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

Management Area	Metals	Pesticides	PCBS	PAHs	Fecal Coliform
Ballona Creek	√	√	√		√
Ballona Creek Estuary	√	√	√	√	√
Cabrillo Beach		√	√		√
Dominguez Channel	√	√	√	√	√
Long Beach Harbor Main Channel		√	√	√	
Los Angeles Fish Harbor		√	√	√	
Consolidated Slip	√	√	√	√	
Los Angeles Inner Harbor		√	√	√	
Los Angeles Harbor Main Channel	√	√	√	√	
Los Angeles Harbor SW Slip		√	√		
Los Angeles River Estuary	√	√	√		
Los Angeles River [1]	√				√
Los Cerritos Channel	√	√			√
Marina del Rey Harbor	√	√	√		√

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.

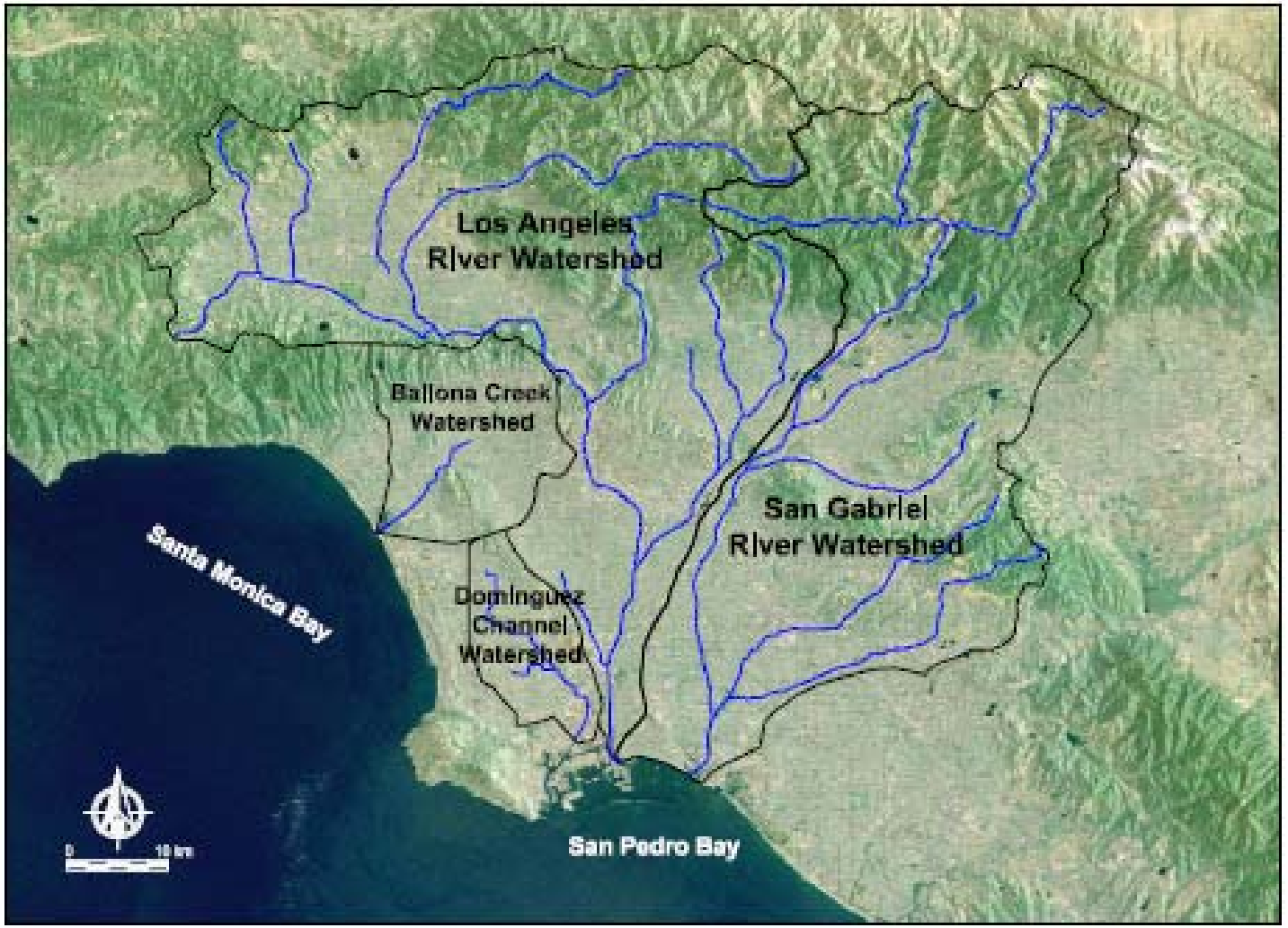
Modeling Process

- 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

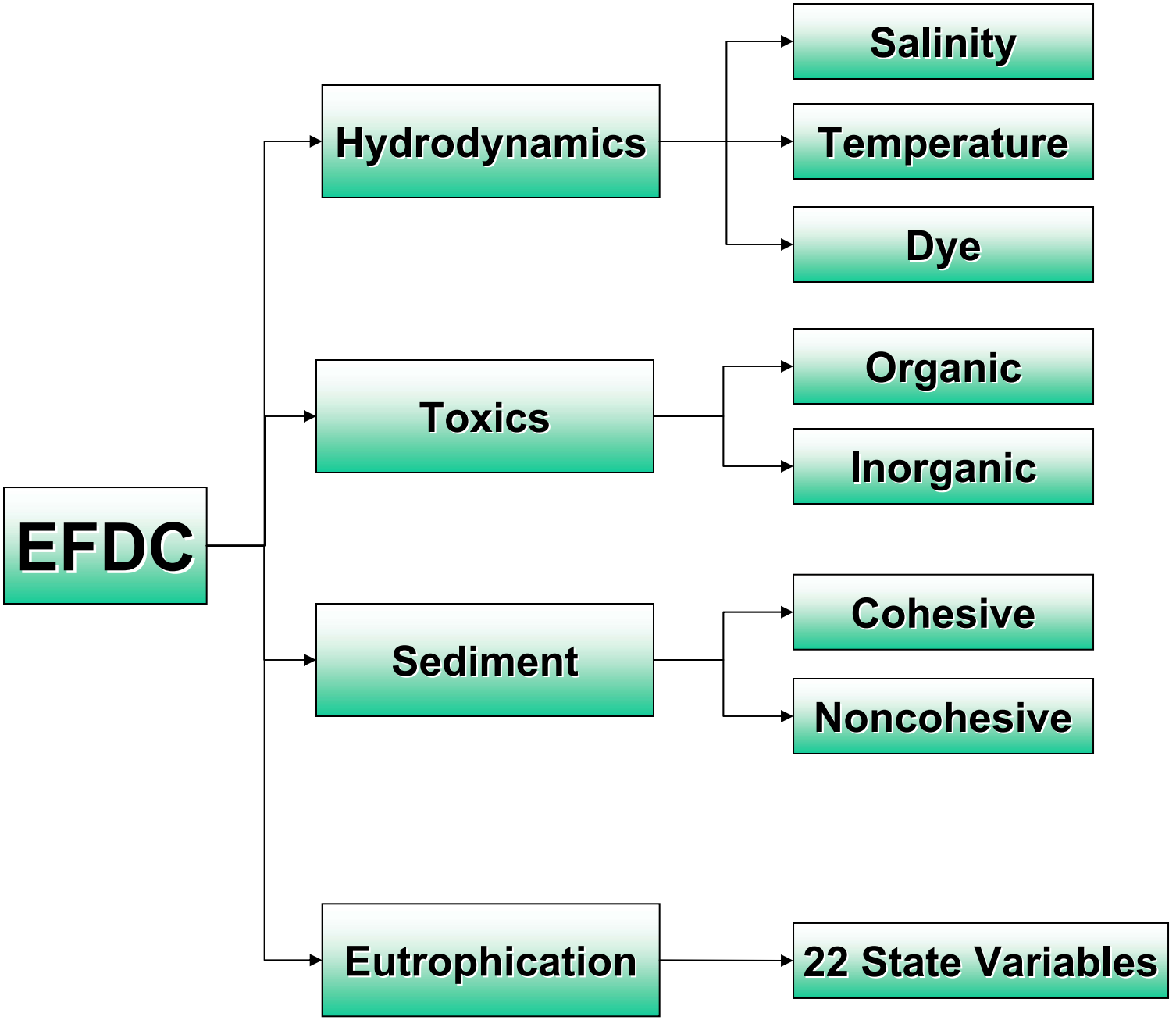
- Watershed Model – Provides Non-Point Source Load to Water Body
- Hydrodynamics- Provides Physics to Describe the Movement of Contaminants
- Eutrophication Model – Describes the Carbon, Nitrogen and Phosphorous Cycles and the Impact of Nutrients
- Sediment Transport Model – Movement of Particulate Material 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
Salinity
Temperature
Dye
Toxics
Organic
Inorganic
Sediment
Cohesive
Noncohesive
Eutrophication
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

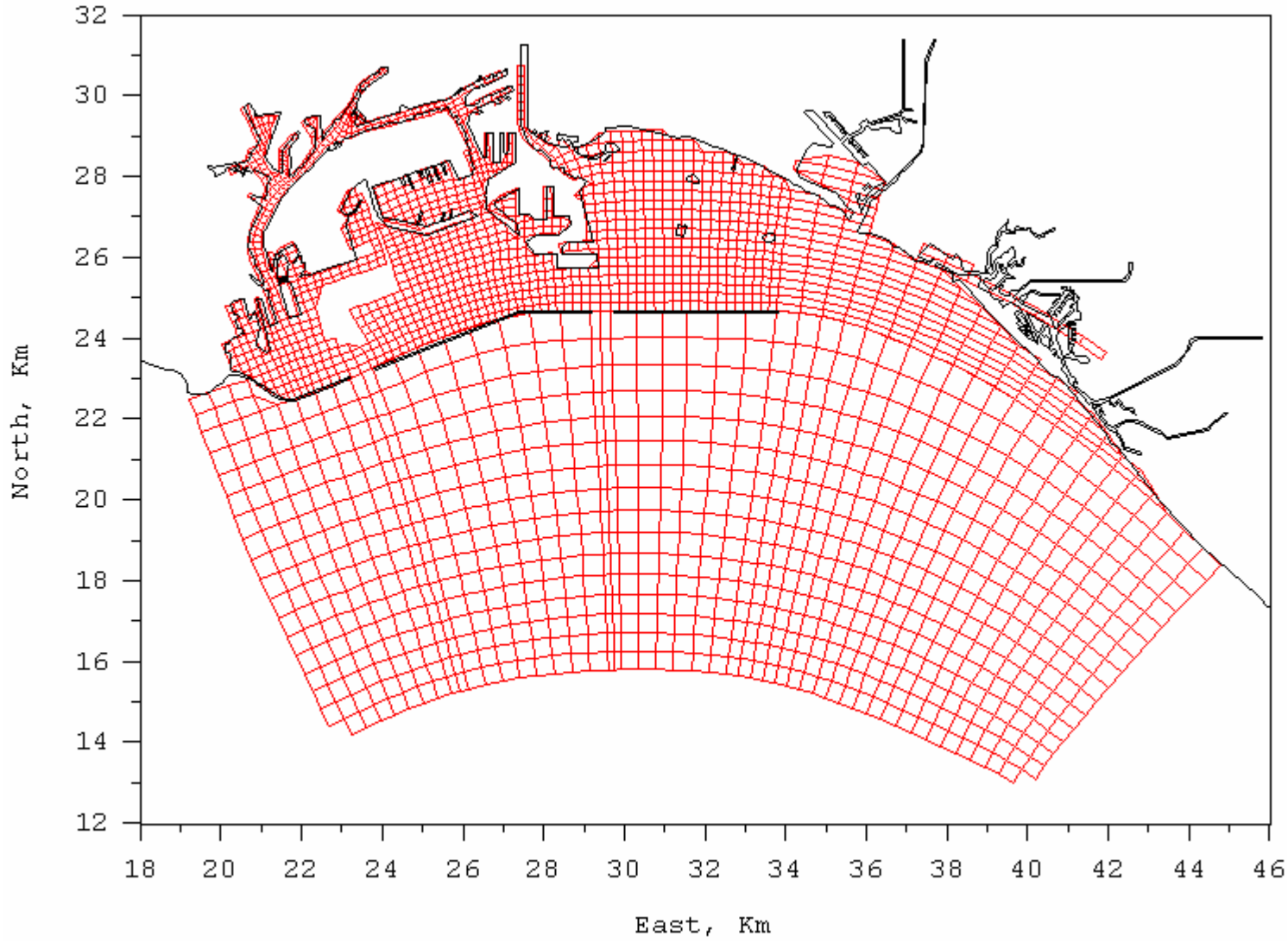
Development of the LA and LB Harbors and San Pedro Bay Model

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

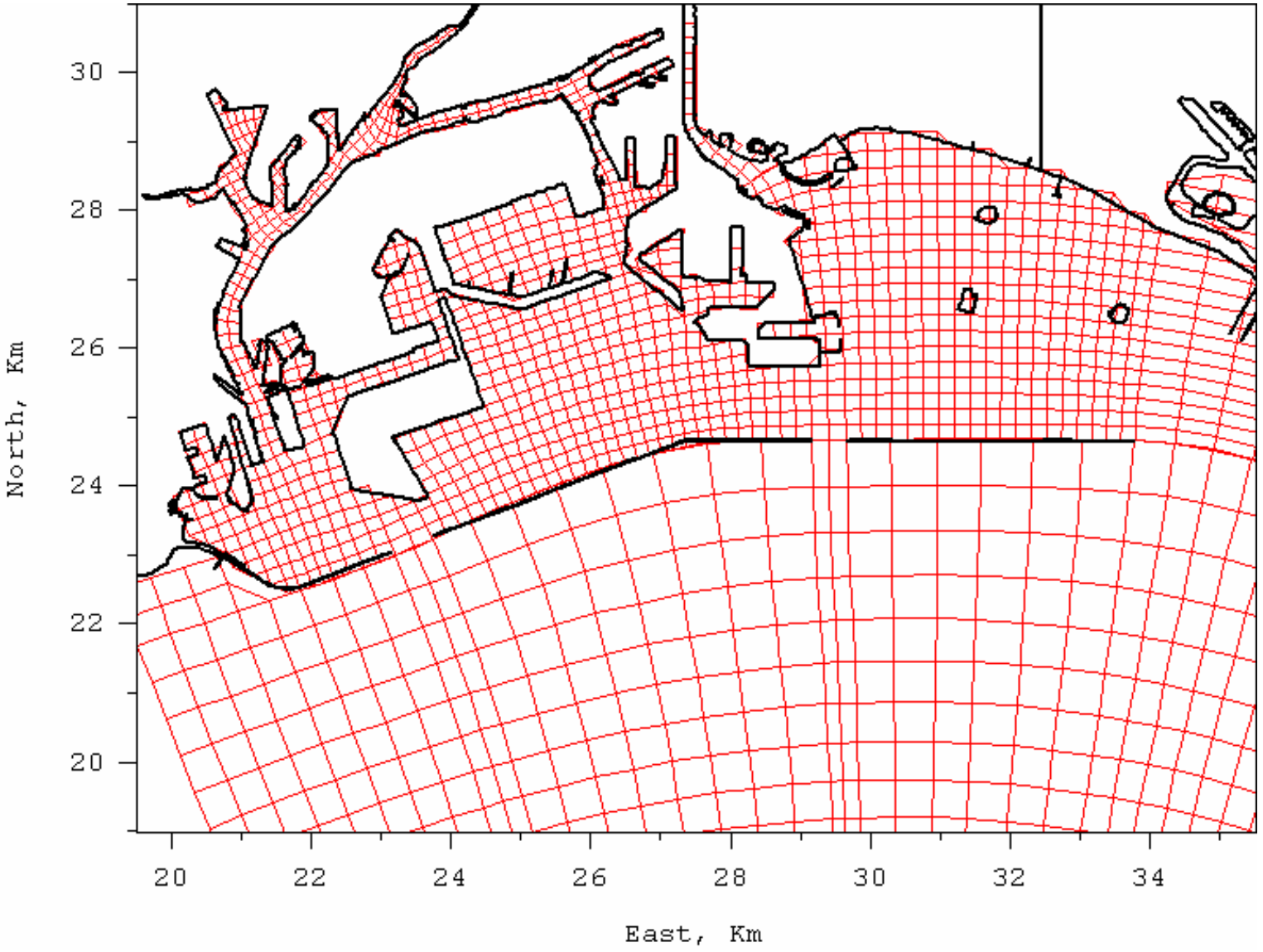
Model Grid System

- 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

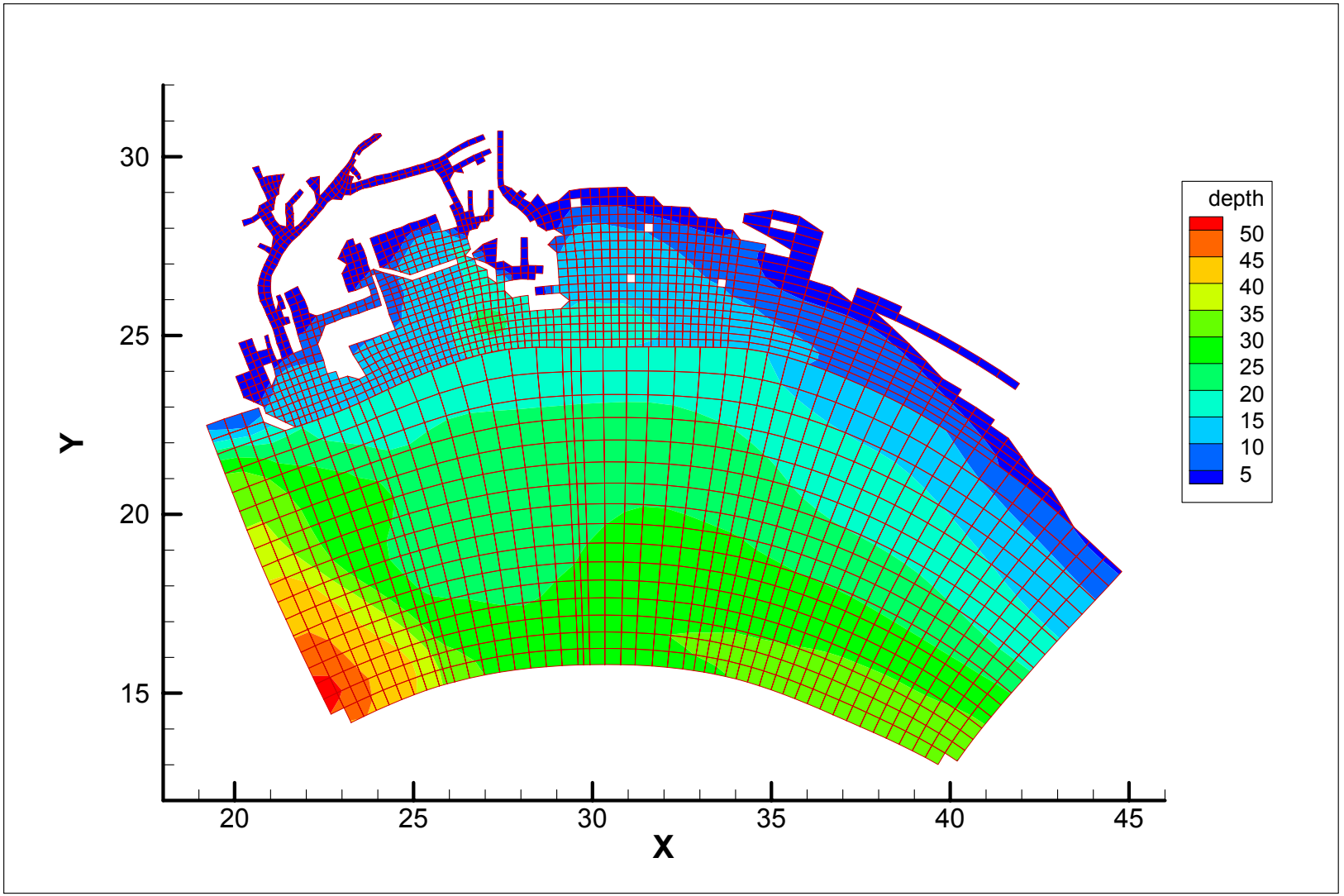
Model Grid System



Model Grid System



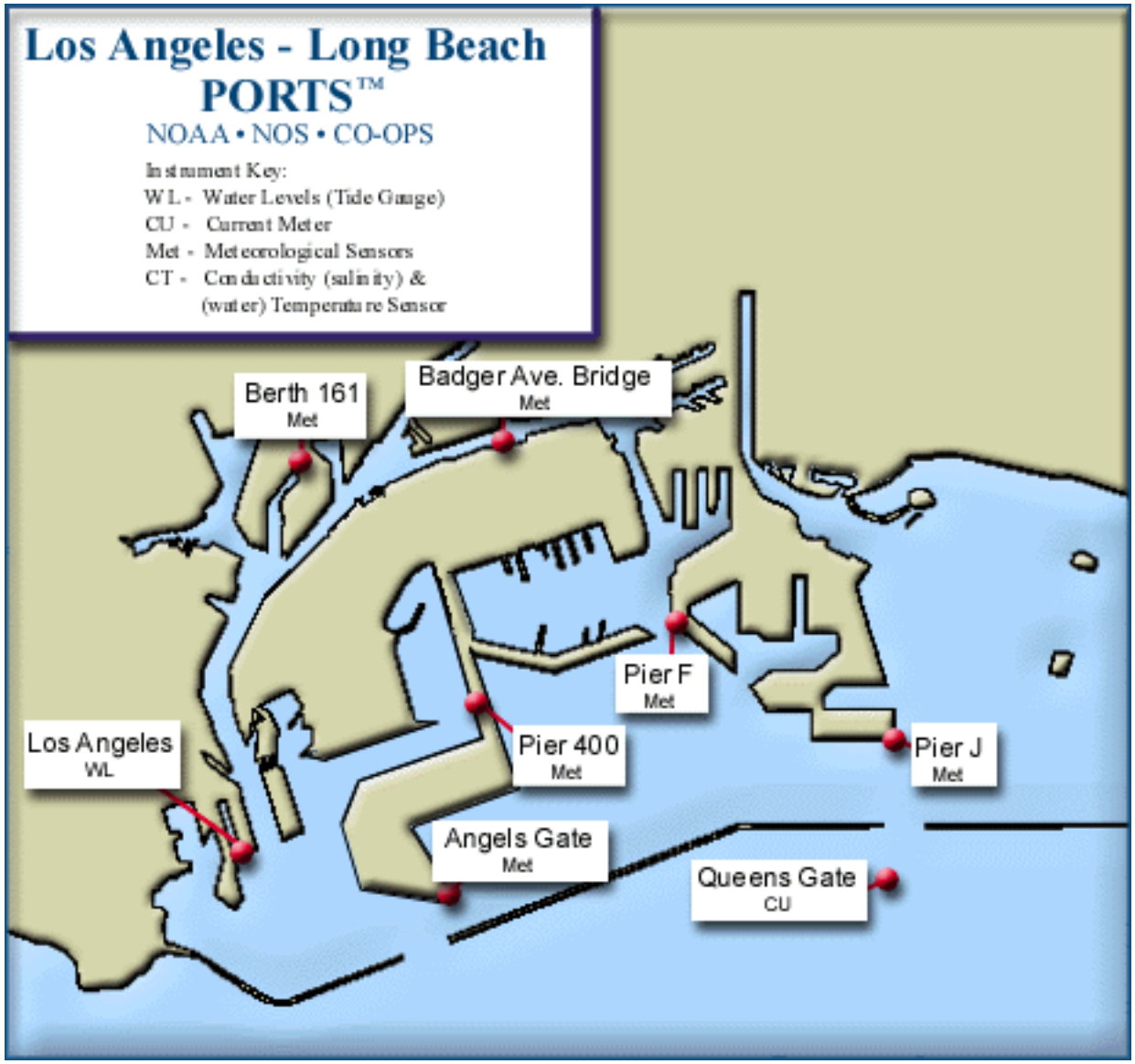
Preliminary Bathymetry



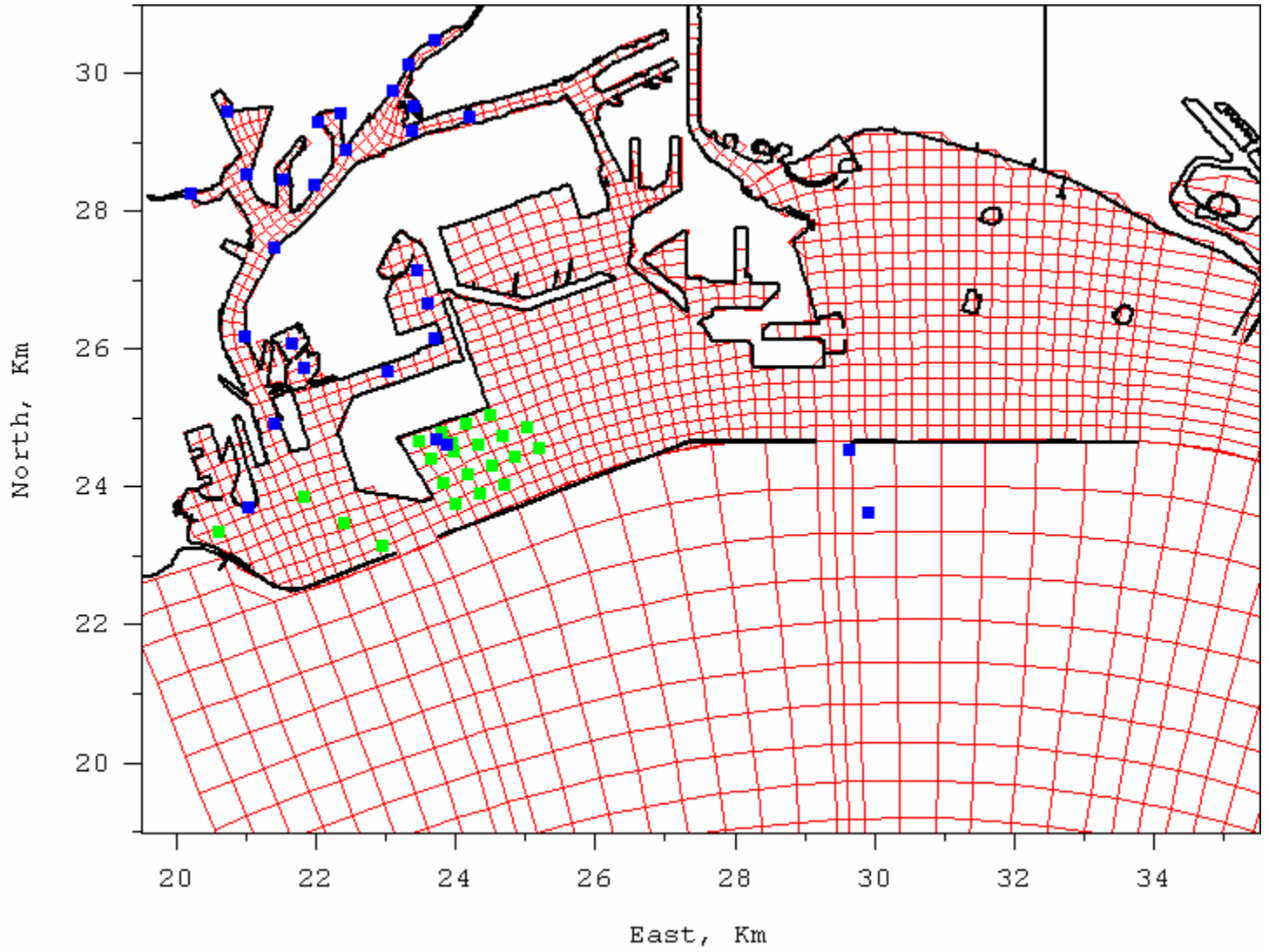
Hydrodynamic Data Coverage and Hydrodynamic Calibration

- Limited Direct Physical Data
  - Tide Gauges
  - Current Meters
- Salinity Monitoring Data
- Calibration to Tide Gauge and Salinity Observations After High Flow EventsPreliminary Results

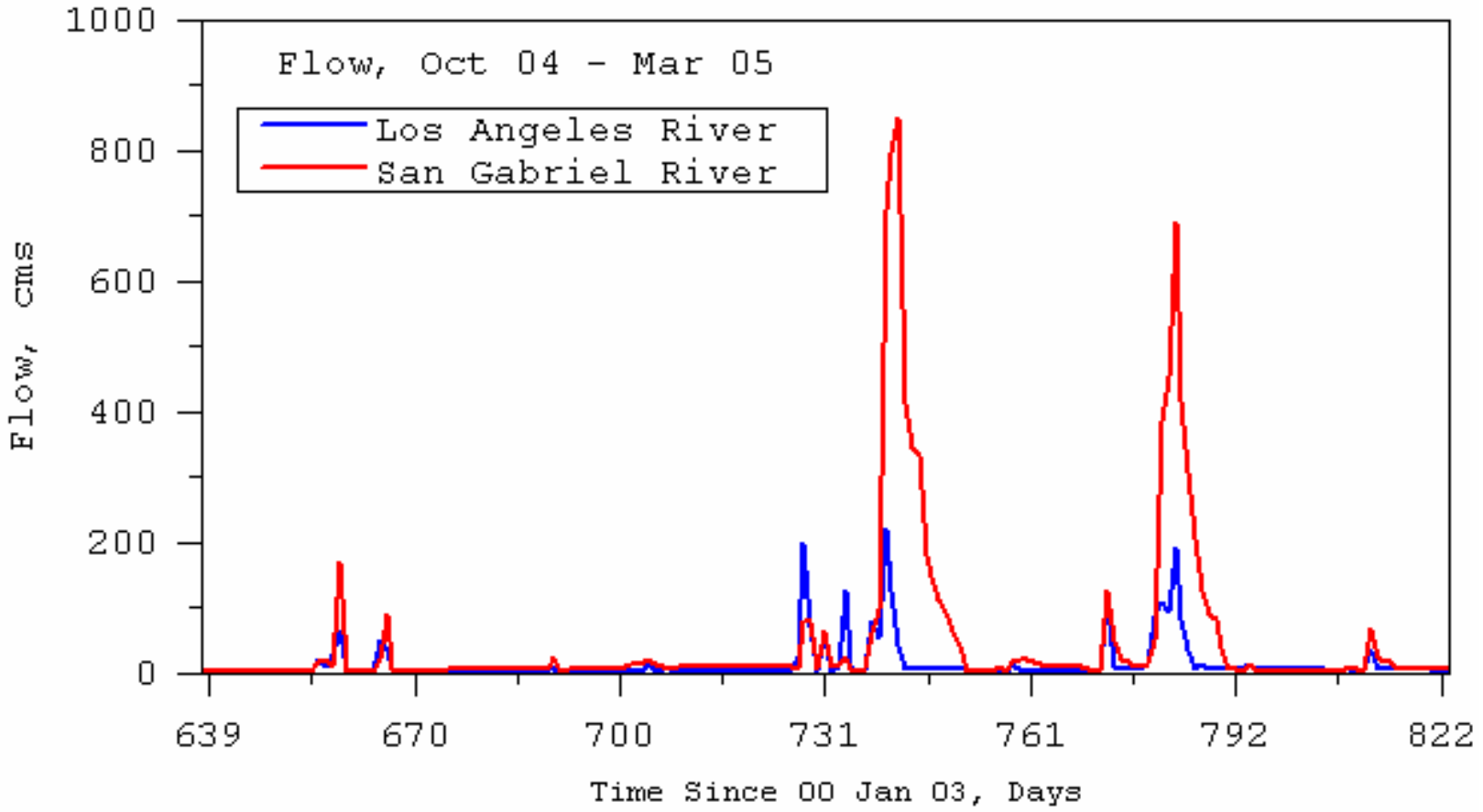
NOAA Ports System Data Stations



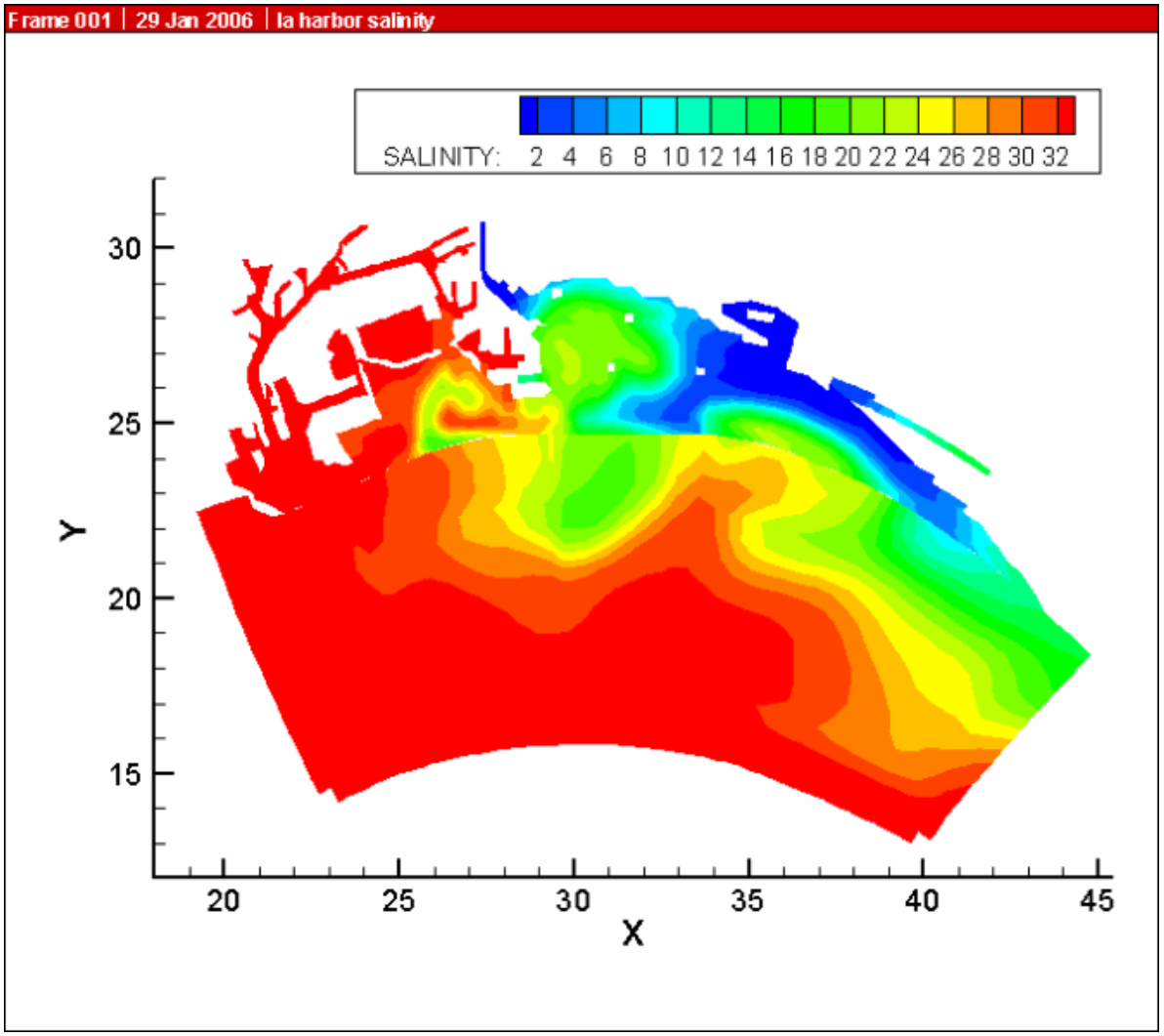
Salinity Monitoring Stations, LA Harbor



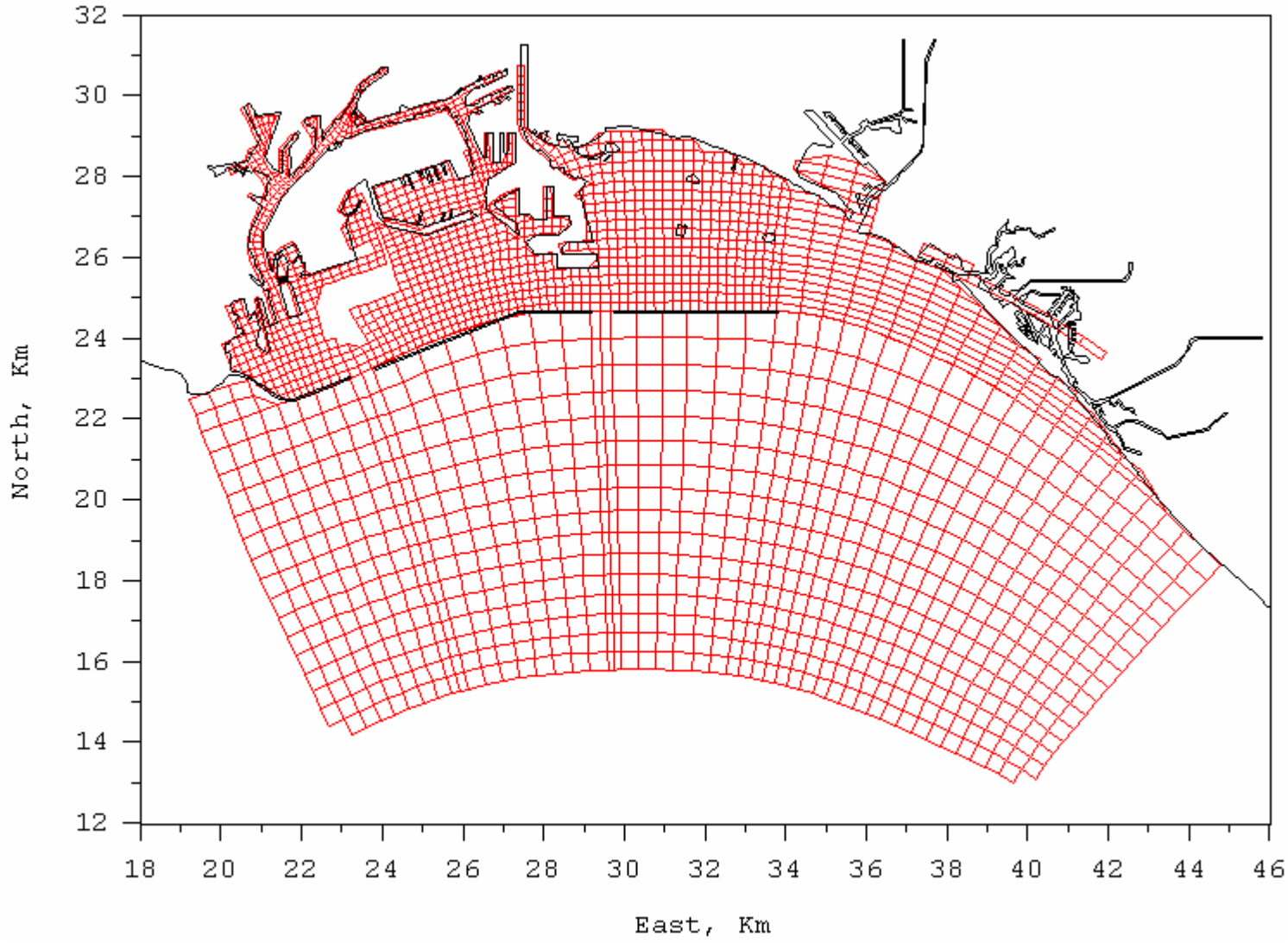
River Flows During a Salinity Transport Calibration Period



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

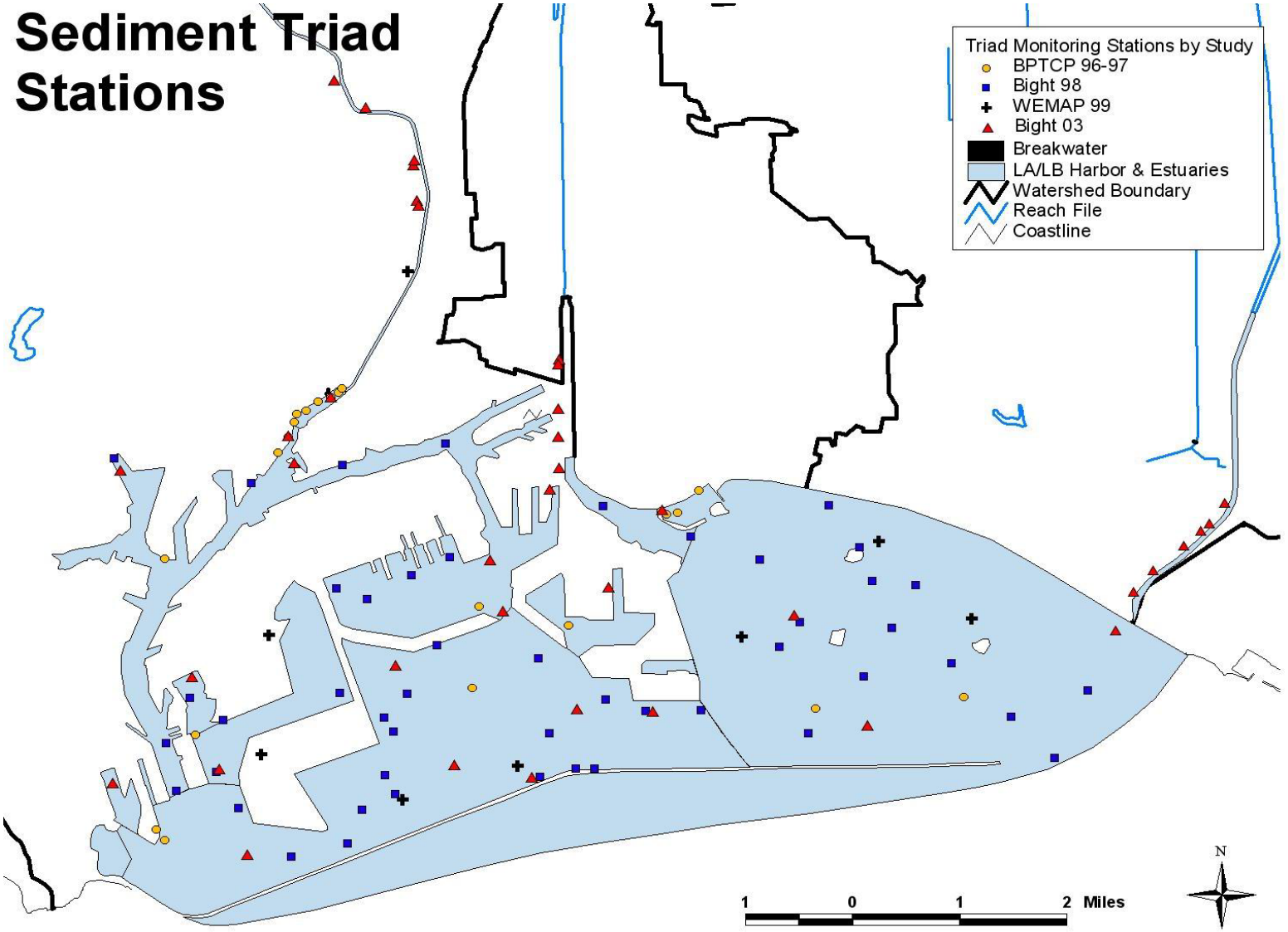
Sediment and Contaminant Transport Modeling Approach

- 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

Sediment Triad Stations



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