

SWAMP Webinar

Water Quality Goals

Jon B. Marshack, D.Env.
Staff Environmental Scientist
Office of Information
Management & Analysis

(916) 341-5514

jmarshack@waterboards.ca.gov



Main Concepts

- **How do we select numerical limits to protect water resources?**
 - ◆ **Porter-Cologne Water Quality Control Act**
 - ◆ **Water quality standards**
 - ◆ **State & Regional Water Board plans & policies**

What Will We Cover Today?

- **Overview of water quality standards**
- **Applying narrative water quality objectives**
 - ◆ Using numerical limits from the literature
- **Water quality goals**
 - ◆ Report
 - ◆ Database and on-line resources
- **Algorithms to select water quality assessment thresholds**

Water Quality Standards

Federal Clean Water Act—

- Provisions of state or federal law
- **Designated use** or uses for waters of the United States and
- **Water quality criteria** for such waters based upon such uses

[40 CFR 130.2(c) and 131.3(i)]

Water Quality Standards In California

- **Found in the
Water Quality Control Plans
(Basin Plans)**
- **Adopted by the
State and Regional Water Boards**

Water Quality Standards In California

Water Quality Standards include

- **Beneficial Use designations**
for each water body or portion thereof
- **Water Quality Objectives**
(criteria) to protect uses
- **Implementation Programs**
to achieve the objectives

Beneficial Uses of Waters of the State

California Water Code § 13050(f)

“ ‘Beneficial uses’ of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to,

- ◆ domestic, municipal, agricultural and industrial supply;**
- ◆ power generation;**
- ◆ recreation;**
- ◆ esthetic enjoyment;**
- ◆ navigation; and**
- ◆ preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.”**

Water Quality Objectives

Water Code §13050(h)

‘Water quality objectives’ means

- **Limits or levels of water quality constituents or characteristics established for the**
 - ◆ **Reasonable protection of beneficial uses of water or the**
 - ◆ **Prevention of nuisance within a specific area**

Water Quality Objectives

Come in two forms

- **Numerical**

- ◆ **Specifies a concentration limit**

- **Narrative**

- ◆ **Describes a requirement or prohibits a condition harmful to beneficial uses**

Narrative Water Quality Objectives

language from the Central Valley Region Basin Plans

- **Chemical Constituents - General**
 - ◆ Waters shall **not** contain chemical constituents in concentrations that **adversely affect beneficial uses**

Narrative Water Quality Objectives

language from the Central Valley Region Basin Plans

- **Chemical Constituents - MCLs**
 - ◆ **At a minimum, waters designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of California drinking water Maximum Contaminant Levels (MCLs)**
 - ◆ **To protect all beneficial uses the Regional Water Board may apply limits more stringent than MCLs**

Narrative Water Quality Objectives

language from the Central Valley Region Basin Plans

■ Toxicity

- ◆ All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life
- ◆ This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances

Narrative Water Quality Objectives

language from the Central Valley Region Basin Plans

■ Tastes & Odors

- ◆ **Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors**
 - **to domestic or municipal water supplies or**
 - **to fish flesh or other edible products of aquatic origin or**
 - **that cause nuisance or**
 - **otherwise adversely affect beneficial uses**

Toxicity vs. Taste & Odor

	California Primary MCL	Taste & Odor Threshold
Ethylbenzene	300 ug/L	29 ug/L
Toluene	150 ug/L	42 ug/L
Xylenes	1750 ug/L	17 ug/L
MTBE	13 ug/L	5 ug/L

California Toxics Rule (CTR)

- **Federal Clean Water Act**
 - ◆ All States required to have enforceable numerical water quality criteria for **priority toxic pollutants** in surface waters
- **National Toxics Rule (NTR), USEPA**
 - ◆ Promulgated in 1992 (amended in 1995 & 1999)
 - ◆ Numerical NTR criteria for many states' waters
- **California Toxics Rule, USEPA**
 - ◆ Promulgated 18 May 2000 (amended Feb 2001)
 - ◆ NTR criteria still in effect
 - ◆ Numerical CTR criteria for California waters

Enforceable Water Quality Standards

- **Two scenarios in California**

**Water Quality Objectives
+ Basin Plan Beneficial Use Designations**

**CTR and NTR Criteria
+ Basin Plan Beneficial Use Designations**

Policy for Application of Water Quality Objectives

from the Implementation Chapter of the Central Valley Region Basin Plans

■ Narrative Objectives

- ◆ Implement with numerical limits in orders
- ◆ Evaluate compliance by considering
 - Direct evidence of beneficial use impacts
 - All material and relevant information submitted by the discharger and other interested parties
 - Relevant numerical criteria and guidelines from other agencies and organizations
 - see *“A Compilation of Water Quality Goals”*

Application of Water Quality Objectives

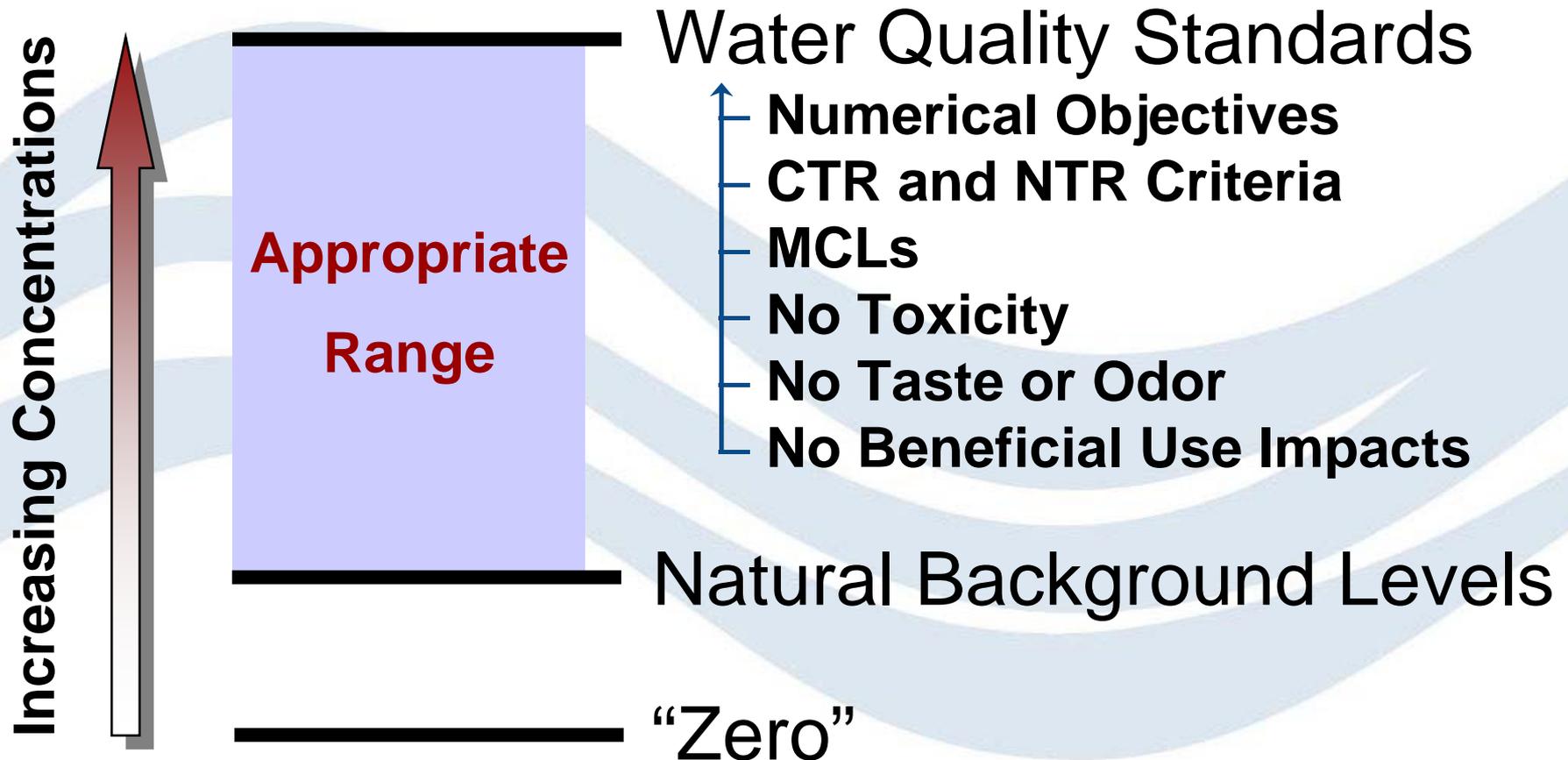
from the Implementation Chapter of the SF Bay Region Basin Plan

- **To evaluate compliance with water quality objectives, Board will consider**
 - ◆ **All relevant and scientifically valid evidence**
 - ◆ **Including numerical criteria and guidelines developed and/or published by other agencies and organizations**
 - Summarized in
“A Compilation of Water Quality Goals”

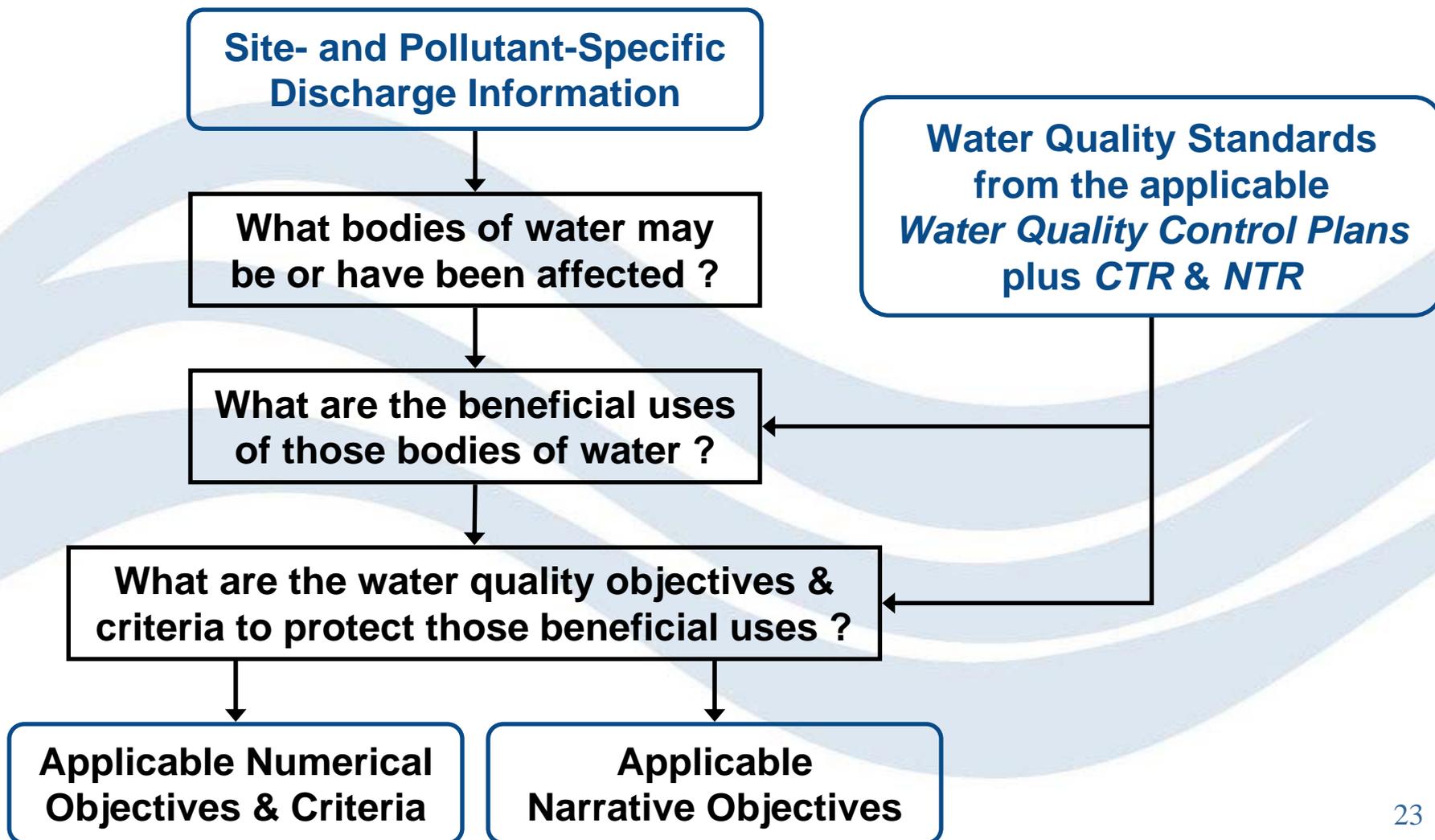
Minimum & Maximum Levels

- **Water Quality Objectives + CTR & NTR Criteria**
define the least stringent limits imposed on ambient water quality
- **Natural Background**
defines the most stringent limits imposed on ambient water quality
 - ◆ Antidegradation Policy (68-16)
 - ◆ Site Assessment and Cleanup Policy (92-49)

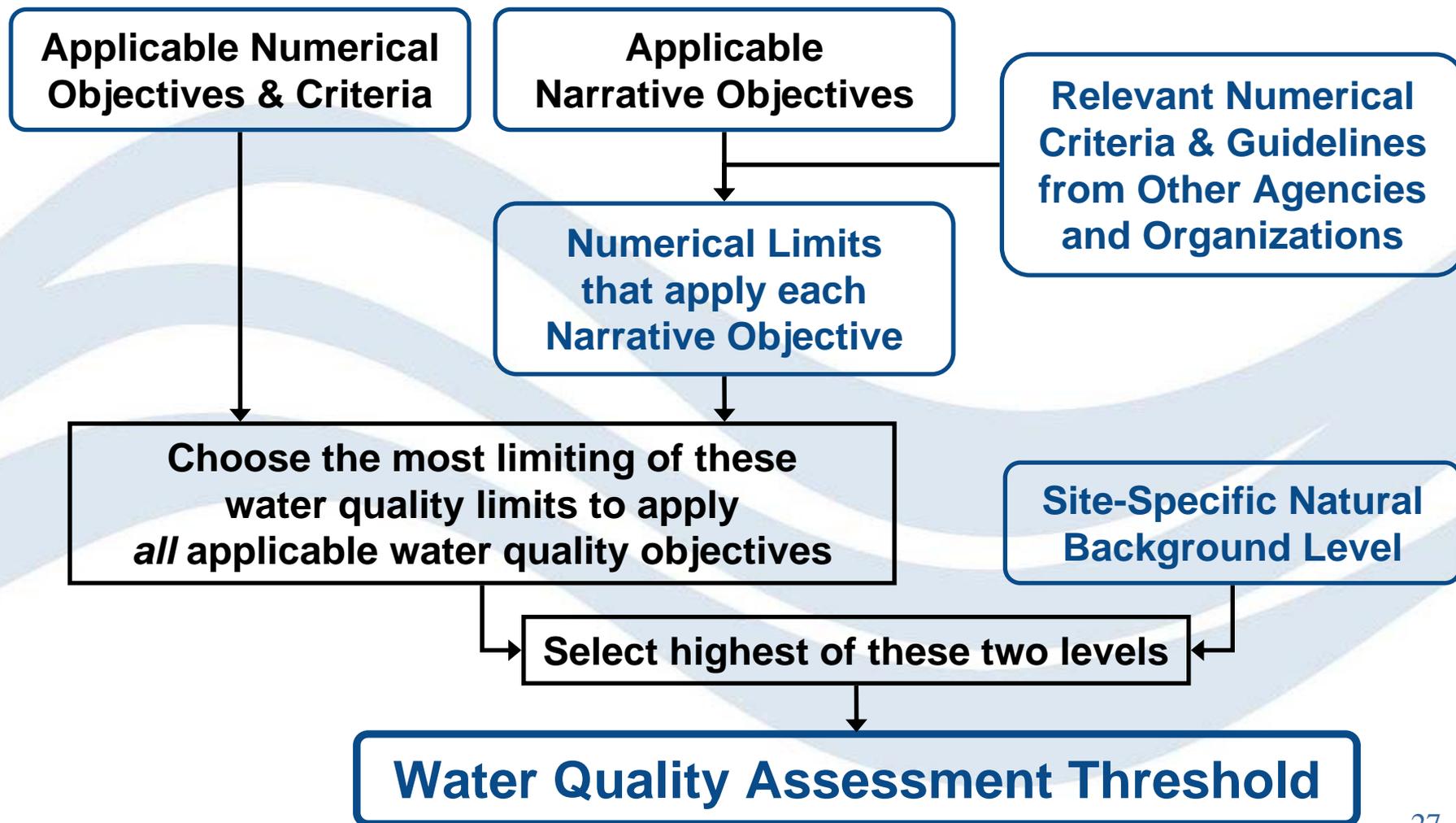
Appropriate Range of Water Quality to Protect Beneficial Uses



Selecting Assessment Thresholds



Selecting Assessment Thresholds



Sources of Water Quality Limits

Used to Apply Narrative Objectives

Chemical Constituents objective

- **California Drinking Water MCLs** **DHS**
 - ◆ Primary MCLs based on human health
 - ◆ Secondary MCLs based on human welfare
 - ◆ Technology & Economics of water use at the tap
- **Federal Drinking Water MCLs** **USEPA**
 - ◆ Only if lower than California MCLs
- ***Water Quality for Agriculture*** **FAO-UN**
- ***Water Quality Criteria*** (McKee & Wolf) **SWRCB**
 - ◆ e.g., industrial use criteria

Sources of Water Quality Limits

Used to Apply Narrative Objectives

Toxicity objective

no “detrimental physiological responses...”

- **California Public Health Goals** **OEHHA**
- **Federal MCL Goals** **USEPA**
 - ◆ non-“zero” limits only
- **California Notification (Action) Levels** **DHS**
- **Integrated Risk Information System** **USEPA**
 - ◆ Reference Doses for non-cancer effects
 - ◆ Cancer Risk Estimates
- **Cancer Risk Estimates** **OEHHA, NAS**

Sources of Water Quality Limits

Used to Apply Narrative Objectives

Toxicity objective

- **Drinking Water Health Advisories** **USEPA & NAS**
- **Proposition 65 Regulatory Levels** **OEHHA**
 - ◆ **Carcinogens at 1-in-100,000 (10^{-5}) risk level**
 - ◆ **Reproductive Toxins at 1/1000 of NOAEL**
 - ◆ **Intent of statute**
 - **Public Notice prior to exposure**
 - **Prohibit Discharge to drinking water sources**
 - **Not establishment of levels considered “safe”**

Sources of Water Quality Limits

Used to Apply Narrative Objectives

Toxicity objective

- **National Recommended (Ambient) Water Quality Criteria** **USEPA**
 - ◆ **Human Health protection**
 - Assume ingestion of aquatic organisms
 - Apply to surface waters only
 - ◆ **Aquatic Life protection**
- **Pesticide Hazard Assessments** **CDFG**
 - ◆ **Aquatic Life Protective Limits** **for DPR**

Sources of Water Quality Limits

Used to Apply Narrative Objectives

Taste and Odor objective

- **Secondary MCLs** DHS & USEPA
- **National Recommended (Ambient) Water Quality Criteria** USEPA
- **Drinking Water Health Advisories** USEPA & NAS
- **Taste and Odor Thresholds** USEPA & others



CENTRAL VALLEY REGIONAL
WATER QUALITY CONTROL BOARD

A Compilation of
Water Quality Goals

July 2008



CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

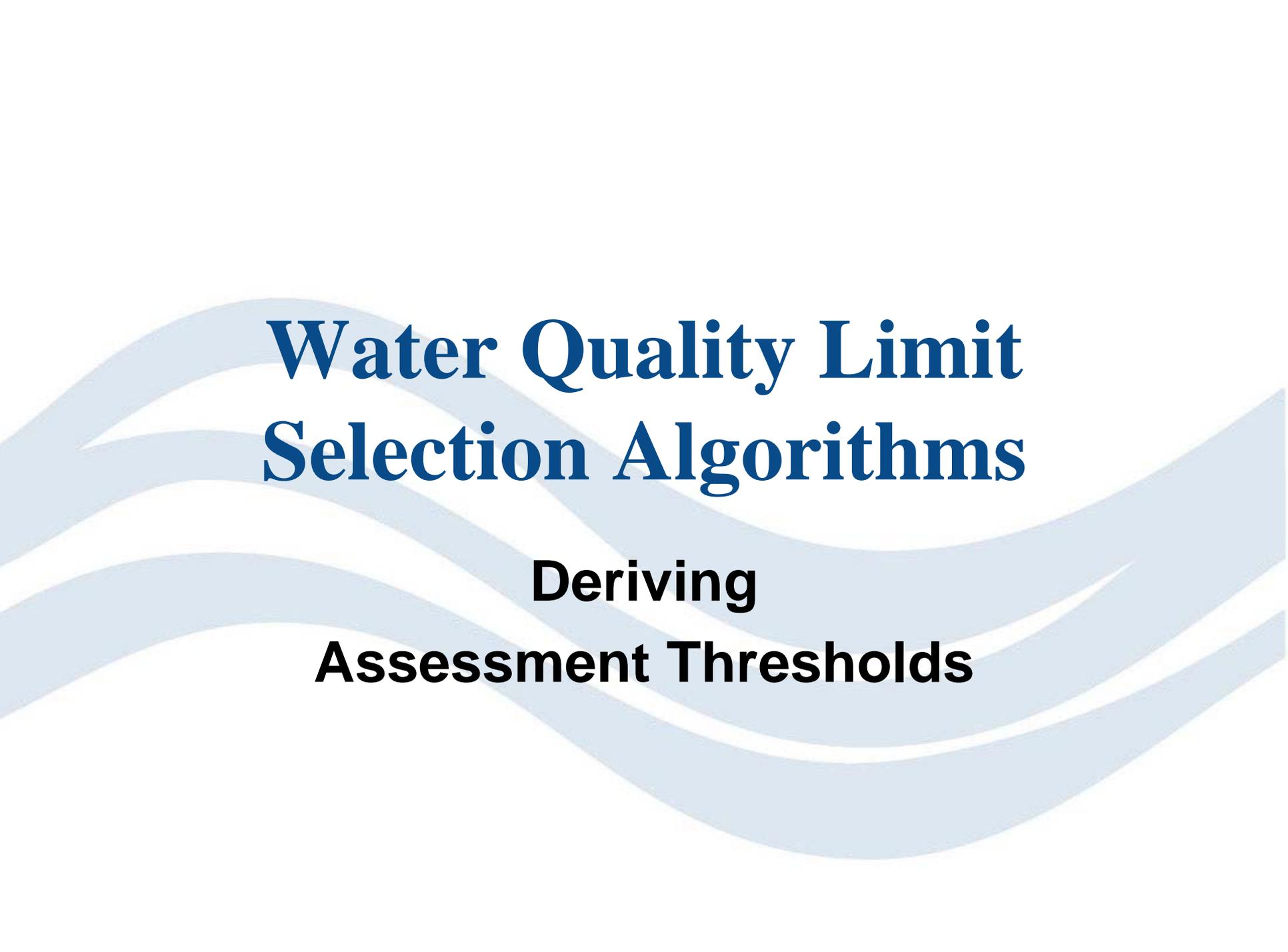
A Source of Numerical Standards, Criteria & Guidelines

Available on
the Internet at

[www.waterboards.ca.gov/
water_issues/programs/
water_quality_goals](http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals)

Water Quality Goals On-Line

**Demonstration:
Intranet Database
&
Support Tools**



Water Quality Limit Selection Algorithms

**Deriving
Assessment Thresholds**

Water Quality Limit Selection

- To be defensible, water quality limits should be chosen to apply each applicable water quality objective and promulgated water quality criterion
- Assessment threshold = most stringent of above limits

Algorithms – Main Steps

- Step 1.** Select a single numerical limit to satisfy each applicable water quality objective and promulgated criterion or relevant portion thereof
- Step 2.** To satisfy all applicable objectives select the lowest limit from Step 1 as the assessment threshold
- Step 3.** Adjust for natural background levels

Algorithms – Guiding Principles for Step 1

- **Use purely risk-based limits instead of risk management-based limits to apply narrative water quality objectives**
 - ◆ **Toxicity-based limits instead of MCLs**
 - ◆ **Risk management-based limits may contain irrelevant information and constraints**
 - e.g., Proposition 65 limits
- **Use California limits when available**
 - ◆ **Instead of federal limits or limits from other sources**
 - ◆ **Consistency with other California agencies**

Algorithms – Guiding Principles for Step 1

- **Use limits that reflect peer-reviewed science**
 - ◆ **Avoid using draft or provisional limits unless nothing else is available**
- **Use limits that reflect current science**
- **Use relevant limits**
 - ◆ **Check intent**
 - **Compare with language of narrative objective**
 - ◆ **Check exposure routes**

Water Quality Limit Selection Algorithms

- **Water Quality Goals 2007 Edition**
 - ◆ **Groundwater**
 - ◆ **Inland Surface Waters**
- **Water Quality Goals 2010 Edition**
 - ◆ **Enclosed Bays & Estuaries**
 - ◆ **Ocean Waters**