchmark modeling was performed for the Portland Harbor and the Columbia Slough. This resulted in seven total geo-regions.

As illustrated in Table 10 above, the modeled benchmarks technologically achievable evaluation for copper have identified a single benchmark for the state. Based on this finding DEQ determined that the geo-region approach for most of the state (for the Cascades, Coastal, Eastern, and Willamette Valley geo-regions) does not provide a significant variation in the benchmarks to justify the permit complexity. This decision accounts for variations and limitations of the data sets and also is protective of water quality.

Therefore, the permit identifies four permit benchmark regions, the Columbia River, the Columbia Slough, the Portland Harbor, and all other regions. The final metal benchmarks are presented in Table 11 below.

Table 11: Final Statewide Metals Benchmarks

Geo-region	Total Copper (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
Columbia River	0.020	0.040	0.12
Columbia Slough	0.020	0.060	0.24
Portland Harbor	0.020	0.040	0.12
Regional	0.020	0.015	0.12

Table 12 summarizes the final benchmarks for all the parameters combined into a single table.

Table 12: Final Statewide Benchmarks (Table 4 in the permit)

Parameter	Units	Columbia River	Columbia Slough	Portland Harbor	Regional
Total Copper	mg/L	0.020	0.020	0.020	0.020
Total Lead	mg/L	0.040	0.060	0.040	0.015
Total Zinc	mg/L	0.12	0.24	0.12	0.12
pH SU	SU	5.5 – 9.0	5.5 – 8.5	5.5 – 9.0	5.5 – 9.0
TSS	mg/L	100	30	30	100
Total Oil & Grease	mg/L	10	10	10	10
E. coli	counts/100 ml	406*	406	406*	406*
BOD5	mg/L	N/A	33	N/A	N/A
Total Phosphorus	mg/L	N/A	0.16	N/A	N/A

*The benchmark for E. coli in this basin applies only to active landfills and sewage treatment plants.
N/A: Not Applicable (no benchmark for this parameter)

3.8 Corrective Actions for Impairment Pollutant and Benchmark Exceedances

3.8.1 Tier I Corrective Actions

The industrial stormwater general permits are based on an adaptive management approach where permit registrants monitor their stormwater discharge, evaluate the effectiveness of their control measures, and take corrective actions to ensure they are controlling pollutants that are exposed to stormwater to achieve the benchmarks in the permit and to protect water quality. When stormwater monitoring results exceed any regional benchmark in A.9, sector-specific benchmark(s) in Schedule E or impairment reference concentrations identified in the permit assignment letter, facilities must investigate the cause no later than 30 days after receiving the monitoring results.

A single exceedance of a statewide benchmark, sector-specific benchmark, or impairment reference concentration triggers a Tier I investigation and a Tier I report. However, after Tier II implementation, a single exceedance of a statewide benchmark is addressed by a Tier II investigation and a Tier II Benchmark Exceedance Report. Both corrective actions follow the same process: investigate the cause of the exceedance, evaluate the use of best management practices, implement indicated corrections, and document the actions in a report. The primary difference between the two corrective actions is that the Tier I investigation is focused on source control best management practices and implementing new

narrative technology based effluent limits (TBELs), such as housekeeping and minimization of exposure, whereas the Tier II corrective action is focused on source removal and stormwater treatment.

To simplify the permit, the Tier I corrective action and the post-Tier II Exceedance Report processes are now combined into Tier I corrective action. To do this, the Tier I investigation to undergo a traditional adaptive management approach of evaluating the cause of the problem and correcting it, was expanded to address treatment issues. Thus, in the permit, a single exceedance of a regional benchmark, sector-specific benchmark, or impairment reference concentration requires a corrective action process in which source control, TBELs, and treatment best management practices (if applicable) are evaluated. Tier I reports are kept on-site only if they are in response to an exceedance of a sector-specific or statewide benchmark. DEQ and agent inspectors will request Tier I reports during a site visit and permit registrants must submit Tier I reports to DEQ or agent anytime upon request. If a Tier I report is generated in response to an exceedance to an impairment pollutant sampling event, permit registrants must submit these to DEQ or agent no later than 60 calendar days after receiving monitoring results.

At such time electronic reporting is applied to record keeping requirements, DEQ and its agents may begin requesting Tier I electronic submittal for sector-specific, statewide and impairment monitoring exceedances.

Language was added to the investigation of elevated pollutant levels to potentially include source tracing investigation activities. This is intended to assist facilities in earlier discovery of significant materials left on-site from past activities or other discrete pollutant sources such as metal roofing. In this way, facilities can plan for removal or isolation of sources as a Tier I corrective action, incentivizing not triggering Tier II corrective actions.

In addition, permit registrants are exempt from Tier I investigation and documentation for exceeded benchmarks that trigger Tier II from the end of the second monitoring year through Tier II implementation date. The presumption is this time frame will be spent investigating pollutant sources to inform Tier II corrective actions and these actions are not required to be summarized in a Tier I report. Likely these results will be part of the Tier II report (known as the revised SWPCP) or the mass reduction waiver, therefore eventually submitted to DEQ or agent.

Depending on permit assignment date and discharge, most facilities will have several opportunities to respond to benchmark exceedances. Preventing stormwater from coming into contact with pollutants – known as source control – is generally more effective and less costly than removing pollutants once they have mobilized in stormwater.

Some examples of effective Tier I source control responses may include:

- removal or isolation of pollutant source;
- minimizing impervious areas allowing infiltration;
- reducing flows through swales or buffers; and/or
- monthly or more frequent, street sweeping.

Facilities must evaluate if they are properly implementing the stormwater pollution control plan including: regularly sweeping the site, training employees on proper pollution prevention measures and conducting maintenance, such as cleaning out catch basins. This site condition assessment will inform the need for improvements and must be summarized in a Tier I report. Tier I reports are integral for DEQ inspectors and agents when evaluating permit compliance.

A corrective action implementation time frame of 30 calendar days after receiving the monitoring results was added to the Tier I action response. Therefore facilities must now investigate causes of elevated monitoring results, review SWPCP and evaluation control measures, determine if changes are needed or SWPCP revision is necessary, completer Tier I report and implement corrective action no later than 30

calendar days. The corrective action implementation deadline must be completed before the next storm event, if possible, or no later than 30 calendar days after receiving the monitoring results, whichever comes first. If there is a known source of stormwater contamination, fulling Tier I response no later than 30 calendar days is fundamental to adaptive management. If permit registrant fails to complete the corrective action within this time frame, the reasoning should be documented in the Tier 1 Report and SWPCP revision, and corrective actions must be completed as soon as practicable.

3.8.2 Tier II Corrective Actions

The requirement to submit a revised stormwater pollution control plan has been replaced with the term Tier II report. This document is still a portion of a facility's stormwater pollution control plan; however, submittal of a complete new plan in response to Tier II will no longer be necessary. The expectation is that a P.E. stamped plan and any pages of the revised plan, such as site map or new discharge point monitoring pages, is adequate. Additional language was added to ensure permit registrants know that treatment is necessary as part of Tier II, and that they can choose a combination of treatment measures and source control. Sole source control improvements should be conducted during the first two years of permit coverage as a part of Tier I corrective action with the objective of not exceeding the second year geometric mean.

When a facility analyzes more than the minimum qualifying samples during the second monitoring year, those samples must be used in the geometric calculation used to evaluate Tier II status. Samples must be taken at least 14-days apart. A definition for qualifying sample has been included in Sector D. Conversely, if the second year of coverage happens to be a dry year and a facility is unable to collect four qualifying samples, the geometric mean calculation may use the previous year to provide additional samples up to four. In the prior permit, the 2013-2014 geometric mean evaluation monitoring year was particularly dry. DEQ added this language to allow sample results from the first year of coverage to support the calculation. Facilities may not use previous years monitoring results beyond the first year of coverage.

The requirement that the portion of the stormwater pollution control plan that addresses Tier II reporting must be stamped by a professional engineer or certified engineering geologist was updated to indicate the stamp must be from an *Oregon* registered professional engineer. *Oregon* certified engineering geologist has been removed from the Tier II report section. *Oregon* certified engineering geologist may only stamp the Tier II mass reduction waiver. Updated language will require the professional engineer or certified engineering geologist to evaluate and provide design recommendations for treatment or mass load reduction on all substantially similar discharge points.

Oregon Revised Statute Chapter 672 requires that anyone offering to practice as an engineer in Oregon be registered in Oregon and hold a valid certificate to practice engineering in Oregon from the Board of Examiners for Engineering and Land Surveying. Although it is not DEQ's role to enforce this statute, restating the Oregon registration requirement in the permit provides greater clarity. Questions regarding ORS 672 should go to the Board of Examiners for Engineering and Land Surveying.

If a treatment system uses chemicals to adjust the stormwater to assist in optimal treatment and this is included in the approved manufacturer's operation and maintenance section of the revised plan, treated stormwater is not considered process water.

In determining the appropriate treatment measures, facilities may consider passive or active treatment measures. Facilities should first consider using volume reduction measures such as Low Impact Development practices, if feasible based on site conditions and potential for groundwater contamination. In addition, source control measures can be used in conjunction with treatment best management practices to effectively address the pollutants of concern. Control measures can be actions (including processes, procedures, schedules of activities, prohibitions on practices and other management

practices), or structural or installed devices to prevent or reduce water pollution. Thus, the definition of "control measures" includes both best management practices and "other methods" used to prevent or reduce the discharge of pollutants to receiving waters. Treatment removes pollutants from stormwater. Some examples of methods to remove pollutants from stormwater are:

Active Treatment Systems

Require electricity to operate. Within the active treatment system category, there are the following**:**

- Chemical filtration
- Chemical treatment
- Electrocoagulation
- Filtration
- Ion exchange
- Reverse osmosis

Passive Treatment Systems

Passive Treatment Systems do not require electricity to operate and are generally lower cost alternatives when compared to active treatment systems. Within the passive treatment system category, there are the following:

- Bioretention/filtration
- Drain inlet insert
- Hydrodynamic separation
- Media filtration
- Absorbent boom/fabric
- Oil/water separator[10]

In an attempt to find timelines acceptable to industry and staff, DEQ and agents are committed to reviewing and notifying facilities no later than 60 calendar days of receipt if either the Tier II report or Tier II mass reduction waiver request is accepted or denied. There have been no changes to Tier II corrective action schedules, but a new reporting requirement was added that requires permit registrants to submit written confirmation of the final implementation date to DEQ or agent no later than 30 calendar days of installing all Tier II corrective actions. This will allow DEQ or agent to evaluate compliance with the Tier II corrective action requirement and monitoring waiver requests submitted post Tier II implementation.

In order to be eligible for a monitoring waiver for the pollutants that exceeded the geometric mean at their associated discharge points, language is now explicit in allowing waiver requests after approved treatment or infiltration measures are installed and once such monitoring results meet the conditions for a monitoring waiver. If any benchmarks are attained between the end-of-second monitoring year through Tier II implementation date, Tier II corrective actions are still required.

At approved substantially similar discharge points, facilities must evaluate appropriate source control and treatment to correctly size and install Tier II corrective actions on these discharge points. The prior permit was silent on this condition. This requirement takes into account the original evidence for discontinuing monitoring at substantially similar outfalls with similar effluent, which is the industrial activity, nature of pollutants and supporting analysis has proven the stormwater is of similar composition. DEQ acknowledges however, the size of the basin may vary. Therefore, installing the proper sized treatment is critical. Once Tier II installation is complete, monitoring of substantially similar effluent must start again. Facilities are eligible for a monitoring waiver at all discharge points

[10] Literature Review of Existing Treatment Technologies for Industrial Stormwater, Herrera July, 2011, page 4, 5.

once Tier II corrective action is implemented and the geometric mean of four consecutive samples is equal to or below the statewide benchmark.

Resuming monitoring at substantially similar discharge points applies to those discharge points claiming similar effluent from drainage areas serving comparable activities where the discharge was not previously monitored due to similar composition. For those parameters that triggered Tier II under the renewed permit, monitoring must resume at all substantially similar discharge points identified in the SWPCP. Any other discharge point(s) not claiming to be substantially similar to the Tier II triggered monitored discharge point(s) may continue to operate under a monitoring exemption. As well as all other parameters which did not exceed the geometric mean at the monitored discharge point(s), at those substantially similar discharge points claiming to have similar effluent(s) discharges may also continue to operate under a monitoring exemption.

3.8.3 Tier II Mass Reduction Waiver

Tier II waiver based on volume reduction was renamed "Tier II mass reduction waiver." Facilities must ensure that measures implemented to reduce volumes and mass load of pollutants remain effective following implementation. The underlying concept of this waiver is that by infiltrating the first flush of runoff when the highest pollutant concentrations occur. In doing so, green infrastructure and volume reduction measures will sufficiently reduce the mass load of pollutants entering the receiving stream. To obtain this mass reduction waiver, the permit registrant must demonstrate that the volume reduction measures are below the mass equivalent of the benchmarks.

Facilities will need to evaluate their site and show how the mass load of pollutants in their discharge is below the mass equivalent of the benchmark(s) in Schedule A.9. The updated SWPCP must provide data and analysis to support this determination, including the description of the measure(s), date(s) measures implemented or expected to be implemented and the mass load analysis. This analysis may be applied to volume reduction measures previously installed.

Once Tier II mass reduction has been implemented:

- Permit registrants must take Tier I corrective actions whenever a single sample result exceeds a benchmark or impairment reference concentration.
- Monitoring must resume at substantially similar discharge points.
- Permit registrants may request a monitoring waiver if the geometric mean of four consecutive qualifying samples is equal to or below the benchmark.

3.8.4 Tier II Natural Background Waiver

The natural background waiver language has been changed slightly, and the permit registrant must comply with the terms of the permit until DEQ or the agent responds to waiver requests. Because these often take more time to review there is not a time table for acceptance or denial.

3.9 Permit Compliance

The language below summarizes the 2011 permit evaluation report. Slight modifications were made and explained.

Consistent with EPA's MSGP, DEQ's language states that any noncompliance with any of the requirements in the permit constitutes a violation of the federal CWA. Even if a facility is conducting corrective actions based on a violation, this does not absolve the permit registrant of the initial underlying violation. For example, if a facility violates a narrative technology-based effluent limit, correcting the violation does not remove the original violation. DEQ also clarified that where corrective action is triggered by an event that does not itself constitute a violation, such as a benchmark exceedance, the registrant may avoid a permit violation provided that the permit registrant takes the corrective action within the deadlines identified in the permit.

DEQ also included in the permit time for a new permit registrant with a new facility (that begins operation after August 1, 2017,) or an existing facility (that was in operation before August 1, 2017, without a stormwater discharge permit) to implement stormwater control measures to meet the requirements in numeric and narrative effluent limits in the permits. These facilities must meet these requirements no later than 90 days of receiving permit coverage.

If a facility is implementing control measures that require capital improvements, the facility must include these measures in an implementation schedule in the stormwater pollution control plan and complete the improvements no later than two years of receiving permit coverage. Capital improvements are defined in the permit as the following improvements that require capital expenditures: (1) treatment best management practices including but not limited to settling basins, oil/water separation equipment, catch basins, grassy swales, detention/retention basins, and media filtration devices; (2) manufacturing modifications that incur capital expenditures, including process changes for reduction of pollutants or wastes at the source; (3) concrete pads, dikes and conveyance or pumping systems utilized for collection and transfer of stormwater to treatment systems; (4) roofs and appropriate covers for manufacturing areas, and (5) removal or permanent isolation of significant materials left from previous activities, and (6) volume reduction measures such as Low Impact Development control measures. DEQ clarified that the installation of volume reduction measures are considered a capital improvement.

These requirements are applicable to all Columbia Slough and Portland Harbor sites eligible to obtain coverage due to activities on Table 3 (Table 2 in the permit).

3.10 Compliance Actions Triggers

Benchmarks may "trigger" Tier I and Tier II requirements. Sector-specific benchmarks and impairment reference concentrations may trigger Tier I requirements (but not trigger Tier II requirements). There are also specific responses that may be triggered by sector-specific numeric and narrative effluent limits. A single pollutant may be subject to more than one trigger, and often different triggers for the same pollutant have different values.

Schedule A.13 was added to clarify that when multiple applicable corrective action triggers are exceeded, the permit registrant must follow the corrective actions for each trigger. For example, the region benchmark for total suspended solids is 100 mg/L, and there is also a sector-specific total suspended solids effluent limit of 88 mg/L for Sector K (Hazardous Waste Treatment, Storage, or Disposal Facilities). Thus, a facility could be subject to both of these "triggers." Meaning if the monitoring results were over 88 mg/L the permit registrant is required to submit an exceedance report for exceeding an effluent limit no later than 30 days after receiving the sample results. In addition, the permit registrant must conduct follow-up monitoring until sample results are at or under 88 mg/L. For exceeding the 100 mg/L TSS benchmark the permit registrant would also complete a Tier I investigation and record keeping requirements.

Schedule B - Monitoring Requirements

Schedule B of the permit contains the following requirements:

Monitoring Requirements
- Pollutant Parameters
- Sampling Procedures
- Monitoring Variance
- Monitoring Waiver

Inspections

Reporting and Recordkeeping Requirements
- Reporting Monitoring Data
- Exceedance Report for Numeric Effluent Limits
- Record Keeping Procedures

4.1 Pollutant Parameters

Pollutant monitoring frequency increased for impairment pollutant sampling and numeric effluent limits based on EPA effluent limitation guidelines. All statewide, sector-specific and impairment monitoring must take place four times a year. Two samples between January 1 and June 30, and two samples between July 1 and December 31. Numeric effluent limits sampling frequency is two time per year; one sample between January 1 and June 30, and one sample between July 1 and December 31.

In the prior permits, impairment reference concentrations were determined at the time of permit assignment. The list of impaired waterbodies, the parameters for which they are impaired, and the water quality criteria are periodically revised. This means that impairment monitoring requirements and reference concentrations can change during the five year tenure of the general permit. This can result in neighboring facilities with different permit requirements. In addition, tracking evolving requirements is administratively very challenging. Therefore, impairment parameters for existing facilities will be based on conditions that exist on May 1, 2017, and will remain consistent through expiration. This includes:
- Water quality standards (acute aquatic life criterion, chronic aquatic life criterion, and human health criterion);
- Approved TMDLs and waste load allocations;
- List of impaired waters;
- Standard analytical methods (40 CFR 136, December, 2016).

To assess the extent to which these pollutants are present in industrial stormwater discharges, DEQ calculated the median and 75th percentile of the data (for non-detect data, half the detection limit was used). These values were then compared to acute aquatic life criteria. For the hardness-dependent criteria (cadmium and nickel), the median hardness of the Biotic Ligand Model data set (34 mg/L) was used. For the chromium criterion, it was assumed that all chromium was in the most toxic form (chromium VI). For each parameter, the median and 75th percentile values were below the respective water quality criteria. That is, more than 75 percent of the data were below the water quality criteria. Because the majority of the data were below criteria, routine monitoring of these pollutants will not be retained.

Table 13: Acute Aquatic Water Quality Criterion Samples

Pollutant	Cadmium	Chromium	Nickel	Mercury	PCBs
Number of samples	11,218	11,210	11,188	409	1,359
Acute aquatic water quality criterion (µg/L)	1.1	16	190	2.4	2
Median (µg/L)	0.5	2.5	3	0.08	0.048
75th percentile (µg/L)	0.5	5.17	6.56	0.1	0.095

4.2 Sampling Procedures

The language regarding grab sampling and composite sampling was reworded to make it clear that, when compositing, composite samples must come from the same storm event. In addition, language was added that requires DEQ or agent approval before switching between grab sampling and composite sampling during the monitoring year. This helps ensure consistency within each monitoring year. Approval is not required when switching sampling methods in different monitoring years. It is preferable, but not required that all sample locations be sampled during the same storm event. Because more infiltration devices are being constructed by industry there are more facilities that do not produce discharge at all their discharge points during the same storm event. Therefore, the phrase, "samples must be collected from the same storm event" has been omitted.

The timing requirements were clarified to include the regular hours of operation at each site, as specified in the stormwater pollution control plan, rather than assuming 8 a.m. to 5 p.m. on weekdays.

Language was added to state that approved methods for pH sampling require either measuring the pH directly in the flow, or analyzing the sample within 15 minutes of sample collection. These requirements are based on Code of Federal Regulations required methods. Registrants must follow the latest version of 40 CFR 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*, which outlines analytical methods, sampling containers, need for preservation and among other procedural details maximum holding times. Facilities may no longer use pH paper or kits to analyze pH range.

In addition, language was added to clarify when more than one type of monitoring for the same pollutant at the same discharge point applies, the permit registrant may use a single sample to satisfy both monitoring requirements. For example, lead monitoring may be required as a statewide benchmark (four times per year), and also be required for impairment monitoring (two times per year). Note that, in such circumstances, if the "target" levels are different, all corrective action requirements apply to all samples. For example, in the current permits, there is a statewide benchmark for lead of 0.040 mg/L, with a sampling requirement of four times per year. There is also an impairment monitoring requirement for lead, with a reference concentration of 0.016 mg/L, and a sampling requirement of two times per year. If a facility were subject to both of these requirements, then:

- Four samples per year could be collected to satisfy both requirements.
- Any single result greater than 0.016 mg/L lead would trigger Tier I corrective actions. That is, even though impairment monitoring is only required two times per year, the corrective action requirement applies to all samples. Of course, any single result greater than 0.040 mg/L lead would also trigger Tier I corrective actions.
- Tier II requirements for lead would apply based on the statewide benchmark of 0.040 mg/L.

4.3 Monitoring Variance

Permit registrants may request a monitoring variance for missed samples due to no storm events of sufficient magnitude to produce run-off during regular business hours of operation and safe conditions.

Except for rare cases, this is the only criteria for approval of a monitoring variance. As previously acknowledged, more facilities may be implementing infiltration or retention best management practices that reduce runoff and the number of opportunities for sample collection. A variance request must be substantiated with supporting data and analysis demonstrating why a facility was unable to get the required samples. If DEQ or agent has evidence contradicting this claim, this is a permit violation for failure to monitor.

The permit includes a description of certain types of supporting documentation. This description is not intended to be inclusive and the more data and analysis a facility can provide the easier it will be for DEQ and agents to substantiate the claim. Neither DEQ nor agents are obligated to respond when approving a monitoring variance, but we do strive to evaluate requests and communicate with facilities. However, if DEQ or its agent has evidence to contradict the monitoring variance, the permit registrant will be contacted.

In addition, the changes in the October 2018, permit includes quarterly Discharge Monitoring Reports submittals. However, the monitoring year did not change. A monitoring year is defined in Schedule D as July 1 of one year to June 30 of the following year. Therefore, in most cases it would not make sense to submit a variance request during the 1st and 3rd quarters. For this reason, variance request may be submitted semi-annually on February 15 and/or August 15, when applicable.

4.4 Monitoring Waivers

The benchmark threshold required to qualify for a waiver was changed from "is below" the benchmark value to "is equal to or below" the benchmark value, so it matches the benchmark threshold for Tier II evaluation. Achieving the benchmarks is adequate when conducting Tier II evaluation and assessing the appropriateness of monitoring waivers, and this change better aligns these two permit compliance mechanisms. Previously, a facility may have had a geometric mean that equals the benchmark, which means Tier II was not triggered, but also meant they did not qualify for a monitoring waiver because a result equal to the benchmark was still not "below" the benchmark. Furthermore, specifics for pH waiver requests allow that once 4 consecutive samples are within the pH range, facilities are eligible to discontinue sampling once approved.

DEQ added a requirement for the permit registrant to submit a summary of the results, including the calculated geometric means of the parameters for which they are seeking a waiver. The majority of permit registrants seeking a monitoring waiver are using the DMR forms for this function, which is acceptable. This language clarifies the permit registrant is responsible for determining which parameters at which discharge points qualify for a waiver.

It is implicit in the permit that monitoring waivers are only valid during the five year term of the general permit. Upon renewal, all monitoring must resume, and monitoring waivers must be re-established. However, to add clarity, DEQ included specific language.

The prior permits were silent on monitoring waivers for Tier II parameters which caused inconsistency in the administration of these waivers statewide. A monitoring waiver will not be granted from the end of the second monitoring year through Tier II implementation date. Once approved Tier II corrective actions are complete and four consecutive sampling results demonstrate discharge equal to or below the benchmarks for Tier II parameters, a waiver may be requested.

The language in the current permits "deemed approved if DEQ or agent does not comment within 30 calendar days" has been eliminated. This caused uncertainty for facility operators and compliance issues. It is highly recommended monitoring waivers are submitted independently of DMR submittals. During annual reporting time frame, staff will take longer to respond and new language requires continued monitoring until approved or denied. Waiver requests must include lab data support documentation and may be emailed if the file size does not exceed 10MB.

No reduction in visual observation and federal numeric effluent limit guidelines is permitted.

4.5 Inspections

This section was updated to be consistent with permit language, provide clarity around inspection requirements, and includes minor edits to terminology. Reports language now requires paperwork to include the name of inspector and nature of discharge (rain or snowmelt).

Monthly inspections are required, including visual observation of discharge by facility staff. Visual observations are used as a regular check to confirm that pollution control measures are functioning properly. If there is no discharge from a facility the inspection can be done at any time during the month. If at any time during a month there is a discharge the permit requires staff to conduct visual observation at all discharge points during the same month. Visual inspection must occur regardless of whether or not the monthly inspection has already occurred. The inspection must observe stormwater discharge for floating solids, odor, foam, visible oil sheen, settled or suspended solids or discoloration. If any of these are observed, facility staff must investigate the cause and document any corrective action or maintenance taken in a Tier I report.

As stated in the monitoring section, visual observations are mandatory when stormwater is discharging despite any monitoring waivers.

4.6 Reporting and Recordkeeping Requirements

This section includes:

- Discharge Monitoring Reports
- Electronic Reporting Submission
- Numeric Effluent Limit Exceedance Report
- Record Keeping Procedures
- Summary Table of Reports and Deadlines

4.6.1 Reporting Monitoring Data

DEQ is requiring additional supporting data with the Discharge Monitoring Reports. This includes: laboratory quality assurance/ quality control, pH field notes and chain of custody forms. These documents will allow DEQ and agent's to better substantiate proper sampling procedures from facility staff and laboratory staff were followed. pH field notes may include calibration confirmation and pH readings performed in the field.

Although only qualifying samples may be used to evaluate geometric mean and monitoring waivers, all sampling results must be reported. DEQ would prefer that those results be identified as non-qualifying.

The permit registrants must submit DMRs quarterly. Even if a reporting quarter has no monitoring data to submit, a DMR must be received by the due dates below. To account for monitoring completed between July 1, 2018, and December 31, 2018, all sample results from this semi-annual time frame must be reported in the 2nd quarter DMR. Therefore, the February 15th, 2019, DMR submittal must include all data analyzed during 2018 which was not reported on the July 31, 2018, DMR submittal. The February 15th, 2019, DMR must also include a monitoring variance request, if applicable, and all supporting data and analysis demonstrating why the monitoring did not occur at the required minimum frequency.

Table 14: DMR Submission Deadlines (Table 6 in the permit)

Reporting Quarters	Months	DMR Due Dates
1st	July-September	November 15
2nd	October-December	February 15*
3rd	January-March	May 15
4th	April-June	August 15*

*Variance request may be submitted semi-annually as applicable

Prior to July 31, 2020, reporting deadline or until directed by DEQ to do otherwise, all monitoring results must be submitted on a DEQ-approved Discharge Monitoring Report form. The EPA promulgated final eRule (40 CFR 127) in 2015 for National Pollutant Discharge Elimination System electronic reporting required all authorized NPDES programs use electronic reporting.

Authorized NPDES programs will also electronically submit NPDES program data to EPA to ensure that there is consistent and complete reporting nationwide, and to expedite the collection and processing of the data, thereby making it more accurate and timely.[11] While the rule changes the method by which information is provided (i.e., electronic rather than paper-based), it does not increase the amount of information required from NPDES regulated entities under existing regulations.[12] EPA anticipates that the final rule will save significant resources, while resulting in a more complete, accurate, and nationally-consistent set of data about the NPDES program.

The first phase of the eRule includes Discharge Monitoring Report submittal from NPDES permit registrants. Reports will be electronically submitted and signed, including uploaded lab reports, likely sometime during this permit cycle. Prior to the start of the electronic reporting implementation, there will be significant outreach and opportunities for training on the new system. NetDMR is a web-based system and requires only a computer, an internet browser and high-speed access to the internet. The system will also allow a permit registrant's contracted laboratory staff or consultant to input sample results directly into the NetDMR system on behalf of the permit registrant, and upload lab reports.

Phase two of the eRule anticipates additional electronic submittals including:

- applications;
- notice of termination;
- no exposure certification;
- exceedance report;
- corrective action reports associated with Tier II; and
- stormwater pollution control plan.

Phase two likely will begin after December, 21, 2020. There is a waiver process from electronic reporting under certain circumstances. In addition to electronic reporting changes, there were minimal clarifications made. Such as all sample results from discharge points must be reported. EPA's NetDMR reporting tool is located on the webpage at: https://netdmr.zendesk.com/home.

4.7 Exceedance Report for Numeric Effluent Limits

No changes were made to this section.

[11] EPA's Final NPDES Electronic Reporting Rule fact sheet, September 2015, page 1
[12] EPA's Final NPDES Electronic Reporting Rule fact sheet, September 2015, page 1

4.8 Recordkeeping Procedures

All records must be retained at a minimum three years and DEQ has included a summary table of reporting requirements and deadlines for quick reference. DEQ has attempted to update this permit with language and tables to assist registrants in understanding compliance expectations. At the time of inspection, DEQ or agent will perform a complete document review as part of permit compliance evaluation. The expanded list is typically part of record review and retention processes, but now is explicit in this permit. The list now separates the requirements and incorporates EPA's MSGP language to read:

- A copy of the SWPCP and any revisions, including revised stamped SWPCP from Tier II corrective action;
- A copy of this permit;
- Permit assignment letter and coverage documents from DEQ for the current permit term;
- Documentation of maintenance and repairs of control measures and treatment systems;
- Tier I reports;
- All inspection reports;
- Documentation of any benchmark exceedance and corrective action taken;
- All copies of any reports or corrective action submitted to DEQ or agent;
- Spills or leaks of significant materials (See Schedule D.3, Definitions) that impacted or had the potential to impact stormwater or surface waters. Include the corrective actions to clean up the spill or leak as well as measures to prevent future problems of the same nature;
- Documentation to support your claim that your facility has changed its status from active to inactive and unstaffed with respect to the requirements to conduct routine facility inspections;
- Discharge Monitoring Reports, laboratory reports and field sampling notes; and
- Employee education materials and records of training.

Below is a summary of reporting requirements and submittal date.

Table 15: Summary of reporting requirements and submittal date (Table 7 in the permit)

Permit Condition	Permit Schedule	Report Required	Due Date
Must not cause or contribute to a violation of instream water quality standard	Schedule A.4	Water Quality Standards Corrective Action Report	No later than 30 calendar days after receiving monitoring results
SWPCP submission	Schedule A.8	SWPCP revision	No later than 30 calendar days after the completion of modification
Sample results exceed applicable statewide or sector-specific benchmarks	Schedule A.10	Tier I Report*	No later than 30 calendar days after receiving monitoring results; Retain on-site and submit upon request
Sample results exceed applicable impairment reference concentrations	Schedule A.10.a.v	Tier I report	No later than 60 calendar days after receiving monitoring results
Second year geometric mean exceeds benchmarks	Schedule A.11	Tier II Report Tier II Mass Reduction Waiver Tier II Natural Background Waiver	No later than December 31 of third monitoring year of coverage
Written confirmation of Tier II implementation	Schedule A.11	Email or letter confirming Tier II proposal installation	No later than 30 calendar days of implementation
Sample results continue to exceed benchmark for Tier II parameters post implementation	Schedule A.11.j.iii	Tier I Report*	No later than 30 calendar days after receiving monitoring results; Retain on-site and submit upon request
Sample results exceed numeric effluent limits	Schedule B.9	Exceedance Report	No later than 30 calendar days after receiving monitoring results
Submission of monitoring results after the preceding calendar quarter	Schedule B.8	Discharge Monitoring Report (DMR)	No later than February 15, May 15, August 15, and November 15

***Do not submit Tier I report for exceedance of statewide or sector-specific benchmarks unless requested by DEQ or agent**

Schedule D - Special Conditions

5.1 Releases in Excess of Reportable Quantities

No changes have been made to this section.

5.2 Availability of Stormwater Pollution Control Plan and Monitoring Data

No changes have been made to this section.

5.3 Definitions

The following definitions were added to the permit:

- Arid areas
- Capital improvements (new first bullet)
- Columbia Slough
- Discharge Point
- Feasible
- Impaired Waters
- Monitoring year
- Permit assignment letter
- Portland Harbor
- Qualifying samples
- Run-on
- Semi-arid areas
- Stormwater

Minor corrections were made to Best Management Practices, High Quality Waters, New Discharger and Outstanding Resource Waters.

Definition of point source was removed.

5.4 DEQ Agents

Very minimal changes were made to wording in this section.

Schedule E - Sector Specific Requirements

Permit registrants must meet the sector-specific requirements that are associated with their primary industrial activity and any co-located industrial activities that meet the description of industrial activities covered by the stormwater regulations (CFR 122.26(b)(14)(i-ix, xi)) and/or are identified in Table 1: Sources Covered on page three and four of the permit. Some permit registrants may have multiple industrial activities that are identified in Table 1 the permit and may be subject to more than one sector-specific requirement. For example, if a facility has multiple discharge points, there may be different requirements for each depending on the type of industrial activity conducted in the drainage area associated with that discharge. This section of the permit lists the industrial activities and their corresponding SIC codes, including any sector-specific benchmarks, additional narrative technology-based effluent limits, as well as, numeric effluent limits. Facilities are required to conduct monitoring for those discharge points associated with each SIC code. There may be instances where parameters may vary based on industrial activity in relation to the discharge point. Should conflicts arise between Schedule E and any other schedule of the permit, the requirements in Schedule E may not apply.

Sector D and the numeric effluent limits for asphalt emulsion, are applicable only for co-located SIC code 2951. DEQ plans to add SIC code 2951, facilities primarily engaged in manufacturing asphalt and tar paving and roofing materials and lubricants and SIC code 3273, referring to glass, clay, cement, concrete and gypsum products, including mobile asphalt and concrete batch plants to the 1200-A general permit which expires Dec. 3, 2017. Adding these codes will help clarify which primary activities are covered under which industrial stormwater general permit. Some already registered facilities will need to transfer coverage from one industrial permit to the other. DEQ will notify any affected permit holders the procedures for obtaining coverage under the correct industrial permit.

Besides incorporating EPA's significant changes to Sector H, G and S, several corrections were made to *Table E-1. Sources of Industrial Activity with Sector Specific Requirement*. Sector J will be incorporated into the 1200-A general permit which expires Dec. 3, 2017. EPA's Sector A changes were not applicable because DEQ regulates log sorting yard wet deck storage in a separate general permit. Wood preservers, 2491, has been added to Schedule E, including applicable arsenic benchmark sampling.

The below language includes explanation taken from EPA's MSGP's fact sheet pertaining to the changes in Schedule E, because DEQ models their requirements after the federal permit. If permit registrants need more information, please visit the EPA's website.

Minor changes were made to some of the Sector E provisions for Sectors E, F, K, L, M, N, O, P, Q, R, S, V, X, Y, Z, AA that further clarify the effluent limit requirements.

The 2018 reissuance upon reconsideration corrected the following errors in Sector E:

- Standard Industrial Code Major Group 29 changed name from Asphalt Paving and Roofing Materials (as referenced in the EPA Industrial Permit) to Petroleum Refining and Related Industries defined by the United States Department of Labor. 2911 Petroleum Refining is grouped into Sector C.
- Standard Industrial Code 3479 is included within Sector AA: Fabricated Metal Products.
- Sector AB applies to Transportation Equipment, Industrial or Commercial Machinery.
- Sector E.AA.4 includes benchmark monitoring for SIC 3479 of Nitrate plus Nitrite Nitrogen at 0.68 mg/L.

6.1 Sectors G, H and J (Mining Sectors)

In EPA's MSGP and the 1200-Z general permit, DEQ is continuing to allow all stormwater discharges from earth disturbances to be covered under the 1200-Z general permit, instead of requiring coverage for some of those discharges under the 1200-C general permit. EPA adopted a single-permit approach for covering all stormwater discharges at a mine needing coverage under an NPDES stormwater permit in

the 2008 version of the federal permit at the request of the mining industry. Previously, EPA required discharges during the exploration and construction phases of a mine to be authorized under the construction permit and discharges from the active mining phase to be covered under the industrial permit.

In the 2015 EPA's MSGP, EPA revised some of the requirements applicable to earth disturbing activities at mining operations, including TBELs, inspection, maintenance, corrective actions, and final stabilization provisions. These revisions were due in part to the promulgation of the recent Construction & Development Effluent Limitations Guidelines and New Source Performance Standards, which applies in the mining context to the construction of staging areas to prepare for erecting structures such as to house project personnel and equipment, mill buildings, etc. and the construction of access roads. For other earth disturbing activities at mining operations conducted prior to active mining activities, EPA has revised the applicable requirements based on EPA's best professional judgment.

One of the main differences between the mining sector requirements 2015 and the 2008 federal permits is that EPA dropped the identification of what activities are subject to the earth disturbance-related requirements based on which "phase" of the mine development is occurring. Previously, the earth disturbance-related TBELs/requirements were assigned to the exploration and construction phases and the active mining permit TBELs/requirements applied to the active and reclamation phases at a mining operation. Associating requirements with mining phases caused too much confusion, especially in light of EPA's inaccurate past association of "overburden" with the exploration phase. Dispensing with the phases not only provides better clarity, but also acknowledges that not all activities associated with a certain phase may meet the threshold for earth-disturbance-related requirements (e.g., field surveys and simple test boreholes performed during exploration).

The 2015 MSGP identifies which activities are covered by earth disturbance-related requirements by when they occur within the general timeline of a mining operation (i.e., before or during active mining) and also by the purpose of the earth-disturbing activities undertaken.

Further information regarding these requirements is found in the EPA 2012 Construction General Permit Fact Sheet, particularly if operators need more information regarding the EPA 2012 Construction General Permit's new buffer requirements and cationic chemical usage requirements. Permit requirements are modeled after the federal construction permit and the 1200-C general permit does not apply.

In the 2015 MSGP, EPA clarified that earth-disturbing activities have ceased, the earth-disturbance-related requirements no longer apply. If pre-active mining earth disturbances do not result in an active mine being established (the reality in a vast majority of instances according to the International Association for Impact Assessment), permit registrants must stabilize the site before permit termination. However, when active mining activities are to occur and a well-delineated active mining area is established, disturbed areas within the active mine area would not need to be stabilized, because the active mining-related requirements in the federal permit would then apply up to the point of mine closure.

In the EPA's 2015 MSGP, active mining also includes the reclamation phase. The requirements for these types of discharges have not been significantly revised from the 2008 version. EPA has added a definition of "active mining area" that is based on the regulatory definition at 40 CFR 440.132(a): "A place where work or other activity related to the extraction, removal or recovery of metal ore is being conducted, except, with respect to surface mines, any area of land on or in which grading has been completed to return the earth to desired contour and reclamation work has begun." The active mining area is where the regular federal permit (i.e., non-earth-disturbance-related) requirements apply.

EPA's 2015 MSGP also recognizes that mines are often subject to other regulations and non-NPDES permits (e.g., exploration permit, mining permit, reclamation plan, Surface Mining Control and

Reclamation Act (SMCRA)). If these other regulations/ permits have overlapping requirements with the permit and a permittee can demonstrate and document compliance with the other regulations/ permits, DEQ shall consider that the permit registrant has complied with the relevant requirements in the 1200-Z.

6.2 Sectors S: Air Transportation Facilities

In the EPA's 2015 MSGP, EPA has updated the requirements for Sector S to incorporate the airport deicing effluent limitation guidelines and new source performance standards. Airlines and airports conduct deicing operations on aircraft and airfield pavement to ensure the safety of passenger and cargo flights. In the absence of controls, deicing chemicals are widely dispersed causing pollutants to enter nearby rivers, lakes, streams, and bays. On May 16, 2012, EPA published the Airport Deicing ELG in the Federal Register to control the discharge of pollutants from airport deicing operations to surface waters. See 40 CFR Parts 9 and 449. The requirements largely apply to wastewater associated with the deicing of airfield pavement at primary airports. The rule also established New Source Performance Standards for wastewater discharges associated with aircraft deicing for a subset of new airports. These guidelines are implemented in discharge permits issued by states and EPA Regional Offices under the NPDES program. Therefore, the 1200-Z is incorporating the requirements from the Airport ELG that are appropriate to the kinds of discharges the permit authorizes.

Effluent Limitations Based on Effluent Limitations Guidelines and New Source Performance Standards

The 1200-Z general permit contains new requirements that are applicable to stormwater discharges from airfield pavement deicing activities at both existing and new "primary airports" (as defined at 40 CFR 449.2), providing the airports have at least 1,000 or more annual non-propeller aircraft departures. The limitation specifies that there shall be no discharge of airfield pavement deicers containing urea. To comply with this limitation, airports must certify annually that they do not use urea-containing deicers, or, alternatively, they must meet the ELG's effluent limitation for "Ammonia as Nitrogen", which is 14.7 mg/L, daily maximum. The EPA's 2015 MSGP also retains a sector-specific effluent limit requirement that applies to airports not subject to the ELG to consider the use of non-urea-based pavement deicers.

The other major part of the ELG concerns only new airports (i.e., those subject to the new source performance standards at 40 CFR 449.11). New airports with 1,000 or more annual non-propeller aircraft departures must meet the applicable requirements for aircraft deicing at 40 CFR 449.11(a). The ELG specifies that new airports with 10,000 annual departures located in certain cold climate zones are required to collect 60 percent of available aircraft deicing fluid after deicing (see 40 CFR 449.11 to determine whether an airport is in a cold climate zone). Airports that discharge the collected aircraft deicing fluid directly to waters of the U.S. must also meet numeric effluent limitations for chemical oxygen demand. However, collected aircraft deicing fluid is not authorized for discharge under the 1200-Z (i.e., it is an unauthorized non-stormwater discharge). Therefore, this effluent limitation is not included the 1200-Z general permit (such an effluent limitation would only be incorporated into an individual permit that covers an airport's wastewater discharges).

Regarding the list of stormwater control options available for the various types of deicing activities, EPA and the 1200-Z adopted the ELG's terminology, such as using "feasible" in place of "practicable" and "as appropriate" (note: "practicability" is included in the definition of "feasibility"). EPA and the 1200-Z also included the ELG's factors for operators to consider when selecting controls to meet their technology-based effluent limits: safety, space, operational constraints, and flight schedules. In addition, new types of technologies or practices identified in the ELG for controlling deicing chemical discharges have been added to the 1200-Z.

Schedule F - NPDES General Conditions

These conditions are standard to all industrial NPDES permits and include language regarding operation and maintenance of facilities, monitoring and record keeping, and reporting requirements. The General Conditions have been revised since the last permit was issued and the permit is clear on page 2 that if conflicts arise between Schedule F and any other schedule of the permit, the requirements in Schedule F will not apply. A summary of the changes is as follows:

- There are additional citations to the federal CWA and CFR, including references to standards for sewage sludge use or disposal.
- There is additional language regarding federal penalties.
- Bypass language has been made consistent with the CFR.
- Overflow language has been eliminated.
- Requirements regarding emergency response and public notification plans have been made more explicit.
- Language pertaining to duty to provide information has been made more explicit.
- Confidentiality of information is addressed.

Appendix 1: Industrial Stormwater Benchmark Model Development for Copper, Lead and Zinc

8.1 Methodology

DEQ developed water quality based benchmarks for copper, lead, and zinc, by using a modeling method based on the approach used by Herrera Environmental Consultants for the Washington Department of Ecology's Industrial Stormwater General Permit.[13] Herrera's approach considers characteristics of the receiving waterbody including background metals concentrations, hardness, and dilution. Monte Carlo simulations were used in the model to incorporate uncertainty and environmental variability in estimating the probability of exceeding water quality standards for a range of effluent concentrations. An acceptable probability of exceeding water quality standards is selected, and the benchmark is the effluent concentration that produces an acceptable probability of exceeding water quality standards. Herrera ran the model on multiple scenarios considering different dilution factors and receiving body conditions of both Eastern and Western Washington.

This methodology reflects the newly adopted aquatic life criterion for copper adopted by DEQ in January 2017, which requires use of the biotic ligand model based on conductivity rather than the hardness based calculations used in previous renewal processes. Renewal of the lead and zinc benchmarks remained as hardness based calculations for this benchmark renewal. To accommodate regional differences in water hardness, the state was separated into seven geo-regions based on USGS ecoregions (Figure 6). Data from 2008-2016 was used in this renewal process to ensure that large enough data sets existed for each geo-region.

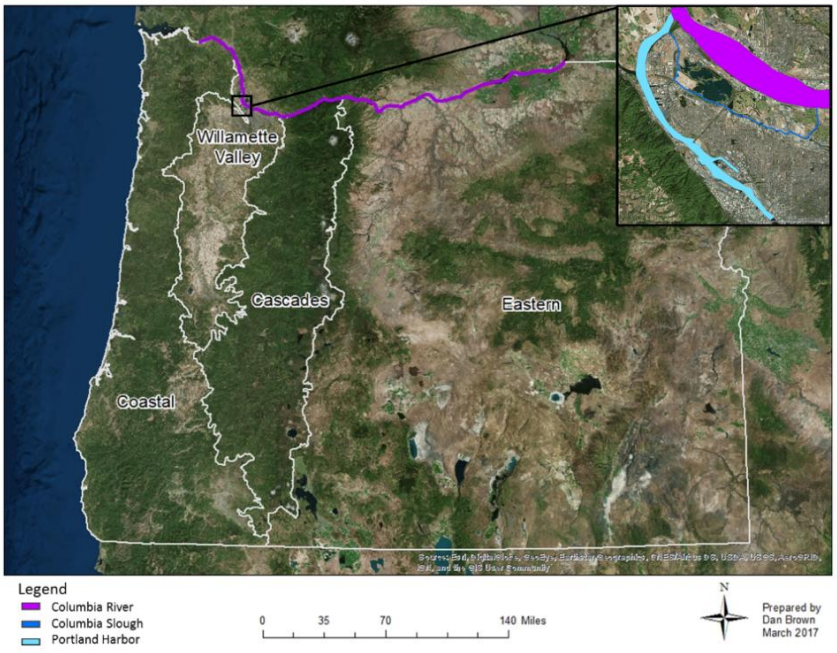


Figure 6: Map of the seven geo-regions used in the copper water quality criteria development

[13] Herrera Environmental Consultants, 2009. Water Quality Risk Evaluation for Benchmarks/Action Levels in the Industrial Stormwater General Permit. Prepared for the Washington State Department of Ecology. http://www.ecy.wa.gov/programs/wq/stormwater/industrial/workgroupdocs/analysisreportwqrisk.pdf

8.2 Site Selection and Data Acquisition

Sites were previously selected based on where industries are or may be located, which could potentially include sites located downstream of industrial facility outfalls. For this renewal process, a list of potential sampling sites was compiled from DEQ's Element and LASAR databases as well as the National Water Quality Monitoring Council's Water Quality Portal, which queries data from the USGS, EPA and the National Water Quality Monitoring Council databases. Additional data for the Columbia Slough and Portland Harbor geo-regions were provided by the City of Portland. This effort resulted in over 15,500 potential sites. As in previous benchmark renewal processes sites located in small, remote mountain streams and sites impacted by saline water from the coast were removed. In addition, sites were removed based on their proximity to an industrial facility outfall. Such sites were identified by the site description or by mapping site locations against the most recent NPDES facility layer in ArcGIS. This vetting process resulted in just over 2,000 sites with the parameters necessary for this analysis that were not in close proximity to an industrial facility outfall. Once the final site list was established, sites were separated into the correct geo-region based on location and parameters for the copper, lead and zinc benchmarks. All data collected between 2008 and 2016 from sites in the final site list were used in these analyses. Non-detect data was excluded from these analyses so as not to bias the distribution fitting procedure.

8.3 Distribution Fitting

Oracle's Crystal Ball software was used to determine the best fit distribution based on the available data in each geo-region for the following parameters: temperature, pH, dissolved copper, dissolved organic carbon, conductivity, total recoverable lead, total recoverable zinc and hardness. This software fits 14 different continuous distributions to the data and ranks the fit of each distribution based on the Kolmogorov-Smirnov goodness-of-fit test. This analysis was limited to the use of only uniform, continuous distributions due to the number of inverse distribution formulas included in MS Excel (i.e., beta, normal, lognormal, gamma and binomial). As a conservative measure, detections below the minimum reporting limit were replaced with the minimum reporting limit value. Regional default values were also used in the copper benchmark analysis based on guidance from DEQ Water Quality Standards Program (PDF). If default or minimum reporting limit values made up more than 20% of a dataset, they were not used to determine the best fit distribution. The highest ranked uniform, continuous distribution was selected for each parameter in this analysis (Tables 16-18).

Table 16: Descriptive statistics for in-stream total lead and zinc in each of the geo-regions

Geo-region	Total Lead				Total Zinc			
	Sample Size	Mean (µg/L)	Median (µg/L)	St. Dev. (µg/L)	Sample Size	Mean (µg/L)	Median (µg/L)	St. Dev. (µg/L)
Cascades	34	0.29	0.24	0.32	31	6.2	4.5	4.29
Coastal	99	0.49	0.08	0.79	65	7.06	5.00	7.17
Columbia River	11	0.32	0.2	0.34	11	6.33	5.3	3.81
Columbia Slough	223	0.86	0.65	0.62	222	8.19	6.63	65.39
Eastern	583	1.64	0.22	9.27	211	9.51	7.19	5.92
Portland Harbor	419	0.18	0.12	0.16	411	2.06	1.53	1.5
Willamette Valley	1436	0.43	0.27	0.67	1465	7.51	6.00	8.22

Table 17: Descriptive statistics for in-stream hardness and dissolved copper in each of the geo-regions

Geo-region	Hardness				Dissolved Copper			
	Sample Size	Mean (µg/L)	Median (µg/L)	St. Dev. (µg/L)	Sample Size	Mean (µg/L)	Median (µg/L)	St. Dev. (µg/L)
Cascades	155	12.87	12.4	2.77	34	1.28	1.55	0.87
Coastal	126	36.89	19.15	126.65	237	0.99	0.6	0.96
Columbia River	110	53.85	54.95	6.97	78	1.1	0.95	0.70
Columbia Slough	212	81.7	83.5	15.7	211	3.38	1.58	0.84
Eastern	468	77.73	54.70	65.83	435	2.51	1.8	2.32
Portland Harbor	369	26.02	25.4	4.25	248	0.89	0.65	0.6
Willamette Valley	853	56.25	35.4	43.33	1677	1.58	1.3	2.24

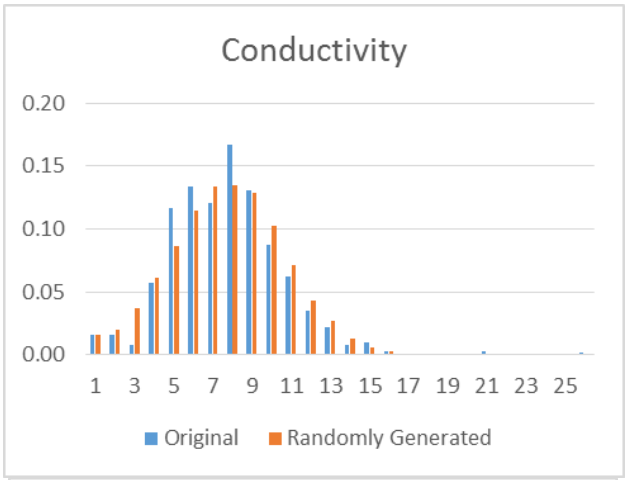
Table 18: Best fit distribution results for parameters in each of the geo-regions.

Geo-region	Temp.	pH	Copper	DOC	Conductivity	Lead	Zinc	Hardness
Cascades	Gamma	Normal	Normal	Normal	Normal	Gamma	Normal	Normal
Coastal	Gamma	Normal	Gamma	Gamma	Gamma	Normal	Normal	Normal
Columbia River	Beta	Normal	Gamma	Gamma	Gamma	Normal	Normal	Normal
Columbia Slough	Beta	Beta	Normal	Normal	Gamma	Normal	Normal	Normal
Eastern	Normal	Normal	Gamma	Gamma	Gamma	Gamma	Normal	Normal
Portland Harbor	Normal	Normal	Normal	Normal	Normal	Gamma	Normal	Normal
Willamette Valley	Normal	Normal	Gamma	Gamma	Gamma	Gamma	Normal	Gamma

8.4 Generating Random Input Data and Histogram Verification

Once the best fit distribution was determined for a parameter, then MS Excel was used to generate random input data using the inverse of the best fit distribution. The inverse distribution equations factor the distribution's characteristic parameters such as mean, standard deviation, alpha, and beta. This simulation was used to create a dataset of 10,000 randomly generated data points. To ensure the consistency of the randomly generated values, the process was completed 10 times.

Histograms of the randomly generated datasets were compared to the distributions of the original data to verify that the Crystal Ball software identified the correct distribution as the best fit. The number of bins and bin size of the histogram was determined based on the original data. If the histogram verification indicated a poor fit, a different distribution that better represented the original data was selected (Figures 7 and 8).



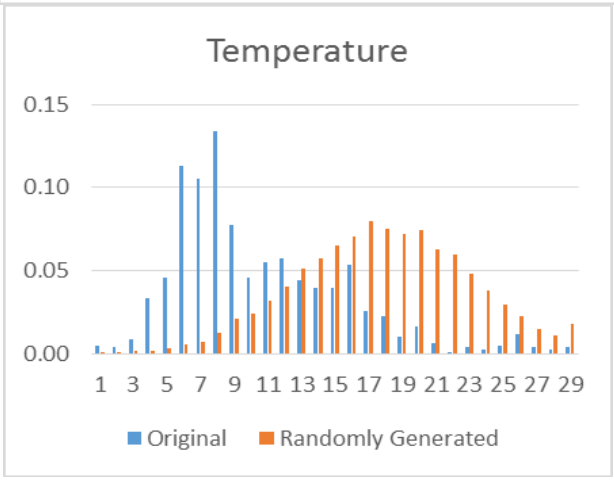


Figure 7 and Figure 8: Histograms indicating a good fit (left) and poor fit (right) between the original data and the randomly generated data

8.5 Copper Benchmark Calculation

In-stream concentrations of copper are calculated using the following equation:

$$Cr = \left(\frac{1}{Fd}\ x\ Cf\right) + \left(1 - \frac{1}{Fd}\right)\ x\ Cb$$

where Cr is the receiving water concentration at the point of discharge, Fd is the dilution factor, Cf is the effluent concentration, and Cb is the receiving water background concentration. For the purposes of this analysis, the dilution factor was held constant at five, a representative value for the state, the effluent concentration ranged from 0-30 µg/L, and the background concentration is a value from the randomly generated copper dataset.

The biotic ligand model (BLM) was used to determine the criteria against which the in-stream copper concentration is compared. The BLM program from Windward Environmental L.L.C. predicts the bioavailability of copper under a wide range of water chemistry conditions. The randomly generated datasets for temperature, pH, copper and dissolved organic carbon are required for the model to run, whereas the randomly generated dataset for conductivity is used to calculate the concentration of the geochemical ions needed for the model (Table 18). Default values for humic acid (10%) and sulfide (0.00001mg/L) were used following the EPA's recommendation. The BLM calculated a final acute value for each of the 10,000 randomly generated copper values, which was used as the criteria for the corresponding in-stream concentration.

Table 19: Geochemical ion estimation equations

where, “SpC” is a measurement of specific conductance in µmhos/cm, “ln” is the natural logarithm, and “exp” is a mathematical constant that is the base of the natural logarithm (~2.71828)

Parameter	Equation
Alkalinity	$Alk. = exp^{(0.88*[ln(SpC)]-0.41)}$
Calcium	$Ca = exp^{(0.96*[ln(SpC)]-2.29)}$
Chloride	$Cl = exp^{(1.15*[ln(SpC)]-3.82)}$
Magnesium	$Mg = exp^{(0.91*[ln(SpC)]-3.09)}$
Potassium	$K = exp^{(0.84*[ln(SpC)]-3.74)}$
Sodium	$Na = exp^{(0.86*[ln(SpC)]-2.22)}$
Sulfate	$SO_4 = exp^{(1.45*[ln(SpC)]-0.5.59)}$

The final acute values are then copied into a spreadsheet containing the in-stream concentration equation results for all 10,000 sets of values at effluent concentrations from 0-30 µg/L, at 2 µg/L increments. This creates a probability distribution of the receiving water copper concentration. The copper benchmark was estimated at the copper concentration in stormwater effluent that corresponded to a 10% probability of exceeding the water quality standard.

8.6 Lead and Zinc Benchmark Calculation

The in-stream concentrations for lead and zinc are calculated using the same equation as copper. The dilution factor is also the same. Rather than using the BLM software to calculate the criteria, DEQ has established formulas for hardness-dependent freshwater metals criteria for lead and zinc as a part of the Aquatic Life Water Quality Criteria for Toxic Pollutants Table 30 (PDF). Table 20 contains the acute criterion equations for lead and zinc.

Table 20: Hardness-dependent acute aquatic life water quality criteria equations for lead and zinc
where, “ln” is the natural logarithm and “exp” is a mathematical constant that is the base of the natural logarithm (~2.71828)

Parameter	Equation
Lead	$Pb = exp^{(1.273*[ln(Hardness)]+(-1.460))}$
Zinc	$Zn = exp^{(0.8473*[ln(Hardness)]+0.884)}$

The in-stream concentrations and acute criteria were calculated in the same spreadsheet and the calculations were performed for each of the 10,000 randomly generated lead and zinc values. The in-stream concentrations were initially calculated at effluent concentrations from 0-30 µg/L, at 2 µg/L increments, and adjusted to higher effluent concentrations, if necessary. As with the copper analysis, this created a probability distribution of receiving water lead and zinc concentrations. The benchmarks for lead and zinc were estimated at lead and zinc concentrations in stormwater effluent that corresponded to a 10% probability of exceeding the appropriate water quality standard.

8.7 Results

Figures 9-11 show the modeled risk-based benchmark curves for copper, lead and zinc for each of the different geo-regions used in this analysis. Table 20 displays the modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for copper, lead and zinc in each geo-region.

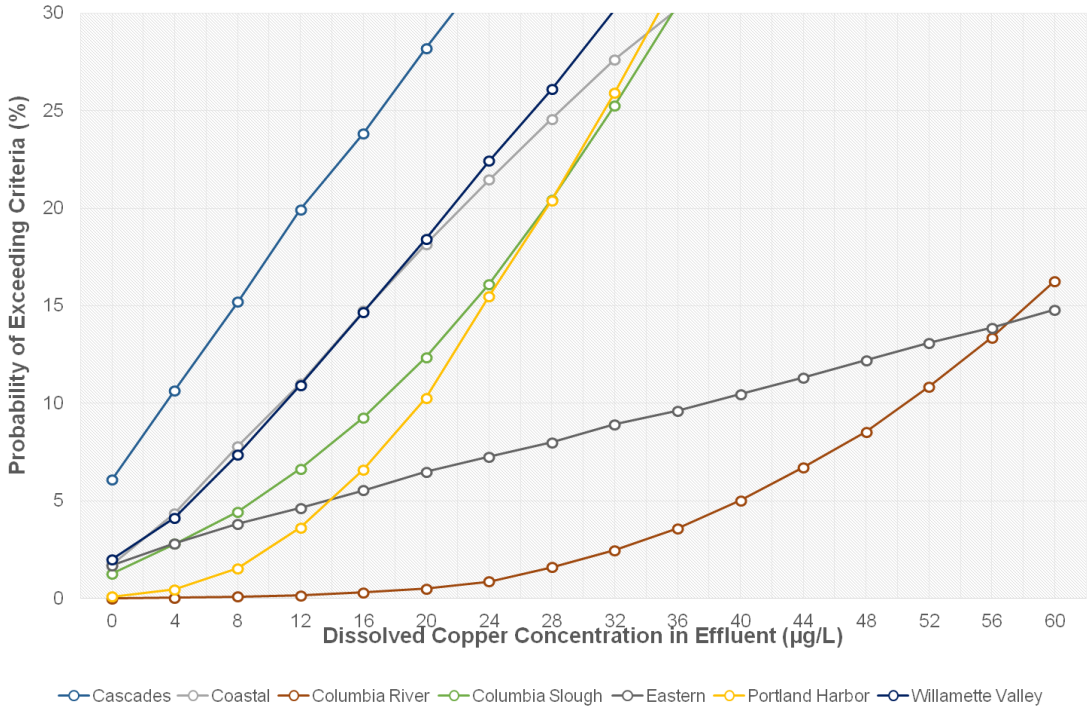


Figure 9: Modeled risk-based benchmark curve for dissovled copper by geo-region

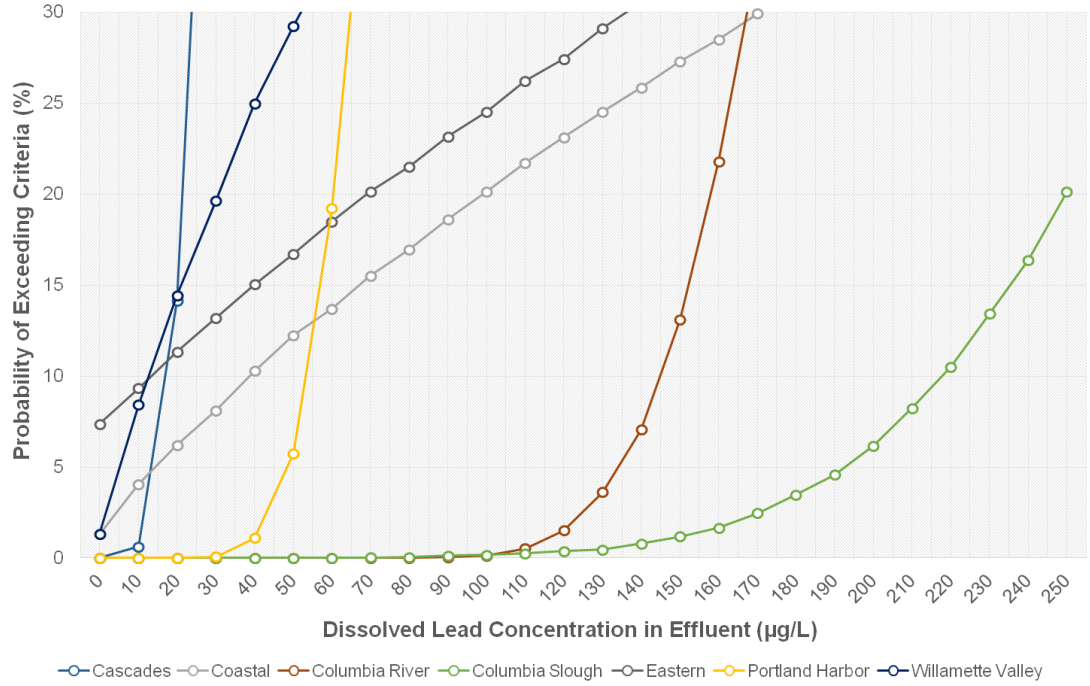


Figure 10: Modeled risk-based benchmark curve for dissoved lead by geo-region

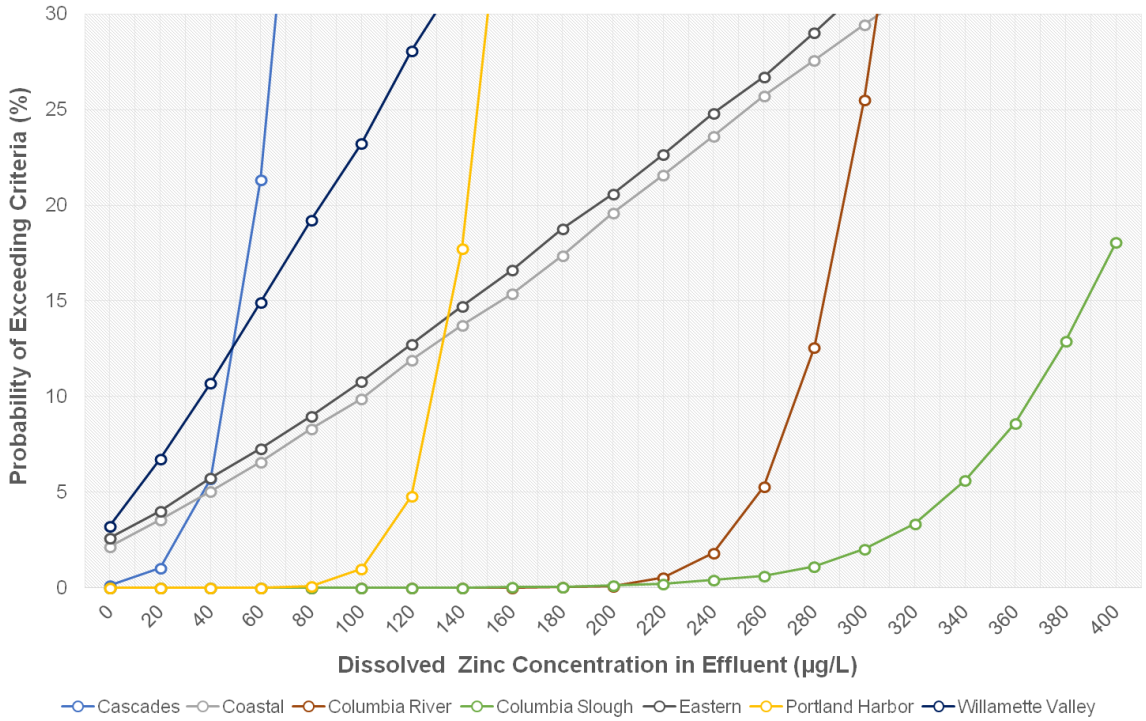


Figure 11: Modeled risk-based benchmark curve for dissolved zinc by geo-region

Table 21: Modeled stormwater runoff concentrations that correspond to a 10 percent probability of exceeding water quality criteria for copper, lead and zinc in each geo-region

Geo-region	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)
Cascades	4	19	48
Coastal	11	40	102
Columbia River	50	146	274
Columbia Slough	17	218	368
Eastern	38	36	92
Portland Harbor	20	54	151
Willamette Valley	11	13	38

Appendix 2: Assessment of Dilution Rate

Dilution is defined as the total streamflow divided by effluent flow (for this modeling, effluent flow is facility stormwater runoff). A higher dilution factor means that there is relatively less effluent in the receiving water, compared to a lower dilution factor. Thus, a higher dilution rate is more protective of the environment than a lower dilution rate.

DEQ's prior benchmarks in the 1200-Z permit are based on a dilution rate of 5, which accounts for higher receiving stream flows during storm events than during dry weather. To select an appropriate dilution rate for model input, DEQ assessed the adequacy of the current dilution rate. DEQ estimated potential dilution based on commonly occurring storm events in different regions of the state, the stormwater runoff from 48 randomly selected facilities, and the flow in streams to which they discharge. Facilities were selected using a stratified random sampling method. This method is appropriate when a known factor may contribute to differences between the items being sampled. In this case, stream size was the factor of concern. Therefore, the facilities were selected based on the size of the stream to which they discharged (see Table 1 below). Because more facilities discharge to streams in larger watersheds, more facilities were selected from large watershed categories.

Table 1. Distribution of evaluated facilities based on regional location and the watershed size corresponding to the point the discharge enters the receiving body

	Watershed Size		Number of Facilities	
Bin	larger than (mi^2)	equal to or less than (mi^2)	NWR & WR region	ER region
A	0.01	0.1	1	
B	0.1	1	5	
C	1	10	10	1
D	10	100	9	
E	100	1000	10	2
F	1000	10000	8	1
G	10000	--	1	

The assessment utilized the rational method, a simple rainfall-runoff equation, to estimate facilities' stormwater runoff based on rainfall depth. The rational method accounts for surface conditions, such as impervious areas, through a runoff coefficient. To calculate the dilution for each facility, estimated facility runoff was compared to the estimated receiving water streamflow. Flows were calculated as follows:

- Runoff from facility
    - The impervious area for each facility was used to calculate the total area that contributes runoff for each facility. Facility impervious area was obtained from the facility's application form and Stormwater Pollution Control Plan.
    - Rainfall intensity was then used to calculate runoff from the facility. Rainfall data were evaluated from three regions in the state (Rogue Valley, Willamette Valley and Eastern Oregon). For each region, the median storm size was calculated, and then three storms with median flow were selected. The rainfall intensity was estimated by looking at the maximum sustained intensity for the three storms.
- Stream flow
    - DEQ estimated a median streamflow using the daily average flows from the rainy season for the last three years.
    - DEQ estimated the flows for each facility's stream based on the contributing area size of the watershed

Results:

DEQ's analysis indicated that the dilution factor of 5 in the current permit is reasonable for the following reasons:

- The estimated dilution factor was 5 or more for approximately 80% of the facilities (see histogram in Figure 1 below). Approximately 20% of the facilities had estimated dilution factors that were less than 5. These facilities all discharged to smaller watersheds (less than 5 square miles), and typically had a large impervious areas contributing to stormwater runoff (see watershed size in Figure 2 below).
- The estimated dilution factor was more than 10 for over three-quarters of the facilities.
- The estimated dilution factor was greater than 200 for over half of the facilities.

Because this is a general permit that applies to wide variety of sources discharging too many different waterbodies, and the dilution factor of 5 in the current permit is appropriate for the majority of the facilities, DEQ concluded that the dilution factor of 5 is protective of the environment and appropriate for model input.

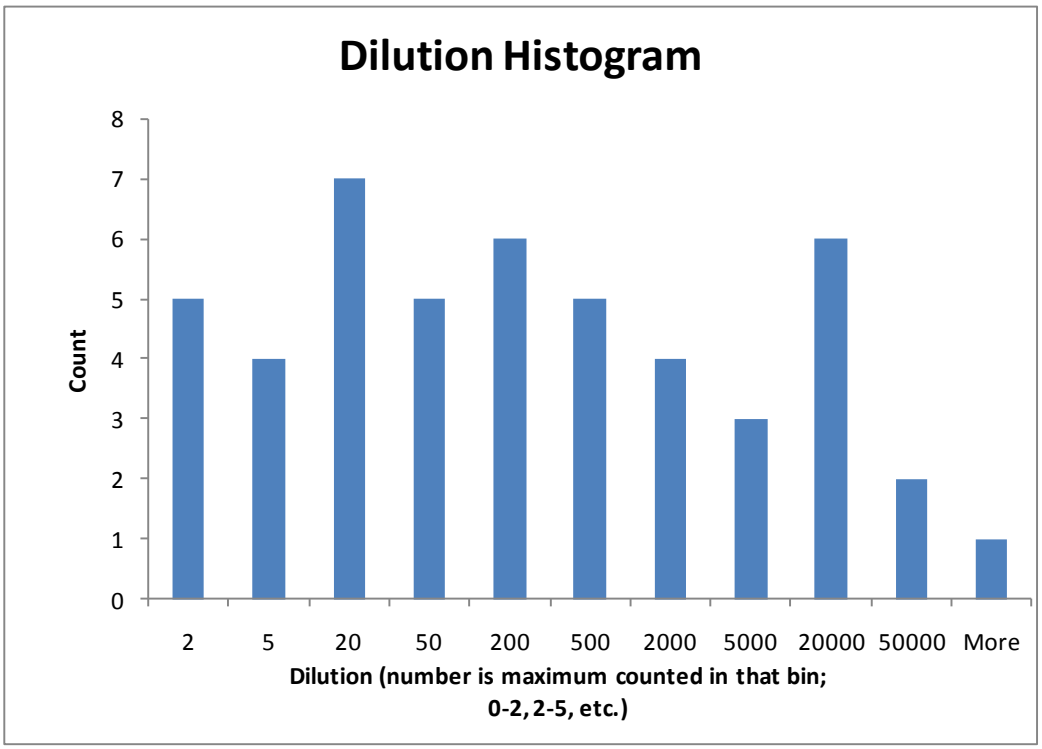


Figure 12. Histogram of dilution factors available to 48 evaluated facilities

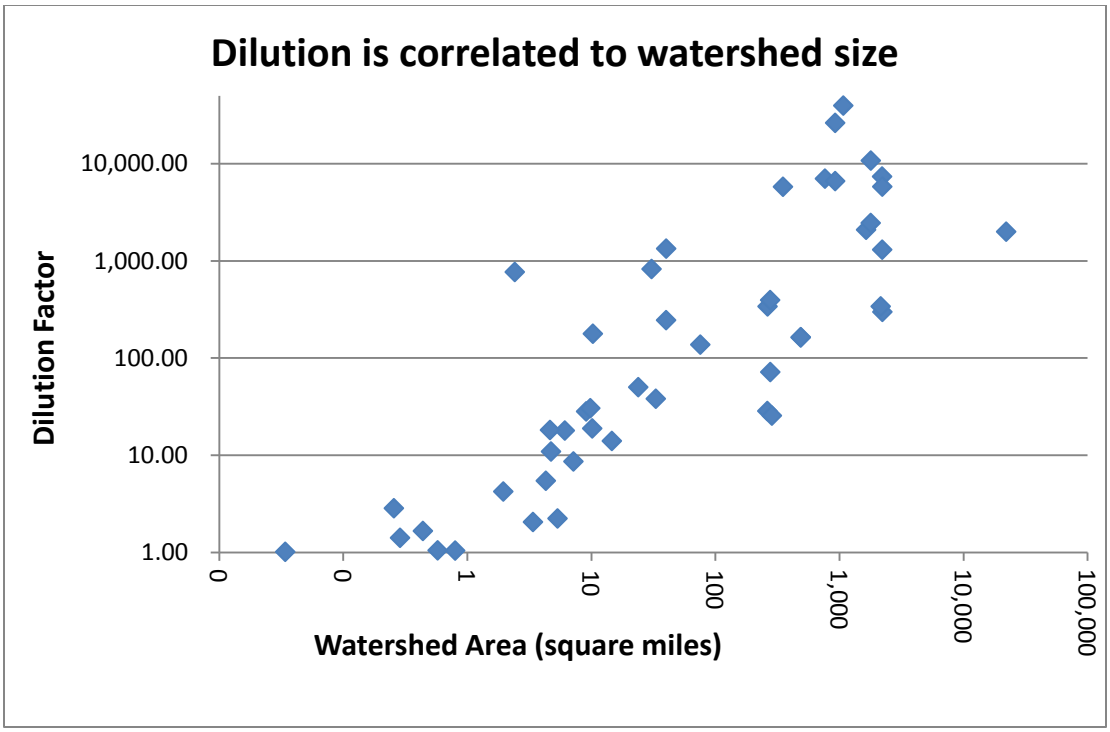


Figure 13. Dilution factors available to 48 facilities plotted against the receiving bodies' watershed area defined by the point the discharge enters the receiving body

Appendix 3: Technologically Achievable Benchmarks Evaluation

In 2012, DEQ developed a technology based benchmark to increase the likelihood that facilities will succeed in meeting the new copper benchmark using treatment technologies that are affordable, feasible, and readily available.[14] Thus, the purpose of the technologically achievable analysis is to identify a consistently achievable and justifiable benchmark that can be reached by Oregon industrial facilities. The methodology assesses BMP study data and then compares it to Oregon DMR data to determine what are reasonable and attainable stormwater discharge concentrations for industrial stormwater permit registrants.

10.1 Approach

For the current permit, DEQ repeated the analyses, with some slight modifications. In the expired permit, each study was examined in detail, and individual study points utilized. In this analysis, summary statistics for each study were used. Both are valid approaches. In the previous approach, each data point is given equal weight, whereas in the current approach, each study is given equal weight. Thus, in the previous approach, a study that collected a large amount of data would have a stronger "influence" on the results than a study that collected a small amount of data. In the current approach, each study has the same influence on the results. In general, these two approaches will have similar results.

Data from the International Stormwater BMP Database[15] were used to assess treatment capabilities by media filter treatment BMPs. DEQ analyzed data from passive media filtration BMPs (such as media filters, sand filters, and layered media) rather than active treatment BMPs (such as electrocoagulation or chemical treatment system) that may not be economically feasible for many facilities. The data were comprised of discrete influent and effluent pairs for individual storm events. DEQ also only examined studies that were U.S. – based. This ensures that technologies are obtainable; it wouldn't make sense for Oregon industrial facilities to use a technology that would need to be shipped from, for example, Australia. Furthermore, U.S. industrial facilities may differ from facilities in other countries in numerous ways (on site and off site infrastructure, housekeeping practices, regulatory requirements, and so on). Limiting the analysis to U.S. treatment system studies helps ensure that the studies are representative of U.S. conditions. Summary statistics for each study were extracted from the database.

This analysis evaluates what might happen if an industrial facility without treatment were to install treatment. That is, an industrial facility stormwater discharge will become a treatment system influent, and the treatment system effluent will then be the final stormwater discharge. Therefore, the treatment system influent concentration from each study corresponds to the industrial facility stormwater discharge concentration. DEQ used the average industrial facility stormwater discharge concentration from each facility to represent the typical stormwater discharge from the facility. The treatment system influent concentration should also be represented by a statistic that is a measure of the center of the data. DEQ selected the median treatment system influent concentration to represent the influent concentration of each facility. This analysis seeks to identify a treatment system effluent concentration that can be obtained by most facilities. If the median treatment system effluent concentration were used, this would result in a benchmark that only about half of the industrial facilities would be able to achieve. Therefore, the 75th percentile of treatment system effluent concentrations was used as the post-treatment concentration, to increase the likelihood that most industrial facilities will be able achieve the benchmark.

[14] NPDES Waste Discharge Permit Evaluation Report, Industrial Stormwater General Permits Nos. 1200-Z and 1200-COLS, undated, circa 2012, pp29-30

[15] The International Stormwater BMP Database is located at http://www.bmpdatabase.org.

For each metal, DEQ developed a regression between the median treatment system influent concentration the 75th percentile effluent concentration. DEQ also calculated and plotted the upper and lower 90% confidence lines for the regressions. The upper 90% confidence line can be interpreted as a post-treatment level that can reasonably be obtained for a particular industrial facility stormwater discharge concentration. For example, an industrial facility stormwater discharge with 80 µg/L copper concentration, if treated by passive filtration, can reasonably be expected to reach a post-treatment concentration of 60 µg/L (Figure 14).

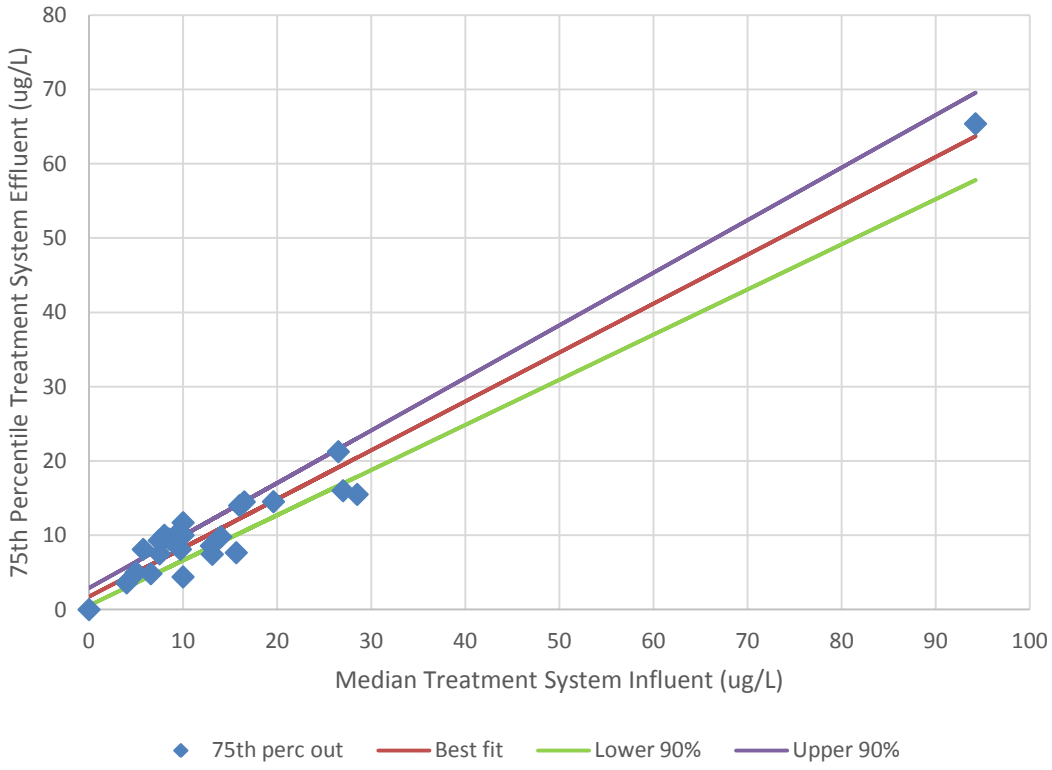


Figure 14: Copper treatability regression

There are a number of statistics associated with this analysis, including:

- The "Adjusted R Square." Roughly speaking, this is a measure of how well the line fits the data. It can also be viewed as a measure of how well the line can be used for predictive purposes: given an input value, will the line accurately predict the output value? The Adjusted R Square ranges from 0 to 1, with values near 1 indicating a better fit. Values of 0.8 or larger are generally considered a good fit, and values of 0.9 or larger are generally considered an excellent fit.
- The ANOVA "Significance F." This is a significance statistic; values of 0.1 or less are generally interpreted as statistically significant. This measures whether or not the line accounts for a significant amount of the variation. This is different from the Adjusted R Square. Significance indicates that the line accurately depicts a "signal" in the "noise." It does not need to explain all the variation; there may be other sources of variation. However, the line is meaningful in the sense that there is a connection between the variables. For example, consider a simple experiment on plant growth in which all variables are constant, except nitrogen and phosphorous. Nitrogen and phosphorous are applied in different amounts to different plants. A regression of plant size on nitrogen could be significant (Significance F), yet have a low Adjusted R Square, because phosphorous is also causing variation.
- The p-values of the regression. These are also significance statistics, with values of 0.1 or less generally considered statistically significant (the Significance F and the slope p-value are

identical; they are the same statistic). It is quite common to have the slope be significant, but not the intercept.

- The "residual" value. This is a measure of how far a data point is from the regression line.

Next, DEQ examined discharge monitoring report data submitted by the facilities under the current 1200-Z and 1200-COLS permits to assess relevant industrial facility stormwater metals discharge concentrations to use in the analyses. Data from 2011 through 2016 were used. This provided enough data from each industrial facility to evaluate. Of course, as data get older, it becomes less representative of current conditions. Therefore, older data was not used. DEQ then calculated the average discharge for each facility, for the entire period. For facilities with multiple discharge locations, discharges from all locations were grouped together to create a single average. DEQ then selected industrial facility stormwater discharge concentrations in the upper 75th to 90th percentile to represent concentrations that would be treated. The upper range of concentrations was selected to assess what facilities with relatively high concentrations can achieve. The expectation is that facilities with lower concentrations will be able to achieve the benchmark. For the upper end of the range, the 90th percentile level was selected instead of the maximum. This was done because facilities with unusually high stormwater discharge concentrations will probably need to do some initial work to bring zinc concentrations down before treatment. In addition, selecting the 90% level helps prevent setting the technologically achievable benchmark at a level that is too conservative (too high).

Finally, the industrial stormwater effluent range was compared to the treatment system regression to determine the technologically achievable benchmark. Below, this process is described using copper as an example (See Figure 15).

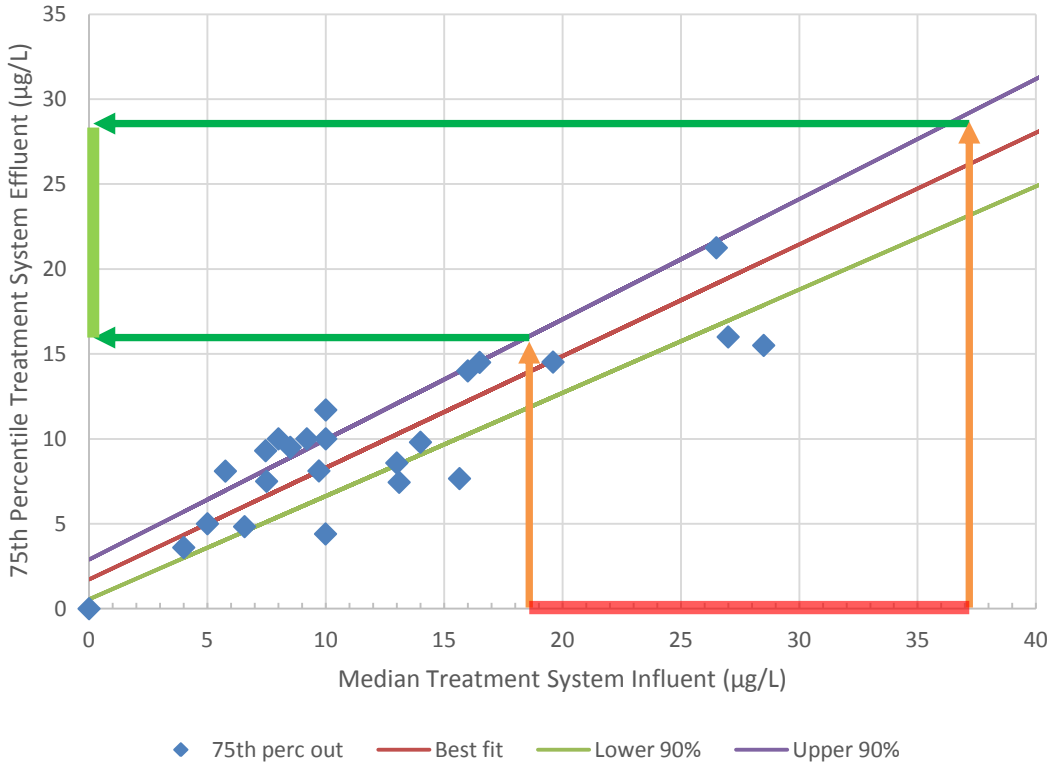


Figure 15: Determining the technologically achievable benchmark for copper

- Observe the industrial facility stormwater discharge range of interest (19-38 µg/L, marked in thick red on the plot). Keep in mind that the industrial facility stormwater discharge concentration is used as the treatment system influent concentration in the plot.
- Each point on the upper 90% line represents the post-treatment level that can reasonably be obtained, for a particular industrial facility stormwater discharge concentration. Thus:
    - Go up from the ends of the range marked in red to intersect the upper 90% line (orange arrows)
    - Go across from those intersections to the 75th percentile treatment system effluent axis (light green arrows)
    - This identifies a range of treatment system effluent concentrations that could be the benchmark. In this case, it is about 16-30µg/L (marked in thick dark green)
- Selecting the highest value in this range as the technologically achievable benchmark would produce a benchmark that even the "worst of the worst" could achieve. Such a value would be too high, because DEQ does want industrial facilities to improve. Selecting the lowest value in the range as the technologically achievable benchmark would produce a benchmark that the "best of the worst" could achieve. However, many of the industrial facilities with higher stormwater discharge concentrations may not be able to achieve this level. Therefore, DEQ selected the middle of the treatment system effluent range as the technologically achievable benchmark. This provides a benchmark that existing industrial facilities at the high end of the stormwater discharge concentration scale can reasonably be expected to achieve.
- Thus, pick the center of this range as the technologically achievable benchmark. In this case, 23 µg/L.
- Finally, given the inherent uncertainties in this process, technically achievable benchmarks were rounded to the nearest one significant digit, or 20 µg/L for copper.

In practice, it is simpler and more accurate to use the equation for the upper 90% confidence line to calculate treatment effluent concentrations that correspond to the industrial facility stormwater discharge concentrations.

This approach makes the following assumptions:

- Median influent from treatment system studies is representative of typical industrial facility stormwater discharge that would be treated.
- Concentrations achieved by 75th percentile treatment system effluent from treatment system studies can be achieved by most industrial facilities through treatment of industrial stormwater discharges.
- The upper 10% bound on the regression line of median treatment system influent and 75th percentile treatment system effluent provides the relationship between a given industrial stormwater discharge concentration and a post-treatment concentration that can be obtained by most industrial facilities.
- The upper range of industrial facility stormwater discharge concentrations can be represented by the upper 75th to 90th percentile of industrial facility stormwater discharge concentrations, based on the average concentration over the period of data collection.

10.2 Analysis

10.2.1 Copper

The treatment system regression for copper is presented below (Figure 16).

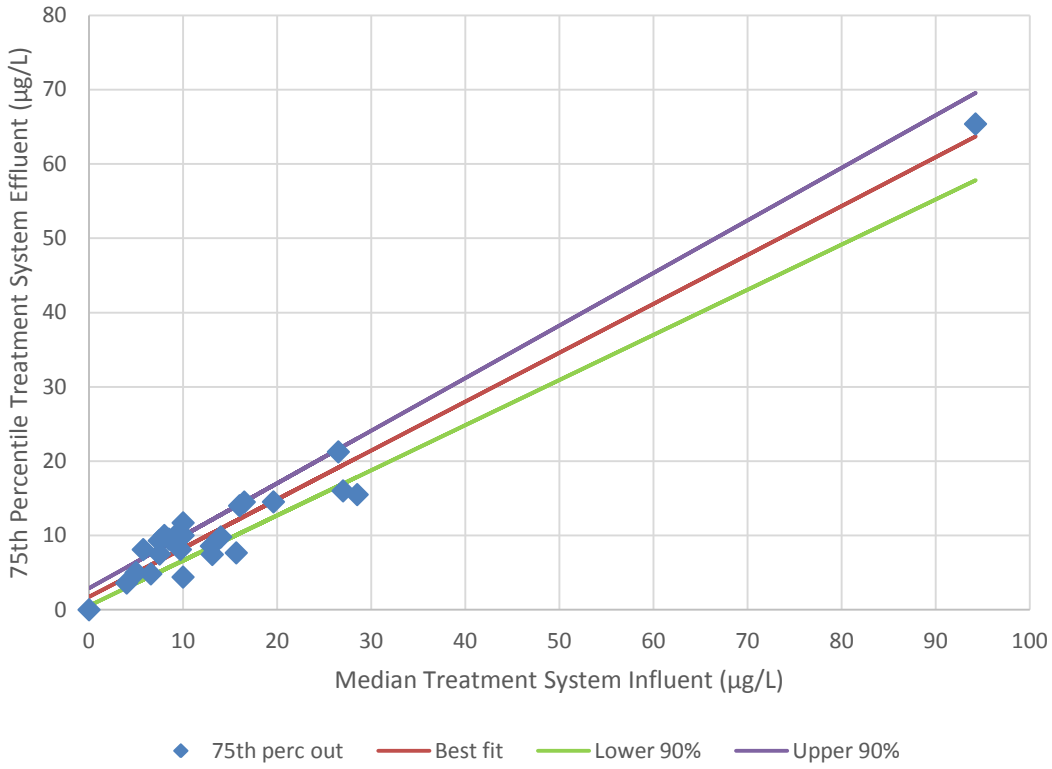


Figure 16: Copper treatability regression. Adjusted R Square 0.95, slope p-value $3.3*10^{-17}$, intercept p-value 0.019

The regression for copper treatability is excellent, with a high Adjusted R Square and statistically significant slope and intercept. The upper 75th to 90th percentile range of industrial facility stormwater discharge average concentrations for copper was 19 to 38 µg/L. Putting these values into the equation for the upper 90% treatment facility regression line indicated a range of 16 to 30 µg/L after treatment. The average of these values provides the technically achievable zinc benchmark of 23 µg/L. After rounding to one significant digit, the final result is 20 µg/L.

10.2.2 Lead

The regression is presented below (Figure 17)

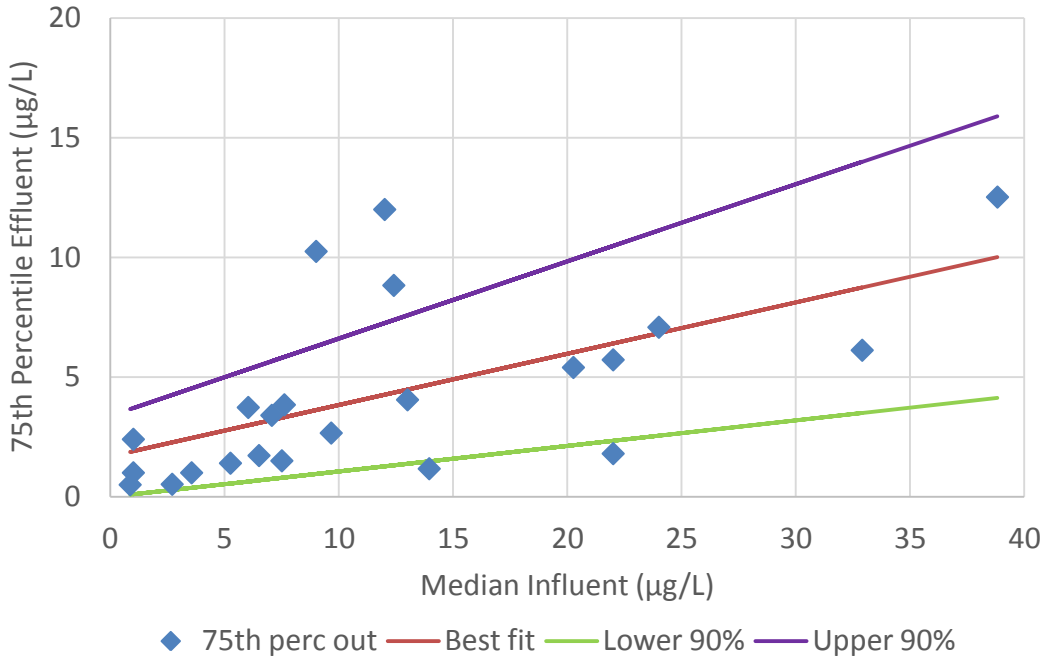


Figure 17: Initial lead treatability regression. Adjusted R Square 0.36, slope p-value 0.0026, intercept p-value 0.10

The Adjusted R Square is quite low; there are some points that deviate quite a bit from the regression line, and the regression is not very good at predicting outcomes. However, the p-values indicate that the slope and intercept are statistically significant. Thus, there is a statistically significant trend, even though (based on the Adjusted R Square) there are other factors that affect the treatment system effluent concentration. The treatment system influent concentration alone does not accurately predict the treatment system effluent concentration.

Five of the data points lie outside of the 90% confidence bounds; three above, and three below. These five points have residuals (Table 22) greater than 3.5 (in the absolute value; some are greater than 3.5, others are less than -3.5). All other residuals (in absolute value) are about 2.6 or less. Thus, both visually and statistically (as assessed by the residuals), these points are outliers. The three points above the 90% bounds are studies in which little or no reduction was achieved. Perhaps there was something wrong with the treatment process. Regardless of the cause, they are atypical, and therefore not good candidates for this analysis. On the other hand, the two points below the 90% line are studies which achieved extremely good reduction. Perhaps there was a polishing step in these studies, or some other factor to account for their success. Similarly, they also are atypical, and therefore not good candidates for this analysis. For another study, all the summary data are equal to 1, except for the maximum input. This indicates that predominantly the same (and very low) concentrations were measured in the treatment system influent and effluent. With virtually no variability in the influent and effluent, this study does not tell us much, if anything. Accordingly, these six studies were removed from consideration, and the regression analysis repeated using the remaining studies (Figure 18).

Table 22: Regression numerical results for lead

Median Influent	75th Percentile Effluent	Predicted 75th Percentile Effluent	Residuals
38.82	12.52	10.01	2.51
20.26	5.4	6.03	-0.63
12.4	8.83	4.34	4.49
9.66	2.66	3.76	-1.10
6.03	3.73	2.98	0.75
7.5	1.5	3.29	-1.79
24	7.08	6.83	0.25
13	4.05	4.47	-0.42
7.06	3.4	3.20	0.20
22	5.72	6.40	-0.68
7.61	3.84	3.32	0.52
1	2.4	1.90	0.50
12	12	4.26	7.74
32.9	6.12	8.74	-2.62
22	1.8	6.40	-4.60
9	10.25	3.62	6.63
3.55	1	2.45	-1.45
0.86	0.5	1.87	-1.37
2.7	0.52	2.26	-1.74
13.95	1.17	4.68	-3.51
5.25	1.4	2.81	-1.41
6.5	1.72	3.08	-1.36
1	1	1.90	-0.90

- Large positive residuals are shaded in red.
- Large negative residuals are shaded in blue.
- One study with questionable results is shaded in pink.

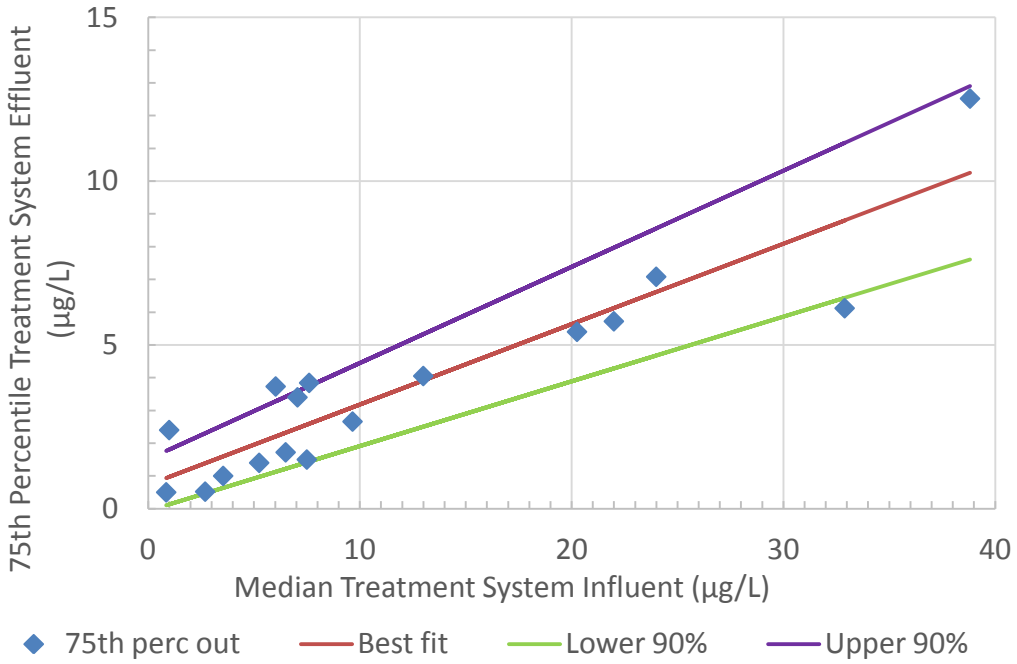


Figure 18: Final lead treatability egression. Adjusted R Square 0.83, slope p-value $2*10^{-7}$, intercept p-value 0.13

With the outliers removed, the Adjusted R Square of 0.83 indicates a good fit, and the slope p-value is highly significant. The difference in the best fit line (compared to the initial regression, with the outliers) is barely noticeable. However, the upper and lower 90% lines are much closer to the best fit line, corresponding to the improved fit.

The upper 75th to 90th percentile range of facility average concentrations for lead was 10 to 17 µg/L. Putting these values into the equation for the upper 90% treatment facility regression line indicated a range of 4.5 to 6.4 µg/L. The average of these values provides the technically achievable lead benchmark of 5 µg/L.

10.2.3 Zinc

In the treatment system data, there was also one study with very low values, and many zero values. Since concentrations should be expressed as non-detects, never as zeroes, this study was eliminated. In addition, there was one obvious, severe outlier, in which the treatment provided very little reduction. This study was eliminated. Although there was a lot of variability in the zinc study data, there was no clear "cutoff" in the residuals that would be indicative of outliers. Therefore, all remaining data were used (Figure 19).

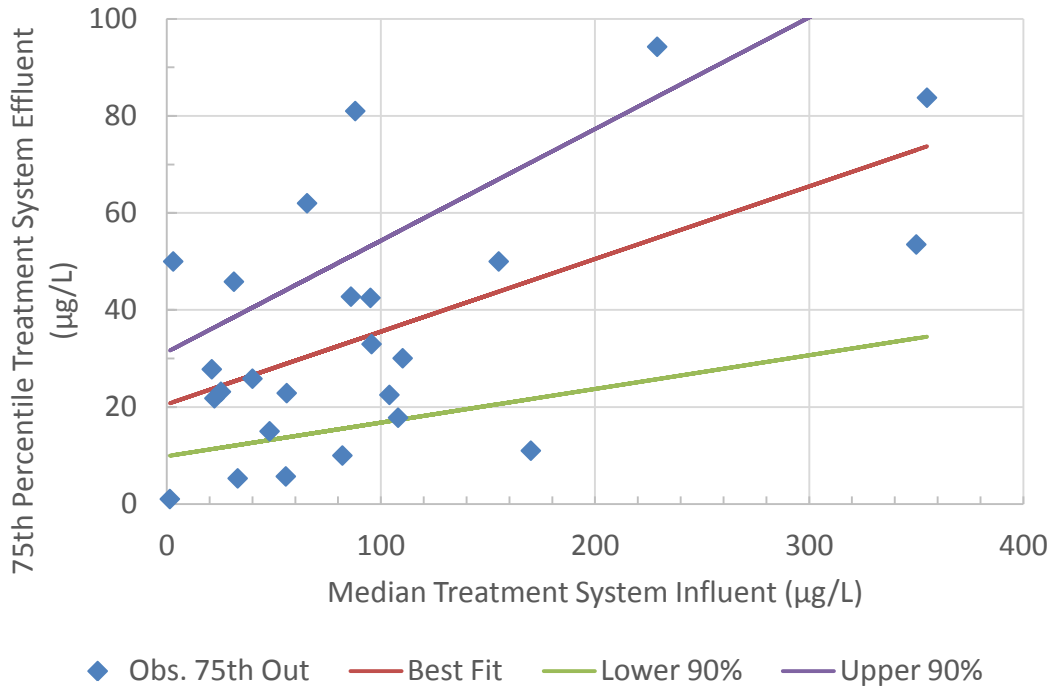


Figure 19: Zinc treatability regression. Adjusted R Square 0.31, slope p-value 0.0004, intercept p-value 0.0003

For zinc, the 75th to 90th percentile industrial stormwater discharge average was 188 to 352 µg/L. This corresponds to achievable discharge concentrations that range from about 74 to 112 µg/L for a technologically achievable benchmark of 90 µg/L (rounded to one significant digit).

10.2.4 Results

Table 23: The technologically achievable benchmarks estimated

Metal	Discharge Range (mg/L)	Treatability Range (mg/L)	Technologically Achievable Benchmark (mg/L)
Copper	0.019-0.038	0.016-0.030	0.020
Lead	0.010-0.017	0.0045-0.0064	0.005
Zinc	0.188-0.353	0.074-0.112	0.090