Reasonable Potential & Effluent Limitations

BACWA Permit Workshop
September 24, 2010

Goals

- How does the Regional Board identify pollutants needing water quality-based effluent limits (WQBEL)?
- How does the Board calculate effluent limits for these pollutants?
- Typical problems - *discussion*

Background: NPDES Permits

Type of Discharger	*Technology-Based Limitations*	*Water Quality Based Effluent Limitations (WQBEL)*
POTWs	Secondary-level	Local WQS
Industrial	BAT, BCT	Local WQS
Muni. Stormwater	Maximum Extent Practicable (MEP)	Narrative

USEPA NDPES regulations: Reasonable Potential Analysis

Each permit shall include limitations necessary to …achieve water quality standards …

> ***(i) Limitations must control all pollutants … [that] cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard,….***
>
> *40 CFR 122.44 (d) (1) (i)*

State RPA Procedures:
State Implementation Policy (SIP)

"Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California"

- ***Section 1.3:*** Determination of Priority Pollutants Requiring Water Quality-Based Effluent Limitations
- ***Section 1.4:*** Calculation of Effluent Limitations

Posted on State Water Board website

State Implementation Policy (SIP):
Standards for Priority Pollutants located in:

- EPA's ***California Toxics Rule*** (CTR) and NTR – Criteria
- Basin Plan toxic pollutant objectives; for SF Basin Plan:
  - Table 3.3 Marine Water Quality Objectives
  - Table 3.4 Freshwater Water Quality Objectives
- *SIP also addresses*: monitoring requirements for dioxins; chronic toxicity control provisions; and, other special provisions

SIP Reasonable Potential Analysis:
Factors used for identifying pollutants

- **Objectives and criteria** – *minimum (chronic)*
  8.1 ug/l 4-day avg. for lead rather than 210 ug/l 1-hr avg.
- **Effluent data** – *maximum effluent concentration*
- **Ambient background data** - *maximum background concentration*
- **Nature of facility operations** – *subjective override*

Explained in the permit Fact Sheet

Note: RPA doesn't apply if TMDL developed

Factors not used by the SIP for identifying pollutants

- **Dilution!!**
- **Data variability (*standard deviation*)**
- **Local background** (*for SF Bay, ambient background from selected sites is used*)

SIP Reasonable Potential: Triggers for needing WQBELs

1. Maximum effluent concentration (MEC) greater than the lowest objective.

   MEC ≥ WQO

2. Maximum ambient background (B) greater than lowest objective, *if pollutant present in effluent*

   B > WQO ***and pollutant present in effluent***

3. Permit writer assessment

   Identified threat to beneficial uses

Reasonable Potential Trigger 1:

MEC ≥ WQO

- Maximum effluent conc. (MEC) - Effluent data (3 – 5 years of data)

Compared with

- Lowest water quality objective/criteria -
  - California Toxics Rule (CTR) includes NTR
  - Basin Plan Table 3-3 and 3-4, plus toxicity

***Example*: Highest Pb in effluent = 10 ug/l (dissolved)**
Lowest CTR objective is 8.1 ug/l

Data Adjustments

Objectives/criteria & ambient background & effluent data may need to be "adjusted" (*SIP 1.2*)

- Use discharger-specific ***Water Effect Ratios*** for metals, where approved
- Discard inappropriate or insufficient data (RB discretion)
  - sample erroneously reported
  - not representative of effluent or ambient water quality
  - questionable QA/QC
  - varying seasonal conditions (??)
- Adjust for hardness (freshwater) or pH, as appropriate
- Use translators for dissolved metals (*next slide*)

Data Adjustments:
Dissolved / Total Recoverable Translators

- Basin Plan objectives/CTR criteria for metals are expressed as "dissolved"
- "Dissolved" objectives/criteria needs to be translated to "total recoverable"
- Translators in SIP Appendix 3 (*or site specific*)

Example:

Lead (dissolved) objective converted to lead (total rec.)

8.1 ug/l dissolved) / (0.951) = 8.52 total

Reasonable Potential Trigger 2:

Ambient Background (B) > WQO

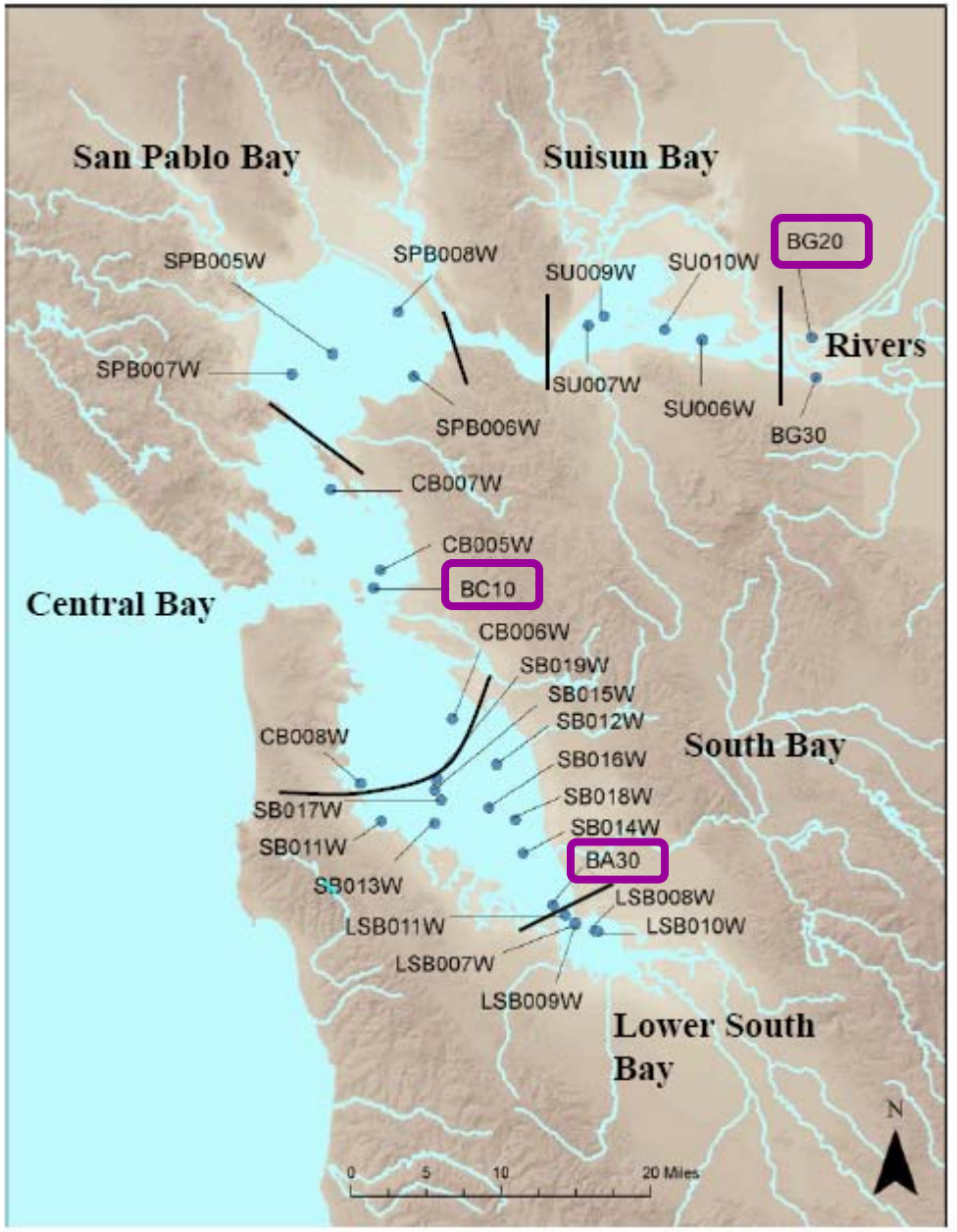
Source of *Maximum Ambient Background*

***For Bay Dischargers*:** SFEI - *Regional Monitoring Program* & *BACWA SF Bay Ambient Water Monitoring Interim Report*

- Highest value of all background data – back to **1993**; *includes estimated values*
- Measured as total recoverable
- Data from designated "background" sites – 3 historic monitoring stations
  - Yerba Buena Island (BC10) (and Richardson Bay?)
  - Dumbarton Bridge (BA30)
  - Sacramento River (BG20)

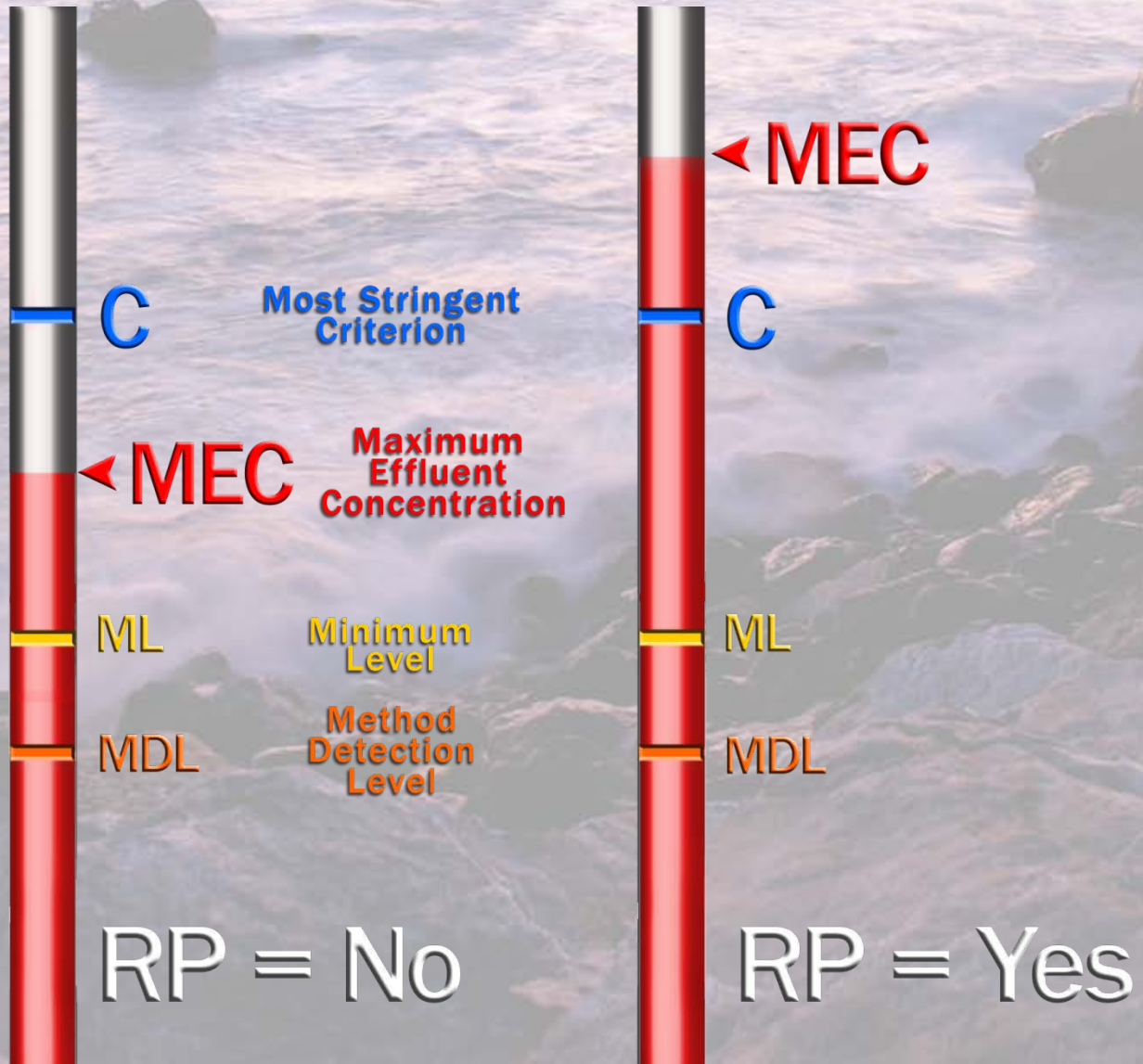
SF Bay

Ambient Background Locations (B)

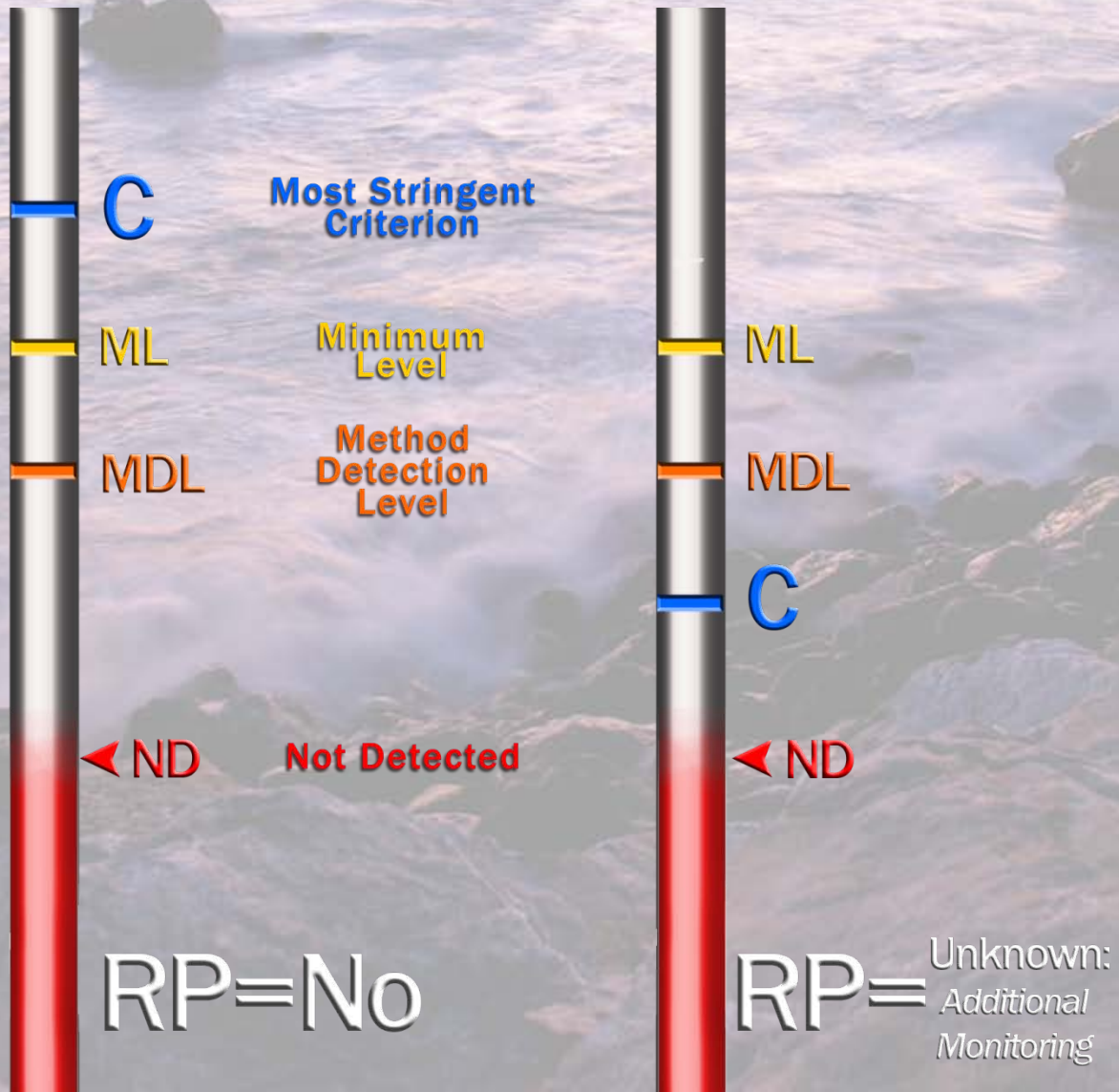


SIP Trigger #1:

Comparison with Lowest Criterion **MEC vs C**

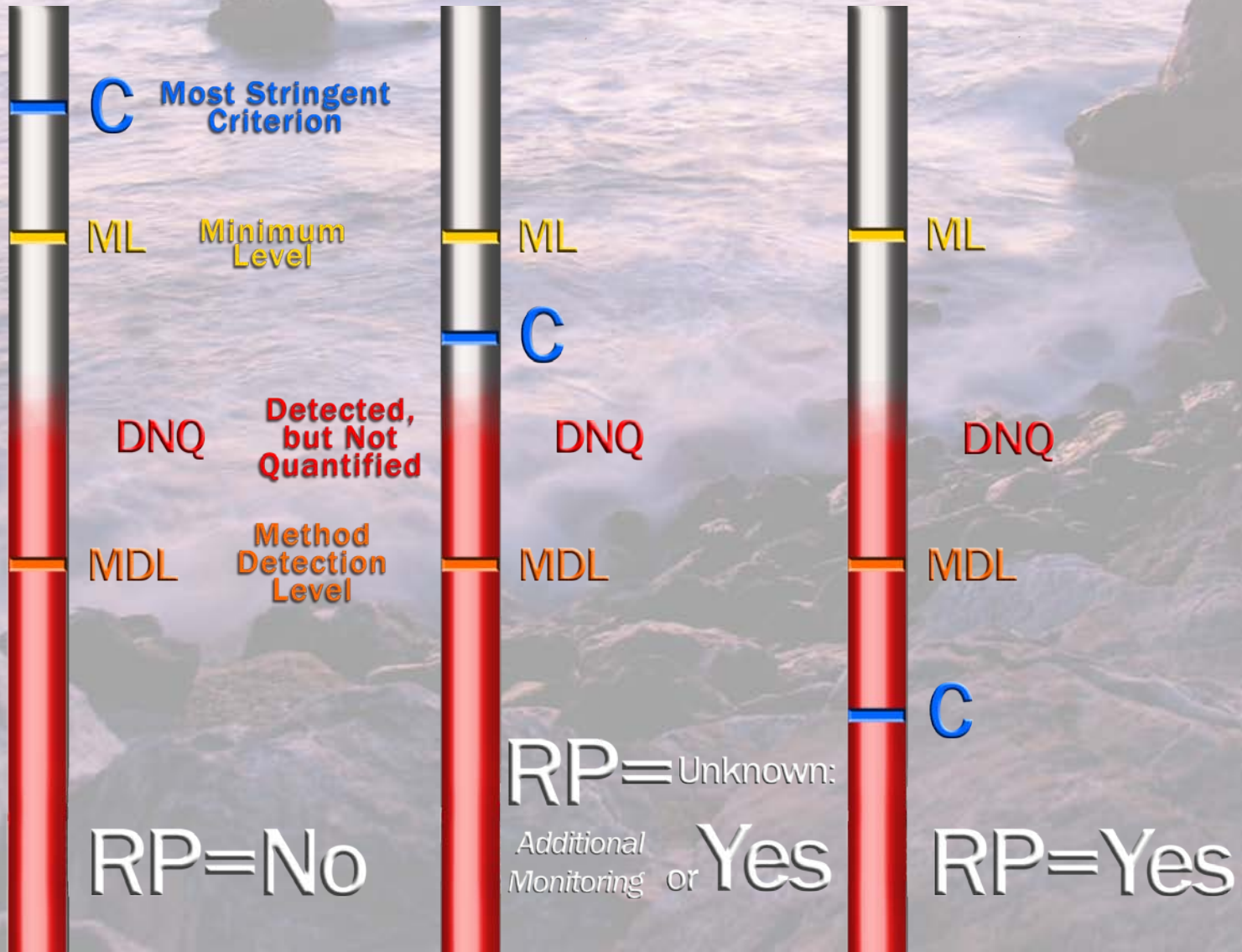


Trigger #1: All Non-Detects



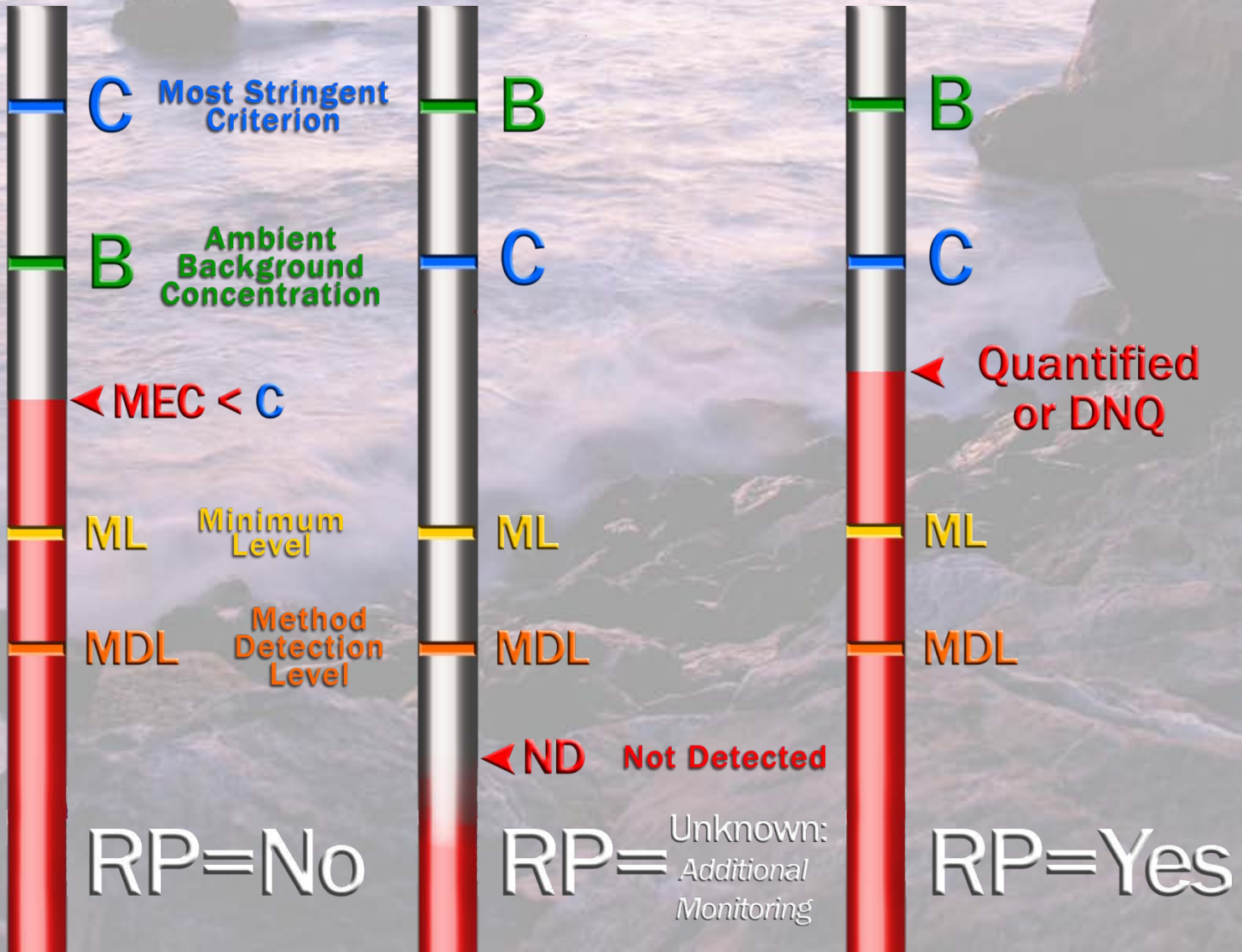
Trigger #1 *(Implied):*

Detected but not Quantified



SIP Trigger #2:

Comparison with the Background



Trigger 3:
Other threats to beneficial uses

Information that can be used by permit writer

- Facility & discharge type
- Lack of dilution
- History of compliance problems
- Potential toxic impact of discharge
- Fish tissue residue data
- 303(d) listing for the pollutant
- Endangered species; critical habitat

Reasonable Potential for Other Parameters (non-priority pollutants)

- Non-toxic parameters (*assessed outside of SIP by permit writer*)
- Toxicity may be assumed by the permit writer to have RP based on trigger 3

Reasonable Potential for Ocean Waters

- Described in Ocean Plan – App. VI - **RPCalc**
- Based on EPA's TSD – *updated for "censored" data*
- Takes into account:
  - Mean and standard deviation
  - Dilution
  - "Shape" of the data (e.g., lognormal distribution)
  - ND and DNQ values
  - Number of samples
  - Background seawater (not max)
- Eventually will be used for inland waters??

Calculation of Effluent Limitations

Inland Waters, Bays & Estuaries per SIP Section 1.4

- Applies to Toxic Pollutants (and toxicity) that show reasonable potential
- Several methods possible
- Yields WQBELs

Options for WQBELs per SIP

a. TMDL-based: assigned portion of the loading capacity of the receiving water

b. Steady-state model statistical procedure: *discussed in following slides*

c. Dynamic model: 3 techniques recommended by EPA (*may give less restrictive WQBELs*)

d. Consideration of intake water pollutants (per SIP section 1.4.4: *background >C; same water body*)

SIP Calculation Approach

Key input factors in spreadsheet:

- All pollutant criteria/objectives
- Dilution factor, *if allowed (not bioaccumulatives)*
- Effluent data *including historical variability*
- # data points
- Frequency of compliance sampling
- Pollutant background concentrations

Step 1: Criteria/Objectives

- Identify applicable criteria/objectives:
  - acute aquatic life
  - chronic aquatic life
  - human health
- Adjust for pH, hardness (freshwater); convert dissolved to total recoverable
- If data insufficient ⇨ *set interim requirements (per SIP 2.2.2.)*

Step 2: Calculate Effluent Concentration Allowance (ECA)

ECA = C + D (C - B)

C = criterion/objective (adjusted & translated)

D = dilution credit (*capped at 10:1 for SF Bay*)

B = the ambient background concentration (*maximum*)

Exceptions:

- when **C** is Human Health (carcinogen) criterion, **B** = average background)
- when background **B** ≥ criterion **C**, then **ECA = C**

Step 3: Adjust for Effluent Data Variability

Calculate long-term average discharge condition (LTA)

LTA = (ECA)(ECA multiplier)

- Applies to aquatic life criteria – chronic and acute, separately
- Takes into account effluent variability (CV) - more variable the data, the lower the multiplier
- Multiplier taken from table or determined by formula
- ⇨ ECA met 99 days out of 100.

Step 4: Lowest LTA from Step 3

Select lowest (most limiting) of:

- **LTA_{acute}**

  or

- **$LTA_{chronic}$**

Step 5: Calculate WQBELs for aquatic life

AMEL - average monthly effluent limitation

MDEL - maximum daily effluent limitation

AMEL = (LTA)(AMEL multiplier)

MDEL = (LTA)(MDEL multiplier)

Multipliers taken from table or calculated – ***factors***:

- Coefficient of variation (data variability)
- Future sampling frequency (i.e., samples per month)
- 95th % probability for AMEL; 99th% for MDEL

Step 6: Calculate human health- based WQBEL

AMEL = ECA [*Effluent Concentration Allowance from step 2*]

***Recall*:** ECA = C + D (C - B)

MDEL = (ECA) (MDEL multiplier/ AMEL multiplier)

Multipliers from Step 5;

***AMEL** = average monthly; **MDEL** = max daily*

Step 7: Final effluent limits (WQBEL)

- Take lowest AMEL (*aquatic life* or *human health*)
- Take lowest MDEL (*aquatic life* or *human health*)
- Regional Board can impose more restrictive limitations to:
  - Protect beneficial uses
  - Implement state/federal antidegradation policies
  - Implement anti-backsliding requirements

***AMEL** = average monthly; **MDEL** = max daily*

Feasibility Evaluation

- Determine if discharge is likely to comply
- If not, compliance schedule needed

Spreadsheets (data summaries RPA, effluent limits, feasibility)

- Prepared by USEPA contractor
- Provided in draft by Board permit writer during permit preparation
- Ideally, request early copy of current spreadsheet and do it yourself
- Also, use recent permits for comparison, especially the Fact Sheet discussion

Example Problems - Data Issues
Permittee responsibility

- Missing data or partial results - no MDL, ML
- Wrong analytical technique
- Sampled at wrong time
- Sample contamination (*roof reconstruction!*)
- Anomalous high copper: *fixtures, piping?*
- Laboratory left out "<" for dioxin congener, *triggered reasonable potential*

Difficult to address years later

Example Problems – Reas. Pot.

- Data duplicated: entered multiple times
- Used old mercury objective from Basin Plan
- Found RP for DDE, dieldrin although non-detect & no special justification
- Associated wrong TEFs with dioxin congeners
- Used wrong MEC or different MECs
- Micrograms instead of nanograms (PCBs, pest.)

Example Problems – Calc. WQBEL.

- Used 0 in spreadsheet for human health → 0.0 effluent limit
- Used effluent hardness rather than receiving water (discharge to freshwater)
- Used default coefficient of variation rather than actual (no justification for using default)
- Used detection level (DL) rather than ½ DL for non-detects for calculating CV
- Found reasonable potential but did not calculate limits

Adapted from a picture © Kurt Jones

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