Los Angeles and Long Beach Harbors and San Pedro Bay Modeling

Long Beach, CA
January 31, 2006
Presentation Outline

- Background
- Overview of Modeling
- Model Development
- Model and Data Coverage
- Some Preliminary Hydrodynamic Results
- Schedule for Remaining Task
- Discussion
Background

• Modeling Tools Are Being Developed to Support TMDL Implementation in Los Angeles Harbor, Dominguez Channel, LA River, and San Gabriel River

• Multiple Model Applications to Different Regions by Different Groups

• Model Applications Integrated by Use of Same Modeling Software System and Coordinated Data Sharing
## 303D Listings

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<th>PCBS</th>
<th>PAHs</th>
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Integration of Multiple Modeling Studies

- Dominguez Channel and Estuary – Everest
- Los Angeles Harbor – Tetra Tech
- San Gabriel River Estuary – SCCWRP
- Everest and Tetra Tech Models Cover All of LA and LB Harbors and Near Shore Region of San Pedro Bay
Integration of Multiple Modeling Studies

- Tetra Tech Model Will Receive Loadings from Everest Dominguez Channel Model
- Tetra Tech Model Can Provide Boundary Conditions for SCCWRP San Gabriel Estuary Model and Receive Loadings
- Since Models Are Based On Same Software System, They Can Be Collapsed Into Single Application if Required.
Modeling Process

- Model Selection
  - EFDC for All Receiving Water Applications
- Data Assembly and Evaluation
- Collection of Additional Field Data as Required
- Model Configuration or Setup
- Model Calibration
- Model Review
- Scenario Simulations to Support TMDL Implementation
Modeling System Components

- Watershed Model – Provides Non-Point Source Load to Water Body
- Hydrodynamics- Provides Physics to Describe the Movement of Contaminants
- Eutrophication Model – Describes the Carbon, Nitrogen and Phosphorous Cycles and the Impact of Nutrients
- Sediment Transport Model – Movement of Particulate Material Including Deposition and Resuspension
- Contaminant Transport and Fate Model – Describes Transport and Fate of Metals and Organic Compounds Having Tendency to Adsorb to Sediments
San Pedro Bay Watersheds
EFDC Modeling System

- Public Domain, Open Source Code
- Maintained by Tetra Tech with Support from US EPA
- More than 100 Applications Worldwide
- 3-D Hydrodynamics with Coupled Salinity and Temperature Transport
- Directly Coupled Water Quality-Eutrophication Component
- Sediment-Contaminant Transport and Fate Components
- Extensive Pre and Post Processing
EFDC

Hydrodynamics

Toxics

Sediment

Eutrophication

Salinity

Temperature

Dye

Organic

Inorganic

Cohesive

Noncohesive

22 State Variables
EFDC Harbor Applications

- Hampton Roads, Virginia – Channel Deepening, Shoreline Modification
- Cape Fear, Wilmington, NC – NPDES
- Charleston Harbor – TMDL
- Savannah River – TMDL, Channel Deepening
- St. Johns River – TMDL and NOAA Ports System
- Mobile Bay – TMDL
- San Diego Bay – TMDL
- Portland, OR – Contaminated Sediment Superfund
- Elliott Bay, Seattle – Contaminated Sediment
Development of the LA and LB Harbors and San Pedro Bay Model

- Model Spatial Coverage and Grid
- Data Coverage
- Calibration Approach
- Preliminary Results
Model Grid System

- Multi-Domain with Focused Resolution
- Allows Sub-Sets of Grid to Run Separately
- Base Configuration Has 2140 Horizontal Cells
- Fine Version with 8640 Horizontal Cells to Study Localized Problems
Model Grid System
Model Grid System
Preliminary Bathymetry
Hydrodynamic Data Coverage and Hydrodynamic Calibration

• Limited Direct Physical Data
  – Tide Gauges
  – Current Meters

• Salinity Monitoring Data

• Calibration to Tide Gauge and Salinity Observations After High Flow Events

Preliminary Results
NOAA Ports System Data Stations
Salinity Monitoring Stations, LA Harbor
River Flows During a Salinity Transport Calibration Period

Flow, Oct 04 - Mar 05

- Los Angeles River
- San Gabriel River

Flow, cms

Time Since 00 Jan 03, Days

0 1000
0 200
0 400
0 600
0 800
Salinity: Dec 04-Jan 05
Model Grid System
Sediment and Contaminant Transport Modeling Approach

• Major Problem Is Initialization of Bed Conditions

• Sediment Physical Properties
  – Sediment Size and Type
  – Void Ratio or Water Content
  – Surface or Profile Data

• Resuspension Potential
  – Site Specific or Literature Values

• Prop Wash and Wake Effects
Sediment and Contaminant Transport Modeling Approach

• Contaminant Properties in Bed
  – Initial Contaminant Levels
  – Particulate Dissolved Organic Carbon Levels Desirable with respect to Hydrophobic Organics
  – Site Specific or Literature Values for Partition Coefficients
Sediment and Contaminant Transport Modeling Approach

- Initialize Water Column Concentrations from Monitoring Data
- Contaminant Loading Estimates
- Calibration to Water Column and Bed Monitoring Data
Status and Schedule

• Hydrodynamic Model Currently Nearing Calibration
  – Complete by 31 March ‘06

• Sediment and Contaminant Transport and Fate Model
  – Preliminary Model Setup in Progress
  – Calibration Completed During Fall ‘06

• Calibration to Water Column and Bed Monitoring Data
Questions and Discussion