

Oregon Bacteria Rule: Bacteria Criteria for Marine and Estuarine Waters



State of Oregon
Department of
Environmental
Quality



Document Development

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1.0 PURPOSE AND AUTHORITY

The goals of this Internal Management Directive (IMD) are:

1. Describe the State bacteria water quality criteria for estuary and marine waters
2. Describe the USEPA bacteria water quality criteria for estuary and marine waters
3. Reconcile the two sets of water quality criteria, indicating the appropriate water quality criteria to use in areas of regulatory overlap
4. Describe how reconciled water quality criteria should be applied to permit scenarios

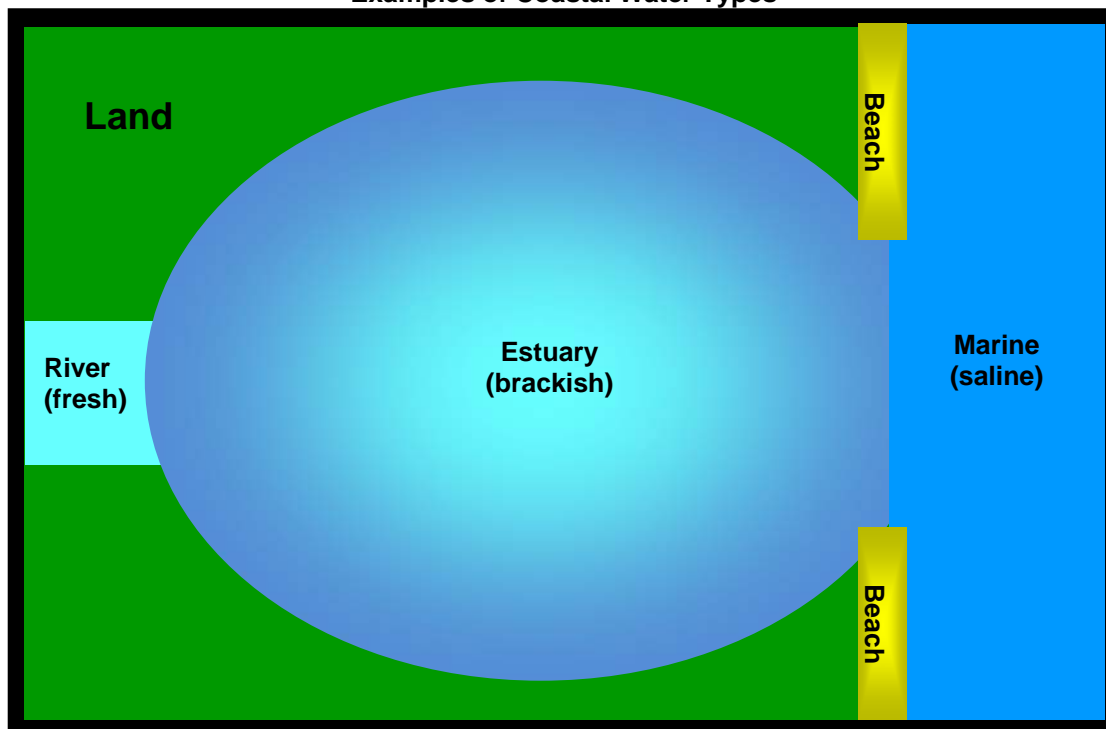
This document is organized into a series of sub-sections based on these goals.

2.0 INTRODUCTION

The first step in this regulatory process is to determine if a Bacteria TMDL has been developed that affects the receiving waters¹, and if it addresses Federal bacteria criteria. Normally a permit writer would follow the TMDL in-lieu of this guidance, but if the existing TMDL does not address the Federal criteria, the guidance in this document should be applied in addition to the directives of the TMDL. Please refer to the following hyperlinks for the applicable TMDLs: [North Coast and Columbia River Estuary](#), [Mid Coast](#) and [South Coast](#). If no TMDL exists, please continue with the bacteria criteria determination process in this IMD.

This document contains a series of figures to illustrate a theoretical coastal/marine area where the various bacteria criteria would be applicable. **Figure 1** is a general description of the coastal waters and use areas subject to the bacteria criteria. Subsequent figures illustrate where the State and Federal criteria are applicable, and how to distinguish between *fresh* and *estuarine* waters.

Figure 1
Examples of Coastal Water Types



¹ There are some TMDLs written for freshwaters that have waste load allocations designed to ensure compliance in estuarine or marine waters downstream. Therefore, a permit writer should check for TMDLs covering marine and estuarine waters, and the freshwaters that discharge into them.

3.0 STATE BACTERIA CRITERIA

The Department has two sets of bacteria criteria that nominally apply to coastal basins and protect the various beneficial uses as described in [OAR 340-041 Tables 101A to 340 A](#). The beneficial uses that primarily determine the application of the bacteria criteria are *Fishing* (including shellfish growing and rearing) and *Water Contact Recreation*.

The criteria are as follows:

- *Freshwaters and estuarine waters other than shellfish growing waters (340-041-0009(1)(a))*
 - **E. coli**
 - 30-day log mean of 126 organisms per 100 ml, based on a min. of five (5) samples
 - No single sample may exceed 406 organisms per 100 ml
- *Marine waters and estuarine shellfish growing waters ((340-041-0009(1)(b))*
 - **Fecal Coliform**
 - Median² concentration of 14 organisms per 100 ml
 - Not more than 10% of the samples may exceed 43 organisms/100 ml

The term “shellfish” generally applies to mollusks, including all edible species of oysters, clams, mussels, and scallops. For purposes of implementation of Oregon’s bacteria criteria, the Department has identified “marine waters” as “all oceanic, offshore waters outside of estuaries or bays, and within the territorial limits of the State of Oregon³”. “Estuarine waters” are defined as:

“all mixed fresh and oceanic waters in estuaries or bays from the point of oceanic water intrusion inland to a line connecting the outermost points of the headlands or protective jetties”.

4.0 APPLICATION OF STATE BACTERIA CRITERIA

Since the beneficial uses (including *Fishing*) are uniformly applied across the three coastal basins and there are no rules specifically delineating where “estuarine waters other than shellfish-growing” are located, the fecal coliform criteria (*Marine water and estuarine shellfish-growing water*) should also be uniformly applied in all marine and estuarine waters. The *E. coli* criteria (*Freshwaters and estuarine waters other than shellfish growing waters*) should therefore be applied only in Oregon’s fresh waters.

Because of the dynamic nature of estuarine environments, there is a high degree of complexity in determining the exact boundary between estuarine and fresh waters. For permitting purposes only, the following procedures should be used for determining the estuarine/fresh water interface:

- Columbia River: The Main Stem Columbia River estuary boundary has been defined, in keeping with the definition used by the Oregon Departments of State Lands (DSL) and Land Conservation and Development (DLCD), to be at the western edge of Puget Island (~RM 39). Please see **Figure 4**.
- Alsea, Coos, Nestucca, Salmon, Tillamook, Umpqua and Yaquina Estuaries: The areas classified as “Ocean-Dominated” in the USEPA’s [Classification of Regional Patterns of Environmental Drivers and Benthic Habitats in Pacific Northwest Estuaries](#) will be considered estuarine. Areas classified as “River Dominated” will be considered fresh water. In the USEPA report, maps of the applicable estuaries, the classified areas and local wastewater treatment facilities are illustrated. The maps of the estuaries from the report are included in **Appendix C** at the end of the document.

² The *Median* is the middle value in a ranked data set. i.e. Given [22, 20, 15, 14, 8, 7, 3], Median = 14

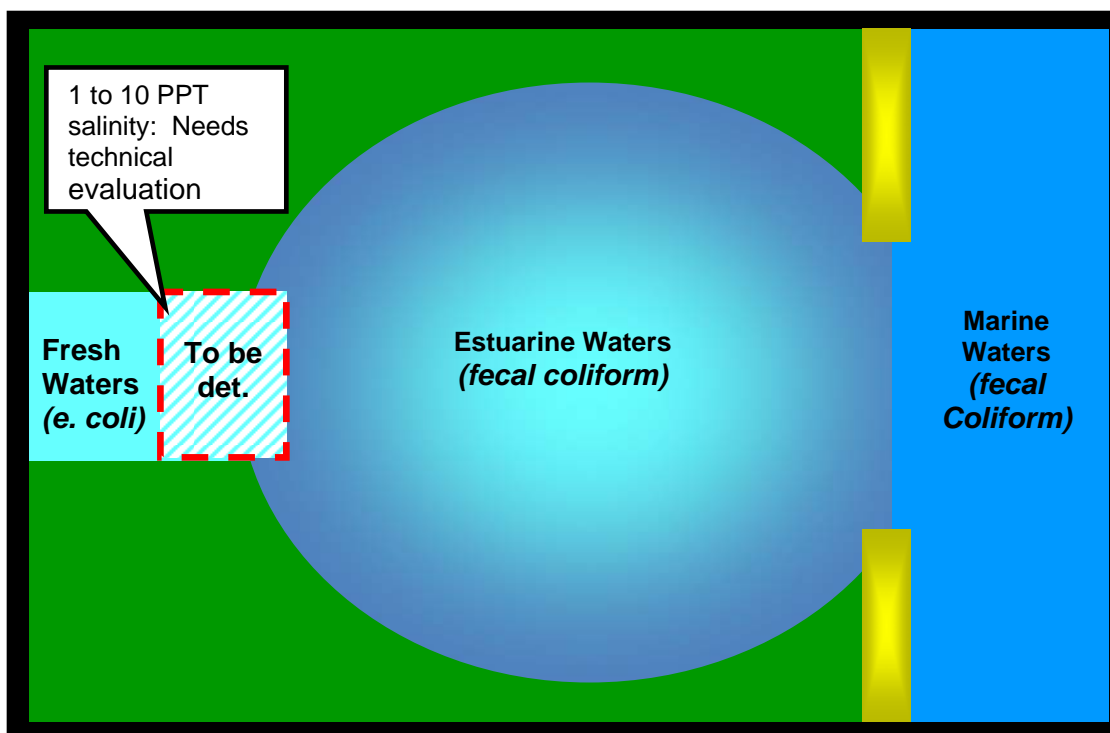
³ OAR 340-41-0002 (34)

- All other waters: all waters with a mean annual salinity greater than 10 ppt⁴ should be considered estuarine and all waters with a mean annual salinity less than 1 ppt should be considered fresh water⁵. This guidance mirrors the rational used to determine the areas where toxics water quality criteria are applied.

In cases where a facility discharges to waters that have a mean annual salinity between 1 and 10 ppt, technical staff should be consulted to make a more specific determination of the receiving water status⁶. Please refer to **Figure 2** for a general representation of the designation of coastal waters and the associated water quality criteria using this procedure.

The permit writer should also consult with the Oregon Departments of Agriculture (ODA) and Fish and Wildlife's (ODF&W) Shellfish Programs to ensure that any areas designated for commercial or recreational shellfish rearing/harvesting (regardless of salinity) are included in the waters designated as "estuarine". Both ODA and ODF&W maintain maps delineating these areas that are available through their program offices or online⁷. An example of an ODA Shellfish Program map is presented in **Appendix B**.

Figure 2
Approximate Location of State Waters



⁴ The main goal behind the Fecal Coliform criteria of 14 org./100 ml is the protection of commercial shell fishing beds. A review of various governmental and trade association publications, indicates that most clam, oyster and scallop populations in the Pacific Northwest require a minimum salinity range of 8 to 23 ppt for propagation and rearing.

⁵ If applicable, conductivity data translated into salinity data might be used for this purpose. Salinity data is available on the DEQ Laboratory's LASAR data base and in compiled form from the Surface Water Management Section.

⁶ Technical staff should include Surface Water Management and TMDL Development sections.

⁷ ODFW: <http://www.dfw.state.or.us/MRP/shellfish/>, ODA: http://www.oregon.gov/ODA/FSD/program_shellfish.shtml & http://coastalgeospatial.noaa.gov/data_gis.html

5.0 FEDERAL BACTERIA CRITERIA

Where Oregon's bacteria criteria address a variety of beneficial uses, especially the protection of growing shellfish for human consumption, the Federal criteria are focused on the protection of the waters that the public might ingest water while recreating.

The *Beaches Environmental Assessment and Coastal Health Act of 2000* (BEACH Act) required coastal states to adopt and implement pathogen and pathogen indicator (bacteria) criteria for *coastal recreation waters* (CRWs)⁸. The primary intent of the Act was to protect the public from gastrointestinal illness contracted while engaged in *primary contact recreation* (PCR) in CRW waters contaminated with human or animal waste.

The definition of PCR is:

*"...recreational activities that could be expected to result in the ingestion of, or immersion in, water, such as swimming, water skiing, surfing, kayaking, or any other recreational activity where ingestion of, or immersion in the water is likely."*⁹.

The definition of CRWs is:

*"...marine coastal waters (including estuaries) that are designated under section 303(c) of the Clean Water Act for use for swimming, bathing, surfing or similar water contact activities. Coastal recreation waters do not include inland waters or waters upstream from the mouth of a river or stream having an unimpaired natural connection with the open sea."*¹⁰

The Federal marine criteria are:

- Enterococcus:
 - The geometric mean¹¹ concentration of enterococcus
 - <35 organisms per 100 ml
 - Single sample maximum concentration of enterococcus are:
 - 104 organisms / 100 ml for a Designated Bathing Beach¹²
 - 158 organisms / 100 ml for a Moderate Use Coastal Recreation Water
 - 276 organisms / 100 ml for a Light Use Coastal Recreation Water
 - 501 organisms / 100 ml for an Infrequent Use Coastal Recreation Water

6.0 APPLICATION OF FEDERAL BACTERIA CRITERIA

When determining where to apply the enterococci criteria, the important language the permit writer should consider is:

Coastal recreation waters do not include inland waters or waters upstream from the mouth of a river or stream having an unimpaired natural connection with the open sea

Accordingly, all the marine waters and estuarine waters up to the mouth of the river into the bay are considered CRW. This determination is further supported by the Department's designation of all coastal waters for "Water Contact Recreation". **Figure 3** illustrates the boundary determination (see dashed line) at the mouth of the river into the bay and the application of the enterococci criteria to the *marine* and *estuarine waters*. When delineating the regulatory boundary, it is strongly recommended that the permit writer consult with other regional permit

⁸ Per 131.22(b), EPA may propose and promulgate a regulation, applicable to one or more States, setting forth a new or revised standard upon determining such a standard is necessary to meet the requirements of the Clean Water Act. Per 40 CFR 131.41(e)(2), EPA specifically promulgated the marine enterococci criterion for the marine coastal recreation waters of Oregon and other listed states.

⁹ **Federal Register** / Vol. 69, No. 220, Pg. 67218 - 67243

¹⁰ 40 CFR 131.41 (b)

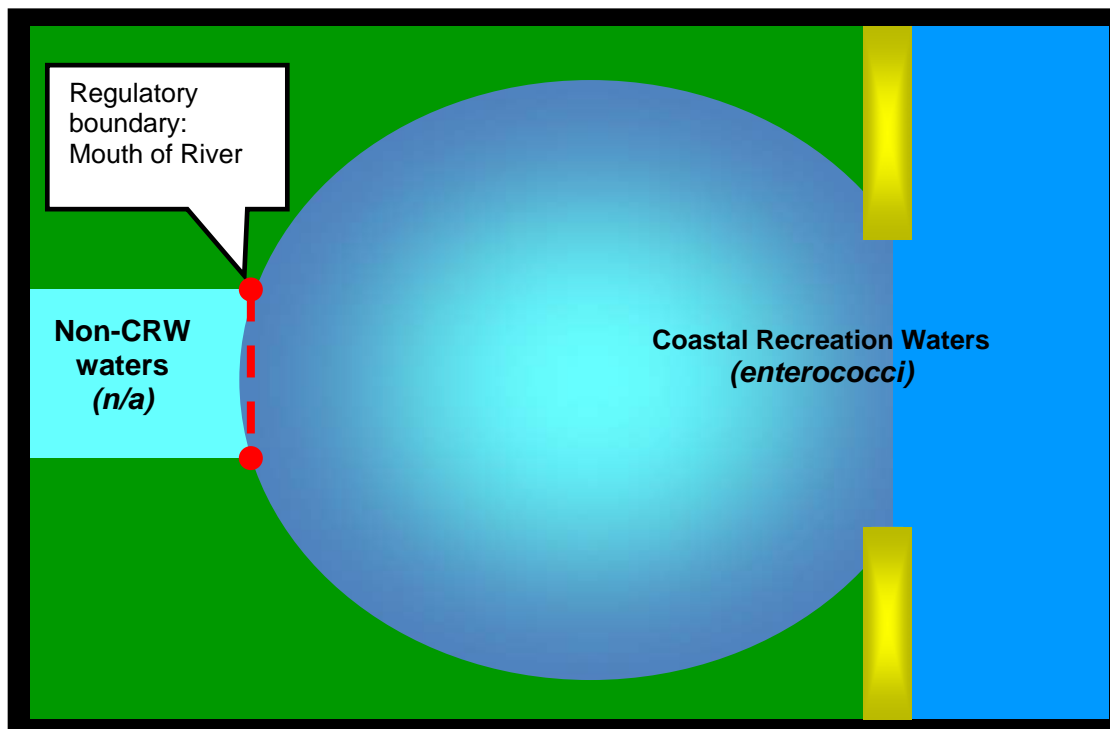
¹¹ Geometric Mean: The average of the log values of a data set, converted back to a base 10 number.

¹² A current list of Oregon beach sites can be found at: www.oregon.gov/DHS/ph/beaches/beaches.shtml

writers and TMDL staff to ensure that the same boundary is consistently used for any subsequent permits or TMDL developments.

It should be noted that some industrial activities can result in concentrations of non-enterococci bacteria that result in a false positive for enterococci bacteria. The criteria apply regardless of origin, unless a sanitary survey shows that the sources of the indicator bacteria are non-human and an epidemiological study shows that the indicator densities are not indicative of a human health risk¹³. In these instances, the permit writer should contact the Surface Water Management Section for technical assistance.

Figure 3
Default Application of Federal Bacteria Criteria



7.0 APPLICATION OF STATE AND FEDERAL BACTERIA CRITERIA

For the most part the federal definition of CRW parallels the Department's definitions of *estuarine* and *marine* waters, except in the vicinity of the fresh/estuarine water interface.

In most cases estuaries are tidally dominated and a technical determination will find that the estuarine waters (departmental definition) will extend upstream of the federal regulatory boundary at the mouth of the river. From a regulatory perspective, this will result in the majority of marine and estuarine waters having both enterococci and fecal coliform criteria, and a small strip of river that has been determined to be estuarine waters with fecal coliform only. The remainder of the river upstream will only have *E. coli* criteria. This scenario is presented in **Figures 5** and **7** below.

Many of Oregon's coastal estuaries are flooded stream valleys that do not have clearly defined embayments that are often fresh water dominated. It might be possible to have a scenario where the determined fresh/estuarine water interface is downstream of the federal regulatory boundary.

Wherever possible, the delineated boundaries should most closely emulate any planning boundaries used by the DSL and DLCDD. Accordingly, the Main Stem Columbia River estuary boundary for both federal and state purposes has been defined, in keeping with the definition

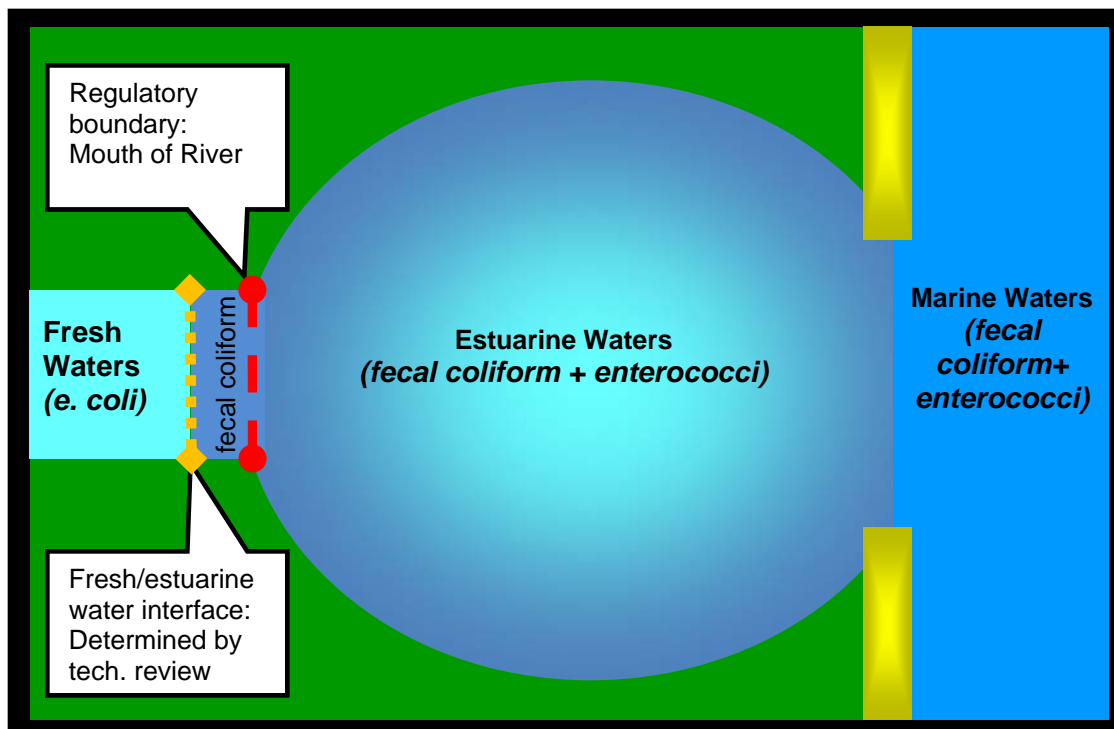
¹³ 40 CFR 131.41 - Bacteriological criteria for those states not complying with Clean Water Act section 303(i)(1)(A)

used by the DSL and DLCD, to be at the western edge of Puget Island (~RM 39). Please see **Figure 4** below.

Figure 4
Columbia River Estuary Boundary



Figure 5
Application of State and Federal Bacteria Criteria



8.0 APPLICATION OF MIXING ZONES FOR BACTERIA CRITERIA

Per OAR 340-41-0009(5), specific effluent discharge limits are assigned for *fresh waters* and *estuarine waters other than shellfish growing waters*. Accordingly, site specific effluent limits are not calculated for facilities pursuant to these criteria.

Estuarine (shellfish growing) and marine waters have bacteria water quality criteria rather than mandated effluent limits. To prevent human health risks, RMZs for bacteria are generally not allowed. In rare cases, it is possible to have waters suitable for shellfish growing, but due to various constraints (i.e., deep ocean outfall, military installations, shipping channel, etc.), cannot support active shellfish harvesting. In this case, a mixing zone may be considered¹⁴, as long as there is no impact to human recreational use or neighboring shellfish harvesting areas.

The application of mixing zones for State bacteria criteria are as follows:

- *Freshwater and non-shellfish growing estuarine water*
 - *E. coli* criteria [OAR 340-041-0009(1)(a)] must be met at end-of-pipe whenever the existing or designated use is water contact recreation (WCR); **no** RMZs are allowed in this situation.
- *Marine waters and estuarine shellfish growing water*,
 - Fecal coliform bacteria criteria [OAR 340-041-0009(1)(b)] must be met at the nearest active shellfish harvesting area. **No** RMZs are permitted within active shellfish harvesting areas.¹⁵
 - It is recommended that when mixing zones are allowed, that effluent limits should still protect for *Water Contact Recreations* with the following minimum fecal coliform limits:
 - 30-day log mean of 126 organisms per 100 ml, based on a min. of five samples.
 - No single sample may exceed 406 organisms per 100 ml.

The application of mixing zones for BEACH Act bacteria criteria are as follows:

- EPA does not prohibit the use of mixing zones in Marine or Estuarine waters. EPA advises against the use of mixing zones where the location may pose a significant health risk. It is important that the permit writer uses proper guidance¹⁶ when determining the appropriate placement and size of mixing zones depending on the potential effects to human health.

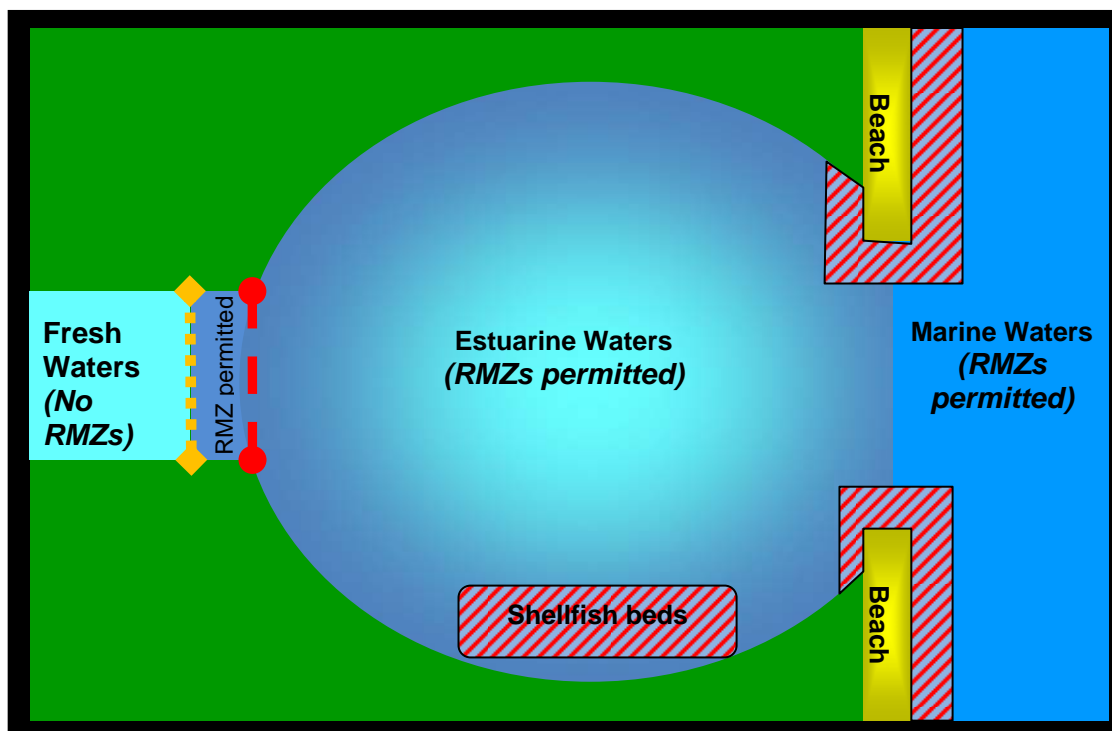
All RMZs for bacteria must comply with the Department's *RMZ IMD*. If a mixing zone is permitted, bacteria criteria must be met at any adjacent shellfish harvesting or human recreation areas. **Figure 6** illustrates the where RMZs might be possible. The figure also includes representations of recreational or shellfish harvesting areas where RMZs are not permitted and applicable water quality criteria must be met at the point of discharge.

¹⁴ The permit writer should review the [Mixing Zone IMD](#) (Part 1, Sec. 2.1) and Policy Guidance Memo entitled "[Implementation of 'Highest and Best Practicable Treatment'](#)" (1992, Lydia Taylor) to ensure that wastewater treatment units are operated in accordance with the "highest and best practicable treatment technology" requirements of the **Statewide Narrative Criteria** (OAR 340-041-0007), in addition to Water Quality Based Effluent Limits.

¹⁵ DEQ, **Regulatory Mixing Zone**, Internal Management Directive, Final 2007.

¹⁶ The Beach Act specifically refers to EPA's Water Quality Standards Handbook: 2nd Edition (EPA-823-B-94-005a, August 1994) as well as EPA's TSD for Water Quality Based Toxics Control (EPA-505-2-90-001, March 1991).

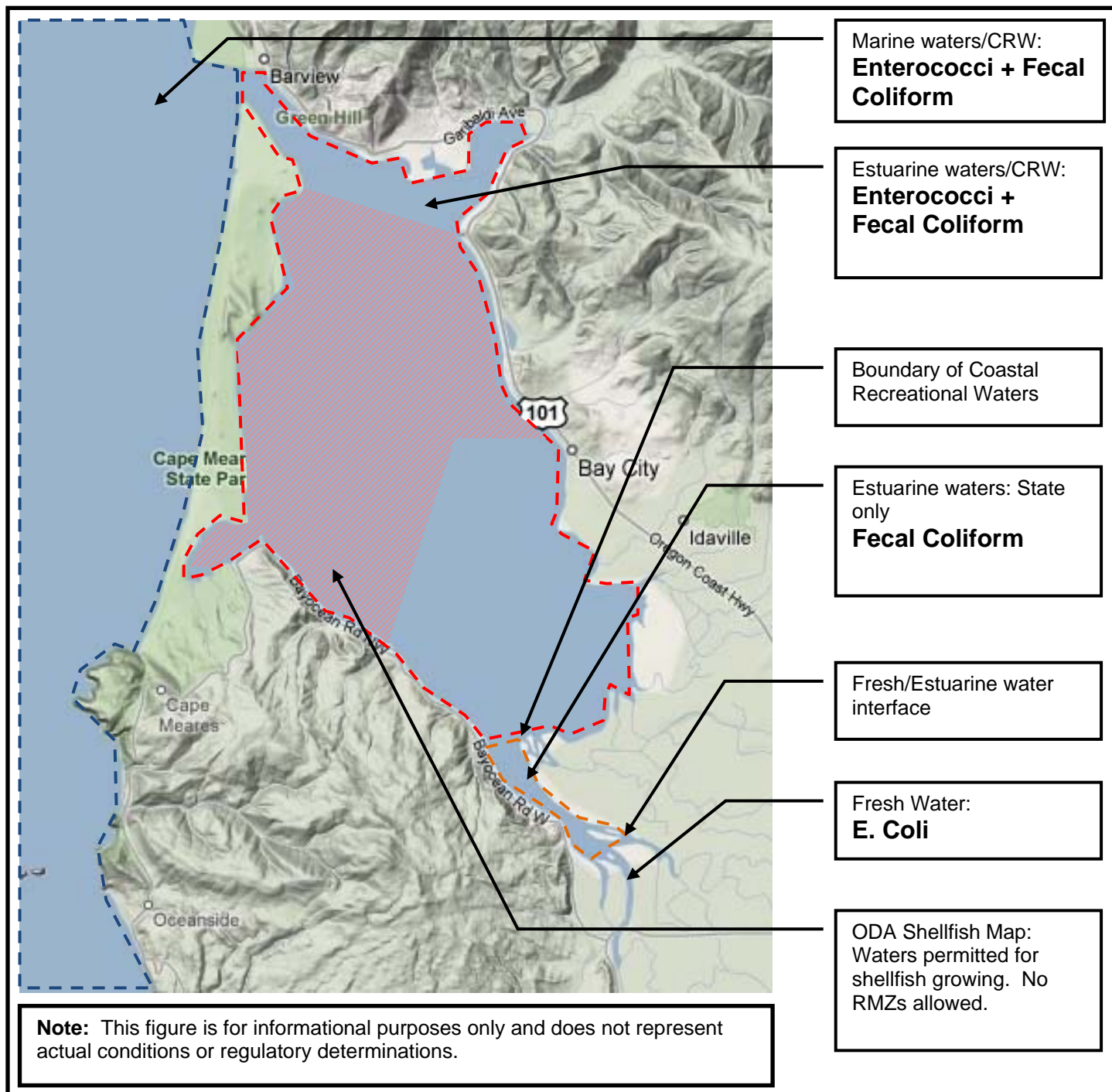
Figure 6
Application of Regulated Mixing Zones in Coastal Waters



9.0 DISCHARGES TO REGULATED WATERS

When conducting a site-specific analysis, the permit writer should develop a map of the potential discharge area showing where the various (federal and state) criteria will apply. Additionally, the map should be used to detail where beneficial uses are actively occurring, helping to determine where RMZs might be allowed as long as water quality criteria are met at the area of active use. See **Figure 7**.

Figure 7
Example of Criteria Determination Map for Coastal Bay

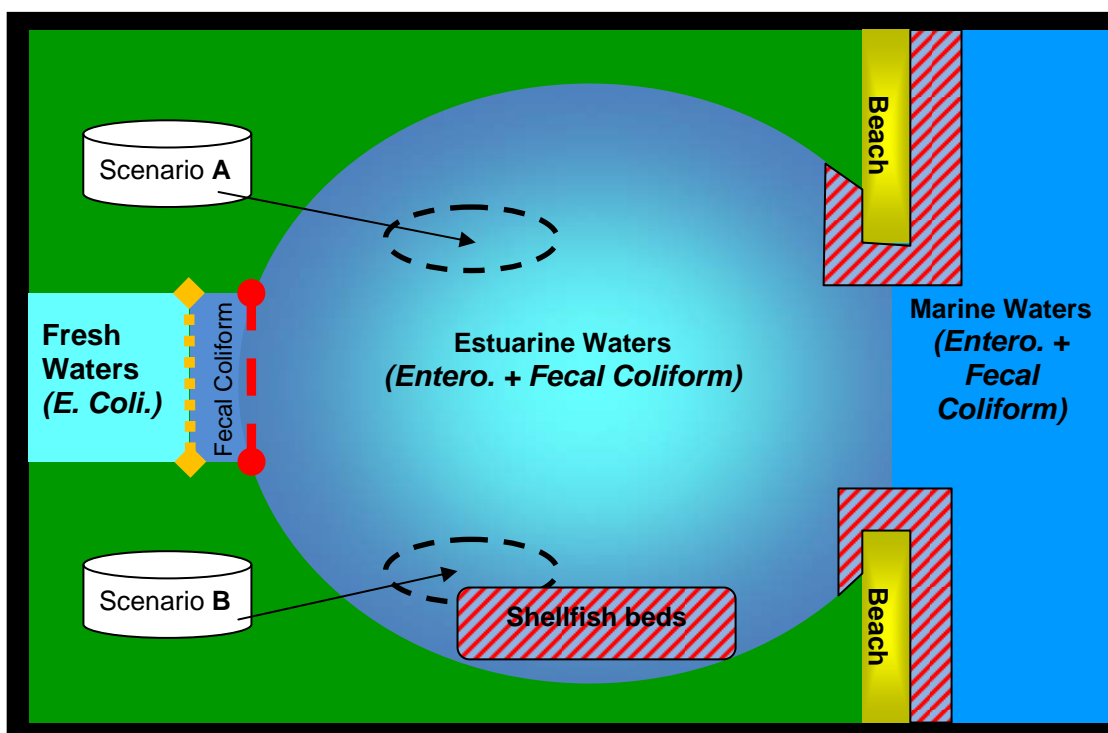


The permit writers should identify any actively occurring beneficial uses (such as swimming areas, boat ramps, shellfish harvest areas, etc.) to help with facility siting or delineation of RMZs. The following list of resources has been compiled to help the permit writer in this task:

- Federal and State Beach lists
- State Depts. of Fish and Wildlife, Parks and Recreation, and Health
- Oregon Coastal Atlas available online at <http://www.coastalatlus.net>
- Review of Oregon's Ocean Resources Management Plan or Local Comprehensive Plans
- Contact with county health, park, and/or recreation departments
- Contact with local business and recreational clubs
- On-site recreation use surveys

Figure I-8 demonstrates the application of the regulatory map for the potential siting of two potential discharge scenarios, labeled "A" and "B". A description of these scenarios is provided below. The siting of outfalls also needs to take into consideration the potential for a mixing zone and availability of assimilative capacity.

Figure 8
Application of Potential Discharge Points into Regulated Waters



Scenario A: The discharge location is to *Contact Recreation Waters* (federal) and *Estuarine Waters* (state). Accordingly the permit should include both federal and state water quality criteria for enterococci and fecal coliform. If no active beneficial uses are identified in the vicinity of the discharge, a mixing zone may be permitted.

Scenario B: The discharge location is to *Contact Recreation Waters* (federal) and *Estuarine Waters* (state). Accordingly the permit should include both federal and state water quality criteria for enterococci and fecal coliform. The proposed mixing zone intersects with a known shellfish harvesting area. Typically a mixing zone would not be allowed unless it can be sized so that water quality criteria, specifically the fecal coliform criteria, can be conservatively met at the boundary of the shellfish harvesting area.

10.0 APPLICATION OF CRITERIA IN PERMITS

The selected bacteria criteria will be included in **Schedule A** and **B** of the NPDES permit. **Table 1** includes suggested language to describe the applied criteria for **Schedule A**. For **Schedule B**, the minimum monitoring requirements will be determined based upon the design capacity and process configuration of the permitted facility. To determine the sampling frequency and type for domestic facilities, please refer to the *Matrix of Monitoring and Reporting Requirements Based on Facility Type and Size* available on the *Monitoring and Reporting* Section of the *Permit Writers Corner* intranet website. The Matrix can also provide general guidance for industrial facilities. When warranted, the permit writer should consider additional monitoring requirements (i.e. weekly sampling) to ensure to provide a robust data set and ensure compliance.

Please refer to 40 CFR Part 136 for the list of currently accepted sampling and analytical methods to demonstrate compliance with permits under the Clean Water Act. As an informational item, an excerpt of this list with the applicable methods for the required water quality criteria, should be included in the Fact Sheet or Evaluation Report to assist the permittee. The permittee has the discretion as to which sampling and analytical method to use, as long as it is appropriate to the stated water quality criteria in the permit.

Table 1
Suggested Criteria Language for Permit

Parameter	Limitations
E. coli Bacteria	<ul style="list-style-type: none">• Shall not exceed a 30-day log mean of 126 organisms per 100 ml, based on a minimum of five samples• No single sample shall exceed 406 organisms per 100 ml
Fecal Coliform Bacteria ¹⁷	<ul style="list-style-type: none">• Median concentration of 14 organisms per 100 ml• Not more than 10% of the samples may exceed 43 organisms per 100 ml
Enterococcus Bacteria	<ul style="list-style-type: none">• Shall not exceed a geometric mean concentration of 35 organisms per 100 ml

11.0 COMPLIANCE AND ENFORCEMENT

In most cases, implementation of the State and Federal criteria for bacteria will result in two effluent limits (fecal coliform & enterococci) for the same parameter (bacteria). If exceedances of the criteria occur, it could result in a violation of both effluent limits. The permittee may be subject to two effluent limit violations for one event. Per the Office of Compliance and Enforcement's [Enforcement Guidance for Field Staff](#), staff are directed to "avoid citing duplicative violations – those where the exact same conduct violated more than one legal citation". Staff should only pursue formal enforcement for the most severe of the two violations.

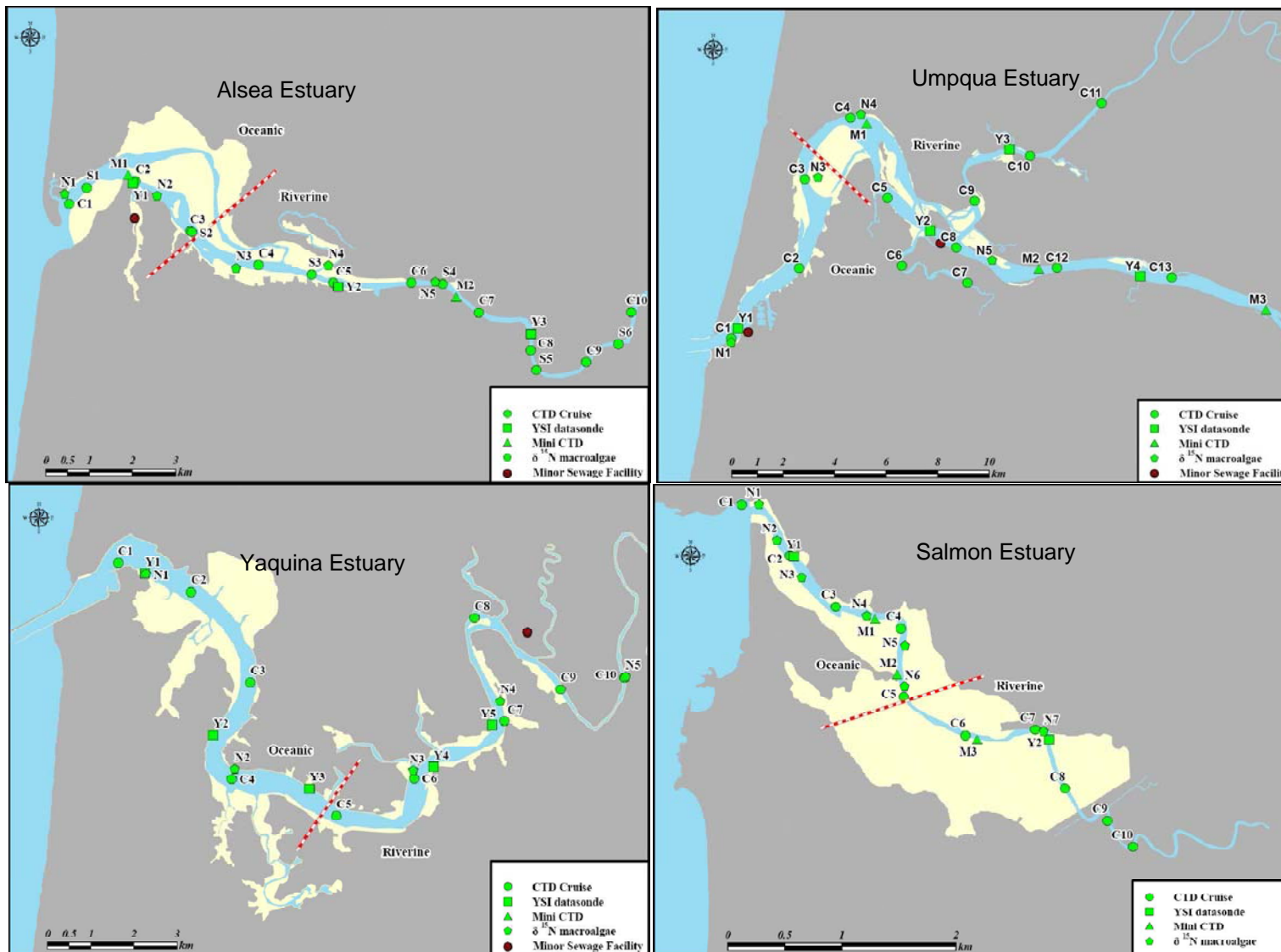
¹⁷ If the minimum monitoring and reporting requirement in Schedule B is than 10 effluent samples during the compliance period (e.g. calendar month), then additional samples may be collected within the allotted period, to better determine compliance.

APPENDIX A: REVISION HISTORY.

Revision	Date	Changes	Editor
1.0	12/30/2010	Initial publishing of document	SRB
1.1	1/18/2011	Correction of formatting issues on cover pages. Corrections of formatting on Figures 5 & 8. Miscellaneous changes to headers.	SRB

[illegible]

APPENDIX C: ESTUARY CLASSIFICATION MAPS



*Red dashed lines represent boundary between waters classified as “ocean dominated” and “river dominated”

