



Ponds 6, 7 & 8 Design Update



Napa Sonoma Marsh Restoration Group Meeting

USGS San Pablo Field Station Office, Building 505, Mare Island



August 21, 2007





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Conservancy

Presentation

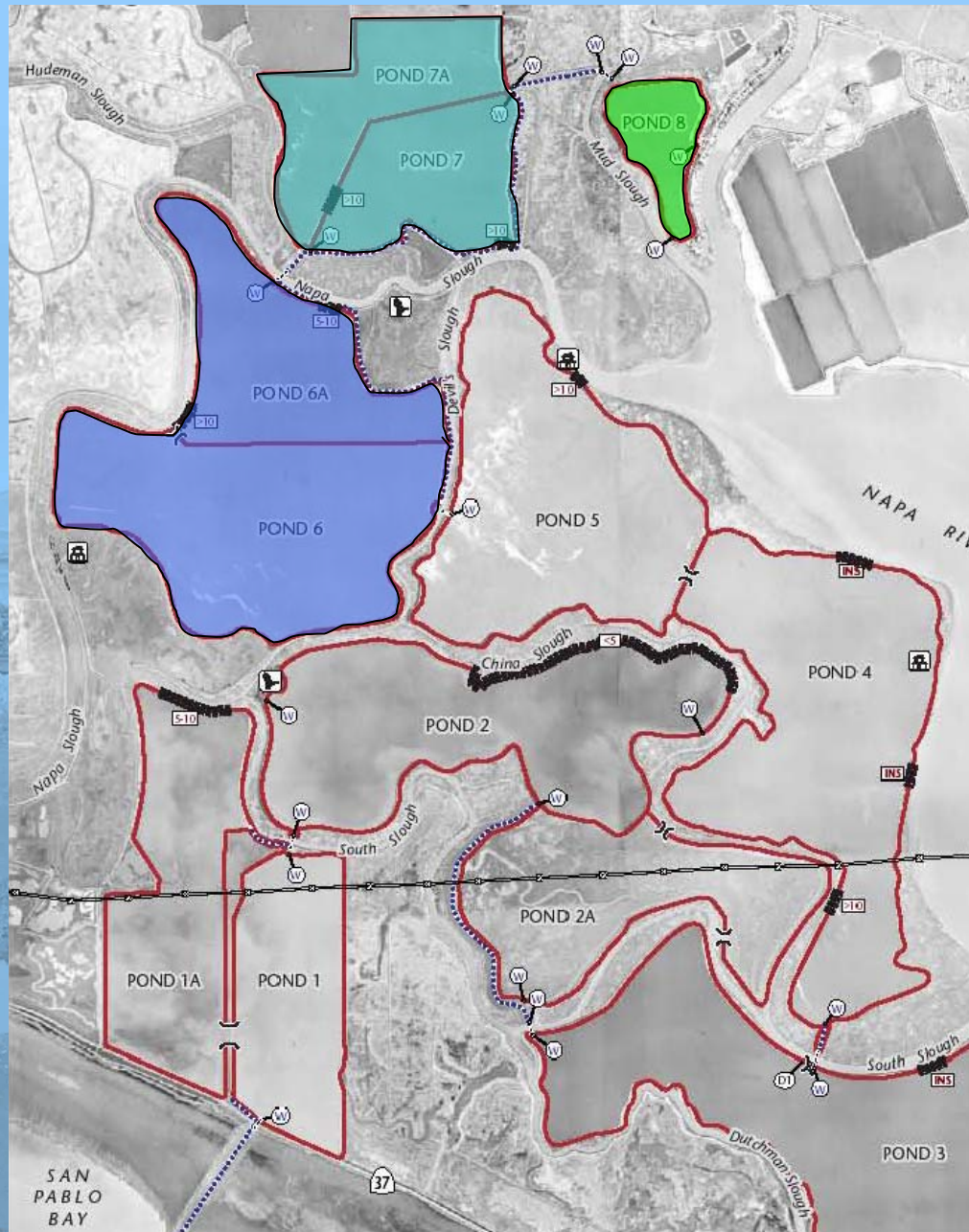
- Project Overview
- Ponds 6/6A Goals and Proposed Design
- Upper Ponds (8 & 7/7A) Goals and Proposed Design
- Mixing Chamber Strategy/Design
- Geotechnical Investigation/Levee Design
- Schedule

The background of the slide is a blue-tinted photograph of a coastal landscape. It shows a wide, flat area with a small stream or channel in the foreground, leading towards a range of hills in the distance. The sky is clear and blue.

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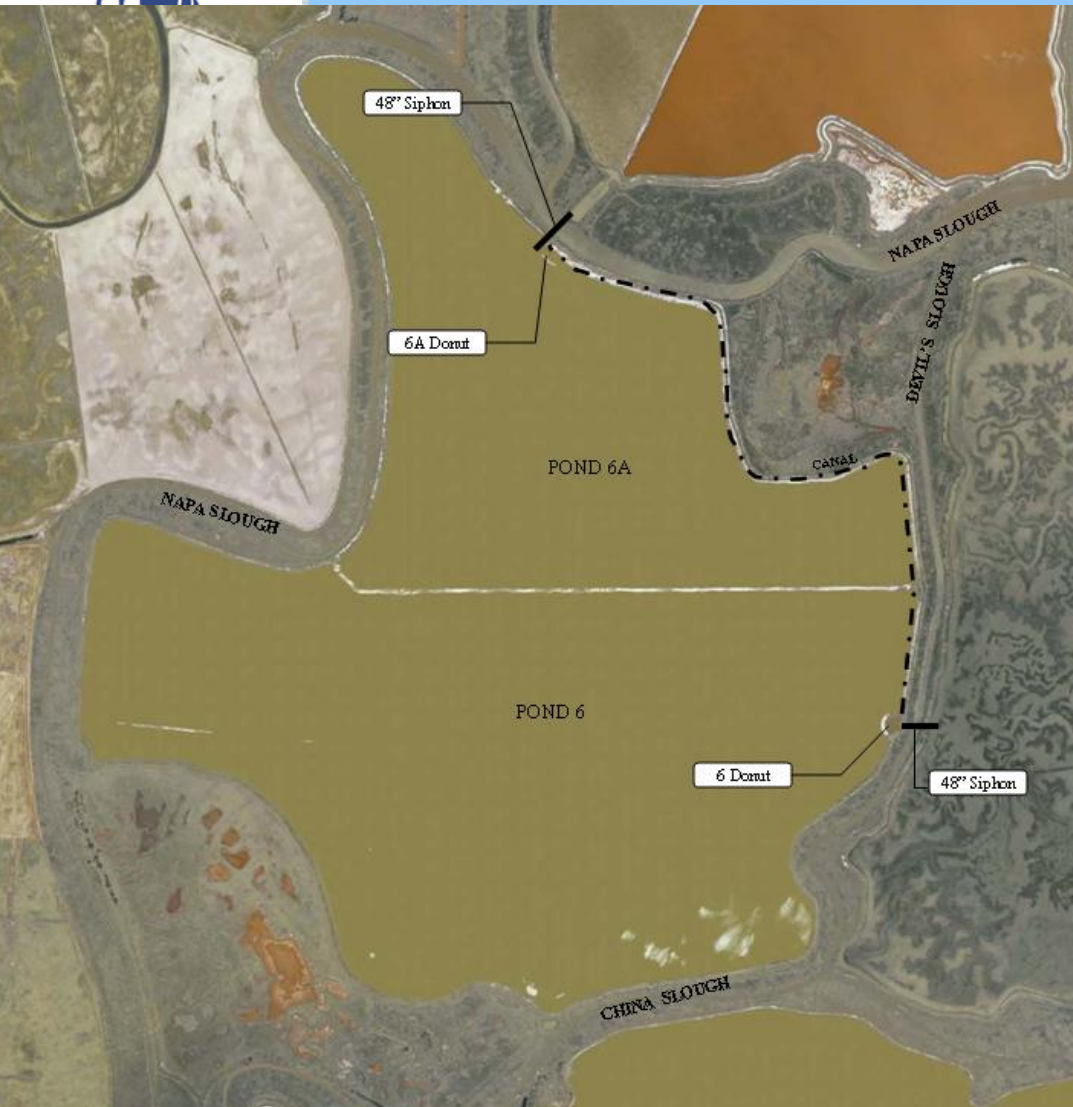
Location Map





Ponds 6/6A

Project Objectives



- Maximize Habitat for Shorebirds and Waterfowl
- Improve Management Flexibility



Ponds 6/6A

Bird Habitat



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- Shorebirds: 4-15 cm depths
- Dabbling Ducks: 10-30 cm depths
- Diving Ducks: 30 cm to several meter depth
- Maintain high water quality
 - Residence time
 - Circulation – New inlets in both ponds



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Ponds 6/6A

Management Flexibility

Improve Circulation, Residence Time, Ability to Fill/Drain

- New Inlet/Outlet at Napa Slough (N)
- New Inlet/Outlet at Napa Slough (NW)
- New Inlet/Outlet at China Slough
- New Culvert(s) between Ponds
- New Outfall at Little Island Farms
- Breach Donuts / Abandon Canal



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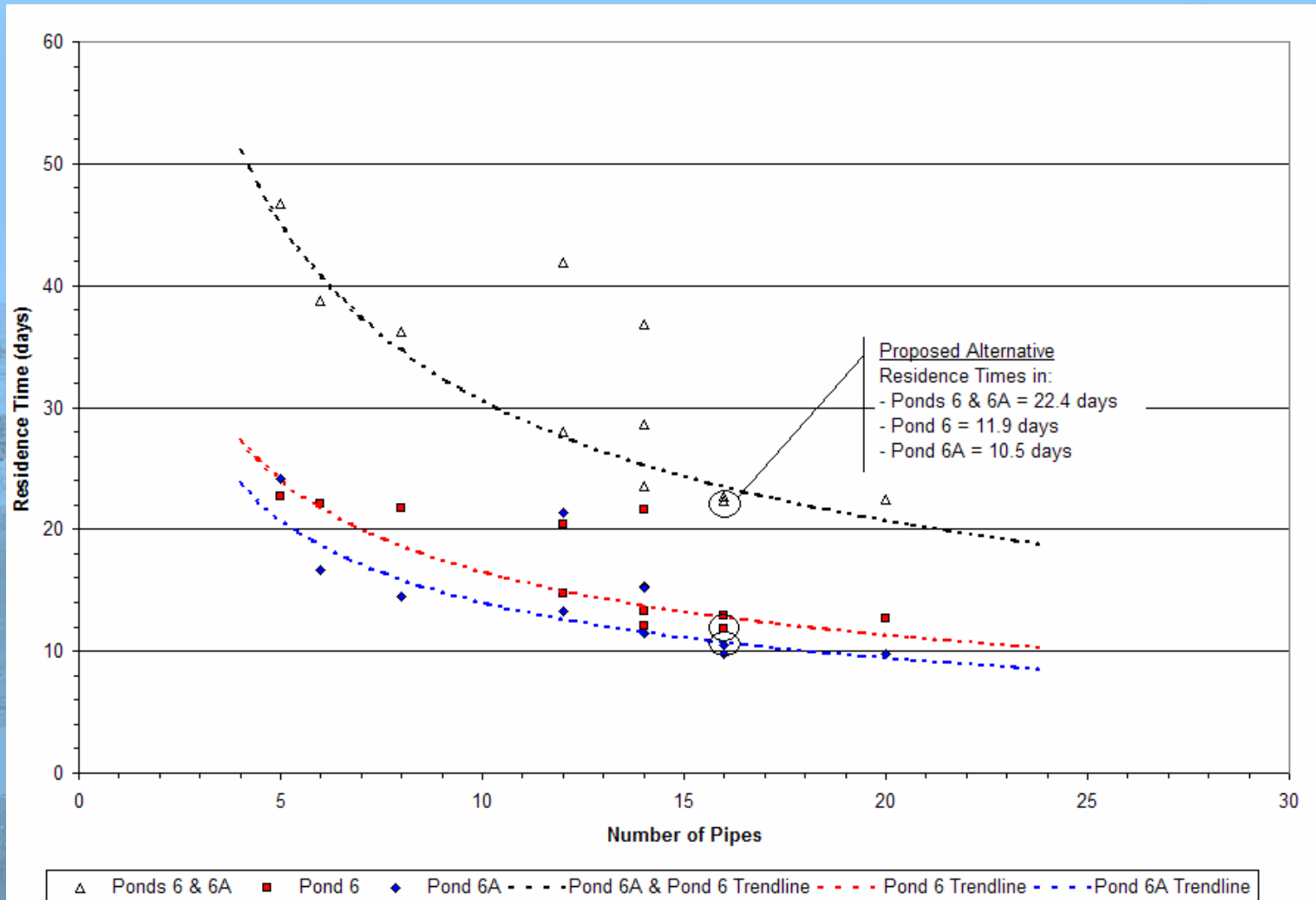


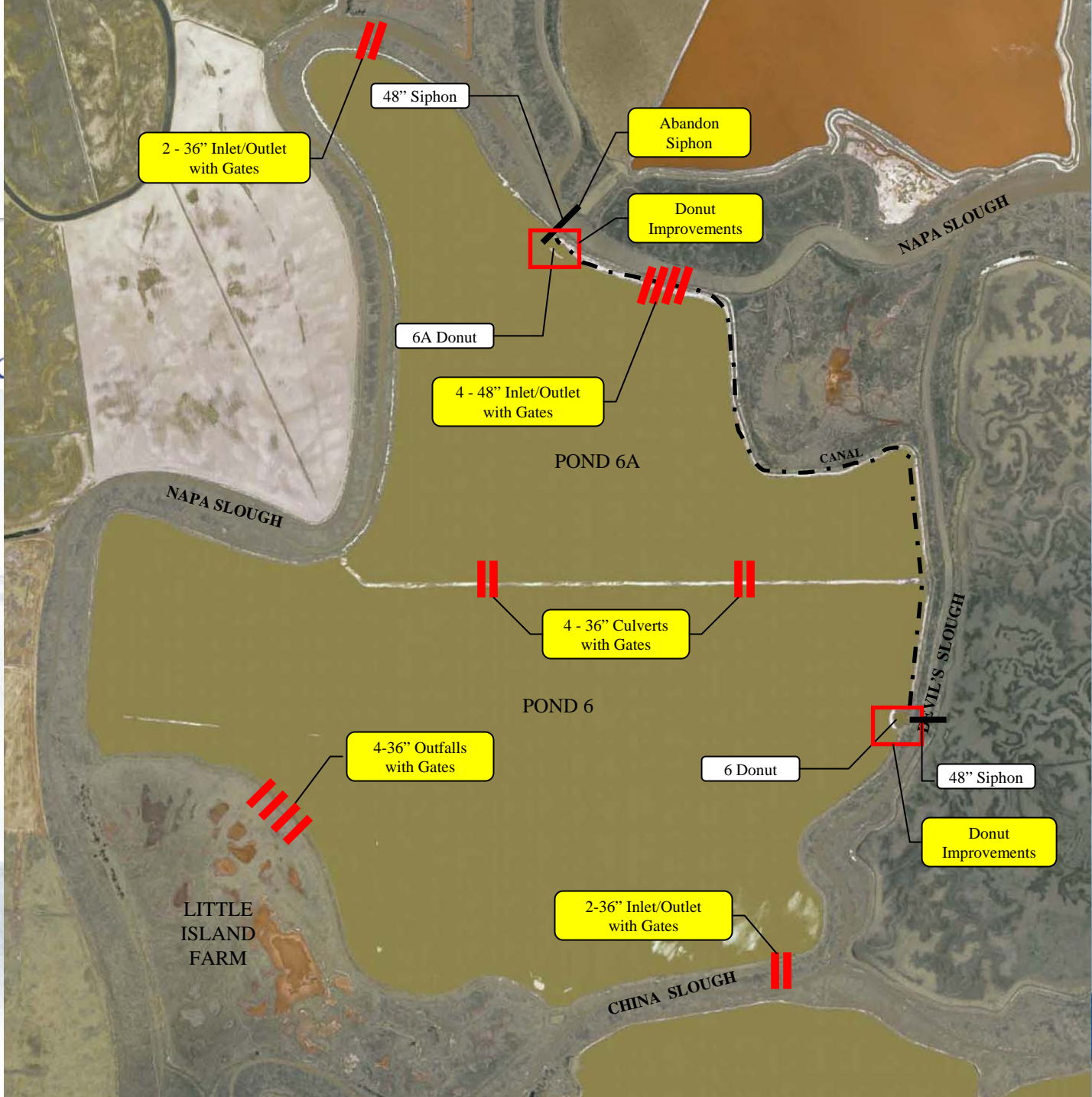
Ponds 6/6A

Residence Time vs. Number of Pipes



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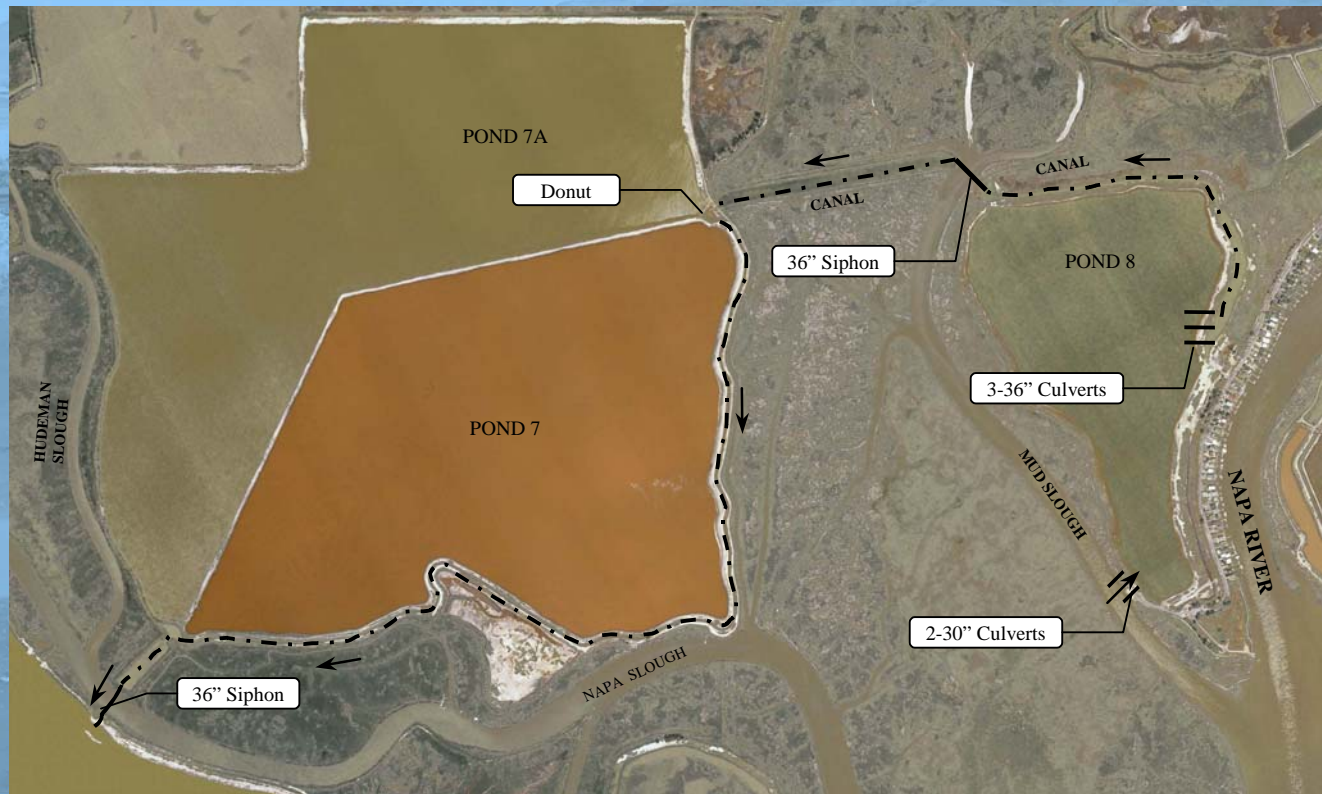


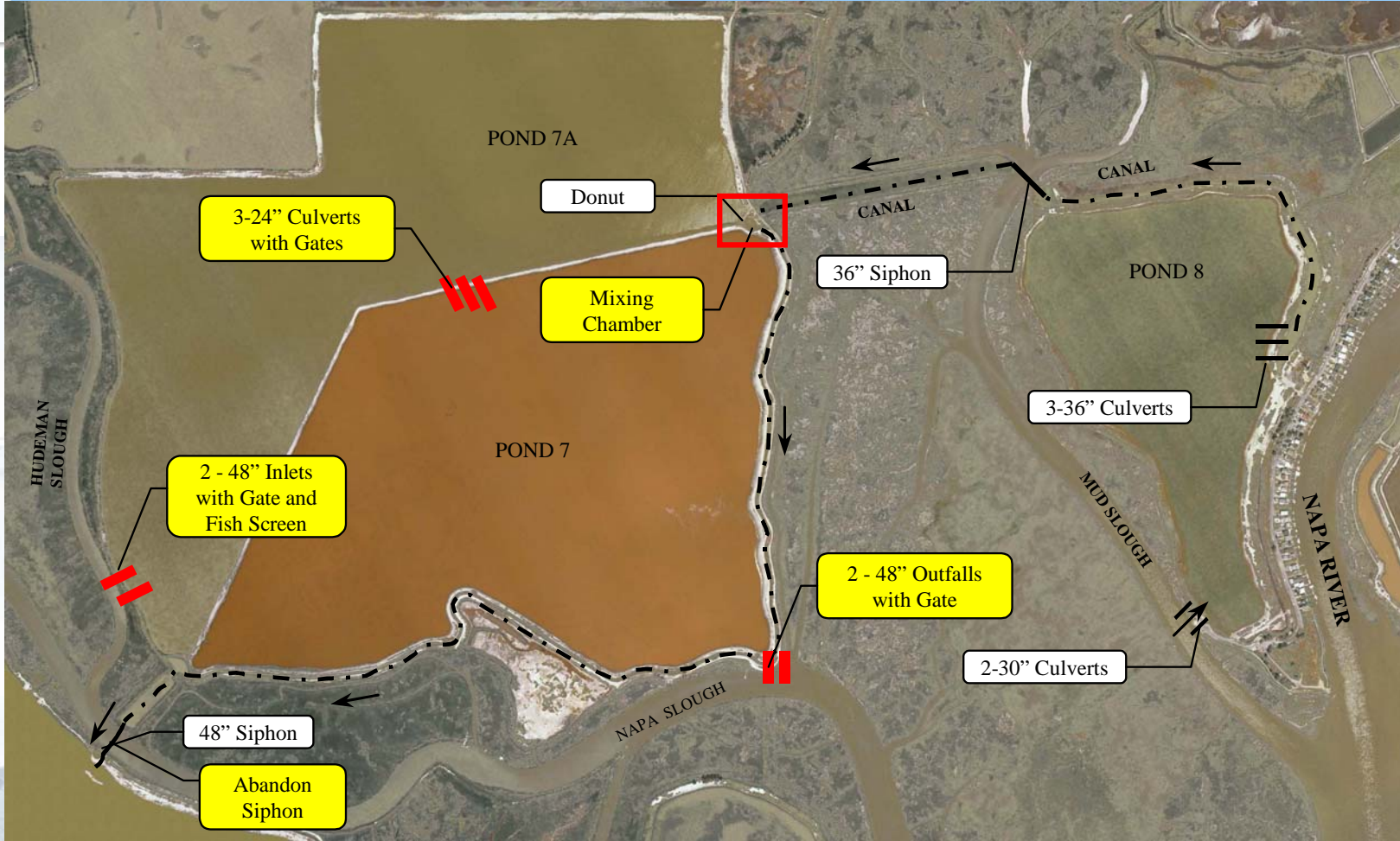




Upper Ponds Project Objectives

- Pond 7 Bittern Reduction in 8 years
- New Outfall to Napa Slough
- Demolish Siphon to Ponds 6/6A
- Improved Pond Management Flexibility







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Mixing Chamber - General Setting

Design Criteria for the Mixing Chamber are:

- Mixing chamber inflow of ambient ~ 14,000 afy
- Initial bittern release = 1% of Mixing chamber inflow = 140 afy
- Design to provide flexibility for future increase in bittern release
- Provide complete mixing

The logo for URS, consisting of the letters "URS" in a bold, blue, sans-serif font.

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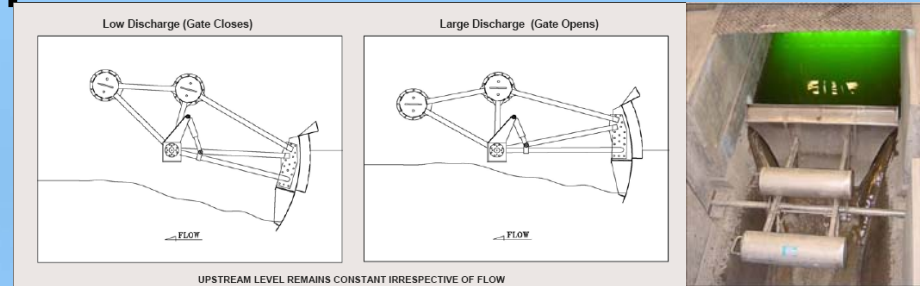


Alternatives looked at



1. Mechanical System

- Control bittern release and ambient water release using a gate with float



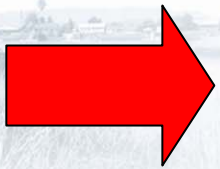
2. Automated System

- Control bittern release using flow sensors and actuators on the gates



3. Pumped System

- Injection of bittern into the Mixing Chamber using pumps





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Recommended Alternative

Alternative 2 (Automated System):

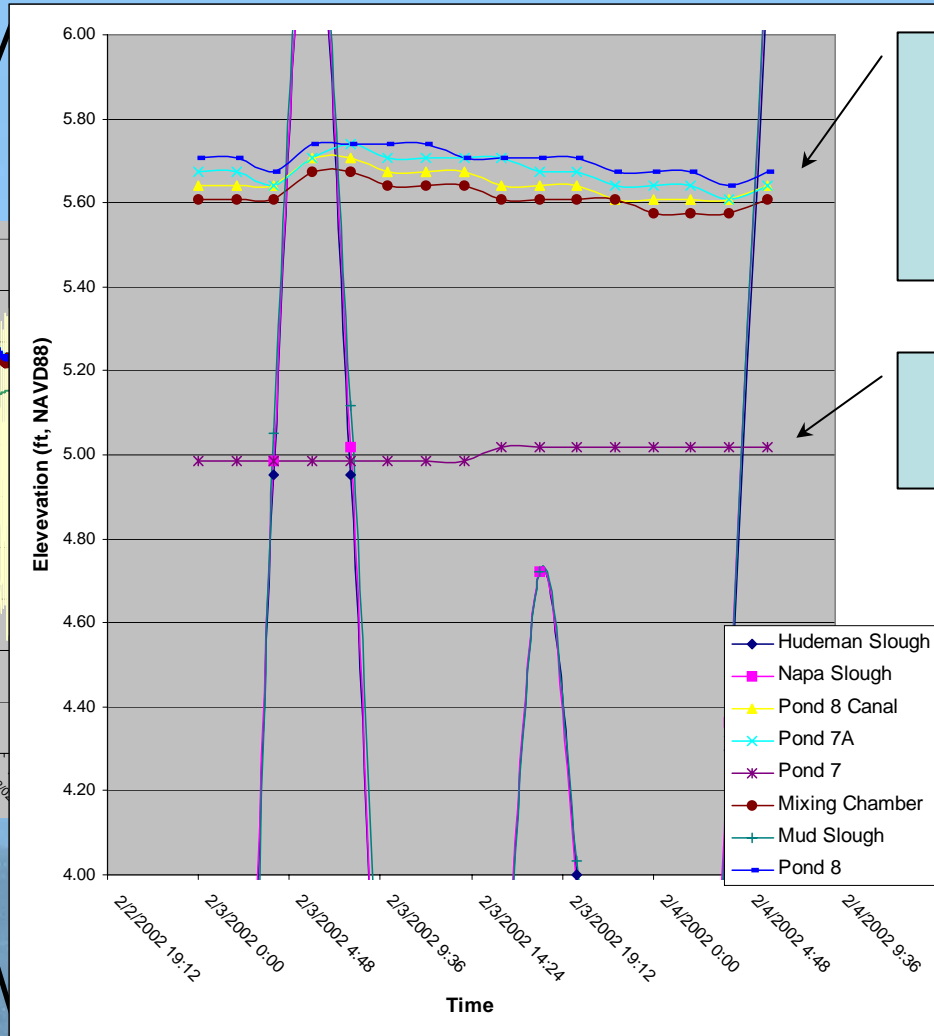
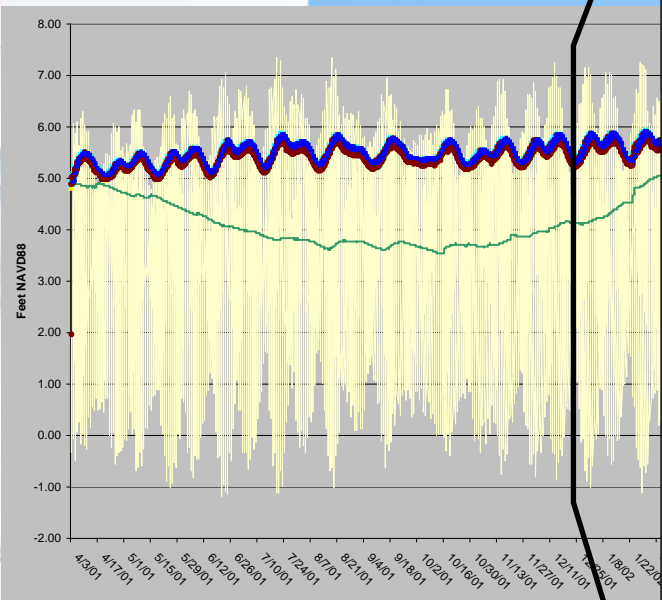
- Highest Flexibility – given design uncertainties, provides flexibility for post-construction calibration and adjustments to meet field conditions
- Data collection & reporting capabilities
- Emergency notifications
- Standard gates available for future habitat pond management
- Less long-term infrastructure to demo

A background image of a wetland landscape with a body of water, reeds, and hills in the distance.The URS logo in blue, bold, sans-serif font.



The hydraulic problem is...

Pond 7 WSEL does not allow for continuous gravity flow into MC



Pond 7A,
Pond 8, and
Mixing
Chamber

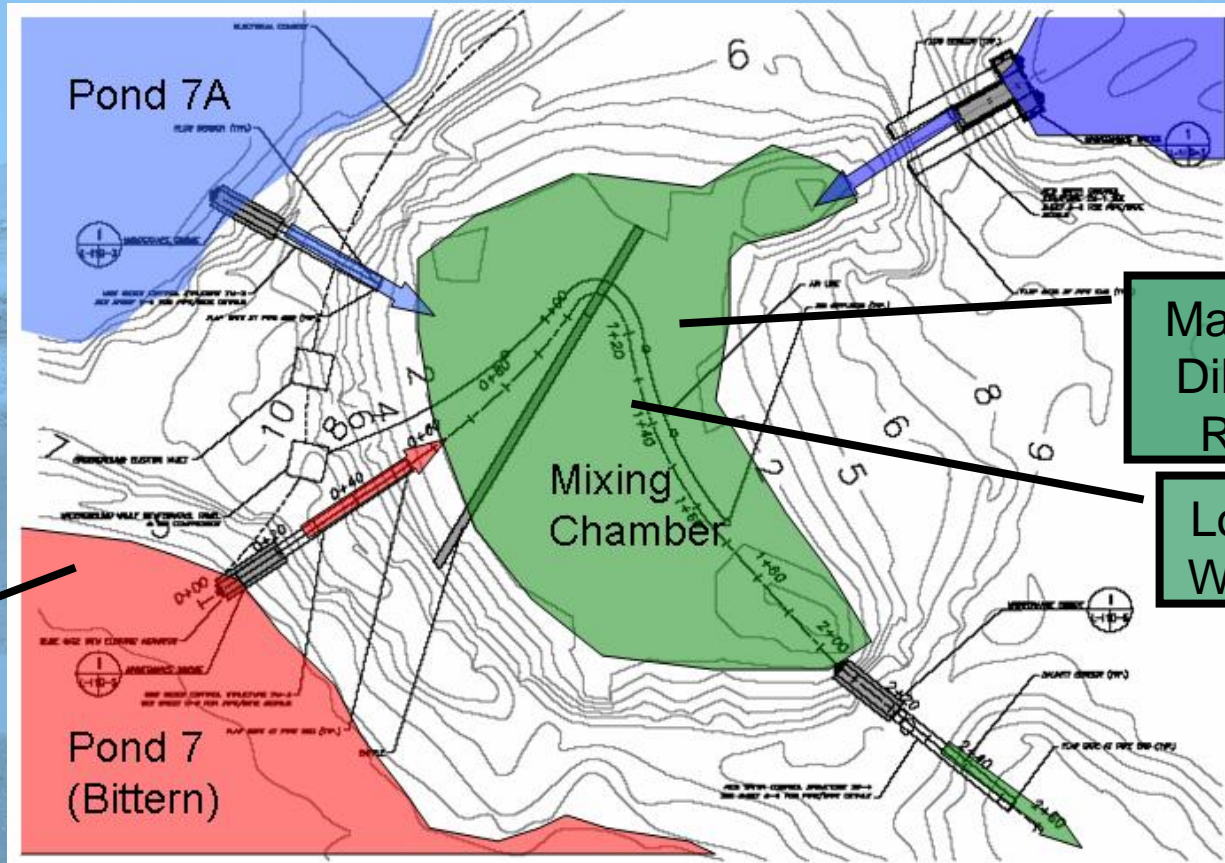
Pond 7
(Bittern)





The solution to the hydraulic issue

Issue: Pond 7 WSEL Does Not Allow for Continuous Bittern Gravity Flow into MC



Increase WSEL

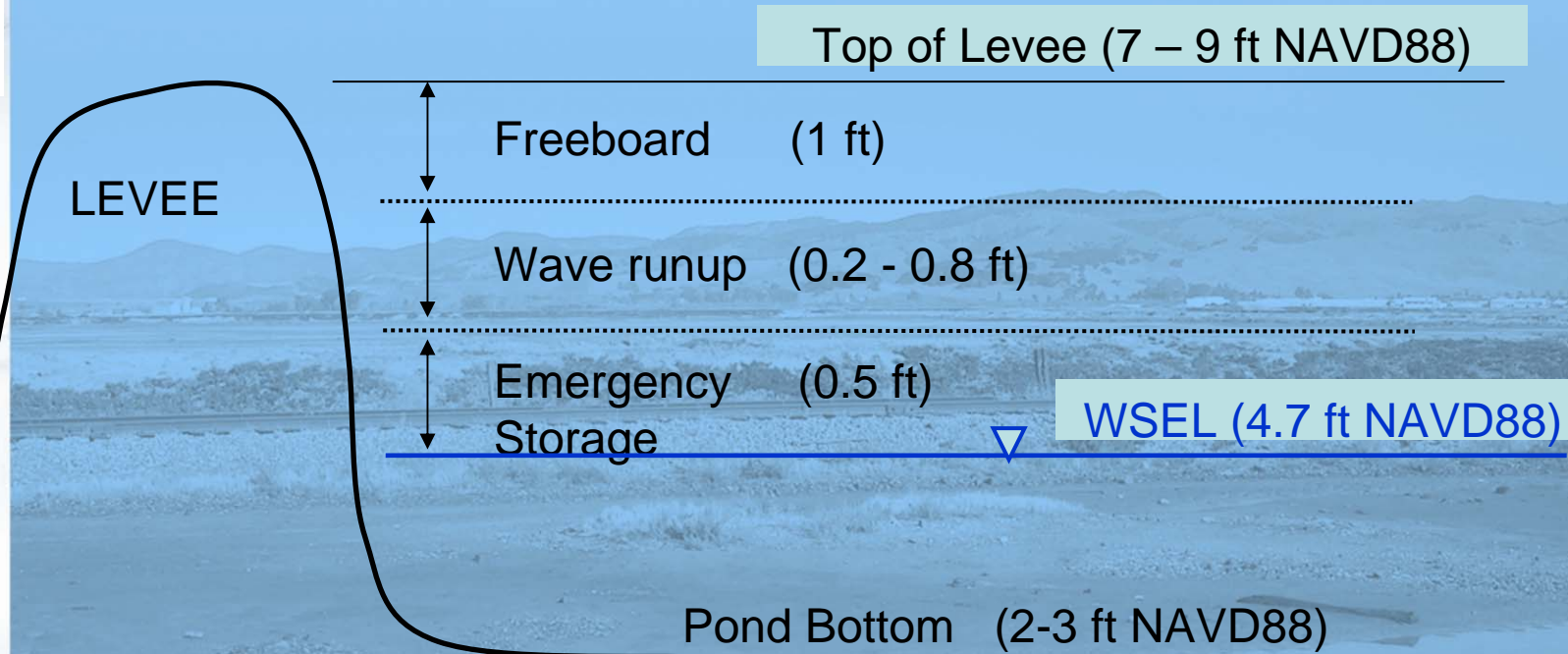
Maintain Dilution Ratio

Lower WSEL





Maximum Allowable Water Surface Elevations in Pond 7



Recommendations

- Target WSEL in P7 is 4.7 feet
- Target WSEL in the Mixing Chamber < 4.7 feet

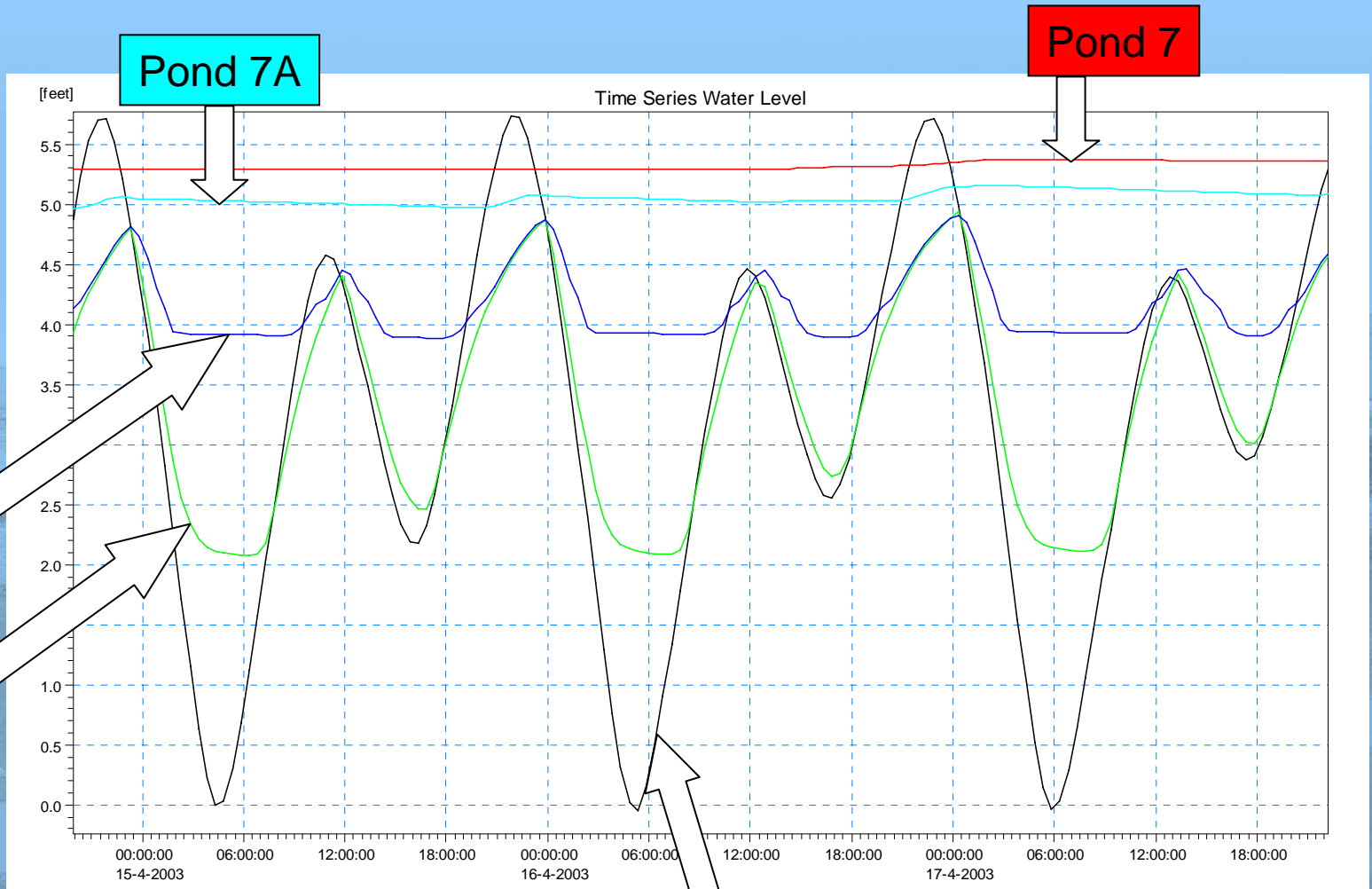




Hydraulic simulation results



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Pond 8

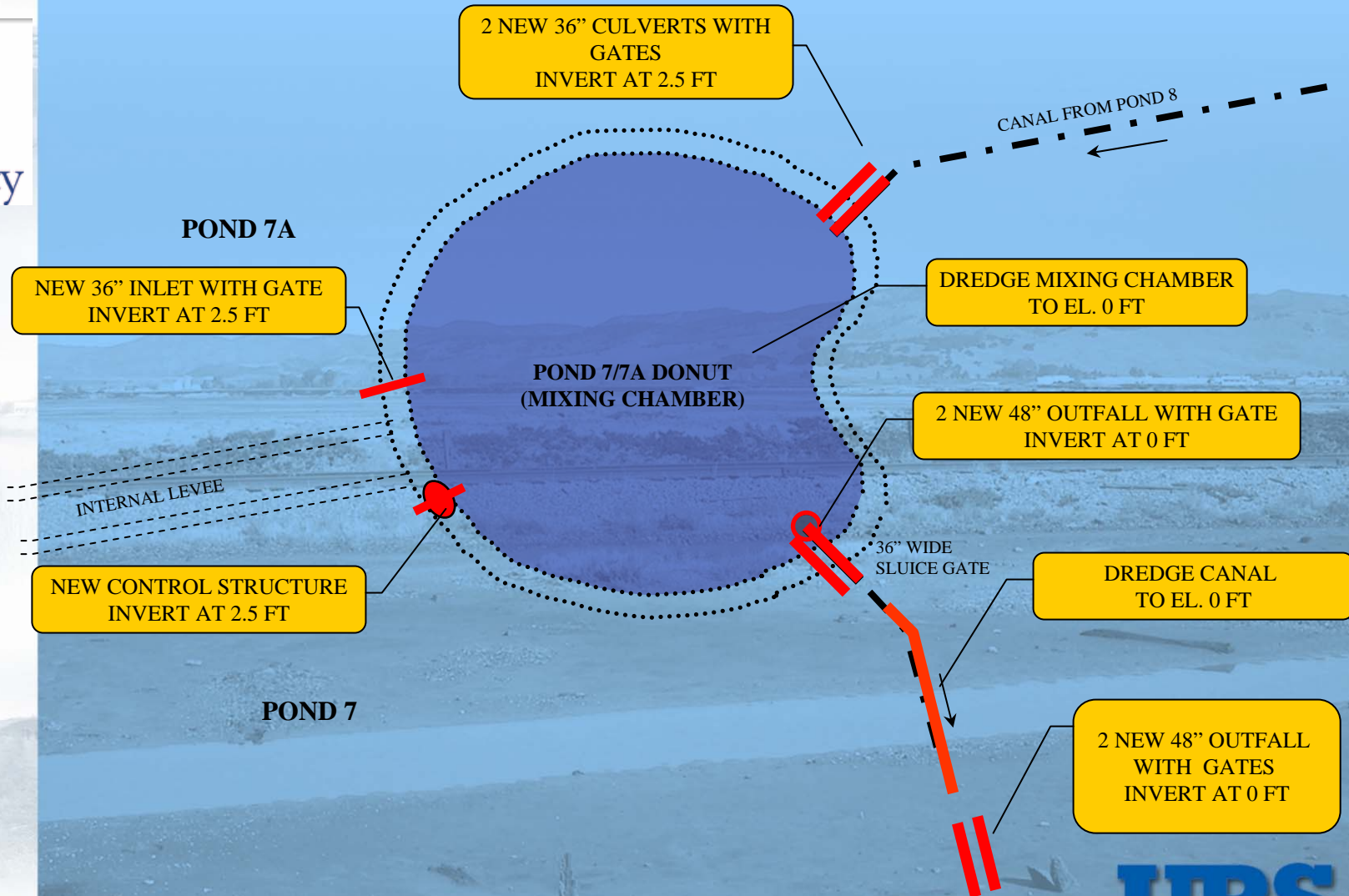
Mixing Chamber

Napa Slough





Proposed Design

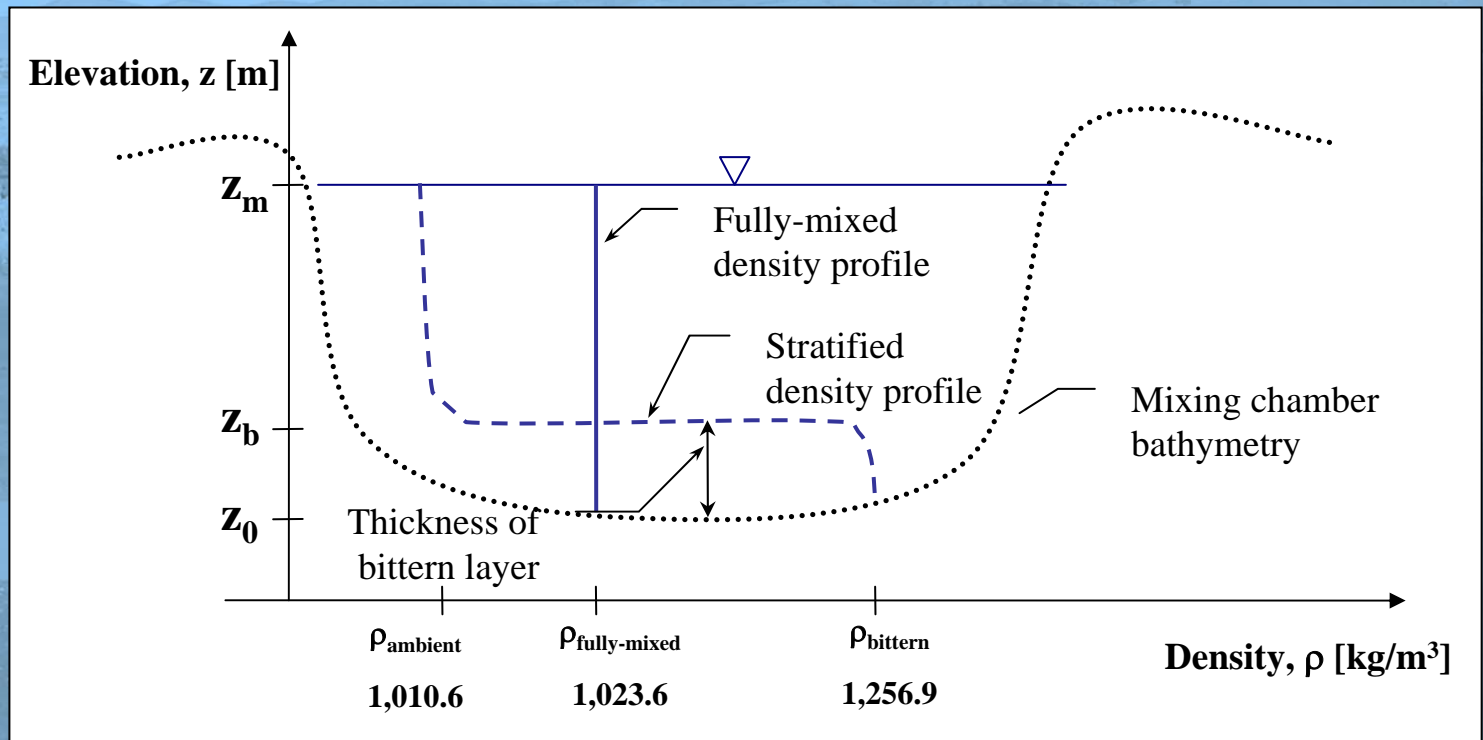




Mixing Power Requirement

The energy required to mix the water column completely depends on:

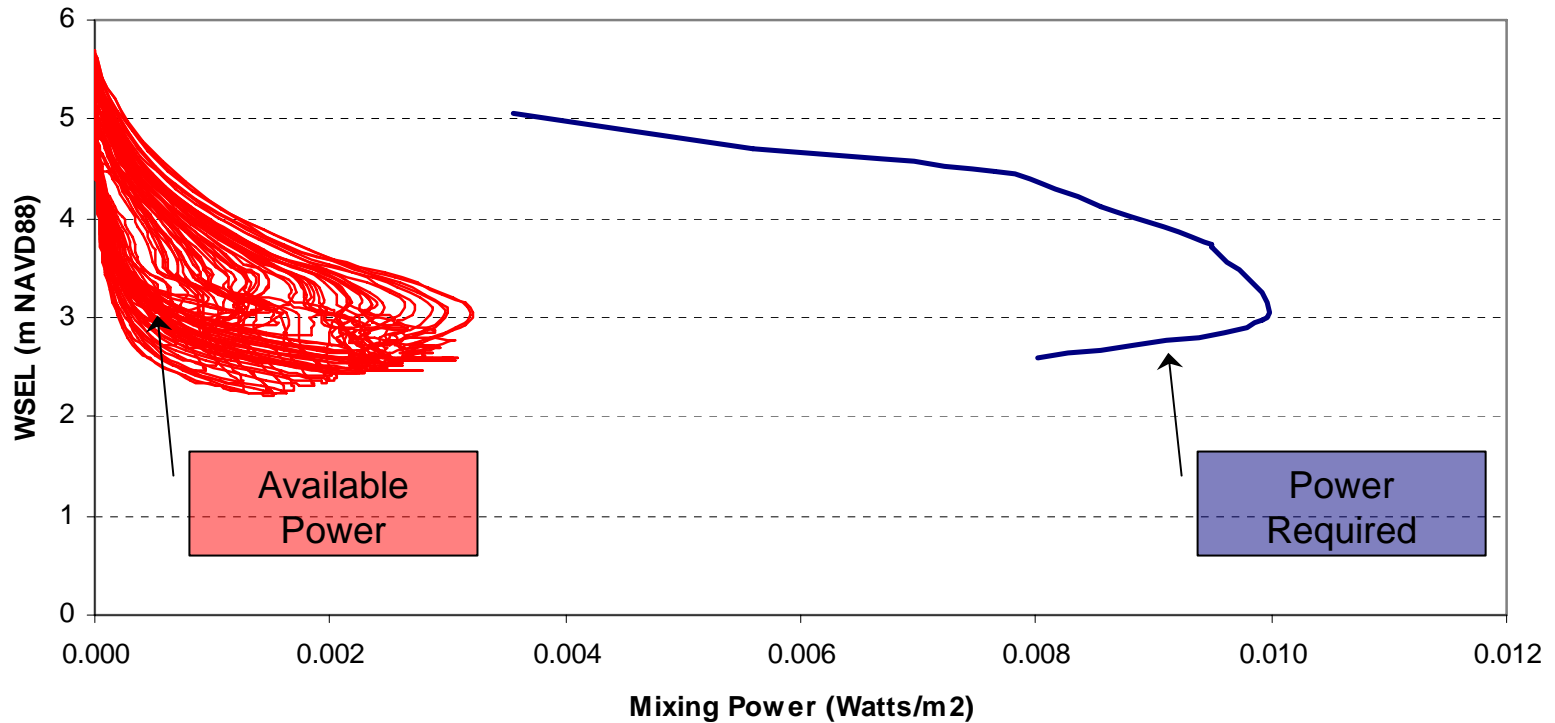
- Bittern and ambient water density difference
- Water depth in the Mixing Chamber





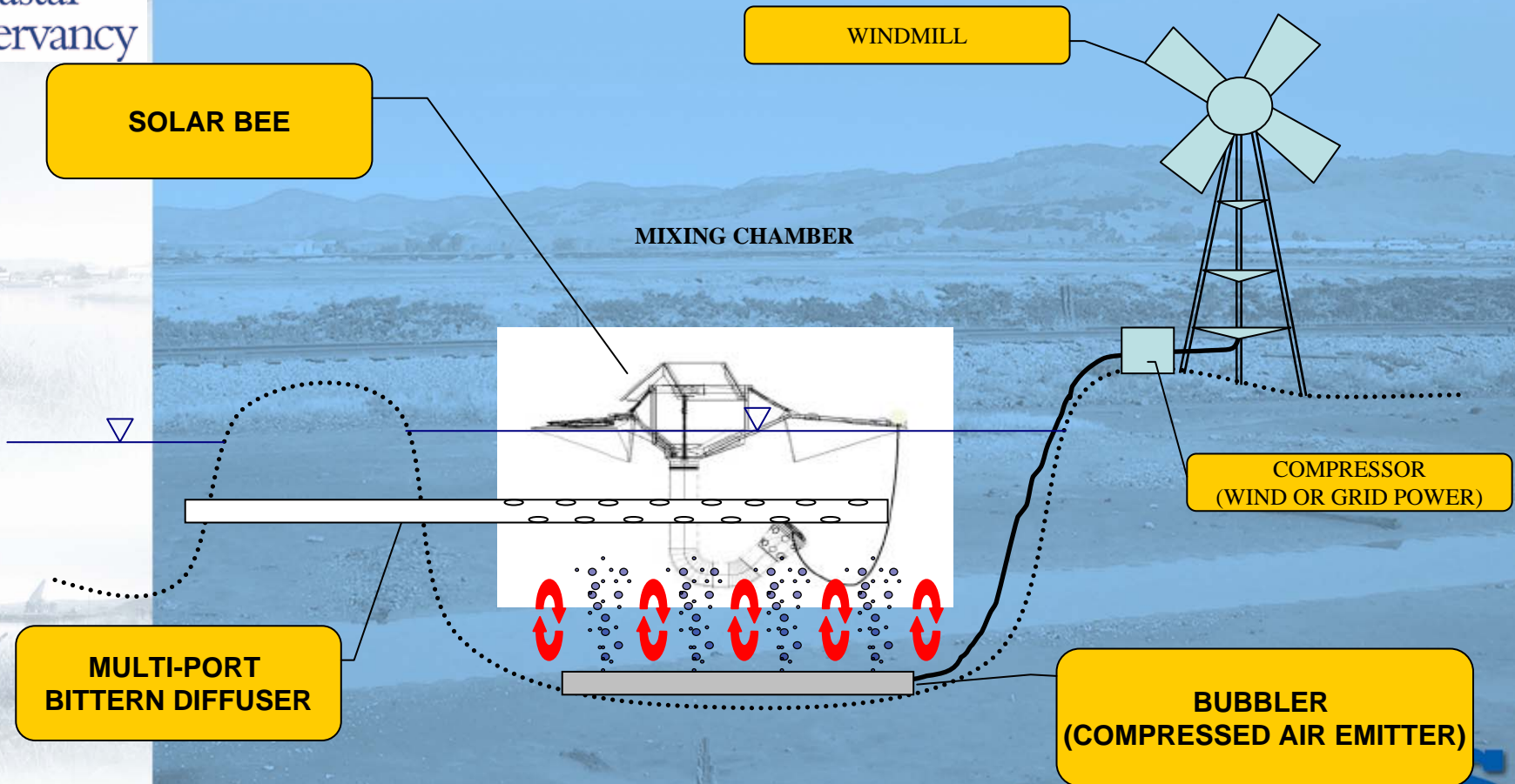
Mixing Power Available

Mixing Power Required and Available Power as a Function of Mixing Chamber WSEL During Tide Cycle





Additional Mixing Power





Mixing Power Requirement

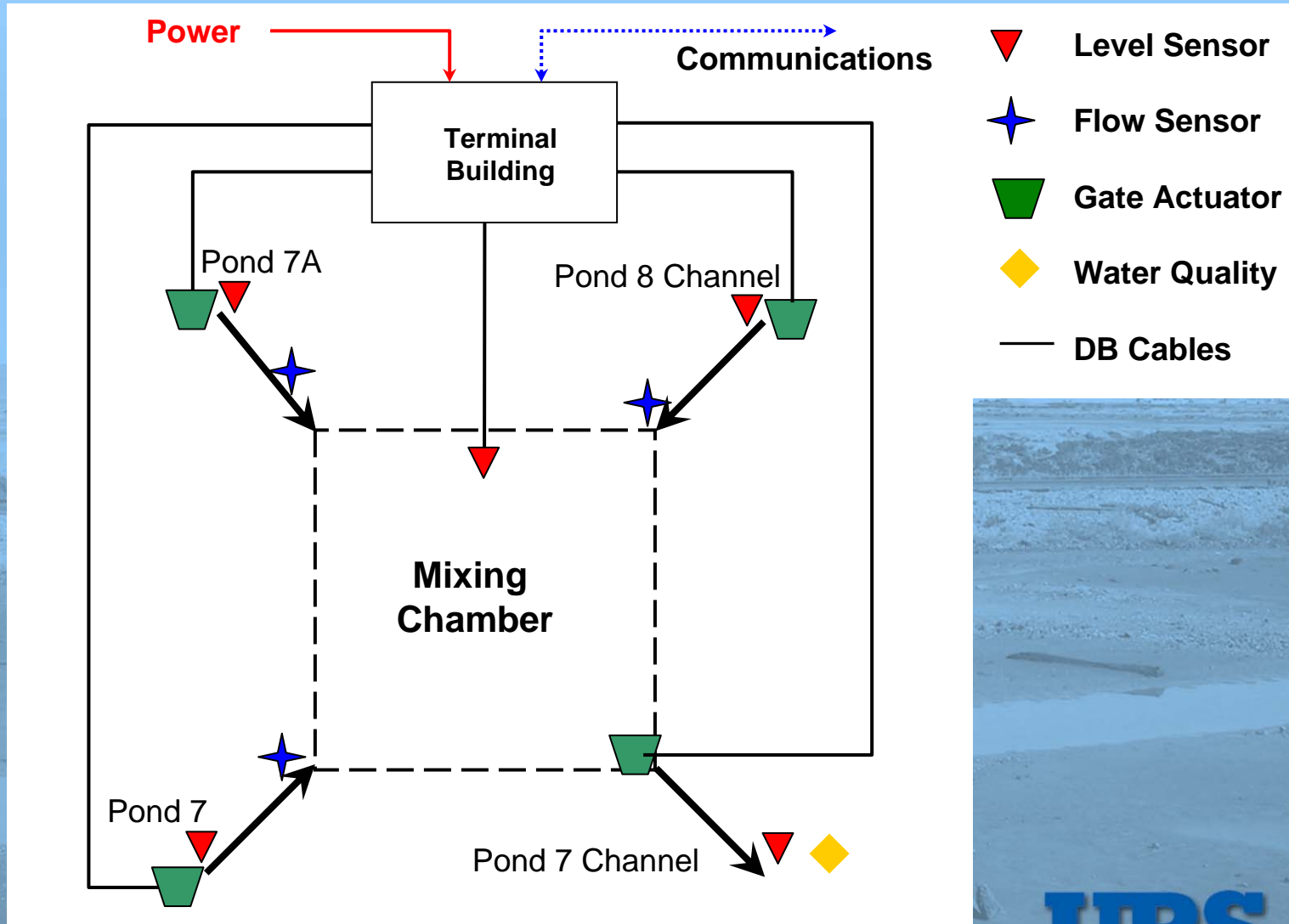


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	PROS	CONS
BUBBLER	<ul style="list-style-type: none">•Placed at best location	<ul style="list-style-type: none">•Clogging•Power requirement
SOLARBEE	<ul style="list-style-type: none">•Renewable power•Heavy mixing	<ul style="list-style-type: none">•Exposed to vandalism•Cost•Required Depth
MULTI-PORT DIFFUSER	<ul style="list-style-type: none">•Simple design•Cheap	<ul style="list-style-type: none">•Clogging



Control System Concept





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Terminal Building

System Components in the Terminal Building

- Controller (PLC) – Gate control
- Remote Terminal Unit (RTU) – Data collection
- Batteries/Charger – Provides Power
- Radio/ Antenna – Offsite Data Communications
- Gate Control Master Panel – Local manual gate control
- Intrusion Sensors (Door Switch/Motion Sensors)



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Geotechnical Investigation / Levee Design

Geotechnical:

- Borings and grab samples to obtain soil profile and soil characteristics
- Settlement, Slope Stability and Seepage Analyses

Levee Improvement Areas:

- Updated based on survey and additional field walks





Schedule

- Geotechnical Analyses Complete
- Structural Design for Headwalls and Pipe Bridges Nearly Complete
- Finalize Mixing Chamber Design
- Finalize Levee Details & Specifications
- 90% Submittal- December 2007





Questions?

