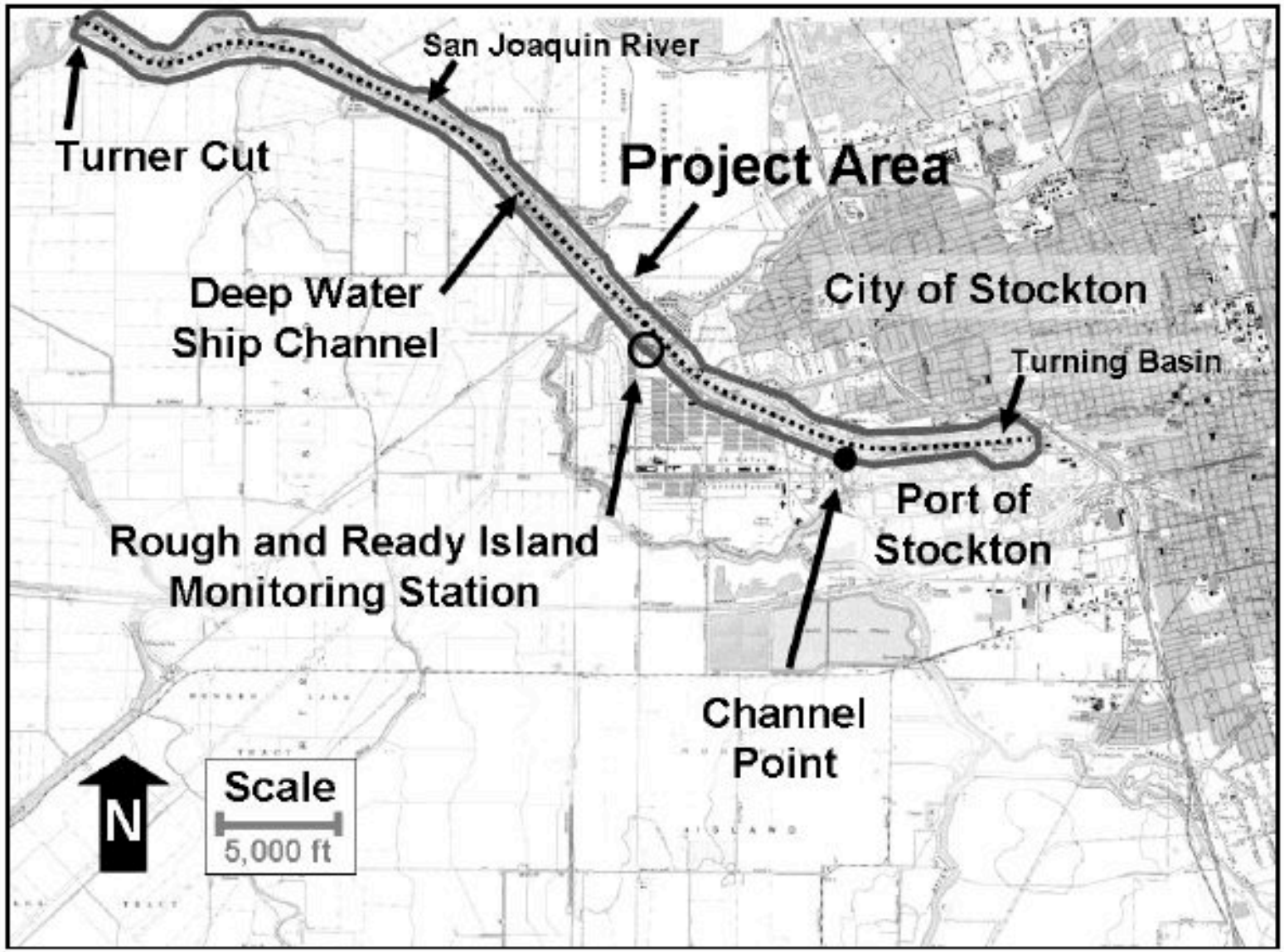
San Joaquin River Deep Water Ship Channel

Dissolved Oxygen Demonstration Project Update

Steve Seville, PE

Jones & Stokes


San Joaquin River
Turner Cut
Project Area
Deep Water
Ship Channel
City of Stockton
Turning Basin
Port of
Stockton
Rough and Ready Island
Monitoring Station
Channel
Point
N
Scale
5,000 ft

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Aeration Demonstration Project

March 21, 2006

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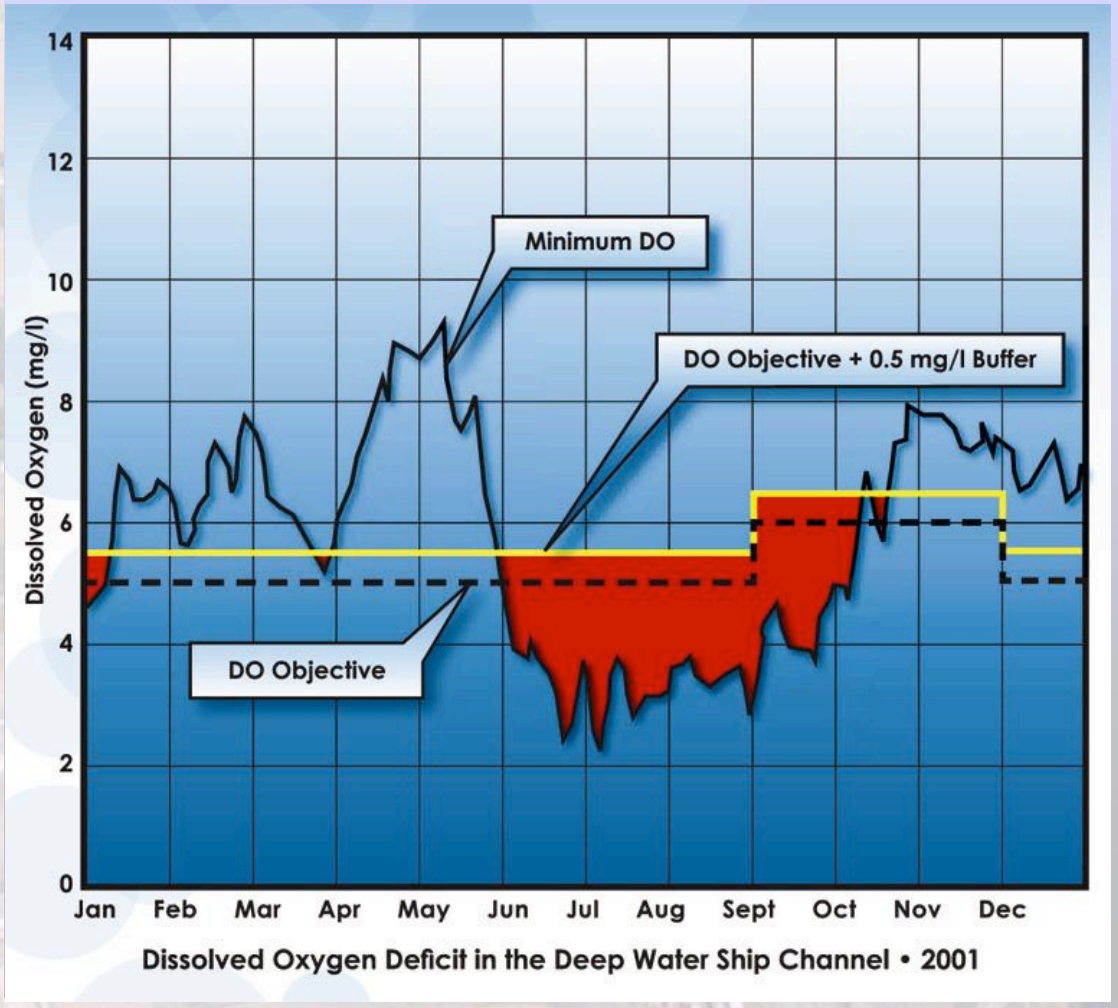
Demonstration Objectives

- **Efficacy of the U-Tube aeration device**
- **Effects of Delivering 10,000 lbs/day O_2 on dissolved oxygen impairment**
- **Effects of aeration on the San Joaquin River and Delta ecology**

Previous Studies on DO

- Causes of DO Depletion in the SJR (1999, 2001)
- Peer Review Workshop (2002)
- DWSC and Upstream Modeling (2003)
- Upstream Monitoring Studies (2004)
- Aeration Feasibility Studies (2003-2004)

Magnitude of the Problem



10,000 lbs/day O_2

- DO Objective
- Minimum DO
- DO Deficit

Largest deficit occurs at Rough and Ready Island near the current monitoring station

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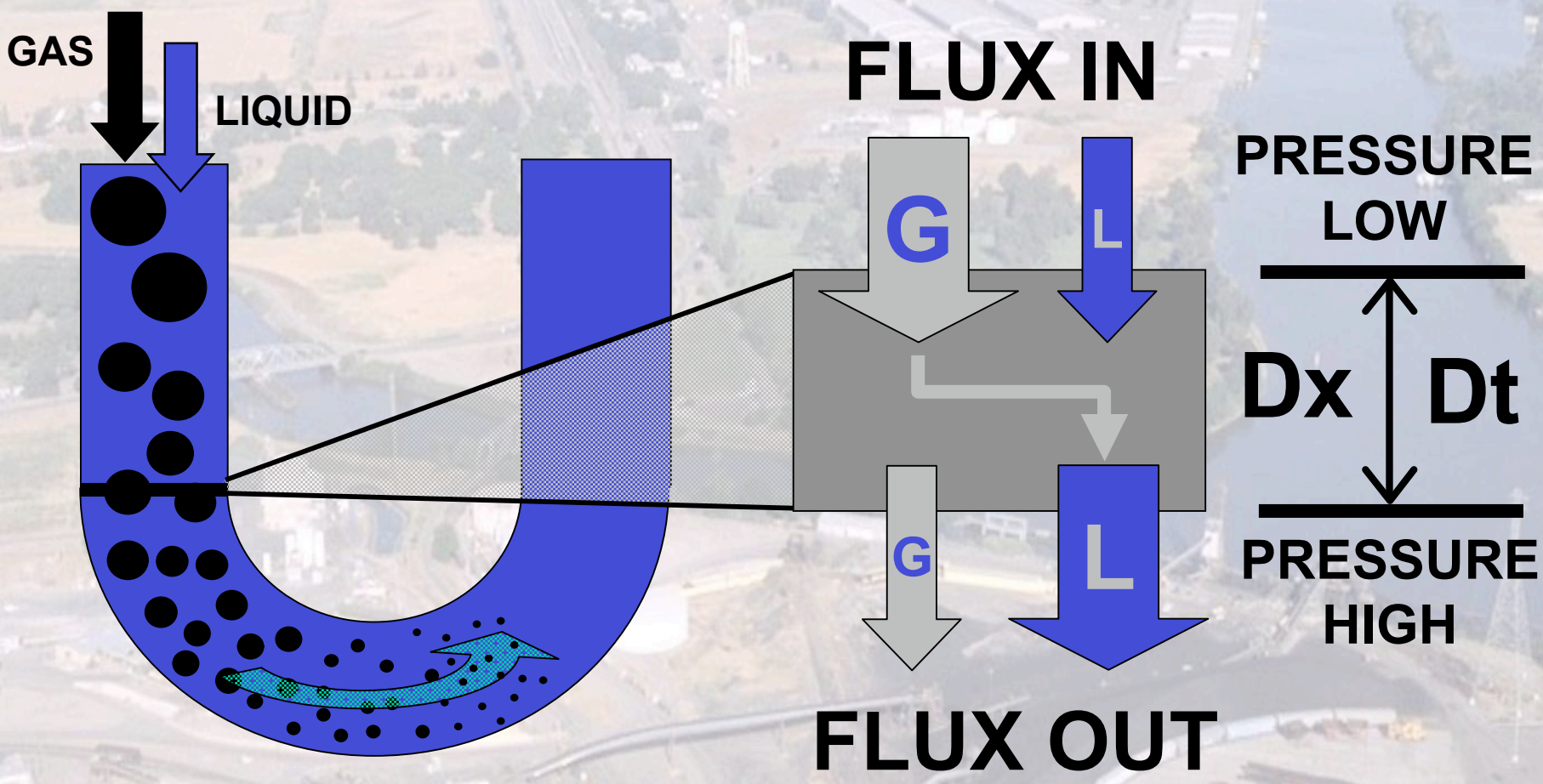
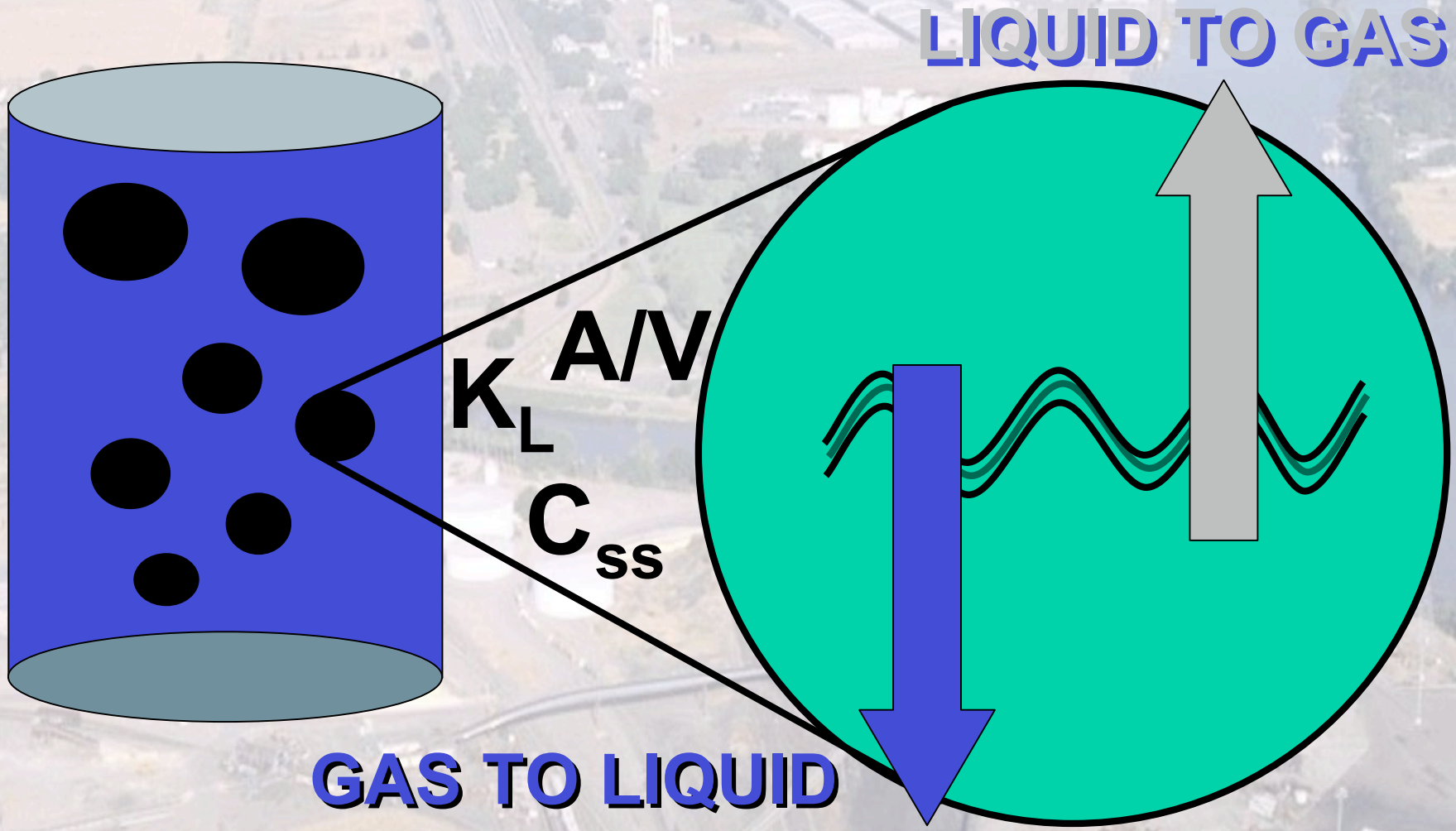
THE MASS TRANSFER MODEL



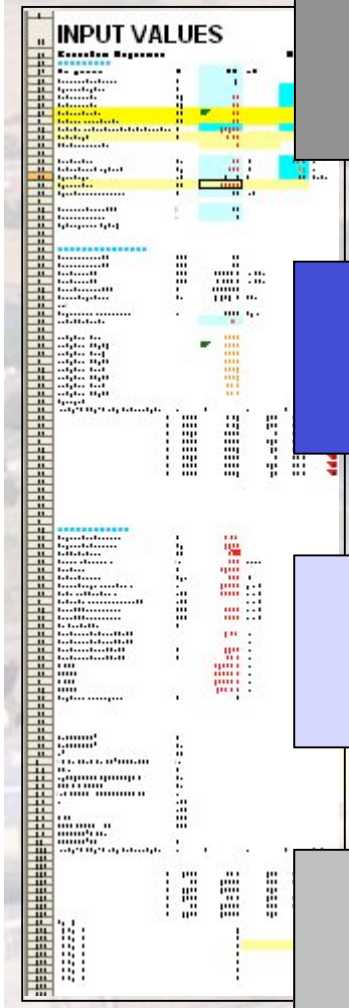
Mass Transfer Equation

$$\frac{dC}{dt} = K_L \times \left(\frac{A}{V}\right) \times (C_{ss} - C)$$

MASS TRANSFER: THE BASICS



THE MASS TRANSFER MODEL



DEPTH

SIZE

GAS FLOW

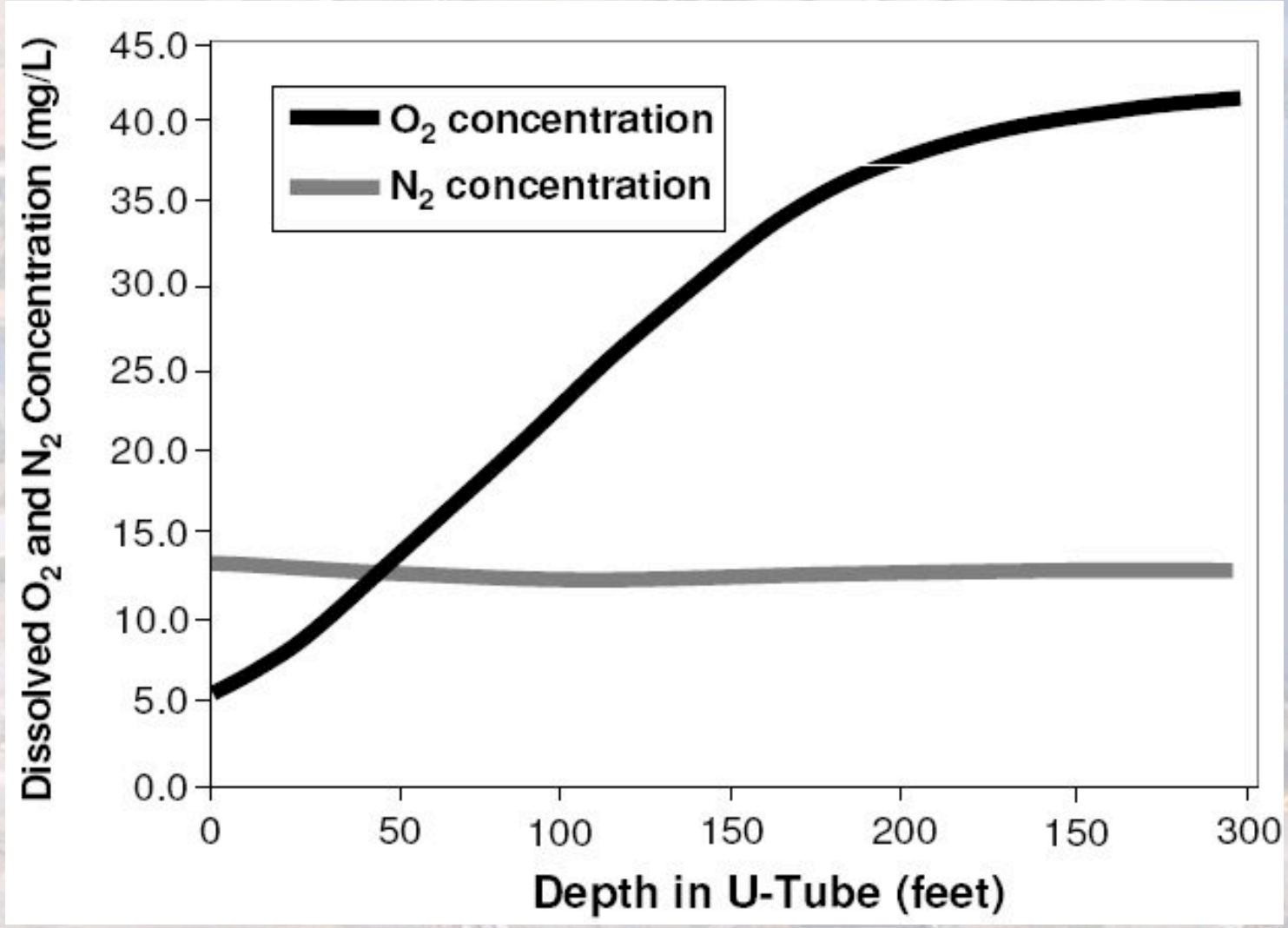
LIQUID FLOW

TRANSFER RATE

EFFLUENT CONCENTRATION

EFFICIENCY

U-tube Model Results



Model Summary

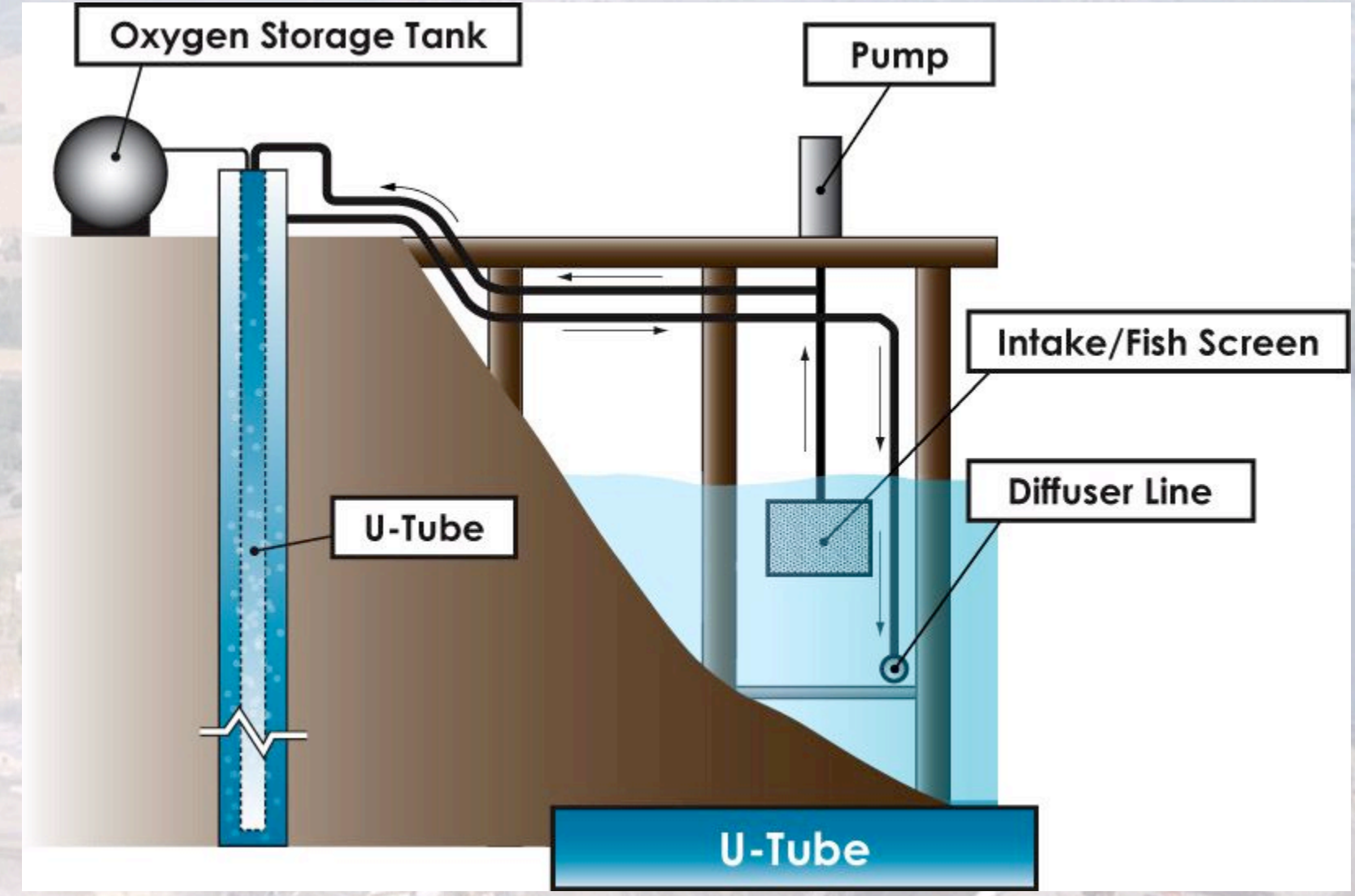
- **No Standard Procedure for U-Tube**
  - **Model Provided a Basis for Design**
  - **Evaluation of Alternatives**
  - **Identify Preferred Configuration**
- **During Design Provides a Back Check**
  - **How may the performance change if design is altered?**

Future of the Model

- **Calibration Data Availability**
- **Public Project**
- **Cooperative Effort for the Environment**

What is a U-Tube?

- **3 Components**
  - **PUMP**
  - **WELL**
  - **OUTFALL**
- **Demonstration U-Tube Specifics**
  - **Two 25 cfs Pumps with Screened Intakes**
  - **Two 200’ Deep Wells**
  - **One 1200’ long discharge pipe, last 200’ has big holes drilled in it**


Oxygen Storage Tank
Pump
Intake/Fish Screen
Diffuser Line
U-Tube
U-Tube

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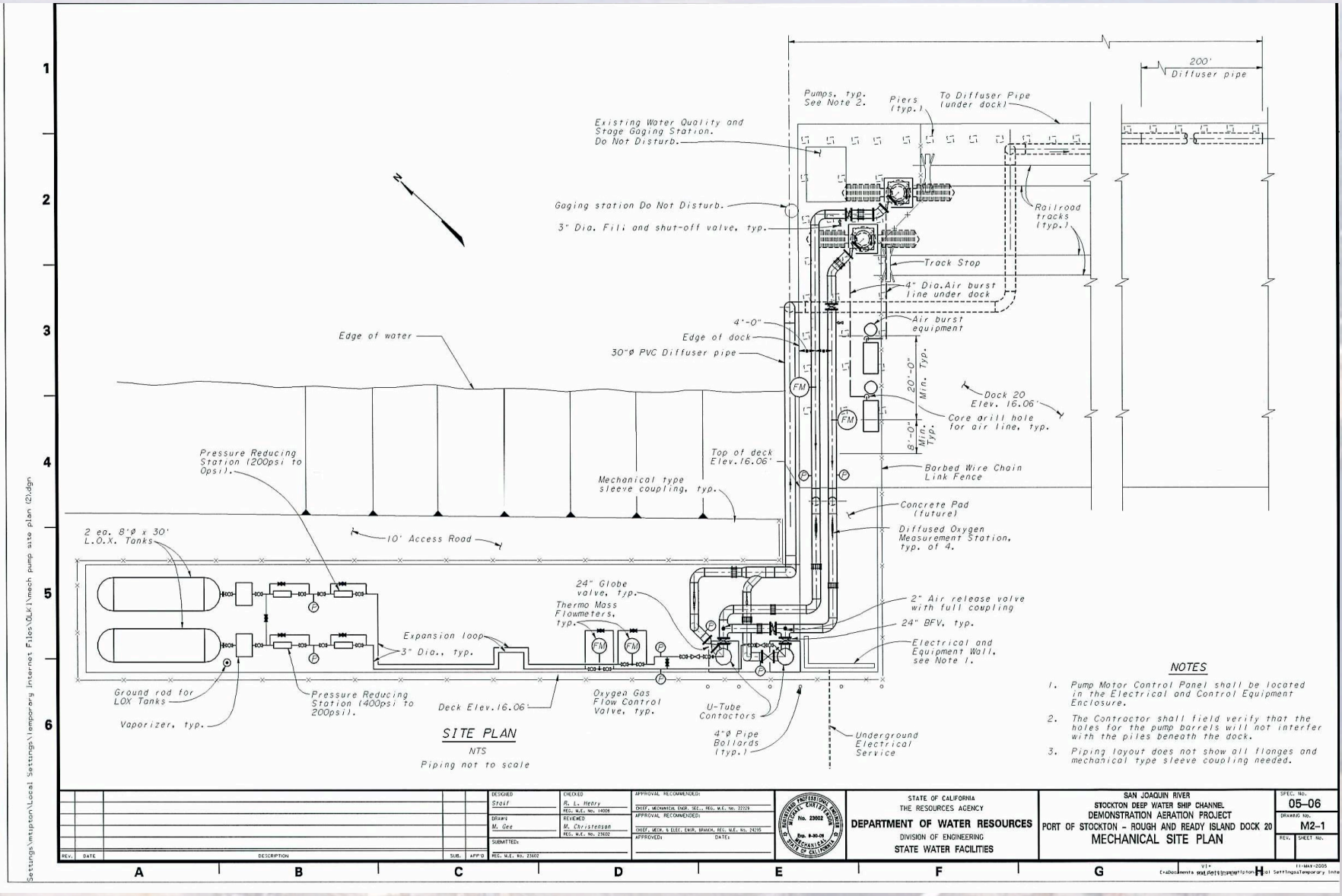
200' Diffuser pipe
Pumps, typ. See Note 2.
Piers (typ.)
To Diffuser Pipe (under dock)
Existing Water Quality and Stage Gaging Station. Do Not Disturb.
Gaging station Do Not Disturb.
3" Dia. Fill and shut-off valve, typ.
Railroad tracks (typ.)
Track Stop
4" Dia. Air burst line under dock
Air burst equipment
4'-0"
Edge of dock
30"ø PVC Diffuser pipe
Edge of water
20'-0" Min. typ.
Dock 20 Elev. 16.06'
Core drill hole for air line, typ.
8'-0" Min. typ.
Top of deck Elev. 16.06'
Barbed Wire Chain Link Fence
Pressure Reducing Station (200psi to Opsi).
Mechanical type sleeve coupling, typ.
Concrete Pad (future)
Diffused Oxygen Measurement Station, typ. of 4.
2 ea. 8'ø x 30' L.O.X. Tanks
10' Access Road
24" Globe valve, typ.
Thermo Mass Flowmeters, typ.
2" Air release valve with full coupling
24" BFV, typ.
Expansion loop 3" Dia., typ.
Electrical and Equipment Wall, see Note 1.
Ground rod for LOX Tanks
Pressure Reducing Station (400psi to 200psi).
Deck Elev. 16.06'
Oxygen Gas Flow Control Valve, typ.
U-Tube Contactors
Vaporizer, typ.
4"ø Pipe Bollards (typ.)
Underground Electrical Service
SITE PLAN
NTS
Piping not to scale
NOTES
1. Pump Motor Control Panel shall be located in the Electrical and Control Equipment Enclosure.
2. The Contractor shall field verify that the holes for the pump barrels will not interfer with the piles beneath the dock.
3. Piping layout does not show all flanges and mechanical type sleeve coupling needed.
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
STATE WATER FACILITIES
SAN JOAQUIN RIVER
STOCKTON DEEP WATER SHIP CHANNEL
DEMONSTRATION AERATION PROJECT
PORT OF STOCKTON - ROUGH AND READY ISLAND DOCK 20
MECHANICAL SITE PLAN
SPEC. No. 05-06
DRAWING No. M2-1

Construction Update

- **Six bids were opened on Nov 9, 2005**
  - **Clyde G. Steagall, Inc. of Loomis, CA**
  - **$3,219,273**
  - **Total cost based on 11 bid items**
    - ✓ **U-Tube Construction ($1.5 M)**
    - ✓ **Plumbing ($0.7 M)**
    - ✓ **Electrical ($0.2 M)**


• 30 inch diameter HDPE pipe
• 6 inch diameter discharge ports
• Alternating at 45 degree angles

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Construction Update

- 200’ disfusser line is installed
- 1000’ discharge line on site and tested
- Deck has been test cored
- Rail stops are being moved
- Deck holes for pump and screen construction scheduled for May-June
- Operational in September, possibly as early as July – depending on wildlife restrictions


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