Appendix L

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Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits

Frequently Asked Questions (FAQs): Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits

While this document cites statutes and regulations that contain requirements applicable to water quality standards and National Pollutant Discharge Elimination System (NPDES) permitting, it does not impose legally binding requirements on the EPA, states, authorized Tribes, other regulatory authorities, or the regulated community and may not apply to a particular situation based upon the circumstances. The EPA, state, Tribal, and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those provided in this technical support document as appropriate and consistent with statutory and regulatory requirements. The EPA may update this document as new information becomes available. In addition to this document, the EPA has related documents that provide considerations and recommendations for implementing criteria based on the national Clean Water Act (CWA) section 304(a) recommended selenium criterion for freshwater, which are available at the EPA's selenium website: https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

Note: For applicable state or authorized Tribal water quality standards that are not based on the national CWA section 304(a) recommended selenium criterion, the EPA will assess the need for alternative state or authorized Tribal specific implementation permitting guidance (i.e., state or Tribal implementation procedures) to ensure consistency with the NPDES permitting requirements at Title 40 of the Code of Federal Regulations (CFR) Part 122.

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List of Acronyms and Abbreviations

µg/L	Micrograms per liter
AML	Average monthly limit
BMP	Best management practice
BPJ	Best professional judgement
CFR	Code of Federal Regulations
CWA	Clean Water Act
FAQ	Frequently asked question
FT	Fish tissue
FTE	Fish tissue element
LTA	Long-term average
MDL	Maximum daily limit
mg/kg	milligrams per kilogram
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly owned treatment works
RP	Reasonable potential
TMDL	Total maximum daily load
TSD	Technical support document
USEPA	U.S. Environmental Protection Agency
WC	Water column
WCE	Water column element
WLA	Wasteload allocation
WQBELs	Water quality-based effluent limits
WQC	Water quality criterion
WQS	Water quality standard

Definitions[1]

Best Management Practice (BMP)
Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of *waters of the United States*. Best management practices also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgement (BPJ)
The method used by NPDES permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data (USEPA 2010).

Bioaccumulation
The uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, sediment) (USEPA 2003).

Chronic
A stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span or more. Chronic should be considered a relative term depending on the life span of an organism. The measurement of a chronic effect can be growth, reduced reproduction, etc., in addition to lethality (USEPA 1991).

Criteria
Per 40 CFR 131.3(b), criteria are elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.

Effluent
A wastewater treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall. Generally, refers to wastes discharged into surface waters.

Frequency
How often criteria can be exceeded without unacceptably affecting the community (USEPA 1991).

Lentic
Characterized by largely standing water, such as lakes and ponds (Jones 1997).

[1] This glossary is meant to provide plain language definitions for key terms used in this document. Individuals should consult the Clean Water Act and the EPA's implementing regulations to identify whether there are legal definitions of these terms.

Lotic
Characterized by flowing water, such as rivers and streams (Jones 1997).

Magnitude
How much of a pollutant (or pollutant parameter such as toxicity), expressed as a concentration or toxic unit is allowable (USEPA 1991).

Reasonable Potential (RP)
Where a pollutant may be discharged at a level that will cause, have the reasonable potential to cause, or contributes to an in-stream excursion above a water quality standard based on a number of factors including, as a minimum, the factors listed in 40 CFR 122.44(d)(1)(ii).

Steady-state
An organism is in steady-state when the rates of chemical uptake and depuration are equal and tissue concentrations remain constant over time (USEPA 2003). For the purposes of the national CWA section 304(a) recommended selenium criterion, steady-state refers to conditions where sufficient time has passed after the introduction of a new or increased input of selenium into a waterbody or watershed of a waterbody such that that fish tissue concentrations of selenium are no longer increasing (USEPA 2024b).

Total Maximum Daily Load (TMDL)
The sum of the individual wasteload allocations and load allocations. A margin-of-safety is included with the two types of allocations so that any additional loading, regardless of source, would not produce a violation of water quality standards (USEPA 1991).

Wasteload Allocation (WLA)
The portion of a receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution (USEPA 1991).

Water Quality Standard (WQS)
A law or regulation that consists of beneficial designated use or uses of a waterbody, the numeric and narrative water quality criteria that are necessary to protect the use or uses of that particular waterbody and an antidegradation policy (USEPA 1991).

Introduction

EPA's National CWA Section 304(a) Recommended Chronic Aquatic Life Selenium Criterion in Freshwater

In 2016, the U.S. Environmental Protection Agency updated its national Clean Water Act (CWA) section 304(a) recommended chronic aquatic life criterion for selenium in freshwater systems to reflect the latest scientific information and, in 2021, issued an erratum, *2021 Revision to: Final Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016,* USEPA, Office of Water, EPA 822-R-21-006, August 2021.[2] The EPA's national CWA section 304(a) recommended selenium criterion still reflects the latest science and the EPA is not aware of any updated scientific information that would change this recommendation. The latest scientific information indicates that selenium toxicity to aquatic life is driven by dietary exposures and that the reproductive life-stages of egg-laying vertebrates are the most sensitive to the toxic effects of selenium. The recommended criterion has four criterion elements: (1) a fish egg-ovary criterion element; (2) a fish whole-body and/or muscle criterion element; (3) a water column criterion element (one value for lentic and one value for lotic aquatic systems); and (4) a water column intermittent criterion element (to account for potential chronic effects from short-term exposures to high concentrations in lentic and lotic aquatic systems) (see Table 1). Under the EPA's 2016 national CWA section 304(a) recommended selenium criterion, the fish tissue criterion elements have primacy over water column elements, except where there are no fish, where fish tissue data are not adequate, or for waterbodies with new or increased discharges where selenium concentrations in fish tissue might not have stabilized and reached steady-state. The EPA also recommends that the egg-ovary tissue criterion element has primacy over whole-body and muscle tissue criterion elements.

Toxicity data indicate that the selenium concentration in fish eggs and ovaries is the most robust and consistent measurement endpoint directly tied to adverse reproductive effects in aquatic organisms. Toxicity to developing embryos and larvae is directly linked to egg selenium concentration (USEPA 2021). The EPA derived the whole-body, muscle tissue, and water column elements from the egg-ovary element so that states and authorized Tribes could more readily implement their water quality criteria based on the EPA's national CWA section 304(a) recommended selenium criterion. The assessment of the available data on chronic selenium exposure for fish, invertebrates, and amphibians indicates that a criterion element derived from fish is expected to be protective of the aquatic community in a waterbody, since other taxa appear to be less sensitive to selenium than fish. The EPA did not develop an acute criterion for selenium when it updated the chronic criterion. Although selenium may cause acute toxicity at

[2] In 2021, the EPA identified that the following text was missing from the second sentence in footnote 4 in the selenium criterion table: "When selenium inputs are increasing" and issued an erratum. The EPA corrected footnote 4 to state: "4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data." https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

high concentrations, the most deleterious effects on aquatic organisms are due to selenium's bioaccumulative properties.

In the case of bioaccumulative compounds like selenium, acute toxicity studies do not address risks that result from chronic exposure to chemicals via the diet (through the food web pathway). Such studies also do not account for the accumulation kinetics of many bioaccumulative compounds, such as selenium, and may underestimate effects from long-term accumulation in some types of aquatic systems. Therefore, since acute studies do not address the primary exposure pathway for organisms to selenium and because chronic toxicity occurs at lower concentrations, an acute criterion was not included in the national CWA section 304(a) recommended selenium criterion. As described in the EPA's *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (hereafter referred to as *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*), the EPA also included an intermittent exposure criterion element to provide protection from the most significant chronic effects of selenium toxicity, reproductive toxicity, by protecting against selenium bioaccumulation in the aquatic ecosystem resulting from short-term, high concentration exposure events (USEPA 2021).

The EPA recommends, as stated in the *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*, that states and authorized Tribes[3] adopt into their water quality standards (WQS) a selenium criterion that includes all four criterion elements (USEPA 2021). For more information see the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016,* which can be found at https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[3] Throughout this document and in the CWA, the term "states" means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands (CWA section 502(3)). The term "authorized Tribe" means those federally recognized Indian Tribes with authority to administer a CWA WQS program.

Table 1. Summary of the Recommended Freshwater Selenium Ambient Chronic Water Quality Criterion for Protection of Aquatic Life.

Media Type	Fish Tissue[1]		Water Column[4]	
Criterion Element	**Egg-ovary [2]**	**Fish Whole-body or Muscle [3]**	**Monthly Average Exposure**	**Intermittent Exposure[5]**
Magnitude	15.1 mg/kg dry weight	8.5 mg/kg dry weight whole-body or 11.3 mg/kg dry weight muscle (skinless, boneless fillet)	1.5 µg/L in lentic aquatic systems 3.1 µg/L in lotic aquatic systems	$$WQC_{int} = \frac{WQC_{30-day} - C_{bkgrnd}(1 - f_{int}}{f_{int}}$$
Duration	Instantaneous measurement[6]	Instantaneous measurement[6]	30 days	Number of days/month with an elevated concentration
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years on average	Not more than once in three years on average

1 Fish tissue elements are expressed as steady-state.
2 Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured, except as noted in note 4 below.
3 Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured, except as noted in note 4 below.
4 Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5 Where $WQC_{30\text{-}day}$ is the water column monthly element, for either lentic or lotic waters; C_{bkgrnd} is the average background selenium concentration; and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥0.033 (corresponding to 1 day).
6 Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in fish population(s) at a given site.

Selenium Technical Support Materials

The EPA has prepared a four-volume set of documents to provide recommendations to states, authorized Tribes, and other agencies for implementing their water quality criteria based on the national CWA section 304(a) recommended selenium criterion for aquatic life (USEPA 2021). These four documents constitute the Technical Support Materials for EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021). Each document of the set focuses on a specific aspect of implementation of criteria based on the national CWA section 304(a) recommended selenium criterion. Together, these four EPA documents provide information to assist states and authorized Tribes with adopting water quality criteria based on the EPA's CWA section 304(a) recommended selenium criterion and implementing them in various CWA programs.

1) *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards*: Provides recommendations for the adoption and implementation of criteria based on the national CWA section 304(a) recommended selenium criterion, including the various flexibilities available to states and authorized Tribes using WQS tools.
2) *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*: Provides an overview on how to establish or enhance existing fish tissue monitoring programs to facilitate implementation of fish tissue-based criterion elements based on the national CWA section 304(a) recommended selenium criterion.
3) *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits*: Provides information to help National Pollutant Discharge Elimination System (NPDES) permit writers understand what permitting guidance (i.e., state or Tribal implementation procedures) may be appropriate to implement state and authorized Tribal WQS based on the EPA's CWA section 304(a) recommended selenium criterion. This set of FAQs also provides recommendations on how to establish water quality-based effluent limits (WQBELs) in NPDES permits.
4) *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*: Provides information on how to complete assessments, list impaired waters, and develop total maximum daily loads (TMDLs) to implement on EPA-approved[4] WQS that are based on the EPA's national CWA section 304(a) recommended selenium criterion.

This document supports CWA regulators in states and authorized Tribes to implement WQS based on the EPA's CWA section 304(a) recommended four-part selenium water quality criterion (WQC)[5] in the EPA's 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016 (USEPA 2021) as it relates to CWA section 402 NPDES permits. These NPDES FAQs are intended to support NPDES permit writers in understanding what permitting guidance (i.e., state or Tribal implementation procedures) may be appropriate to implement EPA-approved state and authorized Tribal WQS based on the EPA's CWA section 304(a) recommended selenium criterion (USEPA 2021).

[4] EPA-approved includes both WQS adopted by states, territories or authorized Tribes and approved by the EPA and WQS promulgated by the EPA.

[5] These FAQs apply specifically with respect to implementation of EPA-approved state and Tribal water quality criteria for selenium that are based on the EPA's national CWA section 304(a) recommended selenium criterion – that is, criteria that include elements that are substantially identical to the recommended selenium criterion. Where the applicable state or Tribal water quality criterion for selenium differs from the EPA's recommended selenium criterion, these NPDES FAQs may not be relevant or applicable. As required by CWA section 301(b)(1)(C), permit writers must include permit limits necessary to meet the applicable state or Tribal water quality criterion.

1. Identifying the Applicable Selenium WQC to Implement in the NPDES Permit

Q1-1: What is the applicable selenium criterion to use in implementing the NPDES permit program?

A1-1: The applicable selenium criterion for CWA purposes is a state or authorized Tribal criterion that has been approved by the EPA as protective of the waterbody's designated uses or a WQC promulgated by the EPA on behalf of a state or authorized Tribe. The applicable selenium criterion may be site-specific, or applicable throughout the state or authorized Tribe's jurisdiction. NPDES permits must include permit limits necessary to meet the applicable state or Tribal WQS, as required by CWA section 301(b)(1)(C). Accordingly, where selenium may be discharged at a level that causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the state or authorized Tribe's applicable selenium criterion, permit writers must develop and include WQBELs that will meet the applicable selenium criterion (see CWA section 301(b)(1)(C) and NPDES regulations at 40 CFR 122.44(d)(1)(i)). In addition, a state or authorized Tribal permit writer may have authority under a state statute or regulation or Tribal law to include WQBELs necessary to meet a lower state or authorized Tribal WQC for selenium that has not yet been approved by the EPA. Permit writers must also include more stringent conditions necessary to meet other appropriate water-quality related requirements under state or Tribal law if a state or authorized Tribe specified such conditions in a CWA section 401 certification.

As a component of their EPA-approved WQS, a state or authorized Tribe's selenium aquatic life criterion, may be based on: (1) the 2016 national CWA section 304(a) recommended selenium criterion; (2) the 2016 national CWA section 304(a) recommended selenium criterion modified to reflect site-specific conditions; (3) Water Quality Guidance for the Great Lakes System, 40 CFR 132.6 (60 FR 15387, March 23, 1995); or (4) other scientifically defensible methods for developing selenium aquatic life criterion. Some states or authorized Tribes' selenium aquatic life criterion may be based on the EPA's 1987 recommended selenium criteria, if previously approved by the EPA. The EPA's 2016 national CWA section 304(a) recommended selenium criterion, as summarized in Table 1, replaces the EPA's 1987 recommended selenium acute and chronic water quality criteria.

States and authorized Tribes have the option to develop, adopt, and submit for approval by the, site-specific criteria. See the EPA's *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* for more information on the adoption and implementation of criteria based on the national CWA section 304(a) recommended selenium criterion, including the various flexibilities available to states and authorized Tribes using WQS tools (USEPA 2024b).

Q1-2: Which criterion elements of EPA's national CWA section 304(a) recommended selenium criterion should be used when implementing the criterion through the NPDES permit program?

A1-2: Where a state or authorized Tribe has adopted a selenium aquatic life criterion based on the EPA's national CWA section 304(a) recommended selenium criterion, the NPDES permitting authority can use any of the criterion elements to assess the need for and to establish effluent limits as stringent as necessary to meet the applicable selenium criterion element. NPDES permits must include permit limits necessary to meet the applicable state or Tribal WQS, as required by CWA section 301(b)(1)(C). The permitting authority may make the determination of which criterion elements to use to evaluate reasonable potential (RP) and develop permit limits based on their best professional judgement (BPJ). Additionally, while all four elements of the EPA's national CWA section 304(a) recommended selenium criterion could be used to evaluate RP and develop permit limits, under the recommended criterion, the fish tissue criterion elements have primacy over water column elements.[6] Because the selenium criterion was designed to be protective of the most sensitive aquatic species and biological effect (i.e., fish and fish reproduction effects), the *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021) notes that the criterion is also protective of other aquatic life, including amphibians and invertebrates. Therefore, in fishless waters,[7] the water column criterion elements could be used as the basis for RP determinations and effluent limits because they would be protective of the aquatic life uses designated by the state or authorized Tribe. For further information on fishless waters, see *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b).

The flowcharts provided in Attachment 1 present a recommended approach for implementing selenium WQC based on the recommended criterion in NPDES permits that considers both the fish tissue and water column elements of the criterion. Specific questions about using the four-part criterion to assess RP and develop WQBELs are discussed in sections two through four of this document.

[6] Fish tissue values may include egg/ovary, whole-body, or fillet. Footnotes 2, 3, and 4 in Table 1 explain that the criterion affirms the primacy of the egg-ovary criterion element over any other criterion element and the whole-body and/or muscle tissue criterion element over the water column criterion elements.

[7] For purposes of EPA's 2016 recommended four-part selenium criterion, EPA defines "fishless waters" as waters with insufficient instream habitat and/or flow to support a population of any fish species on a continuing basis, or waters that once supported populations of one or more fish species but no longer support fish (e.g., extirpation) due to temporary or permanent changes in water quality (e.g., selenium pollution), flow or instream habitat (USEPA 2024b).

Q1-3: What are some considerations when using WQS based on EPA's national CWA section 304(a) recommended selenium water column criterion elements in NPDES permitting?

A1-3: Several factors should be considered when using WQS based on the EPA's national CWA section 304(a) recommended selenium water column criterion elements in NPDES permitting:

1) The relationship between the concentration of selenium in the fish tissue and the concentration of selenium in the water column can vary substantially across aquatic systems.
2) The chemical form of selenium, species of fish, species and proportion of prey, and a variety of site-specific biogeochemical factors affect selenium bioaccumulation. These factors affect the allowable concentration of selenium in ambient water that is protective of aquatic life.
3) The water column elements are the recommended criterion elements to use in fishless waters, for new or increased discharges of selenium, or other scenarios where fish tissue is not at steady-state in terms of selenium bioaccumulation.

The EPA's national CWA section 304(a) recommended selenium criterion includes two fish tissue criterion elements and two water column criterion elements (a 30-day average exposure criterion element and an intermittent exposure criterion element). However, due to the site-specific nature of the relationship between water column and fish tissue concentrations of selenium, the EPA provides two recommended approaches for translating the recommended fish tissue criterion elements into site-specific water column criterion elements. The first approach is the mechanistic model used by the EPA to derive its default water column criterion elements. The second approach uses an empirical bioaccumulation factor approach. Both approaches are described further in Appendix K of *Aquatic Life Ambient Water Quality Criterion for Selenium– Freshwater 2016* (USEPA 2021). The two approaches can be used to develop site-specific values for the water column criterion elements. Site-specific criteria values can either be individually developed and adopted into a state or Tribe's WQS and submitted to the EPA for review and approval, or these values can be developed by using a performance-based approach to derive site-specific criteria values if that performance-based approach has been adopted into a state or Tribe's WQS and reviewed and approved by the EPA. See the EPA's *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* for more information on the adoption and implementation of criteria based on the national CWA section 304(a) recommended selenium criterion, including information related to the development and adoption of site-specific criteria (USEPA 2024b). If the EPA has approved a performance-based approach adopted by a state or authorized Tribe, NPDES permit writers can use that methodology to develop site-specific water column values to implement fish tissue based WQC in NPDES permits. An exception is fishless waters, where a performance-based approach may not be appropriate unless the state or authorized Tribe developed an alternative scientifically defensible approach such as potentially translating from an invertebrate threshold when data for invertebrates are available (USEPA 2024b).

Within this NPDES FAQ document, references to the "water column criterion element" means the EPA's national CWA section 304(a) recommended default water column criterion value, a state- or site-specific water column value approved by the EPA, including a value based on an invertebrate toxicity threshold,[8] or a site-specific water column value developed using a performance-based approach where appropriate and approved by the EPA. Please see *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b) for additional discussion regarding the flexibilities available to states in the adoption of water column criterion elements.

Q1-4: Does a state or authorized Tribal adoption of a site-specific value for either egg-ovary or whole-body/muscle elements require approval by the EPA under CWA section 303(c) before using the site-specific value in NPDES permitting?

A1-4: Site-specific values for the fish tissue criterion elements require approval by the EPA under CWA section 303(c) before such criterion elements are applicable for CWA purposes, including NPDES permitting (40 CFR 131.21(c)). However, as indicated in FAQ 1-1, a state or authorized Tribal permit writer may have authority under a state statute or regulation or Tribal law to include a WQBEL necessary to meet a lower state or authorized Tribal criterion that has not yet been approved by the EPA, or to include such conditions as part of their CWA section 401 certification.

The whole-body fish and fish muscle element as well as the water column elements in the EPA's national CWA section 304(a) recommended selenium criterion are derived from the egg-ovary criterion element. As a result, any state or authorized Tribe that adopts a site-specific value for the egg-ovary criterion element and intends to also adopt other CWA section 304(a) selenium criterion elements in their WQS, would need to derive the related whole-body/muscle criterion element and the water column criterion elements, all of which are based on protection of the egg-ovary criterion element. The state or authorized Tribe would submit the site-specific criterion elements to the EPA for review and approval under CWA section 303(c) (unless the site-specific water column criterion elements were derived by following performance-based approach approved by the EPA). See EPA's *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* for additional discussion on the development of site-specific criterion values for the elements of the four-part criterion and performance-based approaches (USEPA 2024b).

[8] Invertebrate toxicity thresholds may be appropriate if fish currently and historically have not used the water body. If using an invertebrate toxicity threshold, states and authorized Tribes would need to ensure that the resulting water column criterion element is protective of the uses in downstream water bodies. As of now the EPA is not aware of sufficient toxicity data on invertebrates for an invertebrate toxicity threshold for selenium. However, as new toxicity data becomes available, invertebrates may be an appropriate taxa to use for deriving site-specific water column criterion values for fishless waters (USEPA 2024b).

Q1-5: When using criterion elements based on the EPA's national CWA section 304(a) recommended selenium water column criterion elements, can permit writers use mixing zones, initial zones of dilution, or dilution factors in NPDES permits?

A1-5: States and authorized Tribes may, at their discretion, include in their water quality standards, policies generally affecting their application and implementation, such as mixing zones (40 CFR 131.13). These general policies are subject to review and approval by the EPA and must be consistent with the CWA. Even if a state or authorized Tribe chooses to allow mixing zones generally, it may also choose to include in its policy circumstances under which mixing zones are prohibited entirely (e.g., for particular pollutants, waterbodies, and/or waterbody types).

The EPA recommends in section 5.1.2 of the Water Quality Standards Handbook (USEPA 2014) that states and authorized Tribes should carefully consider whether mixing zones are appropriate where a discharge contains bioaccumulative pollutants. Because fish tissue contamination tends to be a far-field problem affecting entire or downstream waterbodies rather than a near-field problem being confined to the area within a mixing zone, where allowed, mixing zones should be applied carefully so that they do not result in impairment of the designated use of the waterbody as a whole or impede progress toward the CWA goals of restoring and maintaining the physical, chemical, and biological integrity of the Nation's waters.

If applicable state or authorized Tribal WQS allow mixing zones or consideration of dilution for bioaccumulative pollutants, a state or authorized Tribe may find it appropriate to restrict or eliminate mixing zones for bioaccumulative pollutants in certain situations such as the following:

- Where mixing zones may encroach on areas often used for fish harvesting, particularly for stationary species such as shellfish; or
- Where there are uncertainties in the protectiveness of the water quality criteria or the assimilative capacity of the waterbody, or evidence indicates a lack of assimilative capacity.

Where a state or authorized Tribal WQS allows mixing zones for bioaccumulative pollutants, the permit writer may use mixing zones or dilution allowances in assessing the need for and deriving WQBELs.

In such cases, WQBELs should be established that provide for WQS to be met during critical conditions after accounting for allowable dilution or at the edge of the regulatory mixing zone. The permit or fact sheet should describe the geographic extent of the mixing zone or dilution volume allowed under the permit and describe the evaluation conducted to determine the appropriateness of the mixing zone. The NPDES permitting authority should make any allowance for dilution or mixing on a case-by-case basis that accounts for site-specific conditions, including but not limited to effluent flow, stream flow, ambient pollutant

concentrations, as well as other physical, chemical, and biological characteristics of the receiving water.

When a CWA-effective state or authorized Tribal WQS prohibits mixing zones or consideration of dilution for bioaccumulative pollutants, WQBELs for bioaccumulative pollutants must require meeting the WQS at the point of discharge.

Q1-6: When implementing the EPA's national CWA section 304(a) recommended selenium fish tissue criterion elements in NPDES permits, how is steady-state defined and demonstrated?

A1-6: For the purposes of the EPA's national CWA section 304(a) recommended selenium criterion, steady-state[9] refers to conditions where sufficient time has passed after the introduction of new inputs of selenium into a watershed of a waterbody such that fish tissue selenium concentrations are no longer increasing (see the description in section 2.1 of *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b) of footnote 4 in the criterion table of the *2021 Revision to the Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*, (USEPA 2021). "New inputs" are both new and increased inputs of selenium and refers to the release of a substantial amount of additional selenium from either anthropogenic point or nonpoint sources into a waterbody or watershed.

In general, the EPA estimates that once a new or increased input of selenium commences, the concentration of selenium in fish tissue will reach steady-state after several months in lotic systems and longer time periods (e.g., two to three years) in lentic systems (USEPA 2021). These times frames can be used to provide a general estimate of steady-state after introduction of a new input of selenium into a watershed. However, these values are general estimates and the time needed for fish tissue to achieve steady-state after a new or increased input of selenium to the waterbody has occurred is site-specific. Potential factors affecting steady-state conditions in an aquatic system include: (1) the hydrodynamics of the aquatic system (e.g., particularly reservoirs with multiple riverine inputs and controlled releases of water into downstream waterbodies); (2) the location of the selenium input; and (3) the site-specific food web. Therefore, if states and authorized Tribes assume that fish tissue is in steady-state in terms of selenium bioaccumulation, the EPA recommends documenting the rationale supporting those assumptions to demonstrate that any resulting regulatory decisions are protective and have a sound scientific rationale. Any available data, including data collected by the state or authorized Tribe, by permittees, and by other sources may be evaluated to determine if there are new or increasing selenium inputs. Where the permitting authority has information that there are substantial new, known inputs or releases that would affect selenium concentrations in fish relative to environmental concentrations, the fish tissue should

[9] This definition of steady-state applies to the national CWA section 304(a) recommended selenium criterion. It does not apply to the discussion of steady-state modeling or conditions in USEPA 1991. For more information on the definition of steady-state, see USEPA 2024b.

not be considered as being in steady-state with respect to selenium and fish tissue criterion elements should not be used to assess permit compliance or as permit limits. As noted under FAQ 1-3, the water column criterion element should be used in these cases to assess RP and develop selenium WQBELs.

Note that the term "steady-state" should not be interpreted as "constancy." Waterbodies that normally experience a range of seasonal or yearly changes in flow for example, may still be in steady-state with respect to selenium fish tissue concentrations so long as there are no new inputs of selenium or increases in existing selenium inputs to the waterbody.

Fish tissue data can be used to evaluate whether fish tissue concentrations are in steady-state. The EPA recommends monitoring fish tissue in the affected waterbody, starting when new or increased inputs of selenium begin (or before if possible) and continuing until fish tissue data demonstrate that selenium concentrations in fish tissue are no longer increasing. With sufficient and appropriate monitoring data, collected over several sequential sampling periods, the state or authorized Tribe can use appropriate statistical methods (one example is the Mann-Kendall statistical approach, but other statistical approaches may be used) to determine when the fish tissue concentrations are no longer increasing.[10] However, see FAQ 3-2 for additional implementation considerations.

[10] The following documents may be referenced for guidance on statistical analyses: *Statistical Methods in Water Resources* (https://pubs.usgs.gov/tm/04/a03/tm4a3.pdf); *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition* (https://www.epa.gov/sites/default/files/2015-06/documents/volume1.pdf); *Statistical Analysis for Monotonic Trends* (https://www.epa.gov/sites/default/files/2016-05/documents/tech_notes_6_dec2013_trend.pdf); *Statistical Methods for Environmental Pollution Monitoring* (https://www.osti.gov/servlets/purl/7037501).

2. NPDES Reasonable Potential (RP) Determinations

Q2-1: Which elements of the EPA's national CWA section 304(a) recommended selenium criterion that are included in an EPA-approved WQS should be used for conducting RP analyses?

A2-1: Any of the four elements from the EPA's national CWA section 304(a) recommended selenium criterion that are incorporated into a CWA-effective WQS can be used by the NPDES permitting authority to determine whether the discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the applicable WQS. If the NPDES permitting authority has site-specific, steady-state fish tissue data that were collected under and met appropriate quality-assurance procedures, those data may be used directly to assess RP.[11] In fishless waters or where steady-state condition fish tissue data are not available, the water column elements should be used to conduct RP analyses. Since the water column element was derived to be protective of fish (and other aquatic life), the NPDES permitting authority has the discretion to use the water column element to conduct RP analyses for all permitted discharges to freshwater receiving waterbodies. Additionally, the NPDES permitting authority may choose to use the water column element in RP analyses for selenium until such time as the EPA approves in 40 CFR Part 136 an analytical method for measuring selenium in fish tissue. In any case, such determinations should ensure that state and authorized Tribal WQS are met.

Q2-2: How should the NPDES permitting authority determine whether a 30-day chronic water column criterion element or an intermittent water column criterion element is appropriate for making RP determinations?

A2-2: Under the NPDES program, continuous discharges are discharges that occur without interruption throughout the operating hours of the discharging facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities (40 CFR 122.2). For a continuous discharge, when using a water column criterion element to evaluate the RP of the discharge, the NPDES permitting authority should use the 30-day chronic element. The 30-day chronic element is based on a monthly average exposure, which is well suited for conducting RP analyses and developing WQBELs for continuous discharges (see also chapter 5 of the EPA's Technical Support Document (TSD) for Water Quality-based Toxics Control (USEPA 1991)).

[11] USEPA 2024c addresses fish tissue monitoring for assessment of the fish tissue elements of the selenium criterion and for the development of site-specific water column criterion elements. Elements of this document will be useful for consideration when sampling fish for RP determinations, such as target species and tissue types, however some considerations may differ such as temporal and spatial considerations (e.g., distance from the facility, age of data) that may be specific to RP determinations.

For non-continuous discharges, the intermittent water column criterion element provides an appropriate measure of aquatic life protection. The intermittent water column element can be calculated using ambient spikes of selenium in the receiving water, with the equations provided in the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* (Table 1) (USEPA 2021). Note that both the continuous (30-day) and the intermittent water column elements are designed to be as protective as the EPA's criterion elements for fish tissue over a 30-day period.

Q2-3: How should an NPDES permitting authority implement criteria based on the EPA's national CWA section 304(a) recommended selenium criterion in RP analyses?

A2-3: The information outlined below, and illustrated in Attachment 1, summarizes recommendations for conducting RP analyses, assuming the state or authorized Tribe has adopted all four elements of the EPA's national CWA section 304(a) recommended selenium criterion. If RP is demonstrated, the permit must contain a WQBEL to limit the selenium discharge such that the state's regulatory selenium criterion is met.

The flowchart in Attachment 1 titled *Permitting for Existing Dischargers*, specifies conditions under which the fish tissue or the water column criterion elements may be used in RP determinations (40 CFR 122.44(d)(1)(ii)). The other flowchart, titled *Permitting for New or Increased Dischargers*, is applicable for new dischargers or dischargers who have increased their selenium discharges. In situations where there will be new or increased discharges, selenium concentrations in fish tissue should not be assumed to be in steady-state, and the water column criterion element should be used in RP determinations, pending the collection of fish tissue data demonstrating steady-state conditions (see FAQ 1-6 for information on steady-state).

Below are four scenarios and recommendations for conducting RP analysis:

a) **Fish tissue data available (with criterion excursion in fish tissue):** If site-specific selenium concentrations in fish tissue indicate an excursion of the applicable fish tissue criterion elements and an NPDES facility discharges quantifiable concentrations of selenium to the waterbody, then the facility would have RP, regardless of whether the fish tissue concentrations are in steady-state. This is because the concentration of selenium in fish tissue indicates that an excursion of the criterion has already occurred. Whether or not fish tissue concentrations of selenium are in steady-state, RP has been demonstrated. See the *Permitting for Existing Dischargers* flowchart (Attachment 1).

b) **Fish tissue data available (with *no* criterion excursion in fish tissue at steady-state):** If the NPDES permitting authority has site-specific fish tissue data that represent steady-state (see FAQ 1-6), and the data do not indicate an excursion of the fish tissue criterion elements that are effective under the CWA, the NPDES permitting authority may determine if a discharge has RP by implementing one of several options:

i) If the state or authorized Tribe has also adopted the water column element as part of their selenium criterion in their EPA-approved WQS, the NPDES permitting authority may evaluate RP using the water column selenium criterion element or an EPA-approved site-specific water column selenium criterion element. Other environmental factors may also affect the use of fish tissue data when determining RP. See the *Permitting for Existing Dischargers* flowchart (Attachment 1) and FAQ 2-4.

ii) If the state or authorized Tribe has developed sufficient implementation procedures, and fish tissue data demonstrates steady-state conditions, the NPDES permitting authority may conclude that there is no RP because there is not an excursion of the fish tissue selenium criterion element. In this case, the NPDES permitting authority should consider requesting additional information as part of the application process and establishing ongoing fish tissue monitoring requirements in the permit as well as perhaps other permit requirements (see FAQ 3-2) to demonstrate that fish tissue selenium concentrations remain in steady-state and that there has not been an excursion of the fish tissue criterion element.

iii) The NPDES permitting authority may consider using a certain percentage of the fish tissue criterion element as a maximum threshold above which RP has been demonstrated. The NPDES permitting authority may also consider applying statistical principles, for example a margin-of-safety factor (see the EPA's TSD (USEPA 1991)), to account for uncertainty (due to a limited data set) around detecting the maximum fish tissue selenium value and, as a result, apply selenium concentrations in fish tissue that are lower than fish tissue selenium criterion values when evaluating RP.

c) **Fish tissue data available (with *no* criterion excursion in fish tissue, but the fish tissue data does *not* demonstrate steady-state):** If a state or authorized Tribe has site-specific fish tissue data that do not indicate an excursion of the fish tissue selenium criterion elements, but the NPDES permitting authority determines that the observed fish tissue concentrations are not reflective of steady-state, then the NPDES permitting authority should use the water column selenium criterion element to determine RP. See the flowchart *Permitting for New or Increased Dischargers* (Attachment 1) and FAQ 1-6. If the NPDES permitting authority determines that the selenium levels in fish tissue are not likely to be in steady-state, the NPDES permitting authority may consider requesting additional fish tissue data as part of the application process and establishing in the permit ongoing fish tissue monitoring to ensure that there is not an excursion of the fish tissue selenium criterion.

d) **No fish tissue data available:** If the NPDES permitting authority does not have site-specific fish tissue data or the receiving waterbody is fishless, the NPDES permitting authority should use the water column selenium criterion element for conducting RP analyses.

Q2-4: What data should be used by an NPDES permitting authority to assess RP using criteria based on the EPA's national CWA section 304(a) recommended selenium criterion?

A2-4: NPDES permitting authorities may use any available relevant and representative fish tissue or effluent data to assess RP. See sections 2.1 – 2.3 of the EPA's *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion* for a review of relevant and representative fish tissue monitoring strategies (USEPA 2024c).

For new dischargers, NPDES permitting authorities should use estimates of effluent characteristics (see sections 3.2 and 3.3 of the EPA's TSD (USEPA 1991)) or, preferably, measurements of effluent selenium concentrations to assess RP using the water column selenium criterion elements (see flowchart in Appendix 1, *Permitting for New or Increased Dischargers*). As noted in FAQ 2-3, for existing discharges and when fish tissue is in steady-state, RP analysis may be based on site-specific fish tissue data if the state or authorized Tribe has appropriate quality-assurance procedures for determining RP (USEPA 2021; see also FAQ 2-5). If the NPDES permitting authority has not yet developed NPDES implementation procedures to determine RP using fish tissue, the EPA recommends using the water column selenium criterion elements in RP determinations (USEPA 2021). For other situations where fish tissue is unlikely to be at or determined to not be at steady-state (e.g., recent new or increased inputs of selenium in the watershed), the water column selenium criterion elements should be used to determine RP.

Where states and authorized Tribes use the selenium water column criterion elements to conduct RP determinations, existing NPDES implementation procedures used for other acute and chronic aquatic life protection criteria may be appropriate (see section 3.3 of the EPA's TSD (USEPA 1991)). Additionally, information regarding effluent variation and, where appropriate, available dilution in the receiving stream, should be considered to determine whether the permittee's selenium discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion of the water column selenium elements.

The NPDES permitting authority may take a more conservative approach by presuming RP based on other information provided by the NPDES permit applicant, such as the known presence of other sources of selenium potentially contributing to the receiving water. The lack of other sources of selenium potentially contributing to the receiving water does not preclude a finding of RP and as recommended by the EPA an RP analysis should be assessed for each NPDES facility.

Determinations of RP should be based on analysis of receiving stream assimilative capacity. Because the selenium water column monthly average exposure criterion element is based on a 30-day average value and the effects of selenium on fish are due to bioaccumulation, the NPDES permitting authority may consider using a 30-day flow value for the receiving water when evaluating RP of a discharge.

Q2-5: Where the EPA's national CWA section 304(a) recommended selenium criterion has been incorporated into an EPA-approved WQS, how should a permitting authority evaluate fish tissue data for RP determinations and compliance with WQBELs?

A2-5: Implementation procedures for WQS developed by a state or authorized Tribe should specify the methods to collect fish and analyze fish tissue concentrations of selenium. The implementation procedures should also include procedures regarding sampling design, which fish species will be collected, timing of fish collection, the fish tissue criterion elements being examined, how fish are processed for selenium analyses, and the analytical method used to analyze selenium in fish tissue. The EPA's *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion* provides a review of relevant and representative fish tissue monitoring strategies (USEPA 2024c), which the state or authorized Tribe should consult.

NPDES regulations at 40 CFR 122.41(j) require permittees to perform monitoring representative of the monitored activity and to retain records of this monitoring. In addition, 40 CFR 122.48(b) requires that NPDES permits specify the type, intervals, and frequency of monitoring sufficient to yield data which are representative of the monitored activity. The regulations at 40 CFR 122.44(i)(2) also require reporting of monitoring results with a frequency dependent on the nature and effect of the discharge.

Regardless of the specific sample type (composite samples vs. individual samples), the maximum central tendency (e.g., mean, median, etc.) selenium data from fish tissue for each sampling event should be used in RP determinations and evaluating compliance with WQBELs (see the EPA's *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion* (2024b)). If different samples of fish from a single sampling event are used to determine RP, consistent with the EPA's RP procedures for other pollutants, the maximum fish tissue value (i.e., maximum composite value or maximum central tendency individual fish concentration) obtained from the different samples of fish should be used as the basis for an RP determination based on the fish tissue criterion element evaluated by the fish sampling and analysis (i.e., egg/ovary, whole fish, and/or fish muscle) (USEPA 1991). If there is more than one sampling event, the fish tissue concentration, either the maximum composite value or maximum central tendency individual fish concentration, observed over all sampling events should be used as the basis for RP determinations (see also FAQ 2-3 and section 2.0 of the EPA's *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion* (USEPA 2024c)).

The EPA's fish tissue criterion elements are expressed as instantaneous values, i.e., they are thresholds that are not to be exceeded (USEPA 2021). Therefore, the fish tissue concentration (i.e., maximum composite value or maximum central tendency individual fish concentration) observed over all sampling locations within a sampling event should be used to determine compliance with the WQBEL. Compliance with the WQBEL should be assessed for each sampling event specified in the NPDES permit.

Q2-6: In cases where a discharge occurs to a lotic (e.g., a flowing stream) water, but downstream waters are lentic (e.g., lakes, impoundments), which the EPA national CWA section 304(a) recommended selenium water column criterion elements incorporated into an EPA-approved WQS should be used in the RP analysis?

A2-6: The regulations at 40 CFR 122.44(d)(1) provides that NPDES permit limitations must control all pollutants or pollutant parameters which the NPDES permitting authority determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contributes to an in-stream excursion above any state water quality standard. This includes water quality standards for downstream waters. The national CWA section 304(a) recommended selenium criterion water column monthly average exposure element for lentic waters is lower than the criterion element for lotic waters. Therefore, if an NPDES discharge is located in lotic waters upstream of lentic waters, the permit writer should ensure that both the lotic WQC and the downstream lentic WQC, are met when conducting the RP analysis and when developing WQBELs for selenium (see 40 CFR 122.44(d)(1)). Additionally, the EPA regulations at 40 CFR 131.10(b) provide that "[i]n designating uses of a waterbody and the appropriate criteria for those uses, the state shall take into consideration the water quality standards of downstream waters and ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." If an NPDES permitting authority bases RP on the fish tissue elements of the selenium criterion using fish from locations near to the discharge, it is then important to document that discharges of selenium do not cause, have the reasonable potential to cause, or contributes to an in-stream excursion of the fish tissue criterion elements in the downstream lentic environment. For additional information on protection of downstream waters, see *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b) and section 4.1 of the *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* (USEPA 2021).

Q2-7: Does EPA have recommendations that address whether a receiving waterbody should be considered lentic or lotic for purposes of RP analysis and NPDES permit WQBEL determinations?

A2-7: In some cases, it might be unclear whether a receiving or downstream waterbody is lentic or lotic with regard to an appropriate selenium water column criterion element (e.g., run-of-the-river reservoirs). Generally, the classification of fresh waters into lotic or lentic categories is made by the state or authorized Tribe, based on site-specific information. States and authorized Tribes should ensure they use transparent, scientifically defensible approaches to appropriately classify receiving waterbodies. Lotic systems such as rivers and streams are characterized by flowing water. Lentic systems, such as lakes and ponds, are characterized by largely standing water. Sections 2.2.2 and 3.2.4, in the EPA's *Aquatic Life Ambient Water Quality Criterion for*

Selenium—Freshwater 2016 (USEPA 2021) provides further discussion of the bioaccumulation of selenium in aquatic systems and categories of fresh water.

A site-specific study or use of available hydrologic information may be necessary to determine the residence time of the waterbody in order to apply the lentic or lotic water column value in a defensible manner for RP analyses. NPDES permitting authorities should determine whether to use the lentic or lotic water column element for a particular waterbody on a case-by-case basis, factoring in downstream waterbody characteristics (e.g., a lake or other lentic system downstream of a lotic system with a point source discharge). One resource that may be helpful for states and authorized Tribes is a geospatial dataset the U.S. Geological Survey (USGS) developed on lotic and lentic waters, available at https://www.sciencebase.gov/catalog/item/5d420fbde4b01d82ce8da8e9.

3. Calculating Water Quality-based Effluent Limits (WQBELs) in NPDES Permits

Q3-1: How should an NPDES permitting authority derive selenium WQBELs for a noncontinuous or intermittent effluent discharge containing selenium?

A3-1: Where the state or authorized Tribe has an EPA-approved WQS based on the EPA's national CWA section 304(a) recommended selenium criterion, for intermittent discharges that occur within a 30-day period, the NPDES permitting authority can derive WQBELs for noncontinuous or intermittent discharges by using the intermittent water column element of the selenium criterion. Under the EPA's CWA section 304(a) recommended selenium criterion, the intermittent water column element is applicable to any receiving water where the long-term instream background concentration is less than the 30-day average criterion value, and where there are instream spikes of selenium concentrations (above the background value) with a duration of less than 30 days. However, in some cases additional data should be collected to determine the duration of instream spikes (e.g., collection of more frequent instream selenium samples, such as daily samples instead of weekly samples). See section 3.3 as well as Appendix J in the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* (USEPA 2021) for more information on the intermittent exposure water column criterion element.

For intermittent discharges, including those that occur less frequently than once per month, permit writers should, at a minimum, assess the long-term average background concentration of selenium in the portion of the stream not impacted by a discharge, as well as the maximum number of days out of any 30-day period that the instream concentration is expected to exceed the long-term average stream background concentration. With respect to a point source discharge of selenium, these in-stream "pulses" are likely to occur on days when the intermittent discharge is occurring, thus, the number of days a discharge is expected to occur may be used as part of the intermittent criterion element as the fraction of 30 days in which an elevated selenium concentration may occur. For discharges that occur less frequently than once per month, the associated fraction would be less than 1/30 or 0.033. As noted in the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* (USEPA 2021), if the fraction (denoted by the EPA as f_{int}) is assigned a value less than one day per month, the intermittent criterion element value could exceed water concentrations that have been shown to be acutely toxic to sensitive species in two- or four-day toxicity tests (USEPA 2004). Because the concentrations that would be acutely toxic in exposures of less than one day might not be much greater than those observed to be toxic in two- to four-day exposures, the EPA notes that the intermittent fraction of the month should *not* be assigned a value less than 0.033 when applying the intermittent selenium water column element.

The number of days an NPDES discharge is expected to occur can be determined from historical effluent data. If sufficient effluent data are not available, data from other sources such as local precipitation maps or data from discharges at other similar NPDES facilities may be used. In cases where selenium concentration data are not available, such as new facilities, permit writers should consider using data from other sources, such as similar NPDES facilities. With that information, the permit writer can use the equation in Table 1 to estimate the calculated value for the intermittent water column element that would be protective on the days when a discharge would occur and could then calculate a WQBEL for the intermittent discharge. The permit writer would determine RP and establish selenium limits using the applicable NPDES implementation guidance (i.e., state or Tribal implementation procedures) that is used for analysis of other water quality criteria, and the projected WQBEL would be calculated using the intermittent water column criterion element.

Q3-2: Can an NPDES permitting authority develop WQBELs using criterion elements based on the fish tissue criterion elements of the EPA's national CWA section 304(a) recommended selenium criterion (i.e., egg-ovary or whole-body and/or muscle) rather than the water column elements?

A3-2: Where the state or authorized Tribe has an EPA-approved WQS based on the EPA's national CWA section 304(a) recommended selenium criterion, any of the four criterion elements can be used for deriving WQBELs pursuant to 40 CFR 122.44(d)(1). If NPDES implementation guidance (i.e., state or Tribal implementation procedures) for the water column selenium criterion elements is currently available to use in developing and establishing WQBELs in NPDES permits, then they should be used if they are protective of WQS.[12] As described by the EPA's *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b), if a state or authorized Tribe believes that the EPA's national CWA section 304(a) recommended selenium criterion elements are not appropriate for a waterbody capable of supporting fish, it can develop a site-specific value for a water column element. Any site-specific WQC that is used for the NPDES permit program must be either approved by the EPA or derived through an EPA-approved water column translation procedure (e.g., performance-based approach). See CWA section 303(c) and 40 CFR 131.21.

While the water column criterion elements are one approach for calculating WQBELs, the recommended primacy of the fish tissue selenium criterion elements may lead NPDES permitting authorities to develop innovative NPDES implementation guidance (i.e., state or Tribal implementation procedures) for the expression of WQBELs based on fish tissue criterion elements. In this case, for existing discharges where fish tissue data demonstrate steady-state,

[12] Note that many states or authorized Tribes have not established NPDES implementation procedures for use in deriving WQBELs from fish tissue data, so the water column element may be the only available choice for deriving a WQBEL that is consistent with the state or authorized Tribe's established procedures. https://www.epa.gov/sites/default/files/2017-08/documents/federal-water-pollution-control-act-508full.pdf

a WQBEL could be expressed in mg/kg dry weight based on either or both fish tissue selenium criterion elements summarized in Table 1 and in *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021) or EPA-approved site-specific fish tissue selenium criterion elements. This expression is appropriate when the state or authorized Tribe has developed the EPA-recommended NPDES implementation procedures for the development of WQBELs that will ensure that the fish tissue criterion elements are met, and permit conditions are incorporated to ensure representative monitoring of fish tissue. The EPA supports the development of such innovative approaches to implement water quality criteria based on the EPA's CWA section 304(a) recommended selenium criterion; however, as with any WQBEL expression, the NPDES limit included in the NPDES permit must be consistent with the requirements of CWA section 301(b)(1)(C) as well as 40 CFR 122.44(d)(1)(i) and 122.45 (see FAQ 1-1).

As noted in Table 1 and in *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021), the recommended frequency for the fish tissue criterion elements of the national CWA section 304(a) recommended selenium criterion is "not to be exceeded." Therefore, to ensure that the fish tissue selenium criterion elements are never exceeded, states and authorized Tribes should consider developing NPDES implementation procedures that *prevent* the likelihood of a fish tissue criterion element excursion in the receiving waterbody. For example, in addition to fish tissue selenium monitoring to address the fish tissue based WQBEL, routine monitoring of effluent selenium concentration, as well as selenium concentrations upstream of the permitted discharge, may help determine whether there has been a substantial increase in selenium inputs that would negate a steady-state condition with respect to fish tissue selenium concentration. NPDES regulations at 40 CFR 122.48(b) require monitoring that yields data representative of the monitored activity.

A second NPDES implementation procedure that an NPDES permitting authority may consider when expressing selenium WQBELs in terms of the fish tissue criterion elements is the incorporation of best management practices (BMPs) in the NPDES permit. BMPs, and specifically a selenium minimization plan, may help reduce the likelihood of increases in effluent selenium concentration that could result in a non-steady-state condition in selenium fish tissue concentration in the receiving waterbody. For example, activities involving management of selenium-bearing materials at a landscape scale may require materials management practices that minimize weathering or other mechanisms that mobilize selenium. For NPDES facilities at which selenium discharges cannot be effectively controlled without materials management, source reduction, and/or other operation-specific practices, 40 CFR 122.44(k)(4) may require the permit writer to incorporate selenium BMPs into the permit in addition to numeric WQBELs.

A third NPDES implementation procedure that NPDES permitting authorities could consider incorporating is a permit reopener clause with respect to the selenium WQBEL. Additionally, if fish tissue data, reported during the permit cycle, or information about new or increasing selenium inputs indicate that the receiving stream fish tissue concentrations are not at steady-state, this could constitute cause for permit modification, pursuant to 40 CFR 122.62(a)(2). In this case, WQBELs expressed as fish tissue concentration (mg/kg) should be replaced by

WQBELs expressed as effluent concentration (µg/L). Both fish tissue and water column WQBELs could be derived at permit issuance with the caveat that the fish tissue WQBELs are applicable unless there is new information that precludes fish tissue from being assumed to be in steady-state (e.g., increasing fish tissue concentrations, new or increasing selenium inputs).

Q3-3: The EPA's national CWA section 304(a) recommended selenium criterion does not include an acute expression. Must permits contain both short- and long-term limit expressions?

A3-3: The EPA's NPDES permit regulations at 40 CFR 122.45(d)(1) require that, for continuous discharges, all NPDES permit limits shall, unless impracticable, be stated as maximum daily limit (MDL) and average monthly limit (AML) for all dischargers other than publicly owned treatment works (POTWs). For POTWs, NPDES permit limits should be stated as average weekly or seven-day average and average monthly or 30-day average limitations for most pollutants. The TSD provides procedures to ensure that the calculated limitations are protective of the designated use (e.g., aquatic life) (USEPA 1991).

As explained in section 4 of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021) and the Introduction section of this document, the EPA is not recommending a separate acute criterion because selenium is bioaccumulative and toxicity primarily occurs through dietary exposure. To meet the NPDES regulatory requirements established in 40 CFR 122.45(d)(1), the EPA provides information for the following scenarios where the permitting authority derives WQBELs from: (1) the fish tissue criterion elements; (2) the chronic water column criterion element; and (3) the intermittent exposure criterion element.

Where a state or authorized Tribe has adopted fish tissue criterion elements and intends to express WQBELs in terms of fish tissue, it may be appropriate for the NPDES permitting authority to consider whether establishing MDLs and AMLs is "impracticable" as authorized by the NPDES regulation.[13] Where WQBELs are expressed in terms of fish tissue the use of an MDL and an AML may be impractical because fish tissue selenium bioaccumulation requires longer exposure periods (see lotic/lentic exposure periods, FAQs 2-6 and 2-7). For example, fish-tissue WQBELs could be developed based on instantaneous measurements which are compared against the selenium WQC when the fish are known to be at steady-state. If the state or authorized Tribe adopts or establishes (e.g., site-specific) selenium criterion that differ from the EPA's 304(a) criterion, or where a state or authorized Tribe's implementation guidance (i.e., state or Tribal implementation procedures) differ from the EPA's TSD, the permitting authority could provide the "impracticability" justification in the permit record. The justification would need to explain why the NPDES permit limit expressions required in 40 CFR 122.45(d)(1) were

[13] The fish tissue criterion may be more appropriately implemented directly as an instantaneous maximum rather than an average value.

impracticable and demonstrate that the WQBELs included in the permit derive from and ensure attainment with the applicable WQS.

Where a state or authorized Tribe has adopted water column criterion elements and intends to express WQBELs in terms of selenium water column concentrations for continuous discharges, the EPA developed a monthly average exposure water column selenium criterion element that is based on a 30-day average exposure concentration. Where the NPDES permitting authority derives WQBELs from the chronic water column criterion element, the EPA's TSD provides a detailed statistical methodology to calculate both maximum daily and average monthly WQBELs from a single criterion value as required by 40 CFR 122.45(d)(1) (USEPA 1991). Since the EPA's national CWA section 304(a) recommended selenium water column criterion elements are based on a 30-day average, a modification to the formula for calculating the chronic long-term average (LTAc) should be used as described in 64 FR 71976.[14] In some cases, the state or authorized Tribe may retain or establish an acute water column criterion that would also need to be considered when developing permit limits (i.e., compare the long-term average [LTA] for acute to the LTA for the chronic to determine the more limiting LTA). The EPA's TSD permit limit development approach derives a single long-term average to calculate the MDL and AML that is deemed to be protective of any applicable criterion by selecting the lowest LTA.[15]

The EPA also derived an intermittent water column selenium criterion element to address intermittent discharges so that the 30-day average water column selenium criterion element (and therefore the fish tissue criterion elements) are met. For intermittent discharges, a maximum daily limitation will most likely be required to ensure that daily discharges are controlled in a manner to ensure that the calculated intermittent criterion[16] is not exceeded and an average monthly limitation would be required to ensure that the underlying 30-day average is met as well.

[14] Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia https://www.govinfo.gov/content/pkg/FR-1999-12-22/pdf/99-33152.pdf

[15] The EPA TSD Tables 5-1 (TSD page 102) indicates the formula for calculating the LTA using a n=4. For selenium, the multiplier for n=30 will need to be calculated and used in the derivation of an LTA. The EPA TSD Table 5-2 (TSD page 103) has the 95th and 99th percentile multipliers for n=30, thus these can be used for derivation of an AML (USEPA 1991). https://www3.epa.gov/npdes/pubs/owm0264.pdf

[16] See section 3.3 of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (USEPA 2021). https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

Q3-4: Should the selenium WQBEL be expressed as total recoverable selenium? If so, how should an NPDES permitting authority translate the dissolved selenium water column criterion element under the EPA's national CWA section 304(a) recommended selenium criterion to a total recoverable selenium concentration for an NPDES permit limit?

A3-4: Yes, WQBELs for selenium should be expressed as total recoverable selenium. While the EPA's national CWA section 304(a) recommended selenium water column criterion elements are expressed as dissolved total selenium, the particulate, as well as dissolved selenium, can have deleterious effects on aquatic life. Total recoverable selenium is further discussed in the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* (USEPA 2021). In the absence of site-specific data, the EPA recommends that it may be appropriate to use a total recoverable-to-dissolved selenium ratio of 1.00 to determine RP and calculate WQBELs for selenium. A ratio of 1.00 means that the concentration of total recoverable selenium is equal to the concentration of dissolved selenium, which may be a valid assumption for some surface waters, especially certain lotic waters, based on geochemistry.

The geochemical conditions governing solubility of selenium will affect the ratio of total-to-dissolved selenium in a waterbody. Selenate (SeO_4^{2-}) and selenite (SeO_3^{2-}) oxyanions are typically the dominant species under the pH and redox conditions of most surficial aquatic environments (Presser and Luoma 2010). Selenate is highly mobile due to the solubility of its salts, whereas selenite is more likely to be immobilized by adsorption onto particulates, particularly iron oxyhydroxides (Presser and Luoma 2010). An oxygenated water with neutral to slightly alkaline pH favors selenate (Presser and Luoma 2010). Under such conditions, selenate will be the dominant form and the ratio of dissolved-to-total for selenium in the water column would be 1.00 and this is the reason the EPA recommends the use of a ratio of 1.00.

The EPA is aware of alternative total to dissolved selenium translators that have been developed by states for specific waterbodies. Water quality data collected by a state or authorized Tribe, USGS, the EPA, and others should be consulted when considering such translators for a given NPDES permit. Additionally, the EPA has provided previous guidance on procedures for translating a criterion based on the concentrations of dissolved constituent(s) to total recoverable permit limits; the EPA's guidance also includes recommendations for sampling and analysis (USEPA 1996).

4. NPDES Monitoring (Basis for RP and WQBELs, Compliance Monitoring)

Q4-1: What EPA analytical methods are recommended for analyzing water and fish tissue samples for selenium under the EPA's NPDES permits program?

A4-1: The EPA provides analytical methods approved for measuring selenium in wastewater effluent at 40 CFR 136.3 (see Appendix L in USEPA 2021). Use of any other analytical methods for permit compliance monitoring must first be approved through the EPA's alternate test procedures approval process (see 40 CFR 136.4 and 136.5). For selenium fish tissue sampling, the EPA has developed *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion*, which describes analytical methods that may be used for measuring selenium in fish tissue samples (USEPA 2024c).

5. Compliance Schedules in NPDES Permits

Q5-1: Could a compliance schedule be considered for implementation of WQS based on EPA's national CWA section 304(a) recommended selenium criterion?

A5-1: The NPDES regulations limit the availability of a compliance schedule for new NPDES dischargers. See 40 CFR 122.29(d)(4) and 122.47(a)(2). Consistent with 40 CFR 122.47(a)(2), a permit for a new NPDES discharger could only include a compliance schedule to meet a WQBEL based on the selenium criterion if the criterion was issued after the discharger had begun construction but less than three years before the discharge of concern had begun. A compliance schedule, defined in CWA section 502(17) and 40 CFR 122.2, may be considered in cases where the applicable WQS for the state or for the authorized Tribe (i.e., a Tribe with treatment-as-a-state for the WQS program, or the state or Tribe's implementing regulations authorize the use of compliance schedules, and the discharger needs additional time to meet NPDES permit limits).[17] The EPA's WQS regulations at 40 CFR 131.15 state that if a state or authorized Tribe intends to allow the use of schedules of compliance for WQBELs in NPDES permits, it must adopt a permit compliance schedule authorizing provision. This authorizing provision would be a WQS subject to EPA review under CWA section 303(c). When the EPA has approved a state or authorized Tribe's authorization of the use of compliance schedules, in accordance with the permitting regulations at 40 CFR 122.47, a discharger may be provided with a compliance schedule in its NPDES permit if the permit writer determines that it is appropriate under the circumstances. The NPDES regulations 40 CFR 122.47(a) require that the permit's compliance schedule must require compliance with the WQBEL "as soon as possible." This timeframe would be based on the actions the discharger will need to take to meet its WQBEL. As further detailed in the May 10, 2007 Memorandum, *Compliance Schedules for Water Quality-Based Effluent Limitations in NPDES Permits*, decisions to provide compliance schedules, and the requirements they include are made on a case-by-case basis, considering the facility and site-specific conditions and the requirements in 40 CFR 122.47.[18] Further information is provided in section 3.4 of the EPA's *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards* (USEPA 2024b).

[17] See EAB decision in *Star-Kist Caribe., Inc*. NPDES No. 88-5, 4 E.A.D. 33 (1992).

[18] https://www3.epa.gov/npdes/pubs/memo_complianceschedules_may07.pdf

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USEPA. 2024a. *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs.* EPA-820-R-24-004. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC. https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

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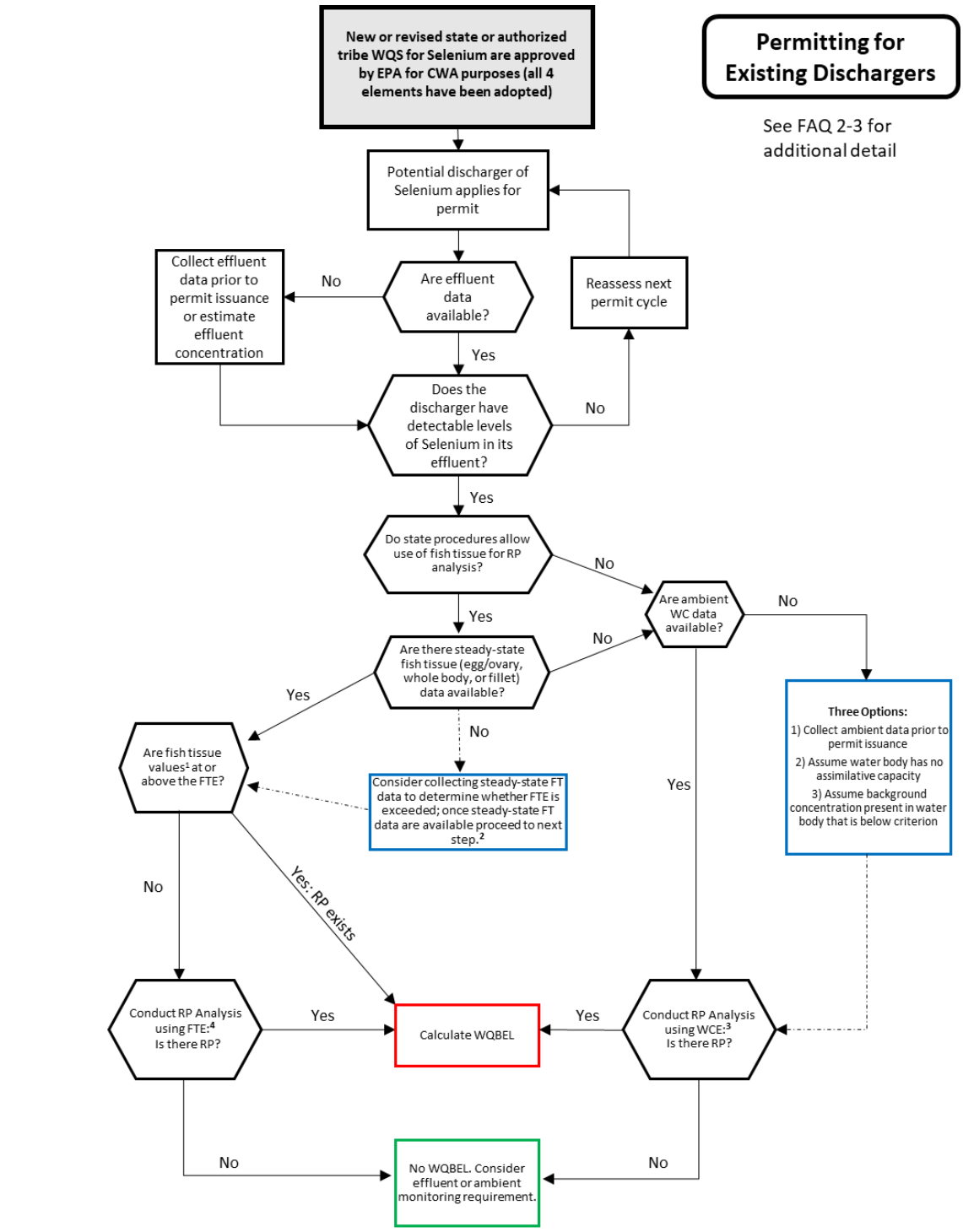
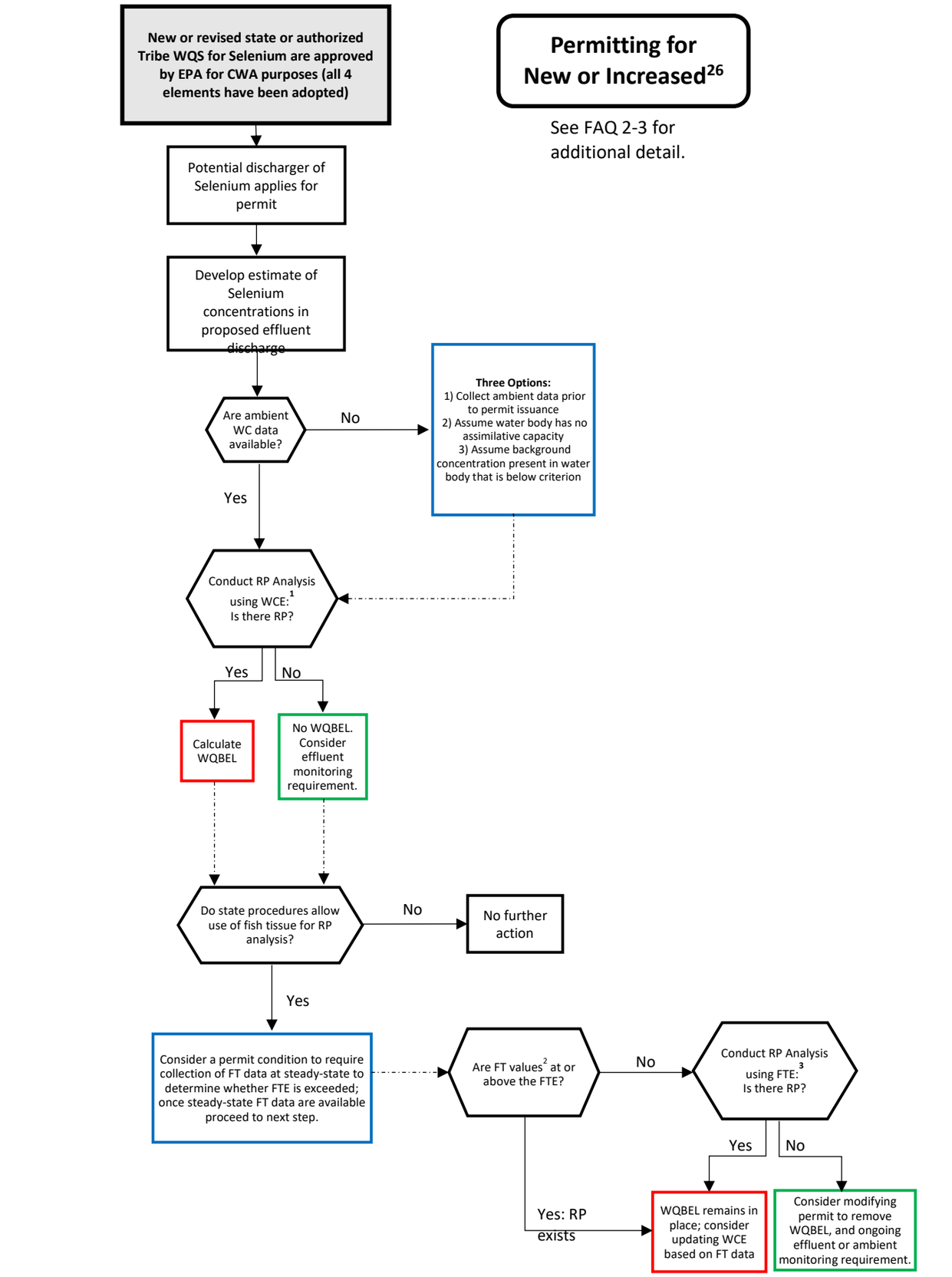
Attachment 1:

The EPA's Recommended Flowcharts for NPDES Implementation of the 2016 National CWA Section 304(a) Recommended Selenium Criterion


Permitting for Existing Dischargers
See FAQ 2-3 for additional detail
New or revised state or authorized tribe WQS for Selenium are approved by EPA for CWA purposes (all 4 elements have been adopted)
Potential discharger of Selenium applies for permit
Are effluent data available?
No
Collect effluent data prior to permit issuance or estimate effluent concentration
Yes
Reassess next permit cycle
Does the discharger have detectable levels of Selenium in its effluent?
No
Yes
Do state procedures allow use of fish tissue for RP analysis?
No
Yes
Are ambient WC data available?
No
Three Options:
1) Collect ambient data prior to permit issuance
2) Assume water body has no assimilative capacity
3) Assume background concentration present in water body that is below criterion
Are there steady-state fish tissue (egg/ovary, whole body, or fillet) data available?
Yes
No
Are fish tissue values[1] at or above the FTE?
Consider collecting steady-state FT data to determine whether FTE is exceeded; once steady-state FT data are available proceed to next step.[2]
Yes
No
Yes; RP exists
Conduct RP Analysis using FTE:[4] Is there RP?
Yes
Calculate WQBEL
Yes
Conduct RP Analysis using WCE:[3] Is there RP?
No
No
No WQBEL. Consider effluent or ambient monitoring requirement.
No
[1] – Fish tissue values may include egg/ovary, whole body, or fillet.
[2] – RP analysis should not be unreasonably delayed pending collection of fish tissue data.
[3] – RP analysis may consider dilution consistent with state WQS and procedures.
[4] – RP analysis using fish tissue must consider the effects of effluent variability and other environmental factors to determine the "potential" for possible excursions of the FTE.
WCE: Water Column Criterion Element*
WC: Water Column (Ambient) Selenium Concentration
RP: Reasonable Potential
WQBEL: Water Quality Based Effluent Limit
FT: Fish Tissue
FTE: Fish Tissue Criterion Element
RP has been determined
Transition box
No RP
Optional pathway
Question
* "Water Column Criterion Element" refers to either:
1. the national default water column criterion element;
2. a state- or site-specific water column value approved by EPA;
3. a site-specific water column value developed from performance-based approach approved by EPA.



[26] This flowchart is appliable for new dischargers or dischargers who have increased their selenium discharges. In these instances, fish tissue selenium concentrations should not be assumed to be in steady-state (see FAQ 1-6 for information on steady-state).