

### Short-Course

#### ◀ Stormwater-Related Water Quality Issues ▶

**Duration:** 1 day (9:00 am-4:15 pm; 1-hr lunch)

**Presenter:**

*Dr. G. Fred Lee*

*G. Fred Lee & Associates*

*El Macero, CA*

*phone: (916) 753-9630*

**Location:** \* to be determined \*

**Organizer:** \* to be determined \*

**Cost:** \* to cover costs \*

### Topic Outline

#### Stormwater as a Source of Contaminants

- Introduction
  - ◆ Overview of Problems - Real and Perceived
- Principles of Water Quality Evaluation and Management
  - ◆ Basic Concepts
    - Designated Beneficial Uses - Water Quality
    - Water Quality Criteria and Standards/Objectives
      - Chemical-Specific • Toxicity-Based (Acute and Chronic) • Biological Criteria
    - Mixing Zones
    - NPDES Limitations
    - Implementation of Standards
      - Relationship between Analytical Methods for Specific Chemicals and Water Quality
      - Toxicity Testing Methods
      - Exceedance of Water Quality Objectives
- What Makes a Chemical Hazardous to Aquatic Life
  - ◆ Overview of Key Principles of Aquatic Chemistry
    - Chemical Species - Soluble vs. Total Contaminants
  - ◆ Overview of Key Principles of Aquatic Toxicology
    - Duration of Exposure
    - Sensitivity of Organisms
  - ◆ Contaminants vs. Pollutants
- Testing Discharge/Runoff vs. Ambient Waters
  - ◆ Objectives of Water Pollution Control - Protect Designated Beneficial Uses
    - Numbers, Types, Character of Desirable Aquatic Organisms of Receiving Water
  - ◆ Trying to Use Effluent Testing as Measure of Potential Impact on Receiving Water Quality
    - Often Unreliable
  - ◆ Examples - Findings of Recent Studies
- Water Quality Impairment
  - ◆ Exceedances of Water Quality Standards - "Administrative Impairment"
  - ◆ Adverse Impact on Designated Beneficial Uses
  - ◆ "Administrative Impairment" ≠ "Beneficial Use Impairment"
- Problems with Use of Exceedances of Water Quality Objectives (Standards) as Determiner of Water Quality Impairment
  - ◆ Chemical-Specific Objectives
    - Worst-Case Assumptions
      - Contaminant Availability 100%
      - Chronic Exposure Conditions
      - Organism Sensitivity
    - Criteria/Objectives: 1-hr Avg. Maximum; 4-day Avg. Maximum; ≤ 1 Exceedance/3 yrs

- ◆ Effluent/Discharge Toxicity Test-Based Limitations
  - Toxicity Test Conditions More Severe Than Typically Occurs in Ambient Waters
  - Effluent Toxicity Cannot Be Directly Translated to Receiving Water Toxicity
  - "Water Effects Ratio" - Problems with Current Approaches
- ◆ Biological Assessment
  - Factors Affecting Numbers & Types of Organisms
    - Habitat • Natural Variability • Storms • Flows • Other Influences
- Overview of Key Principles of Aquatic Life Hazard Assessment
  - ◆ Tiered, Integrated Evaluation of
    - Aquatic Chemistry (Contaminant Fate & Transport), and
    - Aquatic Toxicology (Contaminant Availability, Duration of Exposure, Sensitivity/Types of Organisms), to
    - Assess Potential Impairment of Designated Beneficial Uses by Particular Source/Discharge

#### Characteristics of Stormwater Discharges

- Amounts & Forms of Chemical Contaminants
  - ◆ High Concentrations of Unavailable/Non-Toxic Forms of Contaminants
- Duration of Organism Exposure
  - ◆ Typically Short Durations of Exposure; Episodic Events

#### Concerns for Stormwater-Associated Contaminants: Surface & Groundwater Quality

- Physical Impacts
  - ◆ Flow-Related Erosion
  - ◆ Suspended Solids - Physical & Chemical
    - Abrasion • Deposition
- Chemical Impacts
  - ◆ Aquatic Plant Nutrients (N, P) - Eutrophication
  - ◆ Heavy Metals (Cu, Cd, Zn)
  - ◆ Organics (PAH's, Petroleum Hydrocarbons, etc.)
  - ◆ Urban Soil Lead Residues
    - Typical Concentrations • Water Quality & Potential Public Health Impacts • Sources • Evaluation of Significance • Control
- Microorganisms - Sanitary Quality (coliforms)
- Evidence of Water Quality Problems Associated with Non-Point-Source Discharges
  - ◆ Inaccurate Assessment of Water Quality Problems

#### Management of Stormwater-Associated Contaminants

- Conventional Approaches ("Best Management Practice")
  - ◆ Detention Basins • Wetlands • Vegetative Areas • Others
  - ◆ Efficacy in Controlling Water Quality Problems; Toxic Pit Issues
- Suggested Approaches
  - ◆ Application of Water Quality Criteria & Standards (Objectives)
  - ◆ Lee, G. F., and Jones, A., "Suggested Approaches for Assessing Water Quality Impacts of Urban Stormwater Drainage," IN: Symposium Proc. on Urban Hydrology, TPS-91-4, AWWRA, Bethesda, MD, pp. 139-151 (1991).

#### Stormwater Regulatory Requirements

- Municipal Areas • Industrial Areas • Construction Sites
- Application of Water Quality Standards (Objectives) to Stormwater Discharges
  - ◆ Need for Stormwater-Associated Water Quality Criteria

#### Specific Stormwater Issues Raised by Course Participants

#### Course Evaluation and Closure