Economic Analysis for the Revision of Certain Federal Water Quality Criteria Applicable to Washington

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Contents

Exhibits

Acronym List

AML	Average monthly effluent limit
BMP	Best management practices
CWA	Clean Water Act
DMR	Discharge monitoring report
Ecology	Washington Department of Ecology
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
FCR	Fish consumption rate
I&I	Inflow and infiltration
MDL	Maximum daily effluent limit
MEC	Maximum effluent concentration
MEP	Maximum extent practicable
MERA	Mercury Education and Reduction Act
MS4	Municipal separate storm sewer systems
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
P2	Pollution prevention
PARIS	Permitting and Reporting Information System
POTW	Publicly owned treatment works
QL	Quantitation level
SMS	Sediment management standards
SWMP	Stormwater management program
SWPPP	Stormwater pollution prevention plan
TMDL	Total maximum daily load
WAC	Washington Administrative Code
WLA	Waste load allocation
WQBELs	Water quality based effluent limitations
WQS	Water quality standards

WWTF	Wastewater treatment facility

Executive Summary

The United States Environmental Protection Agency (EPA) is proposing to update the current federal human health criteria applicable to waters under jurisdiction of the State of Washington, to protect Washington residents from exposure to toxic pollutants. This report provides estimates of the potential incremental compliance actions and costs that may be associated with the proposed regulation.

Background and Potential Revised Criteria

EPA promulgated existing criteria for the protection of human health for waters in the State of Washington in 1992 as part of the National Toxics Rule (NTR) (40 Code of Federal Regulations 131.36). The NTR was necessary to bring all states into compliance with the requirements of Clean Water Act (CWA) section 303(c)(2)(B).

EPA derived the criteria in the NTR using a fish consumption rate (FCR) of 6.5 grams per day (g/day) based on national surveys. The best available data now demonstrate that fish consumers in Washington, including tribes with treaty-protected rights, consume much more fish than 6.5 g/day. There are also new data and scientific information available to update the toxicity and exposure parameters used to calculate human health criteria. Therefore, EPA proposes to revise the federal human health criteria applicable to waters under jurisdiction of the state of Washington to take into account the best available science, including local and regional information, as well as applicable EPA policies, guidance, and legal requirements, to protect human health.

Although the proposed rule does not establish any requirements directly applicable to regulated entities or other sources of pollution, state implementation may result in new or revised National Pollutant Discharge Elimination System (NPDES) permit conditions for point source dischargers and additional controls on nonpoint sources of pollutant loadings. This analysis provides information on the potential for incremental costs to be associated with such incremental requirements necessary to assure attainment of state water quality designated uses protected by the criteria in the proposed rule.

Point Source Compliance Costs

EPA identified approximately 406 point source facilities that could ultimately be affected by the rule. Of these potentially affected facilities, 73 are classified as major dischargers, and 333 are minor dischargers. Minor facilities are unlikely to incur costs as a result of implementation of the rule. Minor facilities are typically those that discharge less than one million gallons per day (mgd) and do not discharge toxics in toxic amounts. Although lower human health criteria could potentially change this characterization (effluent monitoring could indicate concentrations at levels of concern), EPA did not have effluent data on toxic pollutants to evaluate any minor dischargers for this preliminary analysis. Additionally, EPA also did not have data to evaluate general permits (e.g., stormwater discharges) for which permit conditions typically focus on best management practices rather than pollutant-specific limits derived from numeric water quality criteria.

Of the 73 potentially affected major dischargers, EPA evaluated a sample of 17 major facilities. EPA evaluated the 2 major municipal facilities with design flows greater than 100 mgd, and the largest industrial facility, in attempt to capture potential for the largest costs. For the remaining major facilities, EPA evaluated a random sample of facilities to represent discharger type and category. For all sample facilities, EPA evaluated existing baseline permit conditions, reasonable potential to exceed human health criteria based on the proposed rule, and potential to exceed projected effluent limitations based on the last three years of effluent monitoring data (if available).

Analysis of the available data for the sample of facilities indicates that there are likely to be exceedances of projected effluent limits for arsenic and mercury. In instances of baseline effluent limitations not being reflective of baseline criteria, EPA estimated baseline effluent limitations, compliance actions, and costs. In instances of exceedances of projected effluent limitations under the proposed rule, EPA determined the likely compliance scenarios and costs. Only compliance actions and costs that would be needed above the baseline level of controls are attributable to the proposed rule.

EPA assumed that dischargers will pursue the least cost means of compliance with water quality based effluent limits. Incremental compliance actions attributable to the proposed rule may include pollution prevention, end-of-pipe treatment, and alternative compliance mechanisms (e.g., variances). EPA annualized capital costs, including study (e.g., variance) and program (e.g., pollution prevention) costs, over 20 years using a 7% discount rate to obtain total annual costs per facility.[1] For the random sample, EPA extrapolated the annualized costs based on the sampling weight for each sample facility. To obtain an estimate of total costs to point sources, EPA added the results for the certainty sample to the extrapolated random sample costs.

For the 73 major dischargers in the state, EPA estimates that the total annual cost may be approximately $13 million. All of these costs are attributable to industrial dischargers, primarily for treatment of arsenic. Overall, compliance with revised human health criteria for arsenic accounts for 99% of the costs, while compliance with revised human health criteria for mercury accounts for the remaining 1%.

Nonpoint Source Controls

Revised human health criteria could also have implications for nonpoint sources. However, it is difficult to model and evaluate the potential costs impacts of this rule to those sources because they are intermittent, variable, and occur under hydrologic or climatic conditions

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[1] EPA updated unit cost estimates that it developed previously using a 7% discount rate (see Section 4.1.4) and as such used the same discount rate for this analysis. Note that using a lower discount rate (e.g., 3%) would yield lower compliance costs.

associated with precipitation events. Also, data on instream and discharge levels of the pollutants of concern after dischargers have implemented controls to meet current water quality standards, total maximum daily loads for impaired waters, or other water quality improvement plans, are not available. Therefore, determining which sources would need an incremental level of control attributable to the revised human health criteria after complying with existing regulations and policies may not be possible.

EPA identified potential incremental exceedances of the revised human health criteria based on available data in the State of Washington Department of Ecology (Ecology) Environmental Information Management System (EIM). According to the state's Water Quality Program Policy (Ecology, 2012c), Ecology generally uses the last ten years of data to determine impairment status of surface waters. EPA used available surface water monitoring data on pollutants of concern from EIM for the years 2005 to 2014. For each monitoring station and parameter, EPA compared the pollutant concentration to both the existing baseline human health criteria and the revised human health criteria. Station results that would indicate impairment under EPA's proposed criteria but not under the existing baseline criteria may represent potential incremental impairments.[2]

Using the baseline criteria, monitoring data indicate potential impairment on the basis of human health criteria exceedances in the water column at 205 stations. Under the revised criteria, there are 254 exceedances, for a total of 49 potential incremental impairments (or a 24% increase compared to the baseline).

2 Note that these results may not reflect the actual listed impairment status of the waterbody. EPA compared identified impairments to Ecology's current draft impairment listings; however, data limitations (e.g. the ability to match monitoring stations to existing impairment status at the waterbody level across data sets) largely preclude matching of monitoring stations to specific waterbody impairments.

1. Introduction

The United States Environmental Protection Agency (EPA) is proposing to update the current federal human health criteria applicable to waters under jurisdiction of the state of Washington, to protect Washington residents from exposure to toxic pollutants. This report provides estimates of the potential incremental compliance actions and costs that may be associated with the proposed regulation.

1.1 Background

The Federal Water Pollution Control Act (as amended through P.L. 107–303, November 27, 2002), also known as the Clean Water Act (CWA), sets the basic structure for regulating pollutant discharges into the waters of the United States. In the CWA, Congress established the national objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and to achieve "wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water" (CWA sections 101(a) and 101(a)(2)).

The CWA establishes the basis for the current water quality standards (WQS) regulation and program. CWA section 303 addresses the development of state and authorized tribal WQS. WQS reflect the CWA national objectives for each water body. The core components of these standards are designated uses, water quality criteria, and antidegradation requirements. Designated uses establish the environmental objectives for a water body, while water quality criteria define the minimum conditions necessary to achieve those environmental objectives. The antidegradation program complements designated uses and criteria by providing a framework for maintaining and protecting water quality.

After states, authorized tribes, territories, and the District of Columbia (hereafter, states and authorized tribes) designate the uses of waters under their jurisdiction, they must establish water quality criteria that protect those designated uses. EPA's regulation at §131.11(a)(1) provides that that such criteria "must be based on sound scientific rationale, and must contain sufficient parameters or constituents to protect the designated use." States and authorized tribes must also adopt antidegradation policies to protect and maintain high quality waters and existing uses of all waters, and identify specific methods to implement those policies (§131.12).

The CWA also requires states and authorized tribes to hold public hearings once every three years for the purpose of reviewing applicable WQS and, as appropriate, modifying and adopting standards. The results of this triennial review must be submitted to EPA, and EPA must approve or disapprove any new or revised standards. CWA Section 303(c)(4)(B) authorizes the Administrator to determine, even in the absence of a state submission, that a new or revised standard is needed to meet CWA requirements.

EPA promulgated existing criteria for the protection of human health for waters in the State of Washington in 1992 as part of the National Toxics Rule (NTR) (40 Code of Federal Regulations 131.36). The NTR was necessary to bring all states into compliance with the requirements of CWA section 303(c)(2)(B).

EPA derived the criteria in the NTR using a fish consumption rate (FCR) of 6.5 grams per day (g/day) based on national surveys. The best available data now demonstrate that fish consumers in Washington, including tribes with treaty-protected rights, consume much more fish than 6.5 g/day. There are also new data and scientific information available to update the toxicity and exposure parameters used to calculate human health criteria. Therefore, EPA proposes to revise the federal human health criteria applicable to waters under jurisdiction of the state of Washington to take into account the best available science, including local and regional information, as well as applicable EPA policies, guidance, and legal requirements, to protect human health.

1.2 Purpose and Scope of the Analysis

The purpose of this analysis is to identify, using available water quality and discharge data and information, the incremental compliance actions and costs that publicly owned wastewater treatment works (POTWs) and industrial point source dischargers may incur as a result of EPA's proposed criteria. EPA did not consider potential costs associated with new or expanding facilities. Although the proposed rule does not establish any requirements directly applicable to regulated entities or other sources of pollution, state implementation may result in new or revised National Pollutant Discharge Elimination System (NPDES) permit conditions for point source dischargers to incorporate revised water quality based effluent limits (WQBELs). Due to the large number of pollutants of concern, the estimates of statewide compliance costs reflect the extrapolation of results for a sample of major dischargers.

The revised standards may also result in incremental determinations that waters exceed WQS. As such, Ecology may need to develop additional total maximum daily loads (TMDLs) for impaired waters. There may also be incremental controls and costs associated with load allocations for nonpoint sources under such TMDLs to attain standards. However, the data and information needed to evaluate potential control needs are more limited. For this preliminary analysis, EPA identified the potential for incremental impairment, and thus incremental controls and costs for nonpoint sources, but did not develop statewide cost estimates.

1.3 Organization of Report

This remainder of this report is organized as follows:

Section 2: Baseline for the Analysis – describes the current applicable toxic criteria and Ecology procedures for implementing the criteria in NPDES permits, sources of toxic pollutants to surface waters, water quality impairments from toxic pollutants, and ongoing efforts to reduce and eliminate these impairments.

Section 3: Potential Revised Criteria – outlines the changes to existing water quality standards.

Section 4: Method for Estimating Potential Costs: Point Sources – describes the method for estimating compliance costs associated with baseline and revised criteria for point sources in terms of revisions to NPDES permits.

Section 5: Method for Identifying Potential Costs: Nonpoint Sources – describes the method for identifying potential for incremental impairment and compliance costs associated with baseline and revised criteria for nonpoint sources.

Section 6: Potential Compliance Costs – provides estimates of potential costs to comply with the revised WQS, and discusses the uncertainties associated with the estimates.

Section 7: References – provides the references used in the analysis.

Appendices provide data and information on individual sample facilities, and analyses of potential impacts under the proposed rule.

2. Baseline for the Analysis

This section describes the applicable baseline for evaluating the incremental costs associated with the revised WQS, including current water quality criteria and associated implementation procedures, potential sources of the pollutants of concern, the current level of impairment, and listing procedures.

2.1 Water Quality Criteria and Implementation Procedures

Exhibit 2-1 shows the applicable baseline criteria for toxic pollutants for which there are human health criteria. Ecology designates all surface waters for the protection of both aquatic life and human health.[3] EPA did not consider further those pollutants for which the aquatic life criteria are more stringent than the proposed revised human health criteria because the more stringent criteria coupled with the implementing procedures (e.g., allowable dilution factors) would always result in more stringent effluent limitations. Therefore the proposed rule would not lead to additional compliance costs for these pollutants.

Exhibit 2-1. Baseline Freshwater and Marine Water Quality Criteria for Toxic Pollutants in Washington[1]

Parameter	Freshwater Aquatic Life (µg/L)		Marine Aquatic Life (µg/L)		Human Health (µg/L)	
	Acute	Chronic	Acute	Chronic	Water and Fish	Fish Only
1,1,2,2-Tetrachloroethane					0.17	11
1,1,2-Trichloroethane					0.6	42
1,1-Dichloroethylene					0.057	3.2
1,2,4-Trichlorobenzene						
1,2-Dichlorobenzene					2700	17000
1,2-Dichloroethane					0.38	99
1,2-Dichloropropane						
1,2-Diphenylhydrazine					0.04	0.54
1,2-Trans-Dichloroethylene						
1,3-Dichlorobenzene					400	2600
1,3-Dichloropropene					10	1700
1,4-Dichlorobenzene					400	2600
2,3,7,8-TCDD (Dioxin)					0.000000013	0.000000014

3 Section 173-201A-600 specifies that all surface waters of the state that do not have specific listings in Table 602 are “to be protected for the designated uses of: Salmonid spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values.”

Exhibit 2-1. Baseline Freshwater and Marine Water Quality Criteria for Toxic Pollutants in Washington[1]

Parameter	Freshwater Aquatic Life (µg/L)		Marine Aquatic Life (µg/L)		Human Health (µg/L)	
	Acute	Chronic	Acute	Chronic	Water and Fish	Fish Only
2,4,6-Trichlorophenol					2.1	6.5
2,4-Dichlorophenol					93	790
2,4-Dimethylphenol						
2,4-Dinitrophenol					70	14000
2,4-Dinitrotoluene					0.11	9.1
2-Chloronaphthalene						
2-Chlorophenol						
2-Methyl-4,6-dinitrophenol					13	765
3,3'-Dichlorobenzidine					0.04	0.077
4,4'-DDD					0.00083	0.00084
4,4'-DDE					0.00059	0.00059
4,4'-DDT					0.00059	0.00059
Acenaphthene						
Acrolein					320	780
Acrylonitrile					0.059	0.66
Aldrin					0.00013	0.00014
alpha-BHC					0.0039	0.013
alpha-endosulfan					0.93	2
Anthracene					9600	110000
Antimony					14	4300
Arsenic	360	190	69	36	0.018	0.14
Asbestos[2]					7000000	
Benzene					1.2	71
Benzidine					0.00012	0.00054
Benzo(a) anthracene					0.0028	0.031
Benzo(a) pyrene					0.0028	0.031
Benzo(b) fluoranthene					0.0028	0.031
Benzo(k) fluoranthene					0.0028	0.031
beta-BHC					0.014	0.046
beta-endosulfan					0.93	2
Bis(2-chloroethyl) ether					0.031	1.4
Bis(2-chloroisopropyl) ether					1400	170000
Bis(2-ethylhexyl) phthalate					1.8	5.9

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Parameter	Freshwater Aquatic Life (µg/L)		Marine Aquatic Life (µg/L)		Human Health (µg/L)	
	Acute	Chronic	Acute	Chronic	Water and Fish	Fish Only
Bromoform					4.3	360
Butylbenzyl phthalate						
Carbon tetrachloride					0.25	4.4
Chlordane	2.4	0.0043	0.09	0.004	0.00057	0.00059
Chlorobenzene					680	21000
Chlorodibromomethane					0.41	34
Chloroform					5.7	470
Chrysene					0.0028	0.031
Copper			4.8	3.1		
Cyanide	22.0	5.2	1.0		700	220000
Dibenzo(a,h) anthracene					0.0028	0.031
Dichlorobromomethane					0.27	22
Dieldrin	2.5	0.0019	0.71	0.0019	0.00014	0.00014
Diethyl phthalate					23000	120000
Dimethyl phthalate					313000	2900000
Di-n-butyl phthalate					2700	12000
Endosulfan sulfate	0.22	0.056	0.034	0.0087	0.93	2
Endrin	0.18	0.0023	0.037	0.023	0.76	0.81
Endrin aldehyde					0.76	0.81
Ethylbenzene					3100	29000
Fluoranthene					300	370
Fluorene					1300	14000
Hexachlorocyclohexane (gamma-BHC; lindane)	2.0	0.08	0.16		0.019	0.063
Heptachlor	0.52	0.0038	0.053	0.0036	0.00021	0.00021
Heptachlor Epoxide					0.0001	0.00011
Hexachlorobenzene					0.00075	0.00077
Hexachlorobutadiene					0.44	50
Hexachlorocyclopentadiene					240	17000
Hexachloroethane					1.9	8.9
Indeno(1,2,3-cd) pyrene					0.0028	0.031
Isophorone					8.4	600
Methyl bromide					48	4000

Exhibit 2-1. Baseline Freshwater and Marine Water Quality Criteria for Toxic Pollutants in Washington[1]

Parameter	Freshwater Aquatic Life (µg/L)		Marine Aquatic Life (µg/L)		Human Health (µg/L)	
	Acute	Chronic	Acute	Chronic	Water and Fish	Fish Only
Methylene chloride					4.7	1600
Nickel			74.0	8.2	610	4600
Nitrobenzene					17	1900
N-Nitrosodimethylamine					0.00069	8.1
N-Nitrosodi-n-propylamine						
N-Nitrosodiphenylamine					5	16
Pentachlorophenol (PCP)			13.0	7.9	0.28	8.2
Phenol					21000	4600000
Polychlorinated biphenyls (PCBs)	2.0	0.0014	10.0	0.03	0.00017	0.00017
Pyrene					960	11000
Selenium	20.0	5.0	290	71.0		
Tetrachloroethylene					0.8	8.9
Thallium					1.7	6.3
Toluene					6800	200000
Toxaphene	0.73	0.0002	0.21	0.0002	0.00073	0.00075
Trichloroethylene					2.7	81
Vinyl chloride					2	525
Zinc			90.0	81.0		
Mercury	2.1	0.012	1.8	0.025	0.14	0.15

Source: Ecology (2014a) and WAC 173-201A-240.
1. Metals criteria are in dissolved form; blanks indicate no baseline criteria.
2. Asbestos criteria are in fibers/L.

Section 173-201A-260 of the Washington Administrative Code (WAC) specifies the procedures for applying water quality criteria. As part of these procedures, the state addresses how to handle situations when natural and irreversible human conditions cause a receiving water to not meet applicable criteria. In those instances, Section 173-201A-260(1)(a) stipulates that the natural conditions constitute the water quality criteria.

2.2 Sources of Toxic Pollutants to Surface Waters

Toxic pollutants can be introduced to surface water through natural and human activities, including municipal and industrial effluents, stormwater discharges, agricultural runoff, forestry (chemical application), atmospheric deposition, and contaminated sediments.

2.2.1 Municipal and Industrial Dischargers

Ecology's Water Quality Permitting and Reporting Information System (PARIS) indicates that there are 406 major and minor NPDES permitted dischargers in Washington. Exhibit 2-2 shows the number of facilities by type (major/minor) and category (based on SIC codes provided in PARIS and facility-specific fact sheets).

Exhibit 2-2. Number of Dischargers in Washington by Category

Category	Minor	Major	All
Agriculture, Fishing, and Forestry	14	0	14
Mining	4	1	5
Construction	4	0	4
Food and Kindred Products	30	1	31
Lumber and Wood Products, Except Furniture	11	0	11
Paper and Allied Products	1	12	13
Chemicals and Allied Products	10	1	11
Petroleum Refining and Related Industries	4	5	9
Stone, Clay, Glass, and Concrete Products	5	0	5
Primary Metal Industries	6	4	10
Fabricated Metal Products, except Machinery and Transportation Equipment	1	0	1
Transportation Equipment	19	0	19
Transportation & Public Utilities (except POTWs)	19	1	20
POTW	184	48	232
Wholesale Trade	10	0	10
Retail Trade	2	0	2
Services	7	0	7
Public Administration	2	0	2
Total	**333**	**73**	**406**

Source: based on data from the Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) database, and supplementary data from facility fact sheets. Categorizations based on 2-digit SIC codes.

Ecology issues general NPDES permits for 18 different discharger categories, including industrial (e.g. lumber and wood products, petroleum refining, metal manufacturing, and construction) and municipal, with over half of permitted dischargers being municipal POTWs.

2.2.2 Urban Stormwater

Stormwater discharges are generated by precipitation and runoff from land, pavements, building rooftops, and other surfaces. Stormwater from municipal and industrial areas may contribute pollutants (including toxic pollutants) to surface waters (for example, see Ecology, 2012a). Ecology regulates stormwater discharges from municipal separate storm sewer systems (MS4s) through general permits. The MS4 permits require the discharger to develop and implement a stormwater management program (SWMP), with the goal of controlling pollutant discharges to the maximum extent practicable (MEP). According to Ecology, an SWMP involves planning, public education and involvement, illicit discharge detection programs, and passing appropriate ordinances to reduce stormwater pollution (Ecology, 2014b).[4]

Ecology has issued a Phase I permit (Ecology, 2015a), which covers 6 jurisdictions (Seattle and Tacoma, and unincorporated King, Pierce, Snohomish, and Clark counties), each serving more than 100,000 people. The Phase II general permits cover those systems serving municipalities with populations less than 100,000 located within Census Bureau-defined urbanized areas. There are two Phase II stormwater permits; one for the eastern part (Ecology, 2012b) of the state and one for the western part (Ecology, 2014c).

Industrial dischargers, including those engaged in manufacturing, transportation, mining, and steam electric power industries, scrap yards, landfills, certain sewage treatment plants, and hazardous waste management facilities may have stormwater requirements in their NPDES permits. Additionally, Ecology issues an Industrial Stormwater general permit (Ecology, 2014d), which requires industrial stormwater dischargers to develop a Stormwater Pollution Prevention Plan (SWPPP) that includes best management practices (BMPs) to prevent, control, and treat stormwater pollution, a monitoring plan and discussion of the site controls that the discharger will implement to prevent stormwater pollution.

2.2.3 Agriculture and Forestry

Pesticides applied to agricultural or forestry lands can reach surface waters through irrigation return flow, stormwater runoff, and erosion of soils.

The Department of Ecology works with farmers in Washington to incentivize and implement BMPs on agricultural land to reduce runoff of pollutants from agricultural lands.

Washington regulates forestry activities on State and private lands through the Washington Forest Practices Act (chapter 76.09 RCW) and the associated forest practices rules (Title 222 WAC). The Washington Forest Practices Board (the authority empowered to enforce forest practices rules) designed and adopted the forest practice rules, in part, to meet the requirements of the CWA and State water quality standards. The rules cover a variety of forestry activities, including timber harvesting, thinning, road construction, fertilization, and chemical application.

2.2.4 Atmospheric Deposition

Atmospheric deposition may be a potential nonpoint source to surface waters through either direct or indirect deposition. Direct deposition occurs when pollutants are deposited directly

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[4] SWMPs do not include numeric WQBELs.

on surface waters from the atmosphere. Indirect deposition reflects the process by which metals and other pollutants such as pesticides deposited on the land surface are washed off during storm events and enter surface water through stormwater runoff. Atmospheric deposition is not directly addressed through any existing regulation, but may be indirectly addressed through TMDLs.

2.2.5 Contaminated Sediments

When pollutants enter a waterbody through runoff, precipitation, or other means, they can accumulate in sediments and contribute to poor water quality for many years (U.S. EPA, 2012). Many waterbody sediments are contaminated by legacy pollutants including DDT, PCBs, and other pesticides. To address sediment contamination, Washington implemented the Washington State Sediment Management Standards (SMS) Chapter 173-204 WAC to reduce and ultimately eliminate sediment contamination in Washington waterbodies.[5] The SMS set numeric and narrative criteria for sediments, apply the standards to reduce pollutant discharges, and provide a decision process for the cleanup of contaminated sites.

2.3 Water Quality

Ecology classifies all surface waters into one of five categories, based on available monitoring data, as follows:

- Category 1 waters are those for which sufficient monitoring data are available to determine that the water is below all applicable criteria (i.e., it is not impaired)
- Category 2 waters are "waters of concern," which means that there is one observation exceeding the criteria or two or more observations exceeding the criteria but not within a 3-year period
- Category 3 waters for which there are insufficient data to determine whether it is impaired
- Category 4 waters are impaired but Ecology is not pursuing TMDLs for them because a) there is an EPA-approved TMDL, b) there is a pollution control program in place, or c) it is impaired by a cause other than a pollutant
- Category 5 waters are impaired and a TMDL or pollution control plan is required; to be placed into Category 5 on the basis of water concentrations, there must be two or more exceedances of criteria within a 3-year period.

Waters can also be placed into Category 5 on the basis of fish tissue concentrations, if the mean of the three highest available resident fish tissue observations exceed the fish tissue criteria, which are back-calculated from surface water concentrations using bioconcentration factors from the NTR.

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[5] See: http://www.ecy.wa.gov/programs/tcp/smu/sed_standards.htm. EPA has not taken a CWA action on the 2013 revisions the SMS.

Ecology recently conducted a public review of the latest updated Water Quality Assessment and 303(d) List for Washington State (the public comment period for the review ended on May 15, 2015). This assessment updates fresh water listings based on data collected as of the end of December 2010.[6] The integrated report identifies impaired waters and reports on the status of water quality statewide. Exhibit 2-3 summarizes the proposed Category 4 and 5 listings for each of the pollutants of interest. Exhibit 2-4 summarizes existing TMDLs targeting or including toxic pollutants in waters in Washington.[7]

Exhibit 2-3. 2015 Proposed Category 4 and 5 Listings for Toxic Pollutants

Parameter	Waterbodies	Lake/Marine Square Kilometers	River Kilometers
2,3,7,8-TCDD (dioxin)	65	50	52
4,4'-DDD	31	3	97
4,4'-DDE	93	14	182
4,4'-DDT	64	4	184
Aldrin	4	2	7
alpha-BHC	10	6	7
Arsenic	12	3	18
Benzo(a) anthracene	25	11	0
Benzo(a) pyrene	23	9	0
Benzo(b) fluoranthene	28	11	0
Benzo(k) fluoranthene	23	10	0
beta-BHC	3	2	0
Bis(2-ethylhexyl) phthalate	3	1	0
Chlordane	13	5	16
Chrysene	34	14	0
Copper	19	1	32
Dibenzo(a,h) anthracene	11	3	0
Dieldrin	54	25	78
Heptachlor epoxide	2	0	7
Hexachlorobenzene	10	11	23
Indeno(1,2,3-cd) pyrene	16	5	0
Toxaphene	19	11	20
Zinc	12	0	47
Mercury	29	8	37

Source: Based on data from the Proposed Draft Assessment Database (available at: https://fortress.wa.gov/ecy/wats/SearchList.aspx).

6 See: http://www.ecy.wa.gov/programs/wq/303d/freshwtrassessmnt/index.html.

7 Additionally, there is a TMDL for sediment contamination in Bellingham Bay (see Ecology, 2001).

Exhibit 2-4. Summary of TMDLs for Toxic Pollutants in Waters in Washington

Waterbody	Parameter(s)	Status and Notes	Source
Stillaguamish Basin	Dissolved oxygen, fecal coliform, mercury, pH, temperature	Mercury levels exceeding aquatic life criteria are rare (occurring during high-flow events) and attributable to natural background sources without contribution from anthropogenic sources; load allocation for total suspended solides expected to reduce occurrences of mercury concentrations higher than aquatic life criteria.	Ecology (2005)
Snohomish River Area	Dioxin	Exceedances of human health criteria attributed to a point source discharge.	Ecology (1992a)
Commence-ment Bay	Dioxin	Exceedances of human health criteria attributed to a point source discharge.	Ecology (1992b)
Deschutes River Watershed	Dissolved oxygen, fecal coliform, PCB, pH, phosphorus, temperature	TMDL is under development.	Ecology (2014e)
Walla Walla River Watershed	Chlorinated pesticides, PCBs, fecal coliform, pH, dissolved oxygen, temperature	Exceedances of human health criteria for chlorinated pesticides and PCBs attributed to historical application of chlorinated pesticides to soils and crops in agricultural areas of the watershed.	Ecology (2006a)
Palouse River	Chlorinated pesticides and PCBs	Exceedances of human health criteria for chlorinated pesticides and PCBs; TMDL includes waste load allocations for WWTPs and nonpoint sources.	Ecology (2007a)
Yakima River Watershed	Toxics and Pesticides	Exceedances of human health and aquatic life criteria are attributed to historical applications.	Ecology (2012c; 2010)
Wanatchee River Area	DDT	Exceedances of human health criteria are attributed to historical applications.	Ecology (2007b)
Lake Chelan	DDT and PCBs	Exceedances of human health criteria are attributed to historical applications	Ecology (2006b)
Lower Okanogan River Basin	DDT and PCBs	Exceedances of human health and aquatic life criteria are attributed to historical applications.	Ecology (2004a)
Lower Similkameen River	Arsenic	Exceedances of human health criteria for arsenic attributed to historic mining practices and natural sources.	Ecology (2004b)
Spokane River	Dissolved metals	Exceedances of aquatic life criteria for dissolved metals attributed to point sources in Idaho (upstream) and Washington.	Ecology (1999)

Exhibit 2-4. Summary of TMDLs for Toxic Pollutants in Waters in Washington

Waterbody	Parameter(s)	Status and Notes	Source

Source: information from the Department of Ecology Water Quality Improvement Projects database (available at: http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html)
TMDL = total maximum daily load
WWTP = wastewater treatment plant

3. Potential Revised Criteria

EPA is proposing changes to several inputs in the equation for calculating human health criteria. The criteria are calculated as follows (EPA, 1980):

$$AWQC = (RfD \times RSC) \times \left[\frac{BW}{DI + (FI \times BAF)}\right]$$

$$AWQC = \left(\frac{10^{-6}}{q1*}\right) \times \left[\frac{BW}{DI + (FI \times BAF)}\right]$$

where,

AWQC = ambient water quality criterion (mg/L)
BW = human body weight (kg)
RfD = reference dose based on noncancer human health effects (mg/kg BW-day)
RSC = relative source contribution (%)
DI = drinking water intake (L/day)
FI = human fish consumption (kg fish/day)
BAF = bioaccumulation factor (L/kg fish)
q1* = cancer potency factor in (kg BW-day/mg).

The criteria from the NTR are the applicable existing AWQC for each pollutant of concern. EPA is proposing updated values for BW, RfD, RSC, DI, FI, BAF and q1*. These updates come from EPA (2014 (as available); 2002), with a FI specifically proposed for Washington.

In 2001, EPA published a revised methylmercury criterion based on the concentration of methylmercury in fish tissue, calculated using the following equation (EPA, 2001a):

$$TRC = \frac{BW \times (RfD - RSC)}{\sum_{i=2}^{4} FI_i}$$

where,

TRC = tissue residual concentration in mg methylmercury/kg fish
FI_i = human fish consumption of trophic level i (kg fish/day)
RSC = relative source contribution in mg methylmercury/kg body weight-day.

Exhibit 3-1 summarizes the key assumptions that EPA made to calculate human health criteria.

Exhibit 3-1. Summary of Key Assumptions for Calculating Human Health Criteria

Variable	Value
Fish consumption rate (FCR; g/day)	175
Body weight (BW; kg)	80
Drinking water intake (DWI; L/day)	2.4
Excess cancer risk level (RL)	10^{-6}
Relative source contribution (RSC)	0.2 to 0.8
Toxicity factors basis	U.S. EPA (2014)
Mercury criteria basis	U.S. EPA (2001a)

Exhibit 3-2 summarizes the human health criteria for the pollutants of concern derived using the assumptions in Exhibit 3-1. The exhibit also shows Ecology's quantification limits (QLs) which represent the minimum level to which dischargers need to measure each pollutant. Compared with the proposed criteria, the state's freshwater and marine aquatic life criteria are more stringent for selenium, while the marine aquatic life criteria are more stringent for copper, nickel, and zinc (see Exhibit 2-1). Because the aquatic life criteria are more stringent, EPA did not analyze discharges of these pollutants in relevant areas.

Exhibit 3-2. Proposed Human Health Criteria (µg/L)

Parameter	Freshwater Criteria	Marine Criteria	Quantification Limit
1,1,1-Trichloroethane	8000	20000	2.0
1,1,2,2-Tetrachloroethane	0.1	0.3	2
1,1,2-Trichloroethane	0.35	0.90	2
1,1-Dichloroethylene	300	2000	2
1,2,4-Trichlorobenzene	0.036	0.037	0.6
1,2-Dichlorobenzene	300	300	7.6
1,2-Dichloroethane	8.9	73	2
1,2-Dichloropropane	0.72	3.3	2
1,2-Diphenylhydrazine	0.01	0.02	20
1,2-Trans-Dichloroethylene	100	400	2
1,3-Dichlorobenzene	0.9	1	7.6
1,3-Dichloropropene	0.22	1.2	2
1,4-Dichlorobenzene	70	80	17.6
2,3,7,8-TCDD (Dioxin)	5.8E-10	5.9E-10	0.000005
2,4,6-Trichlorophenol	0.25	0.28	4
2,4-Dichlorophenol	4	6	1
2,4-Dimethylphenol	90	300	1
2,4-Dinitrophenol	10	40	2
2,4-Dinitrotoluene	0.039	0.18	0.4

Exhibit 3-2. Proposed Human Health Criteria (µg/L)

Parameter	Freshwater Criteria	Marine Criteria	Quantification Limit
2-Chloronaphthalene	100	100	0.6
2-Chlorophenol	20	80	2
2-Methyl-4,6-Dinitrophenol	1	3	NR
3,3'-Dichlorobenzidine	0.012	0.015	1
3-Methyl-4-Chlorophenol	200	200	NR
4,4'-DDD	7.9E-6	7.9E-6	0.05
4,4'-DDE	8.8E-7	8.8E-7	0.05
4,4'-DDT	1.2E-6	1.2E-6	0.05
Acenaphthene	10	10	0.4
Acrolein	3	50	10
Acrylonitrile	0.058	0.85	2
Aldrin	4.1E-8	4.1E-8	0.05
alpha-BHC	4.8E-5	4.8E-5	0.05
alpha-Endosulfan	3	3	0.05
Anthracene	40	40	0.6
Antimony	2.5	37	1
Arsenic[1]	0.0045	0.0059	0.5
Asbestos[2]	7000000	NC	NR
Benzene[3]	0.44	1.7	2
Benzidine	0.00013	0.0012	24
Benzo(a) Anthracene	0.00016	0.00016	0.6
Benzo(a) Pyrene	1.6E-5	1.6E-5	1
Benzo(b) Fluoranthene	0.00016	0.00016	1.6
Benzo(k) Fluoranthene	0.0016	0.0016	1.6
beta-BHC	0.0013	0.0014	0.05
beta-Endosulfan	4	4	0.05
Bis(2-Chloroethyl) Ether	0.027	0.24	1
Bis(2-Chloro-1-Methylethyl) Ether[8]	200	400	0.6
Bis(2-Ethylhexyl) Phthalate	0.045	0.046	0.5
Bromoform	4.6	12	2
Butylbenzyl Phthalate	0.013	0.013	NR
Carbon Tetrachloride	0.2	0.5	2
Chlordane	0.000022	0.000022	0.05
Chlorobenzene	50	80	2
Chlorodibromomethane	0.60	2.2	2
Chloroform	50	200	2

Exhibit 3-2. Proposed Human Health Criteria (µg/L)

Parameter	Freshwater Criteria	Marine Criteria	Quantification Limit
Chrysene	0.016	0.016	0.6
Copper[4,5]	1300	NC	2
Cyanide	4	50	10
Dibenzo(a,h) Anthracene	1.6E-5	1.6E-5	1.6
Dichlorobromomethane	0.73	2.8	2
Dieldrin	7.0E-8	7.0E-8	0.05
Diethyl Phthalate	80	80	7.6
Dimethyl Phthalate	200	200	6.4
Di-n-Butyl Phthalate	3	3	1
Endosulfan Sulfate	4	4	0.05
Endrin	0.002	0.002	0.05
Endrin Aldehyde	0.1	0.1	0.05
Ethylbenzene	12	13	2
Fluoranthene	2	2	0.6
Fluorene	5	5	0.6
Gamma-BHC; Lindane	0.43	0.43	NR
Heptachlor	3.4E-7	3.4E-7	0.05
Heptachlor Epoxide	2.4E-6	2.4E-6	0.05
Hexachlorobenzene	5.0E-6	5.0E-6	0.6
Hexachlorobutadiene	0.01	0.01	1
Hexachlorocyclopentadiene	0.4	0.4	1
Hexachloroethane	0.02	0.02	1
Indeno(1,2,3-cd) Pyrene	0.00016	0.00016	1
Isophorone	30	200	1
Methyl Bromide	100	1000	10
Methylene Chloride	10	100	10
Methylmercury[6]		0.033	
Nickel[5]	30	39	0.5
Nitrobenzene	10	60	1
N-Nitrosodimethylamine	0.00065	0.34	4
N-Nitrosodi-n-Propylamine	0.0044	0.058	1
N-Nitrosodiphenylamine	0.62	0.69	1
Pentachlorophenol (PCP)	0.002	0.002	1
Phenol	4000	30000	4
Polychlorinated Biphenyls (PCBs)[7]	7.3E-6	7.3E-6	0.5
Pyrene	3	3	0.6

Exhibit 3-2. Proposed Human Health Criteria (µg/L)

Parameter	Freshwater Criteria	Marine Criteria	Quantification Limit
Selenium[5]	25	95	1
Tetrachloroethylene	2.4	2.9	2
Thallium	0.048	0.054	0.36
Toluene	29	52	2
Toxaphene	6.6E-5	6.6E-5	0.5
Trichloroethylene	0.3	0.7	2
Vinyl Chloride	0.020	0.18	2
Zinc[5]	450	580	2.5

NC = no criteria proposed
NR = not reported
1. The criteria for arsenic refer to the inorganic form of arsenic only.
2. The criterion for asbestos is expressed in fibers/L, and is the Maximum Contaminant Level Goal (MCLG) developed under the Safe Drinking Water Act (56 FR 3526, January 30, 1991).
3. EPA's national 304(a) recommended criteria for benzene use a CSF range of 0.015 to 0.055 per mg/kg-day. EPA proposes to use the higher end of the CSF range (0.055 per mg/kg-day) to derive the proposed benzene criteria.
4. The criterion for copper is the MCLG developed under the Safe Drinking Water Act (40 CFR 141.80, June 7, 1991).
5. The existing aquatic life criteria are more stringent than the proposed freshwater and marine criteria for selenium, and the proposed marine criteria for copper, nickel, and zinc. As such, EPA did not analyze discharges of these pollutants.
6. The criterion for methylmercury is expressed as the fish tissue concentration of methylmercury (mg methylmercury/kg fish). See *Water Quality Criterion for the Protection of Human Health: Methylmercury* (EPA-823-R-01-001, January 3, 2001) for how this value is calculated using the criterion equation in EPA's 2000 Human Health Methodology rearranged to solve for a protective concentration in fish tissue rather than in water.
7. The criteria for PCBs apply to total PCBs (e.g., the sum of all congener or isomer or homolog or Aroclor analyses).
8. Bis(2-Chloro-1-Methylethyl) Ether was previously listed as Bis(2-Chloroisopropyl) Ether.

4. Method for Estimating Potential Costs: Point Sources

This section describes the method for estimating the potential costs to point sources associated with compliance with the revised human health criteria. Compliance costs for municipal and industrial point sources may result from changes to NPDES permit requirements and associated effluent limitations.

4.1 Major Dischargers

EPA estimated costs to major municipal and industrial dischargers under the proposed criteria by estimating costs to a representative sample of facilities, then extrapolating the results to the rest of the facilities (by category). This section describes sample selection, the reasonable potential analysis, identification of limits under the revised criteria and comparison to existing criteria, estimation of costs to meet revised criteria, and extrapolation to all major dischargers. Unless otherwise noted, EPA updated all cost estimates to 2014 year dollars using the consumer price index.

4.1.1 Sample Selection

Factors that may affect the potential magnitude of compliance costs include flow and type of facility. Larger flows are typically associated with the largest treatment costs, although per-unit costs may decrease due to economies of scale. Industrial category may also be indicative of the potential to incur costs. Treatment requirements differ for municipal and industrial discharges, and effluent quality may be similar across categories of facilities. As shown in Exhibit 2-2, there are 406 total individually permitted dischargers, including 73 major dischargers (48 municipal POTWs and 25 industrial dischargers) and 333 minor dischargers (184 municipal POTWs and 149 industrial).

To evaluate potential costs to major dischargers, EPA selected a representative sample of the major dischargers to evaluate potential costs in detail. First, EPA selected a certainty sample of the two largest municipal facilities[8] and the largest industrial facility; this certainty sample attempts to ensure that the highest potential for cost is captured in the analysis. From the remaining major dischargers, EPA selected a random sample of dischargers across categories. EPA then extrapolated the results of the sample evaluation to estimate costs across all major dischargers by category. Exhibit 4-1 provides a summary of major discharger categories and the distribution of the sample across those categories.

[8] The two largest facilities, the King County West Point POTW and the King County South POTW, represent 25% of all major discharger flow and 35% of major POTW flow.

Exhibit 4-1. Summary of Major Dischargers by Industrial Category

Category	Universe		Sample	
	Facilities	Design Flow (mgd)	Facilities	Design Flow (mgd)
Food and Kindred Products	1	5	1 (100%)	5 (100%)
Mining	1	0	1 (100%)	0 (NA)
Paper and Allied Products	12	336	2 (17%)	24 (7%)
Chemicals, Petroleum Refining, and Related Industries	6	27	3 (50%)	18 (67%)
Primary Metal Industries	4	27	2 (50%)	8 (28%)
POTW	48	1,019	7 (15%)	419 (41%)
Transportation & Public Utilities (except POTWs)	1	12	1 (100%)	12 (100%)
Total	**73**	**1,425**	**17 (23%)**	**486 (34%)**
mgd = million gallons per day POTW = publicly owned treatment works				

Exhibit 4-2 provides a summary of the sample for evaluation. Appendix A provides additional information on these facilities.

Exhibit 4-2. Summary of Major Discharger Sample

NPDES Number	Facility Name	Category	Design Flow (mgd)
Certainty Sample			
WA0029581	King County South WWTP	POTW	144.0
WA0029181	King County West Point WWTP	POTW	215.0
WA0022900	BP Cherry Point Refinery	Petroleum Refining and Related Industries	13.0
Random Sample			
WA0039624	Chambers Creek STP	POTW	28.7
WA0044962	Pasco WWTP	POTW	3.5
WA0037168	Puyallup STP	POTW	14.0
WA0023451	Redondo WWTP	POTW	5.6
WA0022772	Salmon Creek WWTP	POTW	8.1
WA0037338	Transalta Centralia Mining	Mining	5.0
WA0000884	Sonoco Products Company	Paper and Allied Products	0.3
WA0000809	Cosmo Specialty Fibers, Inc.	Paper and Allied Products	24.0
WA0001783	U.S. Oil & Refining Facility	Petroleum Refining and Related Industries	0.6
WA0000761	Tesoro Refining & Marketing Company LLC	Petroleum Refining and Related Industries	4.3

Exhibit 4-2. Summary of Major Discharger Sample

NPDES Number	Facility Name	Category	Design Flow (mgd)
WA0021067	Quincy Industrial	Food and Kindred Products	4.9
WA0040851	Steelscape, Inc.	Primary Metal Industries	0.2
WA0002950	Intalco Aluminum Corp Ferndale	Primary Metal Industries	7.4
WA0001546	Transalta Centralia Generation	Transportation & Public Utilities (except POTWs)	12.1

mgd = million gallons per day
POTW = publicly owned treatment works
WWTP = wastewater treatment plant
STP = sewage treatment plant

4.1.2 Reasonable Potential Analysis

For each facility in the sample, EPA conducted a reasonable potential analysis to determine whether there is reasonable potential for the effluent to cause a water quality violation for any parameter.[9] For consistency with state implementation procedures (Ecology, 2015c), EPA utilized Ecology's spreadsheet tool (PermitCalc) for permit writers for determining reasonable potential.[10]

For each facility and parameter, the reasonable potential analysis uses data on effluent concentrations, receiving water characteristics, ambient parameter concentrations, and dilution factors. EPA gathered these data from a variety of sources, including:

- Facility-specific permit fact sheets, available from PARIS
- Discharge Monitoring Report (DMR) data available from PARIS
- Ambient pollutant concentrations from the Environmental Information Management (EIM) database
- Other facility documentation such as inspection reports and permit applications, available from PARIS.

There were not sufficient and adequate data available for all sample facilities to perform reasonable potential analyses for all parameters for which human health criteria have been specified. EPA did not assess reasonable potential for parameters for which data were unavailable.[11] Appendix A provides facility-specific reasonable potential results (under both

9 Parameters for which the revised human health criteria are more stringent than aquatic life criteria.

10 Available at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html

11 Effluent data for two facilities (Chambers Creek STP and Steelscape) were not available for any of the pollutants for which human health criteria are proposed, so EPA did not carry the analysis further for these facilities.

the baseline and policy scenarios) and additional information on the specific data sources used for each facility.

4.1.3 Projecting Effluent Limitations

When EPA found reasonable potential, it calculated average monthly and maximum daily effluent limitations based on procedures contained in the PermitCalc tool. These procedures specify that the permit writer first derive a waste load allocation according to the following equation:

$$WLA = D \times WQC - C_b \times (D - 1)$$

where,

WLA = waste load allocation (in units of concentration)

D = dilution factor

WQC = water quality criterion concentration (applicable human health criterion)

C_b = ambient background concentration (geometric mean).

In instances where the receiving water is impaired due to natural or irreversible anthropogenic conditions (i.e., $C_b > WQC$), EPA set the WLA equal to the WQC.[12] This approach is consistent with EPA guidance (see EPA, 1991).

According to Chapter 7, Section 5.1 of the Washington Permit Writer's Manual (Ecology, 2015c), the projected average monthly effluent limitation (AML) to protect human health is computed by setting the AML equal to the applicable WLA:

AML = WLA (in units of concentration)

Chapter 7, Section 5.1 of the Washington Permit Writer's Manual further states that the maximum daily effluent limit (MDL) is calculated by multiplying the AML by a factor derived on the basis of the effluent variability and the anticipated number of monitoring and compliance samples collected per month (which is based on EPA, 1991; Table 5-3).

In order to estimate compliance costs attributable to the proposed rule, EPA then compared the projected AML and MDL for each pollutant to the existing NPDES permit limitations for that pollutant. If the projected AML and MDL are more stringent than existing NPDES permit limitations, EPA estimated the costs for the control mechanisms required to ensure compliance with the projected AML and MDL (see Section 4.1.4). However, the NPDES permits for the sampled facilities do not contain any WQBELs.

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12 It should be noted that the approach EPA used in instances when $C_b > WQC$ differs from the approach used by Ecology. According to WAC 173-201A-260 (Natural conditions and other water quality criteria and applications), when the receiving water cannot meet applicable water quality criteria due to the natural conditions, the natural conditions represent the water quality criteria.

Based on EPA's evaluation of the NPDES permit fact sheets for the sample facilities, it appears that the absence of WQBELs in the sample facility NPDES permits is due to a number of reasons. For example, in evaluating reasonable potential for the sample facilities, EPA identified instances where background pollutant concentrations exceeded applicable water quality criteria and no WQBELs were established based on Ecology's use of natural conditions as the water quality criteria. In other instances, it was not clear based on the data and information provided in the fact sheet. Particularly for arsenic, EPA noted discussions in several permit facts sheets that describe the lack of data to quantify the extent of the natural background concentrations of arsenic, and a lack of regulatory mechanism to deal with the issue.

The lack of existing WQBELs may not accurately characterize the potential impacts attributable to the proposed revisions to the human health criteria (i.e., compared to the NTR) because the lack of existing WQBELs appears to be the result of implementing state-specific policies unrelated to EPA's proposed rule that, should they continue to be applied in the context of revised criteria, would continue to result in a lack of WQBELs. However, it is also possible that Ecology would change these implementation policies and practices and develop and implement WQBELs. Therefore, a fair and reasonable approach to evaluate the potential upper-bound impact of EPA's proposed rule is for EPA to evaluate reasonable potential based on the existing human health criteria as a baseline and determine whether a WQBEL would have been included in the permit were it not for the approaches and other policies used by Ecology. EPA's approach reflects the most conservative approach to compliance with 40 CFR 122.44(d)(1), which states that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality." Thus, in cases of no existing WQBELs under the baseline criteria and current Ecology policies, EPA evaluated reasonable potential and projected baseline effluent limitations consistent with the approach described above. For facility-specific results, see Appendix A.

In all cases, an AML would be more stringent than the corresponding MDL. Therefore, EPA compared the baseline AML to the projected AML to determine whether the discharger would be in compliance with the new effluent limitation. In the absence of a baseline effluent limitation (i.e., there was no reasonable potential to exceed existing human health criteria), EPA compared the maximum observed effluent concentration (MEC) to the projected AML to determine whether the discharger will be in compliance with the new effluent limitation. This method ensures facilities are discharging below applicable limitations. If the baseline AML or MEC exceeds the projected AML, compliance actions and associated costs are likely. A summary of these determinations is provided in Exhibit 4-3.

Exhibit 4-3. Summary of Projected Effluent Limitations and Incremental Load Reductions under the Proposed Criteria

Facility Name[1]	QL (µg/L)	MEC or Baseline AML (µg/L)	Projected AML (µg/L)	Incremental Reduction (lbs/year)
Antimony				
Transalta Centralia Generation	0.21	2.0	2.5	0
Arsenic				
BP Cherry Point Refinery	0.5	19	0.81	720
Intalco Aluminum Corporation	0.5	11	0.46	237
King County South WWTP	0.5	0.14	0.0059	0
King County West Point WWTP	0.5	0.14	0.0059	0
Pasco WWTP	0.5	0.018	0.0045	0
Redondo WWTP	0.5	0.14	0.0059	0
Salmon Creek WWTP	0.5	0.14	0.0059	0
Sonoco Products Company	0.5	2.3	0.59	1.6
Tesoro Refining and Marketing Group	0.5	0.14	0.0059	0
Transalta Centralia Generation	0.5	0.018	0.0045	0
Transalta Centralia Mining	0.5	0.018	0.0045	0
US Oil & Refining	0.5	0.14	0.0059	0
Mercury				
Transalta Centralia Mining	0.0005	0.0029	0.00088	0.031
BP Cherry Point Refinery	0.0005	0.0114	0.00088	0.42
Tesoro Refining and Marketing Group	0.0005	0.44	0.017	0.24

AML = average monthly effluent limitation
MEC = maximum effluent concentration
QL = quantitation level (as established by Ecology; see Attachment 1-I (to Form 2C) or Appendix A of EPA/Ecology Form 2A at http://www.ecy.wa.gov/programs/wq/permits/forms.html)
WWTP = wastewater treatment plant
1. Includes sample facilities for which EPA found that there is reasonable potential to exceed the proposed criteria. Chambers Creek STP, Puyallup STP, Quincy Industrial, and Steelscape have no reasonable potential for any pollutants and are not included here. See Appendix A for more details.

EPA estimated the incremental pollutant loading reduction based on the difference between the MEC and the AML (either baseline or projected), in most circumstances, according to the following equation:

$$LR = 0.00834 \times Q \times (MEC - AML) \times 365$$

where,

LR = load reduction (lbs/year)

0.00834 = conversion factor [(lbs)(L)/(μg)(mg)]

Q = effluent flow rate (mgd)

MEC = maximum effluent concentration (μg/L)

AML = average monthly effluent limitation (μg/L)

When the AML was below the analytical limit of quantitation established by Ecology, EPA based the reduction on the difference between the MEC and the QL according to the following equation:

$$LR = 0.00834 \times Q \times (MEC - QL) \times 365$$

where,

LR = load reduction (lbs/year)[13]

0.00834 = conversion factor [(lbs)(L)/(μg)(mg)]

Q = effluent flow rate (mgd)

MEC = maximum effluent concentration (μg/L)

QL = quantitation level (μg/L).

EPA calculated the incremental load reduction by subtracting the load reduction due to the baseline AML (i.e., the baseline scenario) from the load reduction from the projected AML (i.e., the policy scenario).

$$ILR = LR_{policy} - LR_{baseline}$$

where,

ILR = incremental load reduction (lbs/year)

LR_{policy} = load reduction to meet the policy scenario (lbs/year)

$LR_{baseline}$ = load reduction to meet the baseline scenario (lbs/year).

4.1.4 Identifying Compliance Scenarios and Costs

Analysis of the available data for the sample of facilities indicates that there are likely to be exceedances of projected effluent limits for arsenic and mercury (i.e., instances where the projected effluent limits under the baseline criteria are less stringent then the projected effluent limits based on the proposed criteria). There are a number of potential alternatives for compliance with effluent limits for these pollutants, including:

- Optimizing treatment processes (e.g., adding chemicals to increase flocculation or filtration efficiency) to increase pollutant removal efficiencies

[13] In instances of a negative load reduction, EPA set the load reduction to zero.

- Source control (e.g., pollution prevention (P2) program, inflow and infiltration (I&I) reductions, more stringent pretreatment standards)
- Installing end-of-pipe treatment technology (e.g., reverse osmosis, granular activated carbon, or chemical precipitation)
- Alternative compliance mechanisms (e.g., site-specific criterion, dilution credits, TMDL, or variance).

Dischargers will pursue the lowest cost means of compliance with effluent limitations. However, for the proposed human health criteria, technical feasibility is also an issue, particularly when projected effluent limitations are below analytical limits of quantification. Hence, there may be a need for alternative compliance mechanisms. For example, many projected effluent limitations based on the proposed arsenic human health criteria will be below analytical limits of quantification (i.e., dischargers will be unable to demonstrate compliance with the effluent limitations).

Process Optimization

The lowest cost option is likely the adjustment of existing treatment (process optimization). This option would be most feasible when relatively low pollutant reductions are needed or monitoring data indicate that pollutant loads increase throughout the treatment process as a result of chemical additions or treatment techniques.

Process optimization usually involves process analysis and process modifications. Process analysis is an investigation of the performance-limiting factors of the treatment process and is a key factor in achieving optimum treatment efficiency. Performance-limiting factors for common wastewater treatment processes (e.g., sedimentation, activated sludge, filtration) may include operator training, response to changes in wastewater quality, maintenance activities, automation, and process control testing. The cost of process analysis includes the cost of additional or continuous monitoring throughout the treatment process, and a treatment performance evaluation. These costs vary based on the number of treatment processes utilized and the magnitude of the reductions needed.

Process modifications include activities short of adding new treatment technology units (conventional or unconventional) to the treatment train. For increasing pollutant removal efficiencies, process modifications could include adjusting coagulant doses to increase settling, equalizing flow if pollutant concentrations spike during wet weather events, increasing filter maintenance activities or backwash cycles, training operators, and installing automation equipment including necessary hardware and software. Several months of adjustments may be needed to achieve a desired level of process optimization. In practice, the process modifications necessary would be determined by the process analysis study.

Process optimization costs depend on the pollutant needing reductions and existing treatment processes and operations. For example, a facility could add a flocculent aid to secondary treatment to increase solids removal, and thus, the removal of any pollutants that adhere to particulates (e.g., mercury). In addition, chemicals used in wastewater treatment could contain contaminants (e.g., chlorine contaminated with low levels of mercury), and for certain pollutants (e.g., mercury) the use of such chemicals could result in exceedances. Thus, switching chemicals or the source of chemicals could be another low cost process optimization control option.

The effectiveness of process optimization largely depends on the efficiency of current operations, the existing treatment processes, and the fate and transport of the pollutant through the treatment train. For example, if a facility is already well maintained and operated, implementing process optimization may not result in sufficient pollutant reductions because the existing treatment processes are already performing at feasible limits. Also, because the design of most conventional treatment technologies maximizes removal of suspended solids, process optimization aimed at increasing those removal efficiencies may not result in sufficient reductions for pollutants existing primarily in dissolved form. Given the available information for the sample facilities, it is generally not possible to determine the reductions achievable with process optimization; rather, a detailed, site-specific study would be necessary.

Source Controls

If adjusting existing operations would not be feasible or would not be sufficient to achieve the necessary reductions, source controls would likely be the next most cost-effective control option. Source control could be used alone, or in conjunction with process optimization. The feasibility of source control efforts depends on the makeup of the influent and potential sources of the pollutant. For example, certain toxic pollutants are primarily used in industrial processes. Thus, for a municipal facility, a feasible source control option would be regulating indirect industrial dischargers through pretreatment permits. However, for pollutants in which the main sources are commercial and residential wastewater (e.g., mercury), a facility would likely have to concentrate efforts on public outreach and education or a sewer use ordinance. Other pollutants, such as arsenic, may be present in the wastewater due to natural sources (e.g., groundwater), and reducing I&I or treating source water may be necessary.

Costs for source control activities depend on the pollutant and the measures or controls implemented. P2 programs can be a cost-effective means of reducing mercury in wastewater effluents. However, as contributing sources are identified and controlled, the cost-effectiveness and efficacy that a P2 program would provide will diminish, and a discharger may need to pursue alternative compliance mechanisms (i.e., a variance) if compliance with permit conditions has not been achieved.

EPA estimated a range of source control actions and costs for control of arsenic that include industrial P2 programs, I&I reduction programs, and variances. In Washington, arsenic occurs naturally at high levels in state surface waters and groundwater (see http://www.ecy.wa.gov/programs/wq/swqs/PolicyForum5Presentations.pdf#page=31). These naturally occurring sources can be a significant source within municipal wastewater systems, as contaminated groundwater leaks into sewer systems. I&I controls may enable compliance with baseline and revised criteria and EPA estimated the associated costs based on unit costs used in other cost analyses conducted within the region. Note that these costs may be incurred independent of compliance with arsenic criteria or be partially off-set by secondary benefits associated with I&I reduction activities (i.e., reduce flow to treatment plant, which reduces treatment costs, and sewer overflows).

Pollution Prevention Program

Successful P2 programs will likely include at least some of the following steps:

- Identify sources – particularly sources that contribute the greatest load to the influent
- Form a workgroup – preferably composed of representatives from government, industry, community, and environmental organizations that are either familiar with P2 strategies or familiar with the pollutant
- Define program goals – including a statement of how the municipality intends to reduce pollutant levels in its effluent, the purpose for doing so, and a time line for completion
- Develop an approach – including selecting sectors for P2 efforts, the criteria for targeting efforts (e.g., size of the source loading, authority available to control the source, time required to produce desired results), whether efforts will be voluntary or regulatory, and who will execute each program effort
- Estimate program costs – develop estimates and identify entities that will bear the costs
- Implement program – starting with the most cost-effective measures and modifying activities and approach based on measured results
- Assess progress – including both successes and failures (i.e., lessons learned) throughout the duration of the program
- Provide follow-up – necessary to ensure P2 measures continue to be implemented
- Develop a contingency plan – including a description of actions to be taken if plan efforts are unsuccessful.

The focus and approach of the program will be different for each community and sector targeted. As such, plans vary in complexity and in the resources necessary to achieve the goals set forth.

The reductions in mercury achievable through P2, and thus the ability to achieve compliance with numeric effluent limits using P2 alone, will vary based on existing treatment processes, the makeup and size of the service area (e.g., number of potential mercury sources), and the level of P2 already being implemented in the community. For example, in 2003, the Washington State Legislature passed the Mercury Education and Reduction Act (MERA). MERA bans the sale of some mercury-containing products, requires the labeling of mercury-containing light bulbs and lamps, and requires the removal of mercury from elementary and high schools. The State may fine repeat violators of MERA up to $5000 per violation. Ecology also administers an automotive mercury switch removal program. Many automobiles made before 2003 contain mercury switches or other mercury-containing equipment. Ecology offers auto recyclers up to $9 per mercury-containing component. Dentists in the State must use and maintain a dental amalgam separator.

Large municipal facilities with numerous potential mercury sources may see significant reductions after implementation of a measure that targets a major influent mercury source. However, facilities with much smaller service areas may not be able to achieve the same effluent reductions with P2 due to a lower percent of easily identifiable and controllable sources contributing to the influent mercury load. For example, sources from the residential sector are not as easy to identify as those from industrial and commercial sectors since these may originate from a wide range of products and smaller municipalities are likely to receive most of their inflow from the residential sector.

There is little information available on the cost of P2 programs for individual pollutants because facilities typically do not account for pollutant-specific P2 costs as a budget item that can be verified apart from other base program costs. However, the experiences of facilities that have already developed P2 programs for pollutants such as mercury provide some information on likely program components and costs.

Community size is likely to be a factor affecting P2 program costs. For example, it is unlikely that a minor facility would need the same amount of resources for program development and outreach efforts as a large major municipal facility because the service area is smaller and contains fewer households and commercial/industrial dischargers to target. Smaller facilities may also pool their resources together and develop a joint P2 program to save time and money on program development and outreach materials.

EPA (2008)[14] previously estimated that P2 program costs for mercury may be approximately $58,000 per year for a small municipal facility (1 mgd to 5 mgd), $109,000 for a medium-sized municipal facility (≥5 mgd to 20 mgd), and to $165,000 per year for a large municipal facility (> 20 mgd). P2 program costs for pollutants with fewer potential sources would likely be lower ($25,000 to $50,000). More recent information pertaining to program costs is not available, but P2 programs should become less costly over time as more jurisdictions adopt these programs and refine best practices. EPA updated the labor rate components of these cost estimates to incorporate Washington-specific labor rates (Bureau of Labor Statistics (BLS), 2014). In total, these estimates encompass costs for the following program components:

- Program planning and development
- Sampling and analysis of internal process waters and effluents
- Site visits and workshops
- Development of public-service announcements, advertising, and a website to promote awareness of program activities and goals

[14] All historical cost estimates are converted and presented in terms of 2014 dollar values.

- Procurement and distribution of mercury free products (e.g., thermometers) to certain public and commercial sector entities.

EPA also estimated costs to indirect dischargers to a municipal wastewater treatment plant (WWTP) under a mercury P2 program (see Appendix A). For other pollutants, identifying groups of indirect dischargers likely to be contributing to the influent load at the treatment plant is more difficult because the pollutants are no longer actively used (e.g., legacy pesticides), could be formed as a byproduct of numerous processes (e.g., dioxin), or there is a lack of information available. Thus, it is not possible to estimate pretreatment or P2 costs to indirect dischargers for pollutants other than mercury without specific information on the types of industrial dischargers in each service area.

End-of-Pipe Treatment

If process optimization or source control would not be sufficient for compliance with the baseline or revised criteria, alternative discharge options or end-of-pipe treatment technologies may be necessary. However, many of the criteria approach the limits of analytical capabilities (e.g., mercury) or fall below QLs (e.g., arsenic). In addition, for some pollutants, the lowest levels achievable through end-of-pipe treatment are highly uncertain due to the fact that dischargers have not been required to treat to such low levels and performance data are not available.

For metals such as mercury and arsenic, technologies that primarily target the dissolved fraction of the pollutant are most likely to achieve low effluent levels because most of the particulate fraction would already have been removed with existing treatment controls designed to remove solids (see discussion of process optimization).

Exhibit 4-4 summarizes the end-of-pipe treatment technologies that may be used to remove the pollutants of concern.

Exhibit 4-4. Summary of Potential End-of-Pipe Treatment Technologies

Technology	Pollutants Removed
Granular activated carbon	Mercury
Membrane filtration	Arsenic, mercury
Reverse osmosis	Arsenic

For this analysis, and as documented further in Appendix A (Facility Analyses), EPA determined that only end-of-pipe treatment for arsenic was necessary for ensuring compliance with projected effluent limits (i.e., there are compliance options other than treatment for mercury). Based on information contained in U.S. EPA 2008, EPA assumed the use of reverse osmosis as the treatment system for arsenic. Although less costly treatment options exist (e.g., membrane filtration), reverse osmosis can consistently reduce arsenic effluent concentrations to below analytical detection levels. EPA derived the costs for reverse osmosis treatment based on the costs documented in U.S. EPA, 2008.

Alternative Compliance Mechanisms

If none of the control options discussed above would result in compliance with baseline or revised effluent limitations, or if the costs of available treatment would be prohibitive, dischargers would likely need some form of relief from the requirements.

Site-Specific Criteria

If dischargers suspect that the conditions in the vicinity of their discharge warrant alternative (i.e., site-specific) criteria values that would result in less stringent effluent limitations in their permit, they may work to collect data to develop site-specific criteria. Ecology may also develop site-specific criteria as part of a TMDL process (i.e., identifying the appropriate target value). EPA must review and approve site-specific criteria prior to implementation.

Because additional data are likely required to assess the appropriateness of site-specific criteria at a particular location, the extent of use of this mechanism by dischargers is uncertain. However, consideration within the context of a TMDL is likely, and may or may not reflect an incremental increase in effort above that associated with current TMDLs (this type of data collection and evaluation may already be a part of TMDL development efforts).

Intake Credits

Under 40 CFR 122.45(g), EPA allows dischargers to request that technology-based effluent limitations be adjusted to reflect credit for pollutants in the discharger's intake water when certain conditions are met. However in terms of complying with WQBELs, the State of Washington does not yet have an approved intake credit policy and, therefore, does not provide intake credits for water quality-based effluent limitations. Therefore EPA did not consider intake credits as a valid compliance action for the proposed human health criteria.[15]

Variances

Under WAC 173-201A-420, Ecology may temporarily modify criteria for individual facilities, or stretches of water, through the use of a variance. Variances may be approved when:

(a) The modification is consistent with the requirements of federal law (currently 40 CFR 131.10(g) and 131.10(h));

(b) The water body is assigned variances for specific criteria and all other applicable criteria must be met; and

(c) Reasonable progress is being made toward meeting the original criteria.

The decision to approve a variance is subject to a public and intergovernmental involvement process. Under the state's current regulations, the department may issue a variance for up to five years, and may renew the variance after providing for another opportunity for public and intergovernmental involvement and review. Variances are not in effect until they have been

[15] Washington proposed an intake credit policy on January 12, 2015. See http://www.ecy.wa.gov/programs/wq/ruledev/wac173201A/1203ov.html.

adopted under state law and approved by EPA. Factors for allowing variances under 40 CFR 131.10(g):

1. Naturally occurring pollutant concentrations prevent the attainment of the use.
2. Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges to enable uses to be met without violating state water conservation requirements.
3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.
4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way which would result in the attainment of the use.
5. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and unrelated to water quality preclude attainment of aquatic life protection uses.
6. Controls more stringent than those required by CWA sections 301(b) and 306 would result in substantial and widespread economic and social impact.

To demonstrate that any of the first five conditions above apply as part of an application for a variance, dischargers would likely prepare documentation of the conditions warranting the variance.

To evaluate the potential for control costs to cause substantial and widespread economic and social impacts (the sixth condition above), dischargers are likely to follow EPA's (1995) Interim Economic Guidance for Water Quality Standards Workbook which provides worksheets and instructions for public and private sector entities. Following EPA (1995), dischargers conduct a two-step analysis, first determining whether the control costs would have a substantial adverse financial impact and, if so, whether that impact would cause widespread adverse impacts on the surrounding community.

Permitting authorities may require implementation of a P2 or source control program as part of the conditions for granting a variance. Thus, to be conservative (i.e., err on the side of overestimating costs), EPA assumed that facilities would need to implement a P2 program as part of a variance.

Dilution Credits

Under WAC 173-201A-410, Ecology may implement mixing zones and associated dilution credits in NPDES permits. Regulatory mixing zones may be established when a discharger has applied all known and reasonable treatment and a mixing zone analysis has been performed. Once approved, dilution credits can reflect no more than the level of effluent and ambient receiving water mixing which occurs under critical conditions. Dilution credits are used to account for the assimilative capacity of the receiving water when computing the waste load allocation applicable to a specific parameter and associated effluent limitations, as described in Section 4.1.3.

Dischargers who cannot readily comply with end-of-pipe effluent limitations based on the proposed human health criteria and who do not currently possess an approved regulatory mixing zone, may elect to pursue approval of a regulatory mixing zone as means of coming into compliance with the effluent limitations.

When applying for a regulatory mixing zone, a special study is required to estimate and document the level of mixing which is likely to be present in the receiving water under applicable critical conditions. A special study of this type will typically require data collection and the mathematical modeling of the discharge and ambient receiving environment. In developing costs associated with developing a dilution special study, EPA estimated that approximately 320 hours would be required of an environmental engineer to develop and interpret the model, and an additional 50 hours by an environmental engineer at Ecology to review the model. EPA assumed the costs to obtain modeling software would be negligible, as EPA distributes software appropriate to this application (i.e., VisualPlumes) free of charge. Labor costs are based on median wage rates for an environmental engineer in the State of Washington (BLS, 2014).

4.1.5 Summary of Unit Control Costs

EPA based unit costs for P2 programs, I&I reduction, alternative compliance mechanisms, and end-of-pipe treatment (i.e., reverse osmosis) on estimates previously developed for economic analysis of WQS for the State of Oregon (U.S. EPA, 2008). EPA updated these costs to reflect local labor rates and escalated to 2014 dollars using appropriate cost indices.[16] EPA developed costs associated with applying for dilution credits and for process optimization special studies as described in Section 4.1.4.

Exhibit 4-5 summarizes the unit costs utilized in the sample facility compliance cost analyses.

Exhibit 4-5. Estimated Unit Costs of Compliance Mechanisms (2014$)

Compliance Mechanism	Municipals			Industrials
	1-5 mgd	5-20 mgd	>20 mgd	
Pollution prevention program ($/year)	$58,000	$110,000	$165,000	$28,000
Other pollution prevention programs	$60,000	$60,000	$60,000	$28,000
Dilution study	$50,000	$50,000	$50,000	$50,000
End-of-pipe treatment (reverse osmosis)[1]	See note	See note	See note	See note

16 EPA updated all costs to 2014$ using the consumer price index, except for pipeline rehabilitation costs; for these, EPA updated costs using the Engineering News Record Construction Cost Index.

Exhibit 4-5. Estimated Unit Costs of Compliance Mechanisms (2014$)

Compliance Mechanism	Municipals			Industrials
	1-5 mgd	5-20 mgd	>20 mgd	
Variance	$180,000	$300,000	$426,000	$180,000
Inflow and infiltration reduction ($/mile)[2]	$69,000	$69,000	$69,000	See note

Source: EPA (2008); updated to 2014 dollars using the Engineering News Record Construction cost Index for inflow and infiltration pipeline rehabilitation and the average annual Consumer Price Index for other components. Dilution study estimate based on best professional judgement using assumptions identified in the text.
mgd = million gallons per day
1. EPA did not identify a need for end-of-pipe treatment costs for municipal dischargers; for industrial end-of-pipe treatment costs, EPA derived the following linear regression equation from the data in EPA (2008) to estimate costs:

$y = [(1.1 \times 10^6)(x)]+(1.63 \times 10^6)$

where:

y = Total annual project cost ($ millions; 7% and 20 years)

x = Facility flow (mgd)

2. Inflow and infiltration reduction is applicable to municipal dischargers only.

4.1.6 Extrapolation to All Major Dischargers

To extrapolate the sample facility costs, EPA added the estimated compliance costs for the facilities in the certainty sample to the sum of the estimated costs for each facility in the random sample multiplied by the facility weight from the original sampling scheme. See Appendix B for details on this extrapolation.

4.2 Minor Dischargers

Minor dischargers often do not have monitoring requirements for toxic pollutants and may not contribute significantly to instream loads even if such pollutants were present in the effluent from these facilities. Thus, the potential for minor facilities to incur costs as a result of revised human health criteria is low.

EPA reviewed data and information contained in the NPDES permit fact sheets for two minor industrial dischargers to evaluate potential for impact under the proposed rule [KB Alloys, LLC (WA0002976), and Sandvik Special Metals, LLC (WA0003701)]. The primary pollutants of concern for which data were available are metals (e.g., aluminum, chromium, copper, cyanide, lead, nickel and zinc). For metals, aquatic life protection criteria are more stringent than the proposed human health criteria. For both facilities, due in part to the lack of background pollutant data (i.e., background was set equal to zero) and the dilution factors applied to each facility discharge, there was no reasonable potential to exceed water quality criteria for the metals. The NPDES permits include technology-based effluent limitations for the metals of concern.

Effluent data were not available for all other pollutants for which human health criteria are being proposed. In the fact sheets for each facility, Ecology had determined that discharges from each facility are unlikely to contain chemicals regulated to protect human health. Additional data would be needed to confirm or dispute this finding under the proposed rule.

5. Methods for Identifying Potential Costs: Nonpoint Sources

Changes in water quality criteria could result in incremental impacts on nonpoint sources of pollution, such as agriculture, urban areas, and forestry, through TMDLs or other pollution cleanup plans. Section 2.2 discusses the nonpoint sources of pollution, and Section 2.3 summarizes the process by which Ecology categorizes waterbodies. Ambient water quality data can be used to determine the impact that a change in human health criteria may have on the attainment of the criteria and thus the potential for incremental control strategies and costs for nonpoint sources.

5.1 Identifying Exceedances

EPA identified potential incremental impairments based on available data in EIM. According to the state's Water Quality Program Policy (Ecology, 2012d), Ecology generally uses the last ten years of data to determine impairment status of surface waters. EPA used available surface water monitoring data on pollutants of interest from EIM for the years 2005 to 2014.[17] EPA acknowledges that Ecology uses fish tissue equivalent concentrations to trigger waterbody impairments based on the human health criteria in their 303(d) listing methodology, whereas for the purposes of this analysis, EPA identified potential incremental impairments using water column concentrations. For each monitoring station and parameter, EPA compared the pollutant concentration to both the existing baseline human health criteria and the proposed criteria. Station results that would represent impairment under the proposed criteria but not under the existing baseline criteria may represent potential incremental impairments.[18]

Exhibit 5-1 shows the results of this analysis. Using the baseline criteria values, monitoring data indicate potential impairment on the basis of human health criteria exceedances in the water column at 205 stations. Using the proposed criteria, there would be exceedances in the

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17 EPA did not include observations resulting from sampling at known contamination sites, cleanups, groundwater, and outfall monitoring stations. EPA acknowledges that Ecology may use such data to determine impairments. Additionally, EPA eliminated observations with the following data qualifiers: U (analyte was not detected at or above the reported result) and UJ/UJG/UJK (analyte was not detected at or above the reported estimate), REJ (data are unusable for all purposes), but kept observations with the following qualifiers: J (analyte was positively identified, reported result is an estimate), JL (analyte was positively identified, value may be less than reported, B (analyte detected in sample and method blank), T (result is below quantitation level but above MDL), JK (analyte was positively identified, reported result is an estimate with unknown bias), JT (analyte was positively identified, reported result is estimate below quantitation level but above MDL), C (not specified), and NTJ (evidence that analyte is present, estimate is below quantitation level but above MDL).

18 Note that these results may not reflect the actual listed impairment status of the waterbody. EPA compared identified impairments to Ecology's current draft impairment listings; however, data limitations (e.g. the ability to match monitoring stations to existing impairment status at the waterbody level across data sets) largely preclude matching of monitoring stations to specific waterbody impairments.

water column at 254 stations, for a total of 49 potential incremental exceedances (or a 24% increase compared to the baseline).

Exhibit 5-1. Potential Incremental Impairments[1]

Parameter	Number of Locations	Potential Impairments		
		Baseline[2]	Proposed[3]	Incremental[4]
1,2-Dichloropropane	D			
1,3-Dichloropropene	D			
2,3,7,8-TCDD (dioxin)	D			
4,4'-DDT	45	7	24	17
Acenaphthene	5	0	0	0
Anthracene	8	0	0	0
Antimony	49	0	0	0
Arsenic	178	167	167	0
Benzo(a) anthracene	16	5	7	2
Benzo(a) pyrene	10	5	7	2
Benzo(b) fluoranthene	10	6	7	1
Benzo(k) fluoranthene	15	4	5	1
Bis(2-ethylhexyl) phthalate	22	0	14	14
Butylbenzyl phthalate	6	0	2	2
Chlordane	D			
Chrysene	10	5	4	-1
Copper[5]	238	0	0	0
Dibenzo(a,h) anthracene	6	2	3	1
Diethyl phthalate	6	0	0	0
Dimethyl phthalate	2	0	0	0
Di-n-butyl phthalate	19	0	0	0
Fluoranthene	11	0	0	0
Fluorene	5	0	0	0
Indeno(1,2,3-cd) pyrene	15	4	6	2
Nickel	163	0	0	0
Polychlorinated biphenyls (PCBs)	D			
Pyrene	10	0	0	0
Thallium	6	0	0	0
Zinc[5]	201	0	0	0
Mercury[6]	18	0	8	8

Exhibit 5-1. Potential Incremental Impairments[1]

Parameter	Number of Locations	Potential Impairments		
		Baseline[2]	Proposed[3]	Incremental[4]

Source: Based on 2005 to 2014 surface water monitoring data from Washington's Environmental Information Management System (EIM).
D = EIM data are available, but all observations are unusable due to the study type (contaminated site), waterbody type (groundwater), or result qualifiers.
1. Blanks indicate that data are not available, or that EPA did not use all observations due to study, location, or data quality reasons.
2. Number of stations at which monitoring data indicate two or more exceedances of the baseline human health criteria within 3 years.
3. Number of stations at which monitoring data indicate two or more exceedances of the proposed human health criteria within 3 years.
4. Represents difference in results between baseline and proposed criteria.
5. For zinc, nickel, and copper, includes only freshwaters since the aquatic life criteria are more stringent than proposed human health criteria for marine waters.
6. Potential to exceed the proposed fish tissue criterion based on the projected water column target.

5.2 Identifying Compliance Actions and Costs

EPA does not have data on all parameters for all waterbodies, or data on the sources of loadings to potentially impaired waterbodies. Additionally, Ecology is currently in the process of revising and updating its management plan for nonpoint source pollution (see Ecology, 2015b). Reductions in nonpoint source pollution loadings arising from this revised plan will occur in the absence of the proposed rule and represent baseline requirements.

If the revised criteria lead to additional waters being listed on the state's 303(d) list for exceedances of human health based water quality criteria, the magnitude of cost impacts to nonpoint sources depends on the extent to which additional practices are needed for compliance with the potential revisions in comparison to compliance with existing baseline standards.

If nonpoint sources are the primary cause of some incremental impairments, then the revised criteria may result in some costs to nonpoint sources, including:

- Agricultural and forest lands – sediment and erosion controls beyond those specified under existing state and federal regulations and plans;
- Mining – cleanup and remediation including excavation and onsite capping of contaminated soils, capping of onsite solid waste mining debris, regrading of tailings to mitigate mass wasting and off-site migration, and abatement and mitigation of physical hazards; and
- Stormwater discharges – increased or additional nonstructural BMPs (e.g., institutional, education, or P2 practices designed to limit generation of runoff or reduce the pollutants load of runoff); and structural controls (e.g., engineered and constructed systems designed to provide water quantity or quality control).

Control of nonpoint sources of the pollutants of concern could reduce costs to point sources. In the context of a TMDL, load and wasteload allocations reflecting the source of the pollutant could result in less stringent limits for point sources than anticipated through the analysis of the sample facilities as described in Section 4.

If an additional number of TMDLs are needed under the revised criteria, there may be an increase in government regulatory costs. EPA (2001b) estimates that TMDL development costs per water body typically range from under $26,000 to over $500,000[19] depending on the number of TMDLs, the level of complexity, and the extent to which impaired waters are clustered together for TMDL development.[20]

19 Not updated from original dollar years (2000$).

20 EPA (2001b) anticipates that in the future, states will increasingly adopt efficient practices when developing TMDLs, thus potentially reducing development costs.

6. Potential Compliance Costs

This section summarizes the potential costs to point sources and nonpoint sources, and discusses the limitations and uncertainties associated with the analyses.

6.1 Point Sources

Costs for compliance with baseline criteria include costs associated with compliance with WQBELs reflective of existing criteria. Incremental costs associated with the potential revised criteria represent the costs of any additional actions or controls needed for compliance with revised WQBELs under the proposed rule. Exhibit 6-1 provides a summary of the potential total annual statewide costs. The low estimate represents the assumption that the projected control scenario will result in compliance with projected effluent limits; the high estimate includes the estimated cost of also obtaining a variance under the assumption that control actions will not result in compliance with very low limits. For the 73 major dischargers in the state, EPA estimates that the total annual cost may be in the range of $13 million.[21]

Exhibit 6-1. Total Annual Costs by Discharger Type

Discharger Type	Statewide Annual Costs (millions; 2014$)	
	Low	High
Municipal	$0.00	$0.00
Industrial	$13.03	$13.06
Total	**$13.03**	**$13.06**

Of the costs shown in Exhibit 6-1, all costs are attributable to industrial dischargers, primarily for treatment of arsenic. Overall, 99% of the costs are attributable to the revised human health criteria for arsenic while the remaining 1% are attributable to the revised human health criteria for mercury.

6.2 Nonpoint Sources

Costs for compliance with baseline criteria include costs to nonpoint sources (e.g., agricultural and forest operations; contamination from historic mining sites), and municipal stormwater sources associated with implementation of existing programs and TMDLs. Incremental costs associated with compliance with the potential revised criteria represent the costs of any actions or controls above and beyond those needed to meet baseline requirements. EPA did not estimate incremental costs for nonpoint sources for this preliminary analysis. However, if nonpoint sources are the primary source of the pollutants

[21] These costs represent the proposed criteria scenario only. EPA estimated costs to come into compliance with baseline criteria to be in the range of $46.4 million to $47.1 million. For a description of sample facility-specific baseline and proposed criteria scenario costs, see Appendix A.

of concern, control of nonpoint sources could result in less stringent limitations and lower costs than estimated for point sources. For situations in which controls beyond those required under the baseline are necessary, controls could include the development and implementation of TMDLs.

6.3 Uncertainties and Quality Assurance

As noted previously, the proposed rule does not establish any requirements directly applicable to regulated entities or other sources of pollution. State implementation of the proposed rule may result in new or revised NPDES permit conditions for point source dischargers, and incremental control requirements for nonpoint sources. For point sources, EPA has estimated these impacts as the difference between compliance with the existing human health criteria and compliance with the proposed human health criteria. However, there is substantial uncertainty associated with actual state implementation of the proposed rule.

The proposed rule establishes human health criteria applicable to the waters in the state and as such there could be a need for additional controls on nonpoint sources of pollutant loadings to attain WQS. EPA estimated potential incremental impairments using readily available ambient water quality data. However, data are limited to identify specific incremental control actions and costs that may be required of nonpoint sources.

Exhibit 6-2 summarizes additional uncertainties and limitations in the analysis.

Exhibit 6-2. Uncertainties in Analysis of Costs

Uncertainty/Assumption	Effect on Cost Estimate	Notes
Sample facility costs are representative of all facilities in state (by category)	Uncertain	Could result in an overestimate or underestimate of statewide costs if sample facilities are higher or lower than average costs. Does not account for new/expanding facilities.
Baseline controls	Uncertain	EPA did not conduct extensive site-specific review of facility plans and information for addressing baseline water quality issues; thus, facility analyses could under- or overstate baseline and incremental actions and costs.
Means of addressing incremental impairments	Overestimate	Under a TMDL, load and wasteload allocations may result in less stringent requirements for point sources if nonpoint sources are the cause of impairments.
Zero compliance costs for two sample facilities for which effluent data are not available	Underestimate	If these facilities do need to take actions to comply with the revised requirements, the total cost of compliance would be greater than that estimated here.

Exhibit 6-2. Uncertainties in Analysis of Costs

Uncertainty/Assumption	Effect on Cost Estimate	Notes
Total arsenic and dissolved arsenic monitoring data represent only the inorganic fraction of arsenic	Overestimate	Effluent and ambient monitoring data available for the analysis are in terms of total and dissolved arsenic; if some fraction of arsenic measured is in the organic form then this may result in an overestimate of costs since the proposed criterion is in terms of the inorganic form, which is more toxic than other forms.

EPA conducted quality assurance checks on the data, analyses, and results, consistent with the programmatic and project-specific quality assurance plans. In addition, the Agency used Ecology's permit-writing tool, ensuring consistency with state permitting approaches and calculations. EPA also used Washington-specific data sources as available, and for all data entry, EPA confirmed the accuracy of data sources and documentation following procedures described in the quality assurance plans. These procedures include checks on all inputs and calculations, and using multiple approaches to confirm results.

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Appendix A – Facility Analyses

This appendix provides detailed analyses for the sample facilities in alphabetical order by municipal dischargers first followed by industrial dischargers.

A.1 Chambers Creek Regional Wastewater Treatment Facility

The Chambers Creek Regional Wastewater Treatment Facility (WWTF; NPDES permit WA0039624) provides wastewater treatment to 65,000 households and 2,000 businesses in DuPont, Lakewood, Tacoma, University Place, Steilacoom, and other unincorporated areas. The facility also treats wastewater from five industrial users, including the Boeing Corporation Skin and Spar fabrication facility, the Land Recovery Incorporated Hidden Valley Landfill, James Hardie Building Products, and Fredrickson Power.[22] The facility discharges a maximum monthly flow of 14 to 20 mgd (dry weather flow and maximum monthly flow, respectively) to Puget Sound Gordon Point Area.

A.1.1 Treatment Processes

The 2008 permit fact sheet indicates that the current treatment consists of screening equipment and primary sedimentation; secondary treatment includes bioselectors, secondary clarifiers and ultraviolet disinfection.

A.1.2 Effluent Data

No recent effluent monitoring data for the WWTF were available for any of the pollutants for which human health criteria are being proposed.

A.1.3 Receiving Water

The facility discharges to Puget Sound Gordon Point Area, which is a Class AA extraordinary receiving water. According to the 2008 permit fact sheet, Commencement Bay (monitoring station BRW-COMMENCEBAY) is the nearest monitoring station with available water column data. Exhibit A-1 summarizes the available ambient receiving water concentrations for the station based on data from Ecology's Environmental Information Management System between 2008 and 2009.

Exhibit A-1. Ambient Receiving Water Concentrations: Commencement Bay

Pollutant	Water Column Concentration (µg/L)	
	Maximum	Average
Copper	1.3	0.837
Zinc	2.91	1.515
Source: Washington State Department of Ecology Environmental Information Management System, 2008 to 2009 data for station BRW-COMMENCEBAY.		

22 The 2008 Fact Sheet does not identify the fifth industrial discharger.

A.1.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. The necessary data to confirm the reasonable potential analysis under the baseline scenario were not available.

A.1.5 Policy Scenario

EPA did not have the necessary data to perform the reasonable potential analysis under the policy scenario. Thus, it could not determine reasonable potential or calculate permit limits and costs.

A.2 King County South WWTP and CSO System

The King County Department of Natural Resources and Parks (Wastewater Treatment Division) operates the King County South WWTP (NPDES permit WA0029581), which serves 25 jurisdictions and utility districts, including Seattle, across 152 square miles. The majority of flow to the treatment facility is from separated sanitary systems, with approximately 4% coming from a combined system in Seattle. Average WWTP flow is 76 mgd.

A.2.1 Treatment Processes

The 2009 permit fact sheet reports that primary treatment consists of screening and settling followed by primary clarification. Secondary treatment is an activated sludge process and includes aeration and secondary clarification. After disinfection (using sodium hypochlorite), effluent is discharged to Puget Sound.

A.2.2 Effluent Data

Exhibit A-2 summarizes the last three years of effluent data for the treated wastewater for the pollutants of concern for which data are available, based on Ecology's priority pollutant monitoring data and reasonable potential analysis (Appendices C and H in the 2009 permit fact sheet).

Exhibit A-2. Summary of Effluent Data: King County South WWTP[1]

Pollutant	Observations		QL (µg/L)	Summary of Detected Values (µg/L)[2]			
	Total	Nondetect		Median	Average	95th Percentile	Max
1,1,2,2-Tetrachloroethane	23	23	1				
1,1,2-Trichloroethane	23	23	1				
1,2,4-Trichlorobenzene	24	24	0.57-0.71				
1,2-Trans-dichloroethylene	23	23	1				
2,4-Dimethylphenol	24	24	0.94 – 1.2				
2,4-Dinitrophenol	24	24	1.9 – 2.4				
2-Chlorophenol	24	24	1.9 – 2.4				
Acenaphthene	24	24	0.57-0.71				

Exhibit A-2. Summary of Effluent Data: King County South WWTP[1]

Pollutant	Observations		QL (µg/L)	Summary of Detected Values (µg/L)[2]			
	Total	Nondetect		Median	Average	95th Percentile	Max
Acrolein	23	23	5				
Acrylonitrile	23	23	5				
Antimony	32		0.5	0.25	<0.51	0.514	0.67
Arsenic	34		0.5		1.26	1.516	1.60
Benzene	23	23	1				
Benzidine	24	24	23-28				
Benzo(a) anthracene	24	24	0.57-0.71				
Bromoform	23	23	1				
Carbon tetrachloride	23	23	1				
Chloroform	23		1.32	1.3	<1.32	2.034	2.18
Copper	32		0.4		16.5	31.34	42.4
Cyanide	33		0.005	.0025	<0.008	0.019	0.028
Dichlorobromomethane	23	23	1				
Ethylbenzene	23	23	1				
Fluoranthene	24	24	0.57-0.71				
Fluorene	24	24	0.57-0.71				
Hexachlorocyclopentadiene	24	24	0.94-1.2				
Hexachloroethane	24	24	0.94-1.2				
Indeno(1,2,3-cd) Pyrene	24	24	0.94-1.2				
Isophorone	24	24	0.94-1.2				
Methyl bromide	23	23	5				
Methylene chloride	23		5	2.5	<4.74	2.5	7
Nickel	33		0.3	2.90	2.99	4.004	4.45
Nitrobenzene	24	24	0.94-1.2				
N-Nitrosodimethylamine	24	24	3.8-4.7				
N-Nitrosodi-n-propylamine	24	24	0.94-1.2				
N-Nitrosodiphenylamine	24	24	0.94-1.2				
Pentachlorophenol (PCP)	24	24	0.94-1.2				
Phenol	24	24	3.9				
Pyrene	24	24	0.57-0.71				
Selenium	33	33	1.5				
Tetrachloroethylene	23	23	1				
Thallium	33	33	0.04-0.2				

Exhibit A-2. Summary of Effluent Data: King County South WWTP[1]

Pollutant	Observations		QL (µg/L)	Summary of Detected Values (µg/L)[2]			
	Total	Nondetect		Median	Average	95th Percentile	Max
Toluene	23		4	2	<1.45	3.41	3.86
Trichloroethylene	23	23	1				
Vinyl Chloride	23	23	1				
Zinc	33		0.5		29	49.34	68
Mercury	33		0.05	0.025	<0.05	0.052	0.058

Source: 2009 permit fact sheet (Appendix C and H).
QL = quantitation level
1. Blanks indicate unreported data.
2. Metal concentrations are total recoverable form.

A.2.3 Receiving Water

The facility discharges to Puget Sound, which Ecology has designated as an extraordinary marine water. Exhibit A-3 summarizes the available ambient receiving water concentrations based on 2011 to 2012 data from Ecology's Environmental Information Management System (monitoring station LSNT01, identified in the permit fact sheet as the most appropriate monitoring station for ambient data).

Exhibit A-3. Ambient Receiving Water Concentrations (2011 to 2012): Puget Sound

Pollutant	Water Column Concentration (µg/L)1				
	Minimum	Median	Geometric Mean	90th Percentile	Maximum
Antimony	0.143	0.158	0.158	0.172	0.173
Arsenic	1.22	1.4	1.364	1.45	1.46
Copper	0.231	0.287	0.296	0.355	0.387
Cyanide	nd	nd	nd	nd	nd
Mercury	nd	nd	nd	nd	nd
Nickel	0.39	0.4115	0.410904577	0.4275	0.43
Zinc	0.27	0.395	0.428224144	0.605	0.707

Source: based on data from Ecology's Environmental Information Management System, monitoring station LSNT01.
nd=nondetect
1. Metal concentrations are dissolved.

A.2.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a

WQBEL would have been included in the NPDES permit.[23] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-4 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-2 and available ambient data in Exhibit A-3, there is reasonable potential to exceed the baseline human health criteria for arsenic.

Exhibit A-4. Human Health Reasonable Potential Analysis for King County South WWTP – Baseline Scenario[1]

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	1.26	1.364	1.364	0.14

1. See effluent concentrations in Exhibit A-2 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-3.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 428.
3. Consumption of organisms only.

Exhibit A-5 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-5. Human Health Based Effluent Limitations for King County South WWTP – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.14	0.16

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an average monthly effluent limit (AML) of 0.14 µg/L and a maximum daily effluent limitation (MDL) of 0.16 µg/L. Since the average effluent concentration is 1.26 µg/L and the maximum effluent concentration is 1.6 µg/L, which are greater than the projected baseline permit limitations, the discharger will need to reduce arsenic in its effluent to ensure that permit limitations are consistently met.

Arsenic and arsenic-containing chemicals are not used in wastewater treatment. However, the facility has a large industrial base and regulates 65 industrial users of which 27 are significant industrial users and 19 are categorical industrial users (i.e., users subject to EPA's

[23] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

national pretreatment standards), including 32 in the electroplating and metal finishing categories. Thus, a source control program that targets or imposes more stringent limits on the most likely indirect industrial dischargers of arsenic to the plant could reduce arsenic concentrations to the necessary levels. Costs for such a program would depend on the number of arsenic sources and the measures that could be implemented at those sources to reduce arsenic. However, without more detailed information on these industrial users and King County's pretreatment program (e.g., flows and arsenic concentrations for each industrial user, local limits for arsenic, ordinances, etc.), it is not possible to estimate pretreatment or P2 costs to indirect dischargers.

Other potential sources of arsenic to the treatment plant are water and groundwater infiltration. Details on the drinking water sources for the municipalities served by King County South, including whether these sources are surface water or groundwater and levels of arsenic in these sources, were not evaluated. The drinking water maximum contaminant level is 10 µg/L, which is higher than current wastewater effluent concentrations and human health criteria. EPA did not attempt to determine with any certainty whether drinking water is contributing to high arsenic levels in the wastewater effluent. However, if the facility determines that drinking water is the source of high arsenic values in the wastewater, it is likely that the facility would pursue a variance.

The fact sheet for the facility's 2009 permit indicates that King County created a Regional Infiltration and Inflow (I&I) Control Program in 1999 as part of the Regional Wastewater Services Plan (RWSP) to explore the feasibility of a regional I&I control program to reduce the amount of peak wet weather flow entering the County's wastewater conveyance. In response to the RWSP I&I Control Program policies, County staff, working in a consensus-based approach with the local sewer agencies, conducted a comprehensive 6-year, $41 million, I&I control study. The study began in 2000 and culminated with the County Executive's recommendation for a regional I&I control program.

The study included: defining levels of I&I for each local agency tributary to the regional system through an extensive flow monitoring and modeling program; constructing 10 pilot projects in 12 local agency jurisdictions to demonstrate the effectiveness of collection system rehabilitation projects and to test various technologies and gain cost information; developing model standards, procedures, policies, and guidelines for use by local agencies to reduce I&I in their systems; performing a cost-benefit analysis to determine the cost-effectiveness of I&I reduction; developing a long-term regional I&I control plan; working with the local sewer agencies to conduct an I&I reduction feasibility analysis; and performing several I&I reduction projects.

As the focus of these studies and analyses were on reduction of peak flows to minimize combined sewer overflows, it is uncertain whether this I&I reduction program and these modifications to the collection system would address arsenic levels (there are a number of modifications that can correct I&I issues that would not necessarily reduce arsenic concentrations). If groundwater infiltration is causing the high arsenic effluent levels, the facility may have to implement modifications to the existing I&I reduction program for compliance with the baseline scenario criteria.

Due to the fact that ambient receiving water concentrations exceed the baseline human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $426,000, with minimal costs associated with renewal. If the arsenic effluent levels are the result of infiltration of arsenic-contaminated groundwater, total costs could be $10,600,000 for a comprehensive I&I reduction program that includes source identification and pipe rehabilitation for a system with 145 miles[24] of sewer pipes (approximately $1,000,000 per year annualized at 7% over 20 years). Note that if groundwater infiltration is not the only source of arsenic to the treatment plant, an I&I reduction program alone may not be sufficient for compliance and the discharger would not likely undertake such a program for compliance with toxic criteria alone.

A.2.5 Policy Scenario

Exhibit A-6 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-2 and available ambient data in Exhibit A-3, there is reasonable potential to exceed the proposed human health criteria for arsenic.

Exhibit A-6. Human Health Reasonable Potential Analysis for King County South WWTP – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.364	1.364	0.0059

1. See effluent concentrations in Exhibit A-2 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-3.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 428.
3. Consumption of organisms only.

Exhibit A-7 summarizes the calculated permit limits for arsenic under the policy scenario.

24 Estimated based on information from the King County Long Term Control Plan, which indicated "over 350 miles" of service lines in the basin, pro-rated for each plants sub-basin based on the plant's share of the total flow capacity (41% for King County South).

Exhibit A-7. Human Health Based Effluent Limitations for King County South WWTP – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.0069
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.0069 µg/L. Under the baseline scenario, the projected effluent limitations are below the analytical quantitation level (QL) and EPA estimated that the discharger would incur costs for I&I control as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.3 King County West Point WWTP and CSO System

King County provides wholesale wastewater treatment services to 17 cities, 16 local sewer utilities, and one Indian tribe. The King County West Point WWTP and Combined Sewer Overflow (CSO) System (NPDES permit WA0029181) provides coverage for King County's West Point WWTP, four CSO treatment facilities (Alki, Carkeek, Elliott West, and Henderson/MLK), and 38 CSO outfalls. The WWTP discharges to the Puget Sound, and the CSO treatment plants discharge to the Puget Sound, Elliot Bay, and Duwamish Waterway. Average annual WWTP flow is 95 mgd.

A.3.1 Treatment Processes

The 2014 permit fact sheet for the facility indicates that the West Point WWTP treats domestic, commercial, and industrial wastewater and CSO stormwater from the greater Seattle area using a high rate oxygenated activated sludge biological treatment process with chlorine disinfection before discharging the treated effluent to central Puget Sound. The Alki, Carkeek, Denny/Elliott West, and Henderson/MLK CSO treatment plants have primary treatment with disinfection.

A.3.2 Effluent Data

Exhibit A-8 summarizes effluent monitoring data for the WWTP from the permit fact sheet, which reports detected concentrations only for the pollutants of concern.

Exhibit A-8. Summary of Effluent Data (2009-2013): King County West Point WWTP

Pollutant	Number of Observations	Effluent Concentration (µg/L)[1]			
		Minimum	Median	95th Percentile	Maximum
1,4-Dichlorobenzene	9	1.0		10.2	10.2
2,4-Dichlorophenol	9	0.12		0.96	0.96
2,4-Dimethylphenol	9	0.24		0.48	0.48

Exhibit A-8. Summary of Effluent Data (2009-2013): King County West Point WWTP

Pollutant	Number of Observations	Effluent Concentration (µg/L)[1]			
		Minimum	Median	95th Percentile	Maximum
Antimony	15	0.30	0.44		0.63
Arsenic	15	0.27		2.196	2.28
Bis(2-ethylhexyl) phthalate	9	0.41		7.332	10.20
Chloroform	9	1.00		5.68	5.68
Copper	15	0.40		16.3	16.3
Cyanide	15	5.0			6.0
Diethyl phthalate	9	0.120		0.85	0.85
Mercury	21	0.002	0.005	0.0155	0.016
Methylene chloride	9	5.0		5.3	5.3
Nickel	23	0.1	2.81	5.999	6.5
Phenol	9	40		0.95	90
Pyrene	9	0.071		0.29	0.290
Selenium	15	0.50	0.5	0.74	1.30
Thallium	15	0.040	0.050		0.130
Toluene	9	1.0		1.1	1.1
Zinc	23	10.7		50.78	54.2

Source: Summarized data from 2014 Fact Sheet, Table 15 and Appendix F.
1. Metal concentrations are total recoverable form.

A.3.3 Receiving Water

Exhibit A-9 summarizes the available ambient receiving water concentrations based on data from the 2014 Fact Sheet for the permit and King County Department of Natural Resources (2013).

Exhibit A-9. Ambient Receiving Water Concentrations: Puget Sound

Pollutant	Water Column Concentration (µg/L)[1]				
	Minimum	Median	Mean	90th Percentile	Maximum
Arsenic	1.15	1.33	1.29	1.36	1.43
Copper	0.234	0.308	0.322	0.41	0.617
Mercury	nd	nd	nd	nd	nd
Nickel	0.387	0.407	0.408	0.437	0.443
Zinc	0.170	0.417	0.438	0.685	0.694

Exhibit A-9. Ambient Receiving Water Concentrations: Puget Sound

Pollutant	Water Column Concentration (µg/L)[1]				
	Minimum	Median	Mean	90th Percentile	Maximum
nd = nondetect Source: King County Department of Natural Resources (2013; Table 3-2) and 2014 Fact Sheet (for 90th percentile values only); based on 12 samples (9 with detectable concentrations of total mercury). 1. Metal concentrations are dissolved.					

A.3.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[25] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-10 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-8 and available ambient data in Exhibit A-9, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-10. Human Health Reasonable Potential Analysis for King County West Point WWTP – Baseline Scenario[1]

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.27	1.33	1.33	0.14
1. See effluent concentrations in Exhibit A-8 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-9. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 324. 3. Consumption of organisms only.				

Exhibit A-11 summarizes the calculated permit limits for arsenic under the baseline scenario.

[25] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Exhibit A-11. Human Health Based Effluent Limitations for King County West Point WWTP – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.14	0.28
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the baseline scenario, the discharger would have to meet an AM) of 0.14 µg/L and a MDL of 0.28 µg/L. Since the average effluent concentration is not listed in the fact sheet and the maximum effluent concentration is 2.28 µg/L, which is greater than the projected baseline permit limitations, the discharger will need to reduce arsenic in its effluent to ensure that permit limitations are consistently met.

Arsenic and arsenic-containing chemicals are not used in wastewater treatment. However, the facility has a large industrial base and regulates 48 industrial users of which 27 are significant industrial users and 39 are categorical industrial users (i.e., users subject to EPA's national pretreatment standards), including 16 in the electroplating and metal finishing categories. West Point receives an estimated daily flow of 9.6 MGD from these industrial users. Thus, a source control program that targets or imposes more stringent limits on the most likely indirect industrial dischargers of arsenic to the plant could reduce arsenic concentrations to the necessary levels. Costs for such a program would depend on the number of arsenic sources and the measures that could be implemented at those sources to reduce arsenic. However, without more detailed information on these industrial users and King County's pretreatment program (e.g., flows and arsenic concentrations for each industrial user, local limits for arsenic, ordinances), it is not possible to estimate pretreatment or P2 costs to indirect dischargers.

Other potential sources of arsenic to the treatment plant are drinking water and groundwater infiltration. Details on the drinking water sources for the municipalities served by West Point, including whether these sources are surface water or groundwater and levels of arsenic in these sources, were not evaluated. The drinking water maximum contaminant level is 10 µg/L, which is higher than current wastewater effluent concentrations and human health criteria. EPA did not attempt to determine with any certainty whether drinking water is contributing to high arsenic levels in the wastewater effluent. However, if the facility determines that drinking water is the source of high arsenic values in the wastewater, it is likely that the facility would pursue a variance.

The fact sheet for the facility's 2014 permit indicates that King County created a Regional I&I Control Program in 1999 as part of the Regional Wastewater Services Plan (RWSP) to explore the feasibility of a regional I&I control program to reduce the amount of peak wet weather flow entering the County's wastewater conveyance. In response to the RWSP I&I Control Program policies, County staff, working in a consensus-based approach with the local sewer agencies, conducted a comprehensive 6-year, $41 million, I&I control study. The study began in 2000 and culminated with the County Executive's recommendation for a regional I&I control program.

The study included: defining levels of I&I for each local agency tributary to the regional system through an extensive flow monitoring and modeling program; constructing 10 pilot projects in 12 local agency jurisdictions to demonstrate the effectiveness of collection system rehabilitation projects and to test various technologies and gain cost information; developing model standards, procedures, policies, and guidelines for use by local agencies to reduce I&I in their systems; performing a cost-benefit analysis to determine the cost-effectiveness of I&I reduction; developing a long-term regional I&I control plan; working with the local sewer agencies to conduct an I&I reduction feasibility analysis; and performing several I&I reduction projects.

As the focus of these studies and analyses were on reduction of peak flows to minimize combined sewer overflows, it is uncertain whether this I&I reduction program and these modifications to the collection system would address arsenic levels (there are a number of modifications that can correct I&I issues that would not necessarily reduce arsenic concentrations). If groundwater infiltration is causing the high arsenic effluent levels, the facility may have to implement modifications to the existing I&I reduction program for compliance with the baseline scenario criteria.

Due to the fact that ambient receiving water concentrations exceed the baseline human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $426,000, with minimal costs associated with renewal. If the arsenic effluent levels are the result of infiltration of arsenic-contaminated groundwater, total costs could be $11,650,000 for a comprehensive I&I reduction program that includes source identification and pipe rehabilitation for a system with 165 miles[26] of sewer pipes (approximately $1,100,000 per year annualized at 7% over 20 years). Note that if groundwater infiltration is not the only source of arsenic to the treatment plant, an I&I reduction program alone may not be sufficient for compliance and the discharger would not likely undertake such a program for compliance with toxic criteria alone.

A.3.5 Policy Scenario

Exhibit A-12 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-8 and available ambient data in Exhibit A-9, there is reasonable potential to exceed the proposed human health criteria for arsenic.

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26 Estimated based on information from the King County LTCP, which indicated "over 350 miles" of service lines in the basin, pro-rated for each plants' sub-basin based on the plant's share of the total flow capacity (47% for King County West Point).

Exhibit A-12. Human Health Reasonable Potential Analysis for King County West Point WWTP – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.33	1.33	0.0059
1. See effluent concentrations in Exhibit A-8 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-9. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 324. 3. Consumption of organisms only.				

Exhibit A-13 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-13. Human Health Based Effluent Limitations for King County West Point WWTP – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.012
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.012 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for I&I control as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.4 Pasco Wastewater Treatment Works

The Pasco Wastewater Treatment Works (NPDES permit WA0044962) provides wastewater treatment to 43,500 people in the City of Pasco and two permitted industrial users (Easterday Farms Produce Company and A1 Quality Services, a truck washing facility). The Wastewater Treatment Works discharges an annual average flow of 4.5 mgd to the Lake Wallula reach of the Columbia River.

A.4.1 Treatment Processes

The 2014 permit limits evaluation indicates that treatment processes include headworks with traveling screens, grit removal, primary clarifiers, a trickling filter, an intermediate clarifier, aeration basins, and secondary clarifiers followed by disinfection.

A.4.2 Effluent Data

Exhibit A-14 summarizes available effluent monitoring data for the Wastewater Treatment Works from 2012 through 2014.

Exhibit A-14. Summary of Effluent Data (2012-2014): Pasco Wastewater Treatment Works

Pollutant	Number of Observations	Effluent Concentration (µg/L)[1]			
		Median	Average	95th Percentile	Maximum
Arsenic	3	1.0	1.5	2.35	2.5
Chloroform	6		1.65		1.94
Copper	15	40.7	42.013	53.57	54.9
Cyanide	15	10	10	10	10
Mercury	27		0.0004		0.012
Methylene chloride	2		0.72		0.76
Phenol	2		0.77		0.87
Selenium	3	3	5.3	9.21	9.9
Zinc	3	42.1	54.167	74.68	78.3

Source: Discharge monitoring reports for 2012 through 2014 (for arsenic, copper, cyanide, selenium, and zinc), a 2014 permit application (for chloroform and mercury), and a 2014 permit limit evaluation (for methylene chloride and phenol).
1. Metal concentrations are in total recoverable form.

A.4.3 Receiving Water

Exhibit A-15 summarizes the available ambient receiving water concentrations based on data from Ecology's Environmental Information Management System between 2004 and 2014.

Exhibit A-15. Ambient Receiving Water Concentrations: Columbia River

Pollutant	Water Column Concentration (µg/L)	
	90th Percentile	Average
Arsenic	0.77	0.6175
Copper	1.1	0.677
Mercury	0.002	0.002
Nickel	0.71	0.6183
Zinc	6.2	3.77

Source: Washington State Department of Ecology Environmental Information Management System, 2004 to 2014 data for station 36A070.

A.4.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[27] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-16 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-14 and available ambient data in Exhibit A-15, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-16. Human Health Reasonable Potential Analysis for Pasco Wastewater Treatment Works – Baseline Scenario[1]

Parameter	Effluent Conc. (µg/L)	Ambient Conc. (µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.35	0.6175	0.6178	0.018
1. See effluent concentrations in Exhibit A-14 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the median) and available ambient concentrations in Exhibit A-15. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 8477 for carcinogens and 3077 for non-carcinogens. 3. Consumption of water and organisms.				

Exhibit A-17 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-17. Human Health Based Effluent Limitations for Pasco Wastewater Treatment Works– Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.018	0.036
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the baseline scenario, the discharger would have to meet an AML of 0.018 µg/L and a MDL of 0.036 µg/L. Since the average effluent concentration is 1.5 µg/L and the maximum effluent concentration is 2.5 µg/L, which are greater than the projected baseline permit limitations, the discharger will need to reduce arsenic in its effluent to ensure that permit limitations are consistently met.

Arsenic and arsenic-containing chemicals are not used in wastewater treatment and the facility has only two permitted industrial users, one of which is a produce company. If the produce is treated with arsenic-containing pesticides, then any wash water from the

27 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

packaging operations could contribute to the high effluent arsenic levels. Thus, a source control program that targets the most likely indirect industrial dischargers of arsenic to the plant could reduce arsenic concentrations to the necessary levels. Costs for such a program would depend on the number of arsenic sources and the measures that could be implemented at those sources to reduce arsenic. Without specific information on the types of industrial dischargers that may need controls, it is not possible to estimate pretreatment or P2 costs to indirect dischargers.

Other potential sources of arsenic to the treatment plant include drinking water and groundwater infiltration. Details on the drinking water source(s) for the City of Pasco, including whether these sources are surface water or groundwater and levels of arsenic in these sources, were not evaluated. The drinking water maximum contaminant level is 10 µg/L, which is higher than current wastewater effluent concentrations and human health criteria. EPA did not attempt to determine with any certainty whether drinking water is contributing to high arsenic levels in the wastewater effluent. However, if the facility determines that drinking water is the source of high arsenic values in the wastewater, it is likely that the facility would pursue a variance.

The wastewater treatment plant exceeded 85% of the design maximum month in October, November and December 2008, likely due to infiltration. The City has been working on relining old sewer lines to prevent I&I. It is uncertain whether this I&I reduction program would address arsenic levels (there are a number of modifications that can correct I&I issues that would not necessarily reduce arsenic concentrations). If groundwater infiltration is causing the high arsenic effluent levels, the facility may have to implement modifications to the existing I&I reduction program for compliance with the baseline scenario criteria.

Due to the fact that ambient receiving water concentrations exceed the baseline human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal. If the arsenic effluent levels are the result of infiltration of arsenic-contaminated groundwater, total costs could be $16,200,000 for a comprehensive I&I reduction program that includes source identification and pipe rehabilitation for a system with 307 miles of sewer pipes (approximately $1,530,000 per year annualized at 7% over 20 years). Note that if groundwater infiltration is not the only source of arsenic to the treatment plant, an I&I reduction program alone may not be sufficient for compliance and the discharger would not likely undertake such a program for compliance with toxic criteria alone.

A.4.5 Policy Scenario

Exhibit A-18 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-14 and available ambient data in Exhibit A-15, there is reasonable potential to exceed the proposed human health criteria for arsenic.

Exhibit A-18. Human Health Reasonable Potential Analysis for Pasco Wastewater Treatment Works – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (µg/L)	Ambient Conc. (µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.018	0.6175	0.6178	0.0045

1. See effluent concentrations in Exhibit A-14 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the median) and available ambient concentrations in Exhibit A-15.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 8477 for carcinogens and 3077 for non-carcinogens.
3. Consumption of water and organisms.

Exhibit A-19 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-19. Human Health Based Effluent Limitations for Pasco Wastewater Treatment Works – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0045	0.0091

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the policy scenario, the discharger would have to meet an AML of 0.0045 µg/L and a MDL of 0.0091 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for I&I control as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.5 Puyallup WWTP

The City of Puyallup owns and operates a municipal WWTP (NPDES permit WA0037168) that provides primary and secondary treatment. The WWTP discharges an annual average flow of 4.07 mgd to the Puyallup River within the Puyallup Reservation. The EPA has authority to issue permits for the facility based on the Puyallup Tribe's WQS, pursuant to a memorandum of understanding among the EPA, the Puyallup Tribe, and Ecology.

A.5.1 Treatment Processes

The 2014 fact sheet for the permit states that the facility uses preliminary treatment consisting of fine screening for solids removal, and primary treatment includes clarification, sludge/grit centrifugal separation, and grit disposal. Secondary treatment consists of activated sludge, secondary clarification, and ultraviolet light disinfection.

A.5.2 Effluent Data

Exhibit A-20 summarizes available effluent monitoring data for the WWTP from 2012 through 2014.

Exhibit A-20. Summary of Effluent Data (2012-2014): Puyallup WWTP

Pollutant	Number of Observations	Effluent Concentration (µg/L)[1]			
		Median	Average	95th Percentile	Maximum
Copper	15	5.60	5.39	6.34	6.90
Mercury	15	0.00180	0.00183	0.00279	0.00300
Zinc	15	33.90	33.83	43.93	44.70

Source: Discharge monitoring reports for 2012 through 2014.
1. Metal concentrations are in total recoverable form.

A.5.3 Receiving Water

Exhibit A-21 summarizes the available ambient receiving water concentrations based on data from Ecology's Environmental Information Management System from 2009.

Exhibit A-21. Ambient Receiving Water Concentrations: Puyallup River

Pollutant	Water Column Concentration (µg/L)	
	90th Percentile	Average
Arsenic	0.90	0.62
Di(2-ethylhexyl) phthalate	0.07	0.07
Copper	11.60	3.36
Zinc	12.66	5.28

Source: Washington State Department of Ecology Environmental Information Management System, 2009 data for station PSTLA-RIV05.

A.5.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[28] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

28 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Based on effluent concentrations in Exhibit A-20 and available ambient data in Exhibit A-21, there is no reasonable potential to exceed the proposed human health criteria for pollutants for which effluent data are available (copper, mercury, and zinc). Thus, there are no permit limits or costs associated with the baseline scenario.[29]

A.5.5 Policy Scenario

Based on effluent concentrations in Exhibit A-20 and available ambient data in Exhibit A-21, there is no reasonable potential to exceed the proposed human health criteria for pollutants for which effluent data are available (copper, mercury, and zinc). Thus, there are no permit limits or costs associated with the policy scenario.

A.6 Redondo WWTP

The Lakehaven Utility District owns and operates the Redondo WWTP (NPDES permit WA0023451) which serves residential and commercial customers. The WWTP discharges an annual average flow of 2.8 mgd[30] to Puget Sound – Poverty Bay.

A.6.1 Treatment Processes

The 2013 fact sheet for the permit (Washington Department of Ecology, 2013a) indicates that the facility employs primary and secondary treatment consisting of screening, grit removal and comminution, primary clarification, biological treatment using plastic media trickling filters, secondary clarification, and ultraviolet disinfection (p. 8).

A.6.2 Effluent Data

Exhibit A-22 summarizes available effluent monitoring data for the WWTP from 2009 through 2012.

Exhibit A-22. Summary of Effluent Data (2009-2012): Redondo WWTP

Pollutant	Number of Observations			Detected Value (µg/L)[1]	
	Total	Nondetect	QL (µg/L)	Maximum	Average
1,1,2,2-Tetrachloroethane	3	3	1		
1,1,2-Trichloroethane	3	3	1		
1,1-Dichloroethylene	3	3	1		
1,2,4-Trichlorobenzene	3	3	0.29		
1,2-Dichloropropane	3	3	1		
1,2-Diphenylhydrazine	3	3	0.95		
1,2-Trans-dichloroethylene	3	3	1		

29 For all pollutants except arsenic, the aquatic life criteria are more stringent than human health criteria (as noted in the 2014 fact sheet, p. 31). The facility has water quality-based limits for copper; the average monthly limit is 8.5 µg/L and the maximum daily limit is 13.7 µg/L.

30 Based on average flow between 2008 and 2012, from the 2013 fact sheet for the permit, Appendix D.

Exhibit A-22. Summary of Effluent Data (2009-2012): Redondo WWTP

Pollutant	Number of Observations			Detected Value (µg/L)[1]	
	Total	Nondetect	QL (µg/L)	Maximum	Average
1,3-Dichlorobenzene	3	3	1		
1,4-Dichlorobenzene	3	3	1		
2,4,6-Trichlorophenol	3	3	1.9		
2,4-Dichlorophenol	3	3	0.4		
2,4-Dinitrotoluene	3	3	0.16		
2-Chloronaphthalene	3	3	0.24		
2-Chlorophenol	3	3	1		
3,3'-Dichlorobenzidine	3	3	0.48		
4,4'-DDD	3	3	0.024		
4,4'-DDE	3	3	0.024		
4,4'-DDT	3	3	0.024		
Acenaphthene	3	3	0.029		
Acrolein	3	3	5		
Acrylonitrile	3	3	5		
Aldrin	3	3	0.024		
alpha-BHC	3	3	0.024		
alpha-endosulfan	3	3	0.024		
Anthracene	3	3	0.29		
Antimony	3	3	0.3		
Arsenic	5			2.39	1.61
Benzene	3	3	1		
Benzidine	3	3	11		
Benzo(a) anthracene	3	3	0.29		
Benzo(a) pyrene	3	3	0.48		
beta-BHC	3	3	0.024		
beta-endosulfan	3	3	0.024		
Bis(2-chloroethyl) ether	3	3	0.29		
Bis(2-Ccloroisopropyl) ether	3	3	0.29		
Bis(2-ethylhexyl) phthalate	3			3.69	2.88
Bromoform	3	3	1		
Butylbenzyl Phthalate	3	2	0.29	0.76	0.39
Carbon Tetrachloride	3	3	1		
Chlorobenzene	3	3	1		
Chlorodibromomethane	3	3	1		

Exhibit A-22. Summary of Effluent Data (2009-2012): Redondo WWTP

Pollutant	Number of Observations			Detected Value (µg/L)[1]	
	Total	Nondetect	QL (µg/L)	Maximum	Average
Chloroform	3	3	1		
Chrysene	3	3	0.29		
Copper	5			68.7	42.1
Cyanide	3	3	5		
Dichlorobromomethane	3	3	1		
Dieldrin	3	3	0.024		
Diethyl Phthalate	3	3	0.48		
Dimethyl Phthalate	3	3	0.19		
Di-n-Butyl Phthalate	3	3	0.48		
Endosulfan Sulfate	3	3	0.024		
Endrin	3	3	0.024		
Endrin Aldehyde	3	3	0.024		
Ethylbenzene	3	3	1		
Fluoranthene	3	3	0.29		
Fluorene	3	3	0.29		
Heptachlor	3	3	0.024		
Heptachlor epoxide	3	3	0.024		
Hexachlorobenzene	3	3	0.29		
Hexachlorobutadiene	3	3	0.48		
Hexachlorocyclopentadiene	3	3	0.48		
Hexachloroethane	3	3	0.48		
Indeno(1,2,3-cd) pyrene	3	3	0.48		
Isophorone	3	3	0.48		
Mercury	5			0.0851	0.0341
Methyl Bromide	3	3	5		
Nickel	5			2.05	1.60
Nitrobenzene	3	3	0.48		
N-Nitrosodi-n-propylamine	3	3	0.48		
N-Nitrosodiphenylamine	3	3	0.48		
Pentachlorophenol (PCP)	3	3	0.48		
Phenol	3	3	1.9		
Pyrene	3	3	0.29		
Selenium	5			0.51	0.50
Tetrachloroethylene	3	3	1		

Exhibit A-22. Summary of Effluent Data (2009-2012): Redondo WWTP

Pollutant	Number of Observations			Detected Value (μg/L)[1]	
	Total	Nondetect	QL (μg/L)	Maximum	Average
Toluene	3	3	0.38		
Thallium	3	3	0.04		
Toxaphene	3	3	1		
Trichloroethylene	3	3	1		
Vinyl chloride	3	3	1		
Zinc	3			57.4	51.0

Source: 2013 Fact Sheet, Appendix D.
QL = quantitation level
1. Metal concentrations are in total recoverable form.

A.6.3 Receiving Water

Exhibit A-23 summarizes the available ambient receiving water concentrations in Puget Sound based on data from Ecology's Environmental Information Management System from 2011 to 2013.

Exhibit A-23. Ambient Receiving Water Concentrations (2011 to 2013): Puget Sound

Pollutant	Water Column Concentration (μg/L)1	
	90th Percentile	Average
Antimony	0.172	0.158625
Arsenic	1.45	1.36625
Copper	0.3545	0.299
Cyanide	nd	nd
Mercury	nd	nd
Nickel	0.4275	0.411125
Zinc	0.662	0.604167

nd=nondetect
Source: Environmental Information Management System data (NPDES receiving water characterization study).
1. Metal concentrations are dissolved form.

A.6.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a

WQBEL would have been included in the NPDES permit.[31] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-24 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-22 and available ambient data in Exhibit A-23, there is reasonable potential to exceed the baseline human health criterion for arsenic.

Exhibit A-24. Human Health Reasonable Potential Analysis for Redondo WWTP – Baseline Scenario[1]

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.39	1.3663	1.371	0.14

1. See effluent concentrations in Exhibit A-22 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-23.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 182.
3. Consumption of organisms only.

Exhibit A-25 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-25. Human Health Based Effluent Limitations for Redondo WWTP – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.14	0.28

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 0.14 µg/L and a MDL of 0.28 µg/L. Since the average effluent concentration is 1.61 µg/L and the maximum effluent concentration is 2.39 µg/L, which are greater than the projected baseline permit limitations, the discharger will need to reduce arsenic in its effluent to ensure that permit limitations are consistently met.

Arsenic and arsenic-containing chemicals are not used in wastewater treatment and the facility does not have any significant or categorical industrial users. However, drinking water and groundwater infiltration are two potential sources of arsenic to the treatment plant.

[31] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Details on the drinking water sources for the communities served by the Redondo WWTP, including whether these sources are surface water or groundwater and levels of arsenic in these sources, were not evaluated. The drinking water maximum contaminant level is 10 µg/L, which is higher than current wastewater effluent concentrations and human health criteria. EPA did not attempt to determine with any certainty whether drinking water is contributing to high arsenic levels in the wastewater effluent. However, if the facility determines that drinking water is the source of high arsenic values in the wastewater, it is likely that the facility would pursue a variance.

The fact sheet for the facility's 2013 permit indicates that the District completed a comprehensive wastewater system plan in 1999. A collection system analysis found that I&I is a significant problem at this plant, and it recommended various I&I and flow reduction programs. The District incorporated an I&I rehab program focusing on the Redondo basin areas. It is uncertain whether this I&I reduction program and these modifications to the collection system would address arsenic levels (there are a number of modifications that can correct I&I issues that would not necessarily reduce arsenic concentrations). If groundwater infiltration is causing the high arsenic effluent levels, the facility may have to modify or expand the existing I&I reduction program for compliance with the baseline scenario criteria.

Due to the fact that ambient receiving water concentrations exceed the baseline human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal. If the arsenic effluent levels are the result of infiltration of arsenic-contaminated groundwater, total costs could be $6,020,000 for a comprehensive I&I reduction program that includes source identification and pipe rehabilitation for a system with 114 miles of sewer pipes (approximately $568,000 per year annualized at 7% over 20 years). Note that if groundwater infiltration is not the only source of arsenic to the treatment plant, an I&I reduction program alone may not be sufficient for compliance and the discharger would not likely undertake such a program for compliance with toxic criteria alone.

A.6.5 Policy Scenario

Exhibit A-26 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-22 and available ambient data in Exhibit A-23, there is reasonable potential to exceed the proposed human health criterion for arsenic.

Exhibit A-26. Human Health Reasonable Potential Analysis for Redondo WWTP – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.3663	1.371	0.0059

Exhibit A-26. Human Health Reasonable Potential Analysis for Redondo WWTP – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
1. See effluent concentrations in Exhibit A-22 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-23. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 182. 3. Consumption of organisms only.				

Exhibit A-27 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-27. Human Health Based Effluent Limitations for Redondo WWTP – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.012
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.012 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for I&I control as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.7 Salmon Creek WWTP

The Salmon Creek WWTP (NPDES permit WA0022772), operated by the Southwest Suburban Sewer District (District), serves households and some commercial customers in King County. The facility does not serve any industrial customers. It has an average wet weather flow of 3.6 mgd.

A.7.1 Treatment Processes

According to a 2009 inspection report, treatment at the facility includes screening, grit removal, primary clarification, biological treatment, secondary clarification, and chlorine disinfection.

A.7.2 Effluent Data

Exhibit A-28 summarizes available effluent monitoring data for the WWTP from 2010 through 2012.

Exhibit A-28. Summary of Effluent Data (2010-2012): Salmon Creek WWTP

Pollutant	Number of Observations	Effluent Concentration (µg/L)1	
		Maximum	Average
Antimony	3	0.55	0.45
Arsenic	3	2.37	1.76
Bis(2-ethylhexyl) phthalate	3	1.5	
Copper	3	11.6	8.62
Nickel	3	2.3	1.87
Selenium	3	1.4	1.14
Thallium	3	0.017	0.017
Toluene	3	1.1	1.1
Zinc	3	44.2	37.7
Mercury	3	0.0074	0.0064

Source: 2012 priority pollutant monitoring report; bis(2-ethylhexyl) phthalate data are from 2013 fact sheet addendum.
1. Metal concentrations are in total recoverable form.

A.7.3 Receiving Water

The facility discharges to Puget Sound, which is designated as a Class AA receiving water in the vicinity of the outfall. Exhibit A-29 summarizes the available ambient receiving water concentrations in Puget Sound based on data from Ecology's Environmental Information Management System from 2011 to 2013.

Exhibit A-29. Ambient Receiving Water Concentrations (2011 to 2013): Puget Sound

Pollutant	Water Column Concentration (µg/L)[1]	
	90th Percentile	Average
Antimony	0.172	0.158625
Arsenic	1.45	1.36625
Copper	0.3545	0.299
Cyanide	nd	nd
Mercury	nd	nd
Nickel	0.4275	0.411125
Zinc	0.662	0.604167

nd=nondetect
Source: Environmental Information Management System data (NPDES receiving water characterization study).
1. Metal concentrations are dissolved form.

A.7.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[32] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-30 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-28 and available ambient data in Exhibit A-29, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-30. Human Health Reasonable Potential Analysis for Salmon Creek WWTP – Baseline Scenario[1]

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.37	1.3663	1.368	0.14

1. See effluent concentrations in Exhibit A-28 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-29.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1025.
3. Consumption of organisms only.

Exhibit A-31 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-31. Human Health Based Effluent Limitations for Salmon Creek WWTP – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.14	0.28

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 0.14 µg/L and a MDL of 0.28 µg/L. Since the average effluent concentration is 1.76 µg/L and the maximum effluent concentration is 2.37 µg/L, which are greater than the projected baseline permit limitations, the discharger will need to reduce arsenic in its effluent to ensure that permit limitations are consistently met.

[32] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Arsenic and arsenic-containing chemicals are not used in wastewater treatment and the facility does not have any significant or categorical industrial users. However, drinking water and groundwater infiltration are two potential sources of arsenic to the treatment plant.

Details on the drinking water sources for the communities served by the Salmon Creek WWTP, including whether these sources are surface water or groundwater and levels of arsenic in these sources, were not evaluated. The drinking water maximum contaminant level is 10 µg/L, which is higher than current wastewater effluent concentrations and human health criteria. EPA did not attempt to determine with any certainty whether drinking water is contributing to high arsenic levels in the wastewater effluent. However, if the facility determines that drinking water is the source of high arsenic values in the wastewater, it is likely that the facility would pursue a variance.

The fact sheet for the facility's 2003 permit indicates that the District had performed an evaluation of I&I attributed to direct storm runoff and that I&I flow for the Salmon Creek basin was 48%. The District obtained funds for a major rehabilitation program for the Salmon Creek basin and identified a list of collection system rehabilitation projects in its Comprehensive Sewer Plan to address I&I. It is uncertain whether this I&I reduction program and these modifications to the collection system would address arsenic levels (there are a number of modifications that can correct I&I issues that would not necessarily reduce arsenic concentrations). If groundwater infiltration is causing the high arsenic effluent levels, the facility may have to modify or expand its existing I&I reduction program for compliance with the baseline scenario limitations.

Due to the fact that ambient receiving water concentrations exceed the baseline human health criteria, the discharger may also pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal. If the arsenic effluent levels are the result of infiltration of arsenic-contaminated groundwater, total costs could be $6,810,000 for a comprehensive I&I reduction program that includes source identification and pipe rehabilitation for a system with 129 miles of sewer pipes (approximately $643,000 per year annualized at 7% over 20 years). Note that if groundwater infiltration is not the only source of arsenic to the treatment plant, an I&I reduction program alone may not be sufficient for compliance and the discharger would not likely undertake such a program for compliance with toxic criteria alone.

A.7.5 Policy Scenario

Exhibit A-32 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-30 and available ambient data in Exhibit A-31, there is reasonable potential to exceed the proposed human health arsenic criterion.

Exhibit A-32. Human Health Reasonable Potential Analysis for Salmon Creek WWTP – Policy Scenario[1]

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.3663	1.368	0.0059

1. See effluent concentrations in Exhibit A-28 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-29.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1025.
3. Consumption of organisms only.

Exhibit A-33 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-33. Human Health Based Effluent Limitations for Salmon Creek WWTP – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.012

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.012 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for I&I control as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.8 BP Cherry Point Refinery

The BP Cherry Point Refinery (NPDES permit number WA0022900) encompasses 740 acres in a rural area of Whatcom County. The facility's wastewater treatment plant treats process water, ballast water from tankers, tank water draws, and stormwater that falls in process areas of the site. The permit also authorizes treatment of wastewater from the Praxair, Inc. Ferndale facility and a proposed cogeneration facility. The facility discharges treated effluent into the Strait of Georgia. The facility's average flow is 3.87 million gallons per day (mgd).

A.8.1 Treatment Processes

The 2012 NPDES permit for the facility lists current treatment processes as four parallel oil/water separators, two induced gas floatation units, an equalization tank, a complete mix activated sludge unit, a secondary clarifier, and two clarification ponds.

A.8.2 Effluent Data

Exhibit A-34 summarizes the last three years of effluent data for the treated wastewater for the pollutants of concern for which data are available.

Exhibit A-34. Summary of Effluent Data (2012-2014): BP Cherry Point Refinery, Outfall

Parameter	Number of Observations			Summary of Detected Values (µg/L)		
	Total	Nondetect	QL (µg/L)	Maximum	Geometric Mean	Minimum
1,1,2,2-Tetrachloroethane	1	1	0.4			
1,1,2-Trichloroethane	1	1	0.4			
1,1-Dichloroethylene	1	1	0.4			
1,2,4-Trichlorobenzene	1	1	0.4			
1,2-Dichlorobenzene	1	1	0.4			
1,2-Dichloroethane	1	1	0.4			
1,2-Dichloropropane	1	1	0.4			
1,2-Diphenylhydrazine	1	1	0.4			
1,2-Trans-Dichloroethylene	1	1	0.4			
1,3-Dichlorobenzene	1	1	0.4			
1,3-Dichloropropene	1	1	0.4			
1,4-Dichlorobenzene	1	1	0.4			
2,3,7,8-TCDD (Dioxin)	1	1	0.0005			
2,4,6-Trichlorophenol	1	1	1			
2,4-Dichlorophenol	1	1	1			
2,4-Dimethylphenol	1	1	1			
2,4-Dinitrophenol	1	1	1			
2,4-Dinitrotoluene	1	1	0.4			
2-Chloronaphthalene	1	1	0.4			
2-Chlorophenol	1	1	1			
Acenaphthene	1	1	0.1			
Acrolein	1	1	2			
Acrylonitrile	1	1	2			
Anthracene	1	1	0.1			
Antimony	1	1	1			
Arsenic (total)	1			46	46	46
Benzene	1	1	0.4			
Benzidine	1	1	10			
Benzo(a) Anthracene	1	1	0.1			
Benzo(a) Pyrene	1	1	0.1			

Exhibit A-34. Summary of Effluent Data (2012-2014): BP Cherry Point Refinery, Outfall

Parameter	Number of Observations			Summary of Detected Values (µg/L)		
	Total	Nondetect	QL (µg/L)	Maximum	Geometric Mean	Minimum
Benzo(b) Fluoranthene	1	1	0.1			
Benzo(k) Fluoranthene	1	1	0.1			
Bis(2-Chloroethyl) Ether	1	1	0.4			
Bis(2-Chloroisopropyl) Ether	1	1	0.4			
Bis(2-Ethylhexyl) Phthalate	1	1	0.4			
Bromoform	1	1	0.4			
Butylbenzyl Phthalate	1	1	0.4			
Carbon Tetrachloride	1	1	0.4			
Chlorobenzene	1	1	0.4			
Chloroform	1	1	0.4			
Chrysene	1	1	0.1			
Copper (total)	1			10	10	10
Cyanide	1		5			
Dibenzo(a,h) Anthracene	1		1			
Dichlorobromomethane	1		0.4			
Diethyl Phthalate	1		0.4			
Dimethyl Phthalate	1		0.4			
Di-n-Butyl Phthalate	1		0.4			
Ethylbenzene	1		0.4			
Fluoranthene	1		0.1			
Fluorene	1		0.1			
Hexachlorobenzene	1	1	0.4			
Hexachlorobutadiene	1	1	0.4			
Hexachlorocyclopentadiene	1	1	0.4			
Hexachloroethane	1	1	0.4			
Indeno(1,2,3-cd) Pyrene	1	1	0.1			
Isophorone	1	1	0.4			
Methyl Bromide	1	1	0.4			
Methylene Chloride	1	1	0.4			
Nickel (total)	1			42	42	42
Nitrobenzene	1	1	0.4			
N-Nitrosodimethylamine	1	1	0.4			

Exhibit A-34. Summary of Effluent Data (2012-2014): BP Cherry Point Refinery, Outfall

Parameter	Number of Observations			Summary of Detected Values (µg/L)		
	Total	Nondetect	QL (µg/L)	Maximum	Geometric Mean	Minimum
N-Nitrosodi-n-Propylamine	1	1	0.4			
N-Nitrosodiphenylamine	1	1	0.4			
Pentachlorophenol (PCP)	1	1	1			
Phenol	1	1	1			
Pyrene	1	1	0.1			
Selenium (total)	1			83	83	83
Tetrachloroethylene	1	1	0.4			
Thallium (total)	1			0.5	0.5	0.5
Toluene	1	1	0.4			
Trichloroethylene	1	1	0.4			
Vinyl Chloride	1	1	0.4			
Zinc (total)	1			55	55	55
Mercury (total)	1			0.0114	0.0114	0.0114
Source: Based on discharge monitoring reports submitted to Washington Department of Ecology, 2012 to 2014. QL = Quantification limit						

A.8.3 Receiving Water

The Strait of Georgia has been categorized by Ecology as extraordinary marine receiving water with characteristic uses including fish, shellfish, clam, oyster, and mussel rearing, spawning, migration, and harvesting; wildlife habitat, primary contact recreation, sport fishing, commerce and navigation, boating, and aesthetic enjoyment. The Strait is also part of the Cherry Point Aquatic Reserve. The BP Cherry Point facility's NPDES permit contains requirements pursuant to the Cherry Point Reserve Plan. Further, the Strait of Georgia is on the 303(d) list for benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and chrysene concentrations in tissue (mussels) approximately 15 miles from the facility.

Exhibit A-35 summarizes the available ambient receiving water concentrations based on data from 1999 and 2005.

Exhibit A-35. Ambient Receiving Water Concentrations: Strait of Georgia

Parameter	Geometric Mean Concentration (dissolved; µg/L)
Copper	0.673
Mercury	0.001
Zinc	3.9
Source: reported in 2012 Fact Sheet for BP Cherry Point NPDES permit (Appendix I) from Ecology's reasonable potential analysis.	

A.8.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[33] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-36 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-34 and available ambient data in Exhibit A-35, there is reasonable potential to exceed human health criteria for arsenic

Exhibit A-36. Human Health Reasonable Potential Analysis for BP Cherry Point[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	46	NR	0.842	0.14

NR = not reported
1. See effluent concentrations in Exhibit A-34 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-35.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 136.
3. Consumption of organisms only.

Exhibit A-37 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-37. Human Health Based Effluent Limitations for BP Cherry Point – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	19	38

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 19 µg/L and a MDL of 38 µg/L. Arsenic was observed in the effluent at of 46 µg/L. Since the effluent monitoring data exceeds the applicable effluent limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are

33 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

End-of-pipe treatment technologies capable of controlling arsenic include options such as chemical precipitation, microfiltration, and reverse osmosis. Given the limited nature of the information available regarding the internal process operations at the facility, EPA has assumed the use of reverse osmosis for arsenic control. Reverse osmosis is capable of reliably controlling arsenic at levels below the limit of quantitation. Further, EPA has assumed that treatment of the entire plant flow will be necessary. This is a conservative assumption as it is possible that a detailed study of the facility's internal process operations would result in a more targeted treatment strategy—for instance, if only a single internal process flow was the source of the contamination, then only the contaminated stream would require treatment. EPA estimated a reverse osmosis treatment cost for a 3.87 mgd flow at $7,054,000 per year assuming an interest rate of 7 percent over 20 years.

A.8.5 Policy Scenario

Exhibit A-38 summarizes the RP analysis under the policy scenario. Based on effluent concentrations in Exhibit A-34 and available ambient data in Exhibit A-35, there is reasonable potential to exceed human health criteria for arsenic and mercury. However, ambient concentrations for mercury exceed the criteria.

Exhibit A-38. Human Health Reasonable Potential Analysis for BP Cherry Point[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit or Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	19	NR	0.842	0.0059
Mercury	0.0114	0.001	0.0012	0.00088

NR = not reported
1. See effluent concentrations in Exhibit A-34 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-35.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 136.
3. Consumption of organisms only.

Exhibit A-39 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-39. Human Health Based Effluent Limitations for BP Cherry Point – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.81	1.6
Mercury	0.00088	0.0018
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Arsenic

Under the policy scenario, the discharger would have to meet an AML of 0.81 µg/L and a MDL of 1.6µg/L. Under the baseline scenario, EPA estimated that the discharger would incur costs for end-of-pipe treatment using reverse osmosis which would likely result in an effluent quality performance at or near the limit of quantitation. However, if the facility has not yet achieved a level of performance which would result in immediate compliance with effluent limitations under the policy scenario, EPA has included costs associated with a P2 program which is likely to result in compliance.

Mercury

Under the policy scenario, the discharger would have to meet an AML of 0.00088 µg/L and a MDL of 0.0018 µg/L. The maximum effluent concentration is 0.0029 µg/L and the average effluent concentration is 0.0019 µg/L. Based on the available data, the discharger will likely need to reduce mercury in its effluent to ensure that permit limits are consistently met.

Because there are no proven end-of-pipe treatment technologies that can achieve low mercury levels (e.g., <10 ng/L) on a consistent basis, the facility would likely implement a P2 program for compliance with the projected effluent limits. Annual P2 program costs for this industrial facility are estimated to be approximately $28,000. To ensure compliance in case a P2 program would not be sufficient to meet the projected effluent limitations, EPA assumed that the facility would incur costs for a variance.

A.9 Cosmo Specialty Fibers

Cosmo Specialty Fibers (NPDES permit WA0000809) operates a paper mill that produces dissolving pulp of the acetate, viscose, and ether grades with a permitted capacity of 550 tons per day. Average flow is approximately 24 mgd,[34] and the facility discharges to Grays Harbor and Chehalis River.

[34] Based on discharge monitoring reports between 2012 and 2014; average monthly flow for Outfall 1 (discharging to Grays Harbor) is 18 mgd and average monthly flow for Outfall 2 (discharging to Chehalis River) is 6 mgd.

A.9.1 Treatment Processes

Primary treatment consists of an ash clarifier, a disco strainer, a Brinkley screen, and a sweet sewer settling basin. Secondary treatment consists of four aeration lagoons, two clarifiers, and disinfection. Wastewater is routed to a system of storage ponds and then discharged through Outfall 1. Stormwater, truck wash overflow, and filter plant backwash are discharged through Outfall 2.

A.9.2 Effluent Data

Exhibit A-40 summarizes 2012 to 2014 effluent monitoring data for the facility discharge monitoring reports for Outfall 1. Data are not available for Outfall 2.

Exhibit A-40. Summary of Effluent Data (2012-2014): Cosmo Specialty Fibers, Outfall 1

Pollutant	Number of Observations		Detected Values (µg/L)	
	Total	Nondetects	95th Percentile	Median
2,3,7,8-TCDD (dioxin)	14	13	0.000002	nd[1]
2,4,6-Tricholorophenol	32	32		
Chloroform	32	1	28.85	19.1
Pentachlorophenol (PCP)	32	32		

Source: Discharge monitoring reports, 2012 to 2014
nd = nondetect
1. Discharge monitoring report data notes various detection limits for dioxin, between 1 µg/L and 9.3 µg/L.

A.9.3 Receiving Water

The facility discharges to Grays Harbor (via Outfall 1), a Class B marine water, and Chehalis River (via Outfall 2), a Class A fresh water. Ambient data for these waters are not available.

A.9.4 Baseline Scenario

The NPDES permit for facility does not have WQBELs based on human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[35] Based on the effluent concentrations in Exhibit A-40, there is no reasonable potential to exceed criteria for the pollutants of concern. Therefore, there are no costs associated with achieving compliance with the baseline scenario.

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35 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

A.9.5 Policy Scenario

Based on the effluent concentrations in Exhibit A-40, there is no reasonable potential to exceed criteria for the pollutants of concern. Therefore, there are no costs associated with achieving compliance with the policy scenario.

A.10 Intalco Aluminum Corporation

Intalco Aluminum Corporation operates multiple wastewater treatment plants that combine and discharge to the Strait of Georgia. The facility produces primary aluminum metal from alumina ore using the Hall-Heroult reduction process. Wastewater associated with the industrial process includes contact and non-contact cooling water for metal casting and anode production, and wastewater generated from wet air pollution control systems. Additionally, the facility generates domestic wastewater, wastewater from steam cleaning operating systems, and some stormwater. Average flow is 3 mgd.

A.10.1 Treatment Processes

The 2014 permit fact sheet for the facility (p. 10) states that the facility treats wastewater from the casting process and from the wet scrubbers using primary treatment consisting of an 800 gallon receiving tank, a polymer addition system, two clarifiers, two filter feed pumps, a mud recycle tank, a vacuum pump, a vacuum filter drum, a recycle tank, a caustic addition system, and three recycle pumps. Secondary treatment includes an equalization tank and two treatment trains consisting of reaction tanks and flocculation tanks that feed into a clarifier.

Anode cooling water, which is contaminated with coke and pitch containing benzo(a)pyrene, is treated using a baffled settling chamber (fact sheet, p. 11).

Domestic sanitary wastewater treatment consists of inlet vault, lagoon system, outlet weir box, and ultraviolet disinfection (fact sheet, p. 11).

A.10.2 Effluent Data

Exhibit A-41 summarizes 2010 to 2013 effluent monitoring data for the facility from the permit fact sheet.

Exhibit A-41. Summary of Effluent Data (2010 to 2013): Intalco Aluminum Facility

Pollutant	Number of Observations	Maximum (µg/L)	Average (µg/L)
Acenaphthene	5	0.6	0.25
Anthracene	5	0.5	0.04
Antimony	9	17	3.6
Arsenic	5	50	27.4
Benzo(a) Anthracene	5	1.6	0.53
Benzo(a) Pyrene	5	1.9	0.75
Benzo(k) Fluoranthene	5	0.9	0.32
Copper	6	5.2	4.0

Exhibit A-41. Summary of Effluent Data (2010 to 2013): Intalco Aluminum Facility

Pollutant	Number of Observations	Maximum (µg/L)	Average (µg/L)
Cyanide	2	0.7	
Fluoranthene	5	3.3	1.09
Fluorene	5	0.2	0.07
Indeno(1,2,3-cd) Pyrene	5	1.6	0.37
Mercury	6	0.00354	0.0025
Methylene Chloride	2	0.59	0.3
Nickel	9	90	37
Phenol	2	25	
Polychlorinated Biphenyls (PCBs)[1]	36	nd	nd
Pyrene	5	2.8	0.92
Selenium	5	12	3
Thallium	5	1	0.17
Zinc	5	62	53

nd = nondetect
Source: 2014 Fact Sheet, Appendix E and Table 3.
1. Data for PCBs from Ecology's discharge monitoring reports; 36 observations below detection limits.

A.10.3 Receiving Water

Exhibit A-42 summarizes the available ambient receiving water concentrations based on data from the 2014 fact sheet for the permit.

Exhibit A-42. Ambient Receiving Water Concentrations: Strait of Georgia

Pollutant	Water Column Concentration (µg/L)	
	90^{th} Percentile	Average
Chrysene	0.47	NR
Copper (dissolved)	NR	0.47
Indeno(1,2,3-cd) Pyrene	0.012	NR
Mercury (dissolved)	NR	0.00065
Selenium	0.57	NR
Zinc (dissolved)	NR	0.57

Source: 2014 fact sheet for the permit; 90^{th} percentile values are from Appendix E (reasonable potential analysis); average values based on Table 2 (from 10 samples collected upstream from Intalco discharges in July and September 1999).
NR = not reported

A.10.4 Baseline Scenario

The facility does not have WQBELs based on human health criteria for the pollutants of concern.[36] In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[37] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-43 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-41 and available ambient data in Exhibit A-42, there is reasonable potential to exceed the baseline human health criteria for arsenic.

Exhibit A-43. Human Health Reasonable Potential Analysis for Intalco Aluminum[1] – Baseline Scenario

Parameter	Effluent Conc. (µg/L)	Ambient Conc. (µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	50.0	NR	0.6063	0.14
1. See effluent concentrations in Exhibit A-41 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-42. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 77 for carcinogens and 105 for non-carcinogens. 3. Consumption of organisms only.				

Exhibit A-44 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-44. Human Health Based Effluent Limitations for Intalco Aluminum – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	11	22
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Arsenic

Under the baseline scenario, the discharger would have to meet an AML of 11 µg/L and a MDL of 22 µg/L. Arsenic was observed in the effluent at a concentration of 50 µg/L. Since the effluent monitoring data exceed the applicable effluent limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits

[36] There are technology-based limits for benzo(a)pyrene, antimony, and nickel.

[37] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of noncompliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

End-of-pipe treatment technologies capable of controlling arsenic include options such as chemical precipitation, microfiltration, and reverse osmosis. Given the limited nature of the information available regarding the internal process operations at the facility, EPA has assumed the use of reverse osmosis for arsenic control. Reverse osmosis is capable of reliably controlling arsenic at levels below the limit of quantitation. Further, EPA has assumed that treatment of the entire plant flow will be necessary. This is a conservative assumption as it is possible that a detailed study of the facility's internal process operations would result in a more targeted treatment strategy—for instance, if only a single internal process flow was the source of the contamination, then only the contaminated stream would require treatment. EPA estimated a reverse osmosis treatment cost for a 3.0 mgd flow at $5,907,000 per year assuming an interest rate of 7 percent over 20 years.

A.10.5 Policy Scenario

Based on effluent concentrations in Exhibit A-41 and available ambient data in Exhibit A-42, there is reasonable potential to exceed human health criteria for the pollutants shown in Exhibit A-45.

Exhibit A-45. Human Health Reasonable Potential Analysis for Intalco Aluminum[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit (µg/L)	Ambient Conc. (µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	11.0	NR	0.6063	0.0059

1. See effluent concentrations in Exhibit A-41 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-42.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 77 for carcinogens and 105 for non-carcinogens.
3. Consumption of organisms only.

Exhibit A-46 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-46. Human Health Based Effluent Limitations for Intalco Aluminum – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.46	0.92

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the policy scenario, the discharger would have to meet an AML of 0.46 µg/L and a MDL of 0.92 µg/L. Under the baseline scenario, EPA assumed that end-of-pipe treatment (i.e., reverse osmosis) would be necessary to meet effluent limitations. Since reverse osmosis is capable of treating the effluent to levels below the QL on a regular basis and further treatment below the QL is infeasible, EPA estimated that the discharger would incur costs for a P2 program to assist in ensuring compliance.

A.11 Quincy Industrial Wastewater Treatment Facility

The City of Quincy owns an industrial wastewater treatment facility (NPDES permit number WA0021067) that treats process wastewater from a potato and vegetable processor (ConAgra Foods and Quincy Foods, respectively). The facility discharges to a U.S. Bureau of Reclamation wasteway.[38].Ecology has developed a proposed NPDES permit which contains requirements to develop a special study and reapplication to direct the discharge to a new location. The average flow is 1.5 mgd.

A.11.1 Treatment Processes

The fact sheet for the 2012 NPDES permit for the facility lists primary and secondary treatment processes consisting of primary settling, anaerobic digestion, sequencing batch reactors, disinfection, summer season cooling, and re-aeration.

A.11.2 Effluent Data

Effluent monitoring data for the pollutants of interest are not available for this facility. Ecology has determined that the discharge is not likely to contain any pollutants addressed by the proposed human health criteria.

A.11.3 Receiving Water

Quincy Industrial discharges treated process wastewater to the U.S. Bureau of Reclamation wasteway DW237. The wasteway joins with other wasteways and eventually discharges to Potholes Reservoir. The entire water system is part of the federal Columbia Basin Irrigation Project.

According to the 2012 fact sheet for the NPDES permit (p. 25), Potholes Reservoir, downstream of the discharge point, is impaired for dieldrin, 2,3,7,8-TCDD, 4-4-DDE, and PCB. Another downstream waterbody, Frenchman Hills Waterway, is impaired for temperature and pH. Ecology finds that the travel distance from the facility's discharge to these impairments is large and the influence of the discharge is negligible.

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[38] A wasteway drain is a manmade part of an irrigation project that receives excess water from irrigated lands and field underdrain systems. This wasteway system is part of the Columbia Basin Irrigation Project that brings water from the Columbia River to 500,000 acres in central Washington (2012 fact sheet, page 12).

A.11.4 Baseline Scenario

The NPDES permit for the facility does not have WQBELs based on human health criteria for the pollutants of concern. Due to the lack of available monitoring data, EPA could not evaluate reasonable potential and compliance costs for the facility under the baseline scenario.

A.11.5 Policy Scenario

Due to the lack of available monitoring data, EPA could not determine reasonable potential and estimate compliance costs under the policy scenario.

A.12 Steelscape Inc.

Steelscape, Inc., located in Kalama, Washington, is an industrial facility (NPDES permit WA0040851) for the cold rolling and coating of steel strip. The facility is composed of four primary production lines: Pickle Line, Cold Rolling Mill, Metallic (zinc) Coating Line, and Coil Paint Line.

A.12.1 Treatment Processes

The facility has two distinct wastewater treatment systems: one for treating "oily waste" from all process waters that are potentially contaminated with oil or grease, and the other for treating "metal waste." Domestic waste is treated by the Port of Kalama Municipal Wastewater Treatment System.

The oil waste system treats wastewater from the Cold Roll Mill, Metallic Coating, and Coil Paint lines, using collection and blending, oil water separation, holding systems, and feeding systems for hydrochloric acid, de-emulsifier, coagulant, and polymer.

The metal waste system treats waste streams from the Pickle line, Metallic Coating line, Coil Paint line, and other auxiliary waste water from the facility (e.g., demineralizer regenerant waste, cooling tower blowdowns, and clear effluent from the oily waste system). The metal wastewater is chemically reduced, neutralized, oxidized, coagulated, precipitated, clarified, filtered, and dewatered (2010 fact sheet for the permit, p. 7).

A.12.2 Effluent Data

Exhibit A-47 summarizes available effluent monitoring data for the facility for 2012 through 2014. Concentration-based effluent monitoring data were not available for the reasonable potential analysis.

Exhibit A-47. Summary of Effluent Data (2012 to 2014): Steelscape Inc.

Pollutant	Number of Observations	Quantified Values		
		Maximum	Average	Units
Arsenic (total)	32	7	1.34	kg/day
Copper (total)	32	0.004	0.0011	kg/day
Cyanide	32	0.004	0.00032	kg/day
Nickel (total)	32	0.005	0.0016	kg/day

Exhibit A-47. Summary of Effluent Data (2012 to 2014): Steelscape Inc.

Pollutant	Number of	Quantified Values		
Zinc (total)	32	0.024	0.0019	kg/day
Source: Based on discharge monitoring reports submitted to Ecology.				

A.12.3 Receiving Water

The facility discharges to the Columbia River through a submerged outfall that is shared with the Port of Kalama Municipal Wastewater Treatment Plant.

Exhibit A-48 summarizes the available ambient receiving water concentrations.

Exhibit A-48. Ambient Receiving Water Concentrations: Columbia River

Pollutant	Water Column Concentration (µg/L)	
	90^{th} Percentile	Geometric Mean
Arsenic (dissolved)	1.53	0.879
Copper (dissolved)	1.29	0.741
Nickel (dissolved)	0.842	0.4839
Zinc (dissolved)	2.76	1.5862
Source: 2010 Fact Sheet (Table 23).		

A.12.4 Baseline Scenario

The NPDES permit for the facility does not have WQBELs based on human health criteria for the pollutants of concern. Due to the lack of available concentration-based effluent monitoring data, EPA could not evaluate reasonable potential and compliance costs for the facility under the baseline scenario.

A.12.5 Policy Scenario

Due to the lack of available concentration-based effluent monitoring data, EPA could not determine reasonable potential and estimate compliance costs under the policy scenario.

A.13 Sonoco Products

Sonoco Products (NPDES permit WA0000884) is a recycled paperboard manufacturing facility in Sumner Washington, producing an average of 138 tons of paperboard per day from recycled materials (based on data between 2007 and 2012). The facility discharges to the White River. Average flow is 0.14 mgd.

A.13.1 Treatment Processes

The 2013 permit fact sheet indicates that the current treatment consists of primary clarification, activated sludge aeration, and secondary clarification.

A.13.2 Effluent Data

The fact sheet for the 2013 NPDES permit states that the effluent contains some heavy metals. Exhibit A-49 summarizes available effluent monitoring data for the facility from the 2013 permit fact sheet and a 2014 inspection report from Ecology.

Exhibit A-49. Summary of Effluent Data (2012-2014): Sonoco Products

Pollutant	Number of Observations	Concentration (total recoverable; µg/L)
Antimony	1	1.18
Arsenic	1	2.16
Copper1	12	5.56 -28.6
Mercury	1	0.007
Nickel	1	3.04
Selenium[2]	2	0.82 - 10
Thallium	1	nondetect
Zinc[3]	2	28.6 - 40
Source: 2013 fact sheet for the permit and 2014 inspection report. 1. The 2013 fact sheet reports a maximum copper concentration of 28.6 out of 12 samples; the 2014 inspection report has 5.56 ug/L. 2. The 2013 fact sheet reports a concentration of 10 ug/L for selenium; the 2014 inspection report has 0.82 ug/L. 3. The 2013 fact sheet reports a concentration of 40 ug/L for zinc; the 2014 inspection report has 28.6 ug/L.		

A.13.3 Receiving Water

The facility discharges to the White River, which has designated uses of salmonid spawning, rearing and migration, habitat, and primary contact recreation. Exhibit A-50 summarizes the available ambient receiving water concentrations based on data reported in the 2013 permit fact sheet.

Exhibit A-50. Ambient Receiving Water Concentrations: White River

Pollutant	Water Column Concentration (total recoverable; µg/L)
Copper	1.94
Zinc	1.91
Source: 2013 fact sheet for the permit (Table 2); average of 8 samples.	

A.13.4 Baseline Scenario

The NPDES permit for facility does not have WQBELs based on human health criteria for the pollutants of concern.[39] In this case, EPA performed a reasonable potential analysis for

[39] The facility has discharge limitations for selenium and copper; however, these limitations are based on aquatic life rather than human health. All organic toxics have technology-based limitations of nondetect.

each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[40] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-51 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-49 and available ambient data in Exhibit A-50, there is reasonable potential to exceed the human health arsenic criterion.

Exhibit A-51. Human Health Reasonable Potential Analysis for Sonoco Products[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.16	NR	0.0414	0.0045

NR = not reported
1. See effluent concentrations in Exhibit A-49 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-50.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 130.
3. Consumption of water and organisms.

Exhibit A-52 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-52. Human Health Based Effluent Limitations for Sonoco Products – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	2.3	4.7

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 2.3 µg/L and a MDL of 4.7 µg/L. Effluent arsenic was observed at an average concentration of 2.16 µg/L. Since the effluent monitoring data are less than the effluent limitations under the baseline scenario, EPA anticipates that immediate compliance with effluent limitations under the baseline scenario will be feasible, and that no compliance activities are necessary.

[40] Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

A.13.5 Policy Scenario

Exhibit A-53 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-49 and available ambient data in Exhibit A-50, there is reasonable potential to exceed the human health arsenic criterion.

Exhibit A-53. Human Health Reasonable Potential Analysis for Sonoco Products[1] – Policy Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.16	NR	0.0414	0.0045

NR = not reported
1. See effluent concentrations in Exhibit A-49 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-50.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 130.
3. Consumption of water and organisms.

Exhibit A-54 summarizes the calculated permit limits for arsenic under the policy scenario.

Exhibit A-54. Human Health Based Effluent Limitations for Sonoco Products – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.59	1.2

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the policy scenario, the discharger would have to meet an AML of 0.59 µg/L and a MDL of 1.2 µg/L. Effluent arsenic was observed at an average concentration of 2.16 µg/L. Since this value exceeds the applicable effluent limitations under the policy scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the policy scenario.

End-of-pipe treatment technologies capable of controlling arsenic include options such as chemical precipitation, microfiltration, and reverse osmosis. Given the limited nature of the information available regarding the internal process operations at the facility, EPA has assumed the use of reverse osmosis for arsenic control. Reverse osmosis is capable of reliably controlling arsenic at levels below the limit of quantitation. Further, EPA has assumed that treatment of the entire plant flow will be necessary. This is a conservative assumption as it is possible that a detailed study of the facility's internal process operations would result in a more targeted treatment strategy—for instance, if only a single internal process flow was the source of the contamination, then only the contaminated stream would require treatment. EPA estimated a reverse osmosis treatment cost for a 0.14 mgd flow at $2,136,000 per year assuming an interest rate of 7 percent over 20 years.

A.14 Tesoro Refining and Marketing LLC - Anacortes

Tesoro Refining and Marketing LLC operates a wastewater treatment plant (NPDES permit WA0000761) that discharges to Fidalgo Bay in northwestern Washington. The refinery processes crude oil from Alaska's Northern Slope, Canada, and the Bakken Shale Reserves of Montana and North Dakota. The wastewater treatment plant treats process water, sanitary wastewater, stormwater, and ballast water. The permit also authorizes the treatment of wastewater from an onsite crude railcar offloading facility. Average flow is 2.8 mgd.

During extremely heavy rainfall events, Tesoro may also discharge water from a retention pond that would consist almost entirely of stormwater, but may contain small amounts of oily wastewater. Tesoro has increased the volume of the retention pond and no discharges have occurred since December 1996.

A.14.1 Treatment Processes

The 2013 draft fact sheet for the permit states that the facility uses primary and secondary treatment for process wastewater and contaminated stormwater. This system consists of API oil/water separators, primary clarifiers, activated sludge units, secondary clarifiers, and holding ponds. Sanitary wastewater is treated with a septic tank and a neutralization pit.

A.14.2 Effluent Data

Exhibit A-55 summarizes the effluent data for the treated wastewater for the pollutants of concern for which data are available, based on Ecology's reasonable potential analysis (Appendix H in the 2013 draft permit fact sheet).

Exhibit A-55. Summary of Effluent Data: Tesoro Refinery, Outfall 1

Pollutant	Number of Observations		Quantification Limit (µg/L)	Summary of Detected Values (µg/L)[1]	
	Total	Nondetect		Maximum	Average
1,1-Dichloroethylene	4	4	0.2		
1,2-Dichlorobenzene	1	1	2		
1,2-Dichloroethane	4	4	0.1		
1,2-Dichloropropane	4	4	0.4		
1,2-Diphenylhydrazine	4	4	0.5		
1,3-Dichlorobenzene	1	1	2		
1,4-Dichlorobenzene	1	1	2		
2,4-Dichlorophenol	4	4	1		
2,4-Dimethylphenol	1	1	2		

Exhibit A-55. Summary of Effluent Data: Tesoro Refinery, Outfall 1

Pollutant	Number of Observations		Quantification Limit (µg/L)	Summary of Detected Values (µg/L)[1]	
	Total	Nondetect		Maximum	Average
2,4-Dinitrophenol	4	4	1		
2,4-Dinitrotoluene	4	4	0.1		
2-Chloronaphthalene	1	1	2		
3,3'-Dichlorobenzidine	1	1	2		
Anthracene	1	1	2		
Antimony	2			1.4	
Arsenic	1			5.33	5.33
Benzene	4			44.9	
Benzidine	1	1	2		
Benzo(a) anthracene	1	1	2		
Benzo(a) pyrene	1	1	2		
Benzo(b) Ffuoranthene	1	1	2		
Benzo(k) fluoranthene	1	1	2		
Bis(2-chloroethyl) ether	1	1	2		
Bis(2-ethylhexyl) phthalate	1	1	1		
Bromoform	4			0.6	
Butylbenzyl phthalate	1	1	2		
Carbon tetrachloride	4	4	0.4		
Chlordane	4	4	0.1		
Chlorobenzene	4	4	0.4		
Chlorodibromomethane	4			1.9	
Chloroform	4			13.7	
Chrysene	4	4	2		
Copper	4			7	5.01
Cyanide	4			15	7.0
Dibenzo(a,h) anthracene	1	1	2		
Dichlorobromomethane	1			2.4	
Diethyl phthalate	4			4	
Dimethyl phthalate	1	1	2		
Di-n-butyl phthalate	4	4	0.5		
Endosulfan sulfate	4	4	0.1		
Endrin	4	4	0.1		
Endrin aldehyde	4	4	0.1		

Exhibit A-55. Summary of Effluent Data: Tesoro Refinery, Outfall 1

Pollutant	Number of Observations		Quantification Limit (µg/L)	Summary of Detected Values (µg/L)[1]	
	Total	Nondetect		Maximum	Average
Ethylbenzene	4	4	0.4		
Fluoranthene	4	4	0.5		
Fluorene	4	4	0.5		
Hexachlorobutadiene	4	4	0.5		
Hexachlorocyclopentadiene	4	4	0.5		
Hexachloroethane	4	4	0.5		
Indeno(1,2,3-cd) pyrene	1	1	0.1		
Isophorone	4	4	0.5		
Mercury[2]	35			0.44	0.069
Methyl bromide	4	4	0.4		
Methylene chloride	4			0.6	
Nickel	4			7	5.33
Nitrobenzene	4	4	0.5		
N-Nitrosodimethylamine	1	1	0.2		
N-Nitrosodi-n-propylamine	1	1	0.2		
N-Nitrosodiphenylamine	1	1	0.2		
Pentachlorophenol (PCP)	4	4	0.5		
Phenol	52			2	0.009
Pyrene	4			0.8	
Selenium	4			21	
Tetrachloroethylene	4	4	0.6		
Thallium	4	4	1		
Toluene	4			8.2	
Toxaphene	4	4	0.5		
Trichloroethylene	4	4	0.4		
Vinyl chloride	4	4	0.4		
Zinc	4			66	66

Source: 2013 draft permit fact sheet (Appendix H and Table 2); based on the 2010 permit application and annual priority pollutant scans (years not specified).
1. Metal concentrations are total recoverable.
2. Data for mercury is from 2012 to 2014 discharge monitoring reports.

A.14.3 Receiving Water

Tesoro discharges to Fidalgo Bay, which Ecology has designated as an extraordinary marine receiving water. Exhibit A-56 summarizes the available ambient receiving water concentrations based on data in the permit fact sheet for 1998 through 2005.

Exhibit A-56. Ambient Receiving Water Concentrations: Fidalgo Bay[1]

Pollutant	Geometric Mean Concentration (µg/L)	Concentration at 90th Percentile Temperature (µg/L)
Arsenic	1.15	NR
Copper	0.512	0.673
Nickel	0.522	NR
Selenium	0.0713	NR
Zinc	1.26	3.9
Mercury	0.0007	0.001
Source: 2013 Draft Fact Sheet Table 3 and Appendix H (reasonable potential analysis). NR = not reported 1. Metal concentrations are dissolved.		

A.14.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[41] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-57 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-55 and available ambient data in Exhibit A-56, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-57. Human Health Reasonable Potential Analysis for Tesoro Facility[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	5.33	1.15	13.3	0.14

41 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Exhibit A-57. Human Health Reasonable Potential Analysis for Tesoro Facility[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
1. See effluent concentrations in Exhibit A-55 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-56. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using end-of-pipe limitations. 3. Consumption of organisms only.				

Exhibit A-58 summarizes the calculated permit limits for arsenic and mercury under the baseline scenario.

Exhibit A-58. Human Health Based Effluent Limitations for Tesoro Facility – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.14	0.28
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the baseline scenario, the discharger would have to meet an AML of 0.14 µg/L and a MDL of 0.28 µg/L. According to the draft 2013 Fact Sheet for the facility, arsenic was observed in the effluent with a long-term average concentration of 5.3 µg/L. Since this value exceeds the applicable effluent limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

Crude petroleum is an important source of metals at petroleum refining and processing facilities, including arsenic. Metals found in crude petroleum, and their concentrations, depend on the origin of the crude oil. Other sources include arsenic contaminated process equipment and other manufacturing inputs (i.e., spent catalyst). A P2 program that identifies likely sources of arsenic in the facility's waste stream can provide adequate levels of control through updated source control and P2 best management practices. Costs for designing and implementing a P2 program for arsenic is estimated to be $28,000 per year. However, if the facility determines that source water derived from ground water, surface waters, or drinking water is the source of high arsenic values in the wastewater, or if it is determined that control of arsenic in the discharge is infeasible (e.g., due to the economic impacts of controlling the pollutant) it is likely that the facility would pursue a variance.

Due to the fact that ambient receiving water concentrations exceed the proposed human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal.

A.14.5 Policy Scenario

Exhibit A-59 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-55 and available ambient data in Exhibit A-56, there is reasonable potential to exceed the human health arsenic and mercury criteria.

Exhibit A-59. Human Health Reasonable Potential Analysis for Tesoro Facility[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit or Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.15	13.3	0.0059
Mercury	0.44	0.0007	0.069	0.017
1. See effluent concentrations in Exhibit A-55 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-56. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 93 for arsenic and 91 for mercury. 3. Consumption of organisms only.				

Exhibit A-60 summarizes the calculated permit limits for arsenic and mercury under the policy scenario.

Exhibit A-60. Human Health Based Effluent Limitations for Tesoro Facility – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.012
Mercury	0.017	0.042
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Arsenic

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.12 µg/L. Under the policy scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for P2 as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

Mercury

Under the policy scenario, the discharger would have to meet an AML of 0.017 μg/L and a MDL of 0.042 μg/L. The average effluent concentration is 0.069 μg/L and the maximum effluent concentration is 0.44 μg/L. The average ambient mercury concentration is 0.0007 μg/L. Based on the available data, the discharger will likely need to reduce mercury in its effluent to ensure that permit limits are consistently met. Fidalgo Bay is not listed on the State's 303(d) list for mercury.

Because there are no proven end-of-pipe treatment technologies that can achieve low mercury levels (e.g., <10 ng/L) on a consistent basis, the facility would likely implement a P2 program for compliance with the projected effluent limits. Annual P2 program costs for this industrial facility are estimated to be approximately $28,000.

A.15 TransAlta Centralia Generating Station

The TransAlta Centralia Generating Station (NPDES permit WA0001546) is a coal-fired power plant with two 702.5 Megawatt turbine units as well as a 250 Megawatt natural gas power plant on the same site. The facility generates process wastewater, stormwater runoff, and sanitary effluent, as well as sanitary effluent from the adjacent TransAlta Centralia Mining facility. Average flow for the facility is 3.57 mgd.

A.15.1 Treatment Processes

The fact sheet for the facility's 2010 NPDES permit lists current treatment processes as an oil skimmer pond and two effluent detention ponds. Sanitary effluent from the facility, TransAlta Centralia Mining, and the Big Hanaford Project is treated using an activated sludge process.

A.15.2 Effluent Data

Exhibit A-61 summarizes the results of a 2008 priority pollutant scan, from the 2010 fact sheet for the permit (Appendix C).

Exhibit A-61. Summary of Effluent Data (2008): Transalta Centralia Generation, Outfall 1

Pollutant	Number of Observations		Quantitation Level (µg/L)	Detected Value (µg/L)[1]
	Total	Nondetect		
1,1,2,2-Tetrachloroethane	1	1	1	
1,1,2-Trichloroethane	1	1	1	
1,1-Dichloroethylene	1	1	1	
1,2,4-Trichlorobenzene	1	1	2.5	
1,2-Dichlorobenzene	1	1	2.5	
1,2-Dichloroethane	1	1	1	
1,2-Dichloropropane	1	1	1	
1,3-Dichlorobenzene	1	1	2.5	
1,4-Dichlorobenzene	1	1	2.5	

Exhibit A-61. Summary of Effluent Data (2008): Transalta Centralia Generation, Outfall 1

Pollutant	Number of Observations		Quantitation Level (µg/L)	Detected Value (µg/L)[1]
	Total	Nondetect		
2,4,6-Trichlorophenol	1	1	2.5	
2,4-Dichlorophenol	1	1	2.5	
2,4-Dinitrophenol	1	1	10	
2,4-Dinitrotoluene	1	1	2.5	
2-Chloronaphthalene	1	1	2.5	
2-Chlorophenol	1	1	2.5	
3,3'-Dichlorobenzidine	1	1	20	
4,4'-DDD	1	1	0.01	
4,4'-DDE	1	1	0.01	
4,4'-DDT	1	1	0.01	
Acenaphthene	1	1	1	
Acrolein	1	1	10	
Acrylonitrile	1	1	10	
Aldrin	1	1	0.01	
alpha-BHC	1	1	0.01	
Anthracene	1	1	1	
Antimony	1		0.21	2
Arsenic	1		0.24	5
Benzene	1	1	1	
Benzidine	1	1	20	
Benzo(a) anthracene	1	1	1	
Benzo(a) pyrene	1	1	1	
Benzo(k) fluoranthene	1	1	1	
beta-BHC	1	1	0.01	
Bis(2-chloroethyl) ether	1	1	2.5	
Bis(2-chloroisopropyl) ether	1	1	2.5	
Bis(2-ethylhexyl) phthalate	1	1	2.5	
Bromoform	1	1	1	
Butylbenzyl phthalate	1	1	2.5	
Carbon tetrachloride	1	1	1	
Chlorobenzene	1	1	1	
Chlorodibromomethane	1	1	1	
Chloroform	1	1	1	
Chrysene	1	1	1	

Exhibit A-61. Summary of Effluent Data (2008): Transalta Centralia Generation, Outfall 1

Pollutant	Number of Observations		Quantitation Level (µg/L)	Detected Value (µg/L)[1]
	Total	Nondetect		
Copper	1		0.18	2
Dibenzo(a,h) anthracene	1	1	1	
Dichlorobromomethane	1	1	1	
Dieldrin	1	1	0.01	
Diethyl phthalate	1	1	2.5	
Dimethyl phthalate	1	1	2.5	
Di-n-butyl phthalate	1	1	2.5	
Endosulfan sulfate	1	1	0.01	
Endrin	1	1	0.01	
Endrin aldehyde	1	1	0.01	
Ethylbenzene	1	1	1	
Fluoranthene	1	1	1	
Fluorene	1	1	1	
Heptachlor	1	1	0.01	
Heptachlor epoxide	1	1	0.01	
Hexachlorobenzene	1	1	2.5	
Hexachlorobutadiene	1	1	2.5	
Hexachlorocyclohexane (gamma-BHC; lindane)	1	1	0.01	
Hexachlorocyclopentadiene	1	1	2.5	
Hexachloroethane	1	1	2.5	
Indeno(1,2,3-cd) pyrene	1	1	1	
Isophorone	1	1	2.5	
Methyl bromide	1	1	1	
Methylene chloride	1	1	1	
Nickel	1		0.14	1
Nitrobenzene	1	1	2.5	
N-Nitrosodi-n-propylamine	1	1	2.5	
Pentachlorophenol (PCP)	1	1	10	
Phenol	1	1	2.5	
Polychlorinated biphenyls (PCBs)	1	1	0.1	
Pyrene	1	1	1	
Selenium[2]	1		0.39	3

Exhibit A-61. Summary of Effluent Data (2008): Transalta Centralia Generation, Outfall 1

Pollutant	Number of Observations		Quantitation Level (µg/L)	Detected Value (µg/L)[1]
	Total	Nondetect		
Tetrachloroethylene	1	1	1	
Thallium	1	1	0.28	
Toluene	1	1	1	
Toxaphene	1	1	1	
Trichloroethylene	1	1	1	
Vinyl chloride	1	1	1	
Zinc	1		0.33	1

Source: 2010 Fact Sheet, Appendix C.
1. Metal concentrations are total recoverable.
2. Appendix C, Table 2 lists the selenium detected value as 3 ug/L; however Ecology used a maximum value of 80 ug/L in the reasonable potential analysis (Appendix C Table 3).

A.15.3 Receiving Water

The facility discharges to Hanaford Creek. Ambient water quality data are not available for this receiving water.

A.15.4 Baseline Scenario

The NPDES permit for facility does not have WQBELs based on human health criteria for the pollutants of concern.[42] In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[43] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-62 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-61, there is reasonable potential to exceed human health criteria for arsenic.

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42 The facility has discharge limitations for selenium and copper; however, these limitations are based on aquatic life rather than human health criteria. All organic toxics have technology-based limitations of nondetect.

43 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Exhibit A-62. Human Health Reasonable Potential Analysis for Transalta Centralia Generation[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	5.0	NR	12.448	0.018

NR = not reported
1. See effluent concentrations in Exhibit A-61 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean).
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1.
3. Consumption of water and organisms.

Exhibit A-63 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-63. Human Health Based Effluent Limitations for Transalta Centralia Generation – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.018	0.036

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 0.018 µg/L and a MDL of 0.036 µg/L. Arsenic was observed in the effluent at of 5 µg/L. No ambient data are available and Hanaford Creek near the discharge is not listed on the State's 303(d) list as impaired for arsenic. Since the effluent monitoring data exceeds the applicable effluent limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

A P2 program is a possible pathway to achieve compliance with effluent limitations for arsenic. A P2 program that identifies likely sources of arsenic in the facility's waste stream can provide adequate levels of control through updated source control and P2 best management practices. Costs for designing and implementing a P2 program for arsenic is estimated to be $28,000 per year. However, if the facility determines that source water derived from ground water, surface waters, or drinking water is the source of high arsenic values in the wastewater, or if it is determined that control of arsenic in the discharge is infeasible (e.g., due to the economic impacts of controlling the pollutant) it is likely that the facility would pursue a variance.

Due to the fact that ambient receiving water concentrations exceed the proposed human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal.

A.15.5 Policy Scenario

Exhibit A-64 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-61, there is reasonable potential to exceed human health criteria for antimony, arsenic, and selenium.

Exhibit A-64. Human Health Reasonable Potential Analysis for Transalta Centralia Generation[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit or Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Antimony	2.0	NR	4.98	2.49
Arsenic	0.018	NR	12.448	0.0045
Selenium	80.0	NR	199.16	24.69

NR = not reported
1. See effluent concentrations in Exhibit A-61 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean).
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1.
3. Consumption of water and organisms.

Exhibit A-65 summarizes the calculated permit limits for antimony and arsenic under the policy scenario. For this analysis, EPA did not consider limitations for selenium further since under the policy scenario the discharger would face more stringent limitations established on the basis of aquatic life criteria.

Exhibit A-65. Human Health Based Effluent Limitations for Transalta Centralia Generation – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Antimony	2.5	5.0
Arsenic	0.0045	0.0091

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Antimony

Under the policy scenario, the discharger would have to meet an AML of 2.5 µg/L and a MDL of 5.0 µg/L. Based on the available effluent data, the facility will be capable of immediate compliance with antimony effluent limitations under the policy scenario.

Therefore, EPA estimates there will be no compliance cost associated with effluent limitations.

Arsenic

Under the policy scenario, the discharger would have to meet an AML of 0.0045 µg/L and a MDL of 0.0091 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for P2 as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.16 TransAlta Centralia Mining

TransAlta Centralia Mining (NPDES permit number WA0037338) mines and processes approximately 6 million tons of coal annually for use at the adjacent TransAlta Centralia Generating Station. The mine discharges stormwater overflow to Big Hanaford Creek and its tributaries. Average monthly flow is approximately 8 cubic feet per second (or 5 mgd).[44]

A.16.1 Treatment Processes

The 2011 NPDES permit fact sheet for the facility lists current treatment processes as sedimentation ponds, which are built as excavation progresses and abandoned as reclamation progresses. Discharges from the facility consist of stormwater overflows. Sanitary effluent from the facility is treated by the TransAlta Centralia Generating Station.

A.16.2 Effluent Data

Exhibit A-66 summarizes 2014 and 2015 effluent monitoring data for the mine.

Exhibit A-66. Summary of Effluent Data (2014 to 2015): Transalta Centralia Mining, Outfall[1]

Pollutant	Number of Observations	Water Column Concentrations (total recoverable; µg/L)			
		Median	Average	95th Percentile	Maximum
Arsenic	12	2.8	3.567	22.275	12.1
Mercury	3	0.00195	0.001907	0	0.00294
Source: discharge monitoring data submitted to Ecology.					

A.16.3 Receiving Water

The facility discharges to Big Hanaford Creek and several tributaries, which are designated as "Class A" receiving waters. Ambient water quality data are not available for this receiving water.

44 Based on 2012 to 2014 discharge monitoring reports submitted to Ecology.

A.16.4 Baseline Scenario

The permit does not include any water quality-based effluent limitations (WQBELs) based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[45] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-67 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-66, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-67. Human Health Reasonable Potential Analysis for Transalta Centralia Mining[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	2.8	NR	2.8	0.018

NR = not reported
1. See effluent concentrations in Exhibit A-66 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the median).
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1.
3. Consumption of water and organisms.

Exhibit A-68 summarizes the calculated permit limits for arsenic under the baseline scenario.

Exhibit A-68. Human Health Based Effluent Limitations for Transalta Centralia Mining – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.018	0.060

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the baseline scenario, the discharger would have to meet an AML of 0.018 µg/L and a MDL of 0.060 µg/L. Arsenic was observed in the effluent at of 2.8 µg/L. No ambient data are available and Hanaford Creek near the discharge is not listed on the State's 303(d) list as impaired for arsenic. Since the effluent monitoring data exceeds the applicable effluent

45 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

A P2 program is a possible pathway to achieve compliance with effluent limitations for arsenic. A P2 program that identifies likely sources of arsenic in the facility's waste stream can provide adequate levels of control through updated source control and P2 best management practices. Costs for designing and implementing a P2 program for arsenic is estimated to be $28,000 per year. However, if the facility determines that source water derived from ground water, surface waters, or drinking water is the source of high arsenic values in the wastewater, or if it is determined that control of arsenic in the discharge is infeasible (e.g., due to the economic impacts of controlling the pollutant) it is likely that the facility would pursue a variance.

Due to the fact that ambient receiving water concentrations exceed the proposed human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal.

A.16.5 Policy Scenario

Exhibit A-69 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-66, there is reasonable potential to exceed human health criteria for arsenic and mercury.

Exhibit A-69. Human Health Reasonable Potential Analysis for Transalta Centralia Mining[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit or Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.018	NR	2.8	0.0045
Mercury	0.0029	NR	0.0035	0.00088

NR = not reported
1. See effluent concentrations in Exhibit A-66 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the median).
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1.
3. Consumption of water and organisms.

Exhibit A-70 summarizes the calculated permit limits for arsenic and mercury under the policy scenario.

Exhibit A-70. Human Health Based Effluent Limitations for Transalta Centralia Mining – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.0045	0.015
Mercury	0.00088	0.0018
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Arsenic

Under the policy scenario, the discharger would have to meet an AML of 0.0045 µg/L and a MDL of 0.015 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for P2 as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

Mercury

Under the policy scenario, the discharger would have to meet an AML of 0.00088 µg/L and a MDL of 0.0018 µg/L. The maximum effluent concentration is 0.0029 µg/L and the average effluent concentration is 0.0019 µg/L. Based on the available data, the discharger will likely need to reduce mercury in its effluent to ensure that permit limits are consistently met.

Because there are no proven end-of-pipe treatment technologies that can achieve low mercury levels (e.g., <10 ng/L) on a consistent basis, the facility would likely implement a P2 program for compliance with the projected effluent limits. Annual P2 program costs for this industrial facility are estimated to be approximately $28,000. To ensure compliance in case a P2 program would not be sufficient to meet the projected effluent limitations, it is assumed that the facility would incur costs for a variance.

A.17 U.S. Oil & Refining Corporation

U.S. Oil and Refining Corporation (NPDES permit WA0001783) in Tacoma consists of an oil refinery, tank farm, and marine terminal. The facility encompasses 122 acres and has a daily throughput of 36,000 barrels per day (based on output between 2002 and 2006). The refinery separates crude oil into component parts and blends them into petroleum products including gasoline, jet fuel, diesel fuel, marine fuel, gas oils, and asphalts. The average wastewater flow for the maximum month is 0.62 mgd.

A.17.1 Treatment Processes

The 2008 permit fact sheet for the facility indicates that the facility employs primary and secondary treatment for process wastewater and contaminated stormwater before discharging to a City of Tacoma storm drain. Primary treatment includes an oil/water separator and an induced air flotation unit, and secondary treatment is an activated sludge biological unit and a clarifier. Sanitary waste from the facility is collected separately and treated by the City of Tacoma's municipal wastewater treatment plant.

A.17.2 Effluent Data

Exhibit A-71 summarizes effluent monitoring data for the facility from a 2014 monitoring report, which reports detected concentrations only for the pollutants of concern.[46] According to the 2008 NPDES permit fact sheet, monitoring data for organic toxics are not reported because all samples were below detection limits.

Exhibit A-71. Summary of Effluent Data (2013-2014): US Oil & Refining Facility[1]

Pollutant	Number of Observations	Average (µg/L)	Maximum (µg/L)
Antimony	2	0.47	0.54
Arsenic	2	6.5	8.6
Copper	2	0.58	0.6
Mercury	2	0.00245	0.0028
Nickel	2	1.295	1.4
Phenols	2	nd	nd
Selenium	2	3.08	3.56
Thallium	2	nd	0.02
Zinc	2	3.7	5.7

nd = nondetect
Source: 2014 Inspection Report (Table 1 and Table 2); includes one sample taken by Washington Department of Ecology (2014) and one sample submitted by the facility (2013).
1. Metal concentrations are in total recoverable.

A.17.3 Receiving Water

USOR discharges to the Lincoln Avenue Ditch, where it flows to the Blair Waterway which is a tidal inlet to Commencement Bay. The Blair Waterway is a Class B marine waterbody, with uses including industrial uses; fish migration; shellfish spawning, rearing and harvesting; wildlife habitat; secondary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce; and navigation.

Exhibit A-72 summarizes the available ambient receiving water concentrations from the 2008 permit fact sheet.

46 The NPDES permit requires an annual priority pollutant scan; however, these data are not available in Ecology's discharge monitoring report (DMR) online tool nor EPA's ICIS-NPDES database.

Exhibit A-72. Ambient Receiving Water Concentrations: Blair Waterway

Pollutant	Water Column Concentration (µg/L)
Arsenic (unfiltered)	1.3
Copper (dissolved)	0.81
Mercury (total recoverable)	0.0023
Zinc (dissolved)	3.7
Source: 2008 permit fact sheet (p. 21).	

A.17.4 Baseline Scenario

The permit does not include any WQBELs based on the existing human health criteria for the pollutants of concern. In this case, EPA performed a reasonable potential analysis for each pollutant based on the baseline (i.e., existing) human health criteria to confirm whether a WQBEL would have been included in the NPDES permit.[47] In cases of reasonable potential, EPA calculated a WQBEL using the existing human health criteria and evaluated compliance with this baseline WQBEL.

Exhibit A-73 summarizes the reasonable potential analysis under the baseline scenario. Based on effluent concentrations in Exhibit A-71 and available ambient data in Exhibit A-72, there is reasonable potential to exceed the baseline human health arsenic criterion.

Exhibit A-73. Human Health Reasonable Potential Analysis for U.S. Oil & Refining Facility[1] – Baseline Scenario

Parameter	Effluent Conc. (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	8.6	1.3	1.466	0.14
1. See effluent concentrations in Exhibit A-71 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-72. 2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 1025. 3. Consumption of organisms only.				

Exhibit A-74 summarizes the calculated permit limits for arsenic under the baseline scenario.

47 Based on 40 CFR 122.44(d)(1), were it not for the approaches and other policies used by Ecology. 40 CFR 122.44(d)(1) requires that effluent limitations must be established when a pollutant is discharged "…at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

Exhibit A-74. Human Health Based Effluent Limitations for U.S. Oil & Refining Facility – Baseline Scenario

Parameter	Average Monthly Effluent Limit (total; µg/L)[1]	Maximum Daily Effluent Limit (total; µg/L)[1]
Arsenic	0.14	0.28
1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.		

Under the baseline scenario, the discharger would have to meet an AML of 0.14 µg/L and a MDL of 0.28 µg/L. Arsenic was observed in the effluent at a concentration of 8.6 µg/L and in the ambient receiving water at a concentration of 1.3 µg/L. Blair Waterway near the discharge is not listed on the State's 303(d) list as impaired for arsenic, though ambient data used in the reasonable potential analysis does exceed criteria. Since the effluent monitoring data exceeds the applicable effluent limitations under the baseline scenario, the discharger will need to control arsenic in its effluent to ensure that permit limits are consistently met. It is possible that more recent or future monitoring data could provide evidence that the facility is in compliance with the projected effluent limits and no costs would be incurred for compliance. However, additional data could provide further evidence of non-compliance. Based on the available information, EPA assumes the discharger will need to reduce discharge concentrations for compliance with the baseline scenario.

A P2 program is a possible pathway to achieve compliance with effluent limitations for arsenic. A P2 program that identifies likely sources of arsenic in the facility's waste stream can provide adequate levels of control through updated source control and P2 best management practices. Costs for designing and implementing a P2 program for arsenic is estimated to be $28,000 per year. However, if the facility determines that source water derived from ground water, surface waters, or drinking water is the source of high arsenic values in the wastewater, or if it is determined that control of arsenic in the discharge is infeasible (e.g., due to the economic impacts of controlling the pollutant) it is likely that the facility would pursue a variance.

Due to the fact that ambient receiving water concentrations exceed the proposed human health criteria, the discharger may pursue obtaining a water quality standards variance. The one-time cost associated with pursuing a variance is estimated to be $180,000, with minimal costs associated with renewal.

A.17.5 Policy Scenario

Exhibit A-75 summarizes the reasonable potential analysis under the policy scenario. Based on effluent concentrations in Exhibit A-71 and available ambient data in Exhibit A-72, there is reasonable potential to exceed human health criteria for arsenic.

Exhibit A-75. Human Health Reasonable Potential Analysis for US Oil & Refining Facility[1] – Policy Scenario

Parameter	Baseline Average Monthly Effluent Limit (total; µg/L)	Ambient Conc. (dissolved; µg/L)	Conc. at Edge of Mixing Zone[2] (µg/L)	Human Health Criterion[3] (µg/L)
Arsenic	0.14	1.3	1.466	0.0059

NA = not available
1. See effluent concentrations in Exhibit A-71 (reasonable potential analysis uses the maximum or 95th percentile concentration if the number of observations is less than 10, and otherwise uses the geometric mean) and available ambient concentrations in Exhibit A-72.
2. Based on Washington Department of Ecology's Permit writer spreadsheet tool using a dilution factor of 71.
3. Consumption of organisms only.

Exhibit A-76 summarizes effluent limitations for arsenic applicable to the facility under the policy scenario.

Exhibit A-76. Human Health Based Effluent Limitations for US Oil & Refining Facility – Policy Scenario

Parameter	Average Monthly Effluent Limit (total; ug/L)[1]	Maximum Daily Effluent Limit (total; ug/L)[1]
Arsenic	0.0059	0.012

1. Based on Washington Department of Ecology's Permit writer spreadsheet tool.

Under the policy scenario, the discharger would have to meet an AML of 0.0059 µg/L and a MDL of 0.012 µg/L. Under the baseline scenario, where the projected effluent limitations are below the analytical QL, EPA estimated that the discharger would incur costs for P2 as well as pursuit of a variance in order to ensure compliance with effluent limitations below the QL. Since the projected effluent limitations under the policy scenario are also below the QL, no additional compliance strategy would be required under the policy scenario (i.e., the discharger would not pursue a second variance).

A.18 References and Sources

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Appendix B – Sample Facility Results and Statewide Extrapolation

This appendix provides a summary of the sample facility results (facility-specific details are provided in Appendix A), and shows the extrapolation of statewide costs for the baseline scenario and the policy scenario.

EPA annualized capital costs, including study (e.g., dilution, variance) and program (e.g., pollution prevention) costs over 20 years using a 7% discount rate to obtain total annual costs per facility, then calculated a minimum and maximum annual cost for each facility in the sample.

B.1 Baseline Scenario Extrapolation

Exhibit B-1 summarizes the estimated annual compliance costs for the sample facilities under the baseline scenario.

Exhibit B-1. Potential Total Annual Compliance Costs for Sample Facilities, Baseline Scenario

Facility Name	Permit Number	Category	Total Costs (2014$)[1]	
			Low	High
Certainty Sample				
King County West Point WWTP	WA0029181	POTW	$1,100,000	$1,140,211
King County South WWTP	WA0029581	POTW	$1,000,000	$1,040,211
BP Cherry Point Refinery	WA0022900	Chemicals, petroleum, and related industries	$7,053,698	$7,053,698
Random Sample				
Chambers Creek STP	WA0039624	POTW	$0	$0
Puyallup STP	WA0037168	POTW	$0	$0
Salmon Creek WWTP	WA0022772	POTW	$643,000	$659,991
Redondo WWTP	WA0023451	POTW	$568,000	$584,991
Pasco WWTP	WA0044962	POTW	$1,530,000	$1,546,991
Tesoro Refining & Marketing Company LLC	WA0000761	Chemicals, petroleum, and related industries	$28,000	$44,991
U.S. Oil & Refining Facility	WA0001783	Chemicals, petroleum, and related industries	$28,000	$44,991
Quincy Industrial	WA0021067	Food and kindred products	$0	$0

Exhibit B-1. Potential Total Annual Compliance Costs for Sample Facilities, Baseline Scenario

Facility Name	Permit Number	Category	Total Costs (2014$)[1]	
			Low	High
Transalta Centralia Mining	WA0037338	Mining	$28,000	$44,991
Cosmo Specialty Fibers, Inc.	WA0000809	Paper and allied products	$0	$0
Sonoco Products Company	WA0000884	Paper and allied products	$0	$0
Intalco Aluminum Corp Ferndale	WA0002950	Primary metal industries	$5,906,642	$5,906,642
Steelscape, Inc.	WA0040851	Primary metal industries	$0	$0
Transalta Centralia Generation	WA0001546	Transportation & public utilities (except POTWs)	$28,000	$44,991
1. Annual costs plus one-time costs annualized over 20 years using a 7% discount rate.				

Exhibit B-2 shows the extrapolation of the sample results to estimate statewide costs for major dischargers under the baseline scenario. For each category of facilities, EPA calculated a per-facility cost based on the sample, and applied that cost to all other facilities in that category statewide.

Exhibit B-2. Sample and Total Annual Compliance Costs (millions; 2014$) by Discharger Category, Baseline Scenario

Category	Major Dischargers		Sample Costs		Total Costs	
	Sample	Statewide	Low	High	Low	High
Certainty						
Municipal	2	2	$2.10	$2.18	$2.10	$2.18
Chemicals, Petroleum, and Related Industries	1	1	$7.05	$7.05	$7.05	$7.05
Random						
Municipal	5	46	$2.74	$2.79	$25.22	$25.69
Mining	1	1	$0.03	$0.04	$0.03	$0.04
Food and Kindred Products	1	1	$0.00	$0.00	$0.00	$0.00
Paper and Allied Products	2	12	$0.00	$0.00	$0.00	$0.00
Chemicals, Petroleum, and Related Industries	2	5	$0.06	$0.09	$0.14	$0.22
Primary Metal Industries	2	4	$5.91	$5.91	$11.81	$11.81

Exhibit B-2. Sample and Total Annual Compliance Costs (millions; 2014$) by Discharger Category, Baseline Scenario

Category	Major Dischargers		Sample Costs		Total Costs	
	Sample	Statewide	Low	High	Low	High
Transportation & Public Utilities (except POTWs)	1	1	$0.03	$0.04	$0.03	$0.04
Total						
All Dischargers	17	73	$17.91	$18.11	$46.38	$47.05
1. Annual costs plus one-time costs annualized over 20 years using a 7% discount rate.						

B.2 Policy Scenario Extrapolation

Exhibit B-3 summarizes the annual compliance costs for the sample facilities under the policy scenario.

Exhibit B-3. Potential Total Annual Compliance Costs for Sample Facilities, Policy Scenario

Facility Name	Permit Number	Category	Total Costs (2014$)[1]	
			Low	High
Certainty Sample				
King County West Point WWTP	WA0029181	POTW	$0	$0
King County South WWTP	WA0029581	POTW	$0	$0
BP Cherry Point Refinery	WA0022900	Chemicals, petroleum, and related industries	$56,000	$72,991
Random Sample				
Chambers Creek STP	WA0039624	POTW	$0	$0
Puyallup STP	WA0037168	POTW	$0	$0
Salmon Creek WWTP	WA0022772	POTW	$0	$0
Redondo WWTP	WA0023451	POTW	$0	$0
Pasco WWTP	WA0044962	POTW	$0	$0
Tesoro Refining & Marketing Company LLC	WA0000761	Chemicals, petroleum, and related industries	$28,000	$28,000
U.S. Oil & Refining Facility	WA0001783	Chemicals, petroleum, and related industries	$0	$0
Quincy Industrial	WA0021067	Food and kindred products	$0	$0
Transalta Centralia Mining	WA0037338	Mining	$28,000	$44,991
Cosmo Specialty Fibers, Inc.	WA0000809	Paper and allied products	$0	$0

Exhibit B-3. Potential Total Annual Compliance Costs for Sample Facilities, Policy Scenario

Facility Name	Permit Number	Category	Total Costs (2014$)[1]	
			Low	High
Sonoco Products Company	WA0000884	Paper and allied products	$2,135,858	$2,135,858
Intalco Aluminum Corp Ferndale	WA0002950	Primary metal industries	$28,000	$28,000
Steelscape, Inc.	WA0040851	Primary metal industries	$0	$0
Transalta Centralia Generation	WA0001546	Transportation & public utilities (except POTWs)	$0	$0

1. Annual costs plus one-time costs annualized over 20 years using a 7% discount rate.

Exhibit B-4 shows the extrapolation of the sample results to estimate statewide costs for major dischargers. For each category of facilities, EPA calculated a per-facility cost based on the sample, then applied that cost to all other facilities in that category statewide.

Exhibit B-4. Sample and Total Annual Compliance Costs (millions; 2014$) by Discharger Category, Policy Scenario

Category	Major Dischargers		Sample Costs		Total Costs	
	Sample	Statewide	Low	High	Low	High
Certainty						
Municipal	2	2	$0.00	$0.00	$0.00	$0.00
Chemicals, Petroleum, and Related Industries	1	1	$0.06	$0.07	$0.06	$0.07
Random						
Municipal	5	46	$0.00	$0.00	$0.00	$0.00
Mining	1	1	$0.03	$0.04	$0.03	$0.04
Food and Kindred Products	1	1	$0.00	$0.00	$0.00	$0.00
Paper and Allied Products	2	12	$2.14	$2.14	$12.82	$12.82
Chemicals, Petroleum, and Related Industries	2	5	$0.03	$0.03	$0.07	$0.07
Primary Metal Industries	2	4	$0.03	$0.03	$0.06	$0.06
Transportation & Public Utilities (except POTWs)	1	1	$0.00	$0.00	$0.00	$0.00
Total						
All Dischargers	17	73	$2.28	$2.31	$13.03	$13.06

1. Annual costs plus one-time costs annualized over 20 years using a 7% discount rate.