



# Welcome to Mayor Pro Tem Dave Martin's Lake Houston Dam Spillway Improvement Project Public Meeting

July 8, 2021



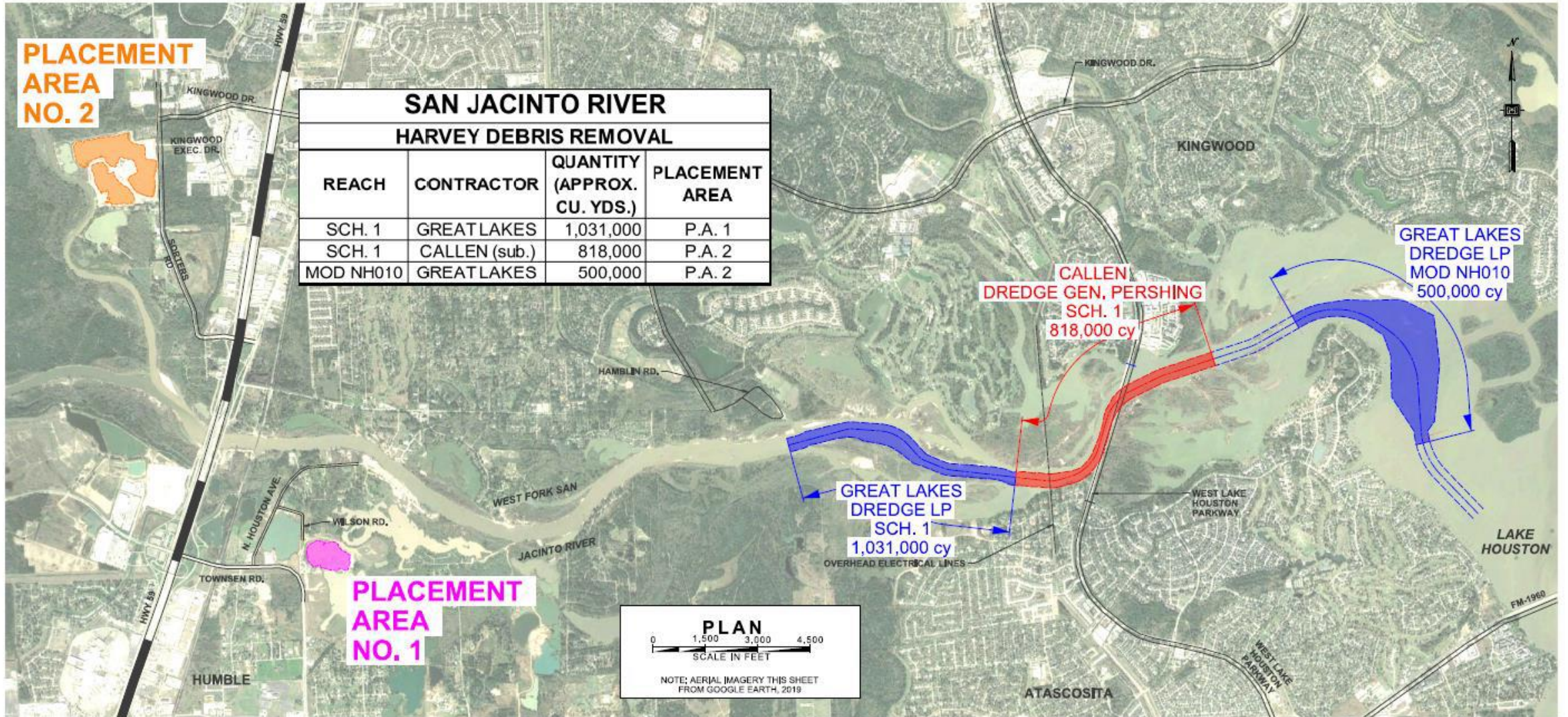


# Lake Houston Dredging Operation

Stephen C. Costello, P.E., Chief Recovery Officer  
July 8, 2021



# USACE – FEMA Mission Assignment





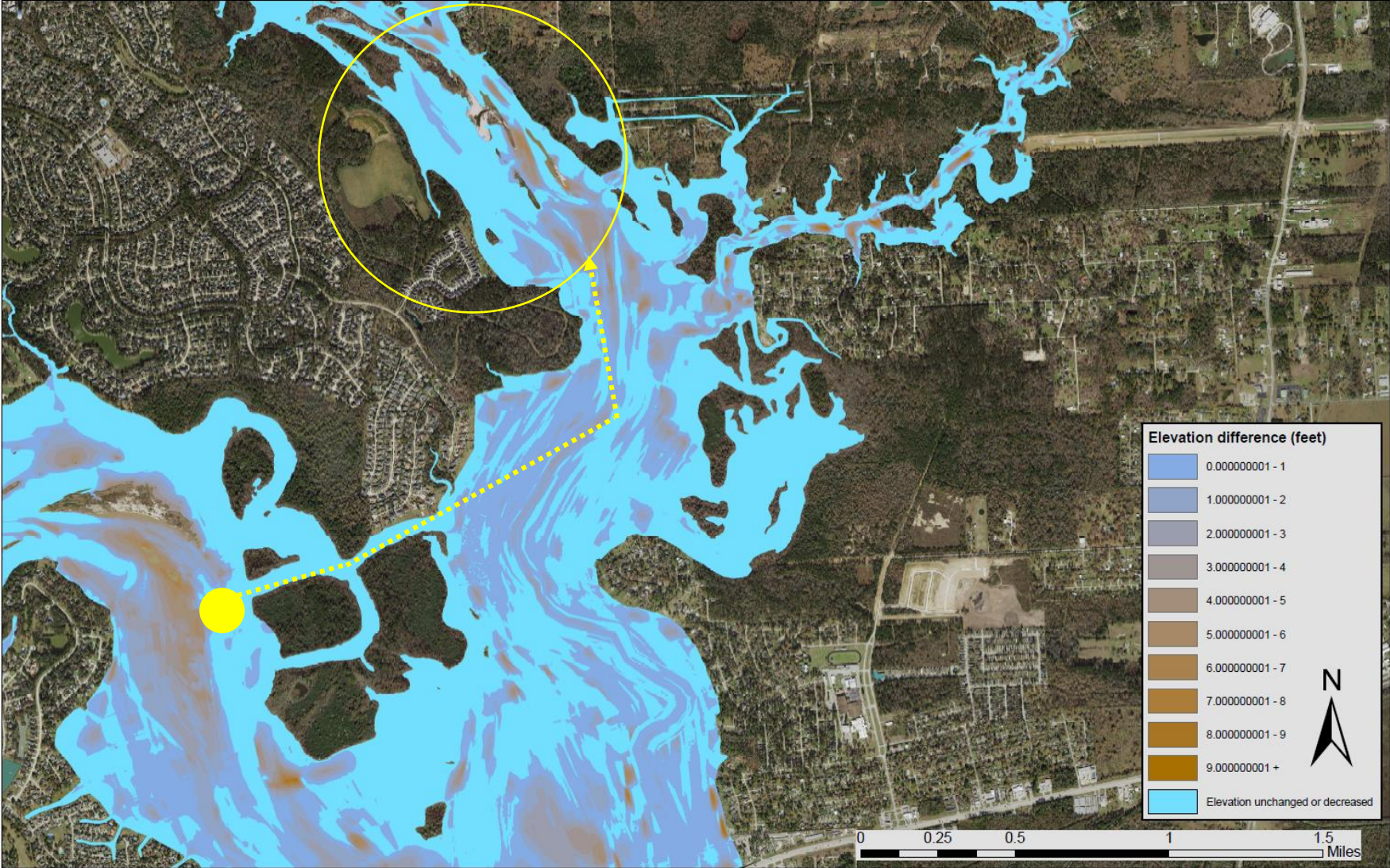
# Office of the Governor's Grant | TWDB – Harris County Grant





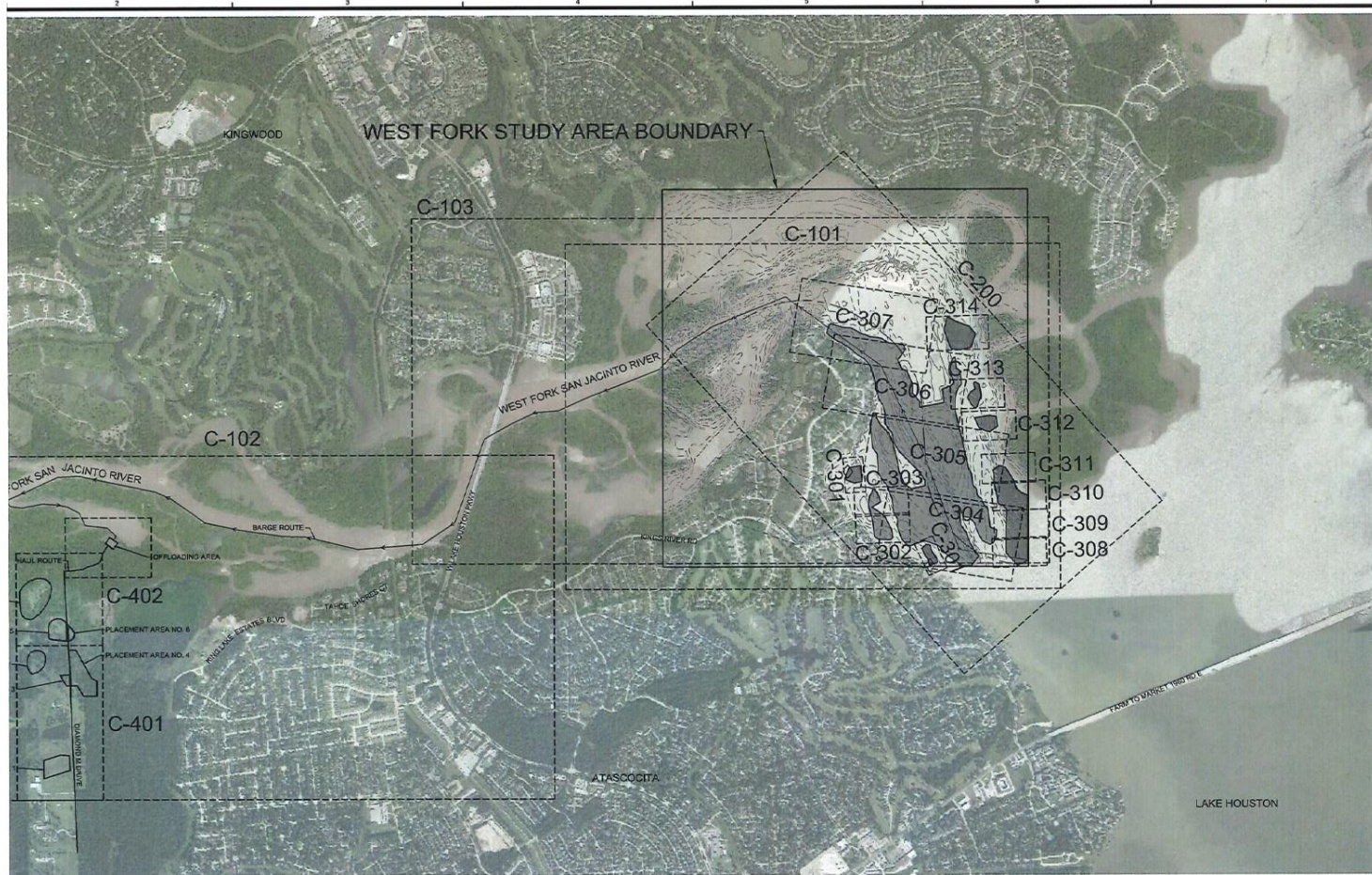
# East Fork Dredging Phase

Change in Lakebed Elevation between 2011 and 2018 at the East Fork of the San Jacinto River

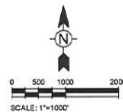




# West Fork – FEMA Public Assistance



LOCATION PLAN  
SCALE: 1"=1000'



	<b>TETRA TECH</b> <small>www.tetra-tech.com</small> 1500 CITYWEST BLVD, STE. 1000 HOUSTON, TX 77042 (832) 291-5160	DRAFT NOT FOR CONSTRUCTION <small>MARKED WITH SITE/NO NUMBER 101</small>

MARK	DATE	DESCRIPTION	BY
133920		PRELIMINARY DRAFT DELIVERABLE	
030521		DRAFT DELIVERABLE	

CITY OF HOUSTON DEPARTMENT OF SOLID WASTE MANAGEMENT WEST FORK SAN JACINTO RIVER AND LAKE HOUSTON DEBRIS REMOVAL PROJECT	LOCATION PLAN
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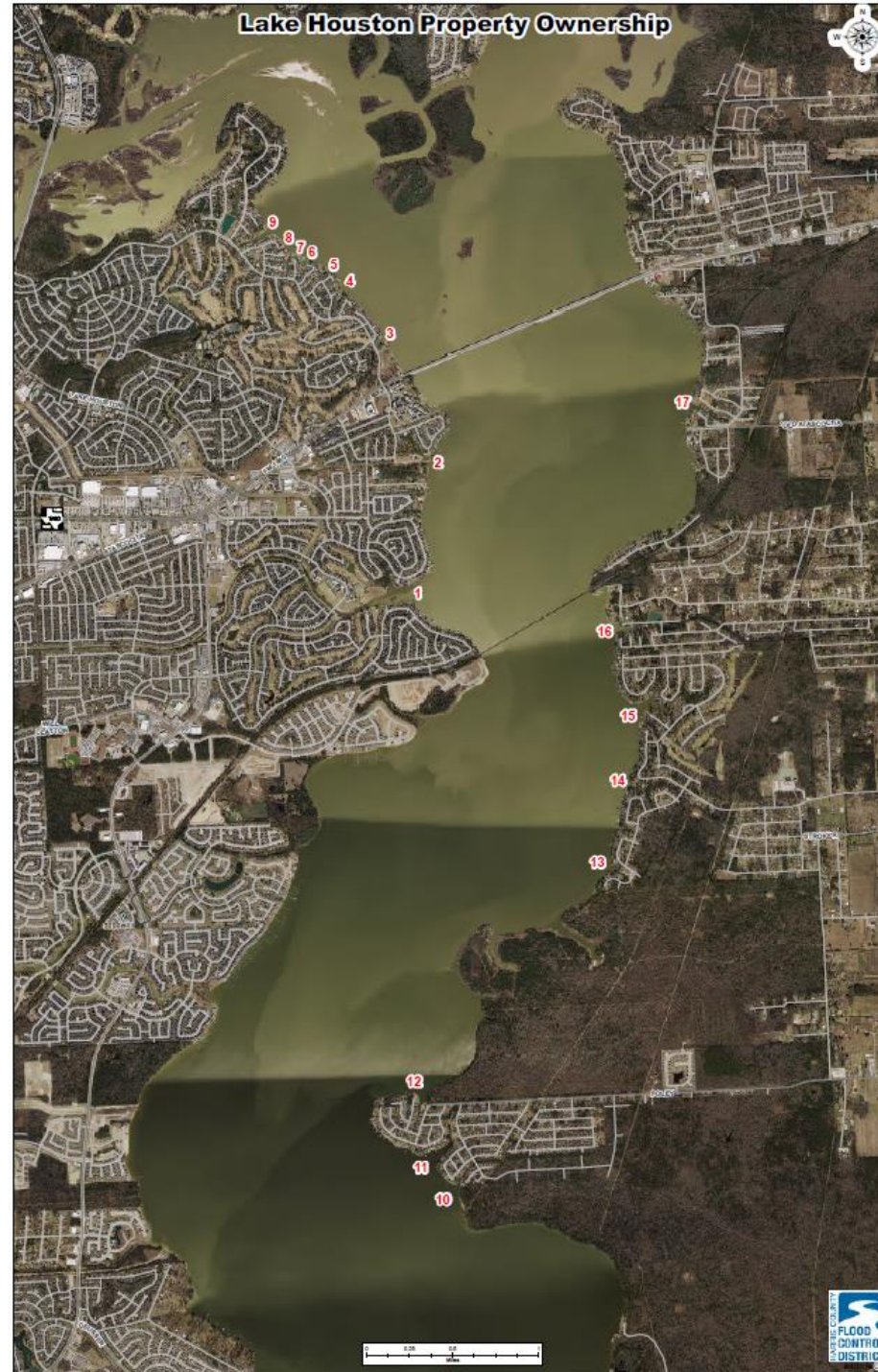
PROJ: 200-207015-0000
DATE: 02/02/2011
DESIGN: JA
DRAWN: AS
CHECK: JO
<b>G-003</b>

Bar measures 1 inch. otherwise drawing not to scale



Lake Houston Dredging Operations

# Lake Houston Long Range Plan



Lake Houston Dredging Operations

# Dredging Summary

DREDGING PROJECT	AGENCY	FUNDING SOURCE	MATERIAL DREDGED (CY)	COST (M)
West Fork	USACE	FEMA-PA	1,849,000	\$73.7
West Fork	USACE	FEMA-PA	500,000	\$17.1
Mouth Bar	City of Houston	Governor Grant TWDB/HC Grant	442,976	\$16.6
Mouth Bar North	City of Houston	TWDB/HC Grant	175,895	\$6.6
East Fork*	City of Houston	TWDB/HC Grant	36,137	\$18.0
West Fork**	City of Houston	FEMA-PA	1,000,000 (EST)	\$40 (EST)
Lake Houston***	City of Houston	TWDB/CoH Grant	--	\$50 (EST)
<b>TOTALS</b>			<b>4,004,008</b>	<b>\$222</b>

\* Ongoing Estimate Approx. \$18M total dredging costs

\*\* Construction Documents for bidding in progress

\*\*\* Scope of work pending development of long range plan



# Lake Houston Dam Spillway Improvement Project

- Presented by: Chris Mueller, PhD, PE of Black & Veatch
- Public Meeting, July 8<sup>th</sup>, 2021





An aerial photograph of a large dam under construction. The dam spans across a wide river. In the foreground, there's a large area of green grass and a gravelly embankment. The dam structure itself is made of concrete and has several spillways. Construction equipment, including cranes and trucks, is visible on the dam's surface. The water in the river is a light brown color. The background shows a dense line of trees.

## AGENDA

Project Background  
Planning Study Findings  
Preliminary Engineering  
Implementation Schedule  
Questions & Answers



# Project Stakeholders



**FEMA**

- City of Houston, Coastal Water Authority, and Their Customers
- Harris County Flood Control District and Harris County Residents
- Upstream Residents
- Downstream Residents
- Federal Emergency Management Agency
- Texas Division of Emergency Management



# Project Background/Purpose



- Increase Outflow Capacity of the Reservoir
- Provide a Flood Risk Reduction to Adjacent Communities and w/o Impact to Reservoir Operations OR Downstream Property
- Preserve (or improve) Dam Safety
- “Fit” the Project within the Grant Fund Budget



# Lake Houston: Water Supply Reservoir First

## Lake Houston's Importance as a Drinking Water Reservoir

- Examined Water Quality Impacts at Lake Houston Related to Operational Flow Releases
- Ongoing Water Quality Coordination with City of Houston



**Influent Pump Station on Lake Houston**



**Northeast Water Purification Plant Expansion**



# FEMA Benefit Cost Ratio >1 Required

## Benefits

- Reduction in water surface elevation
- Reduction in building flooding
- Reduced streets inundated
- Lessened societal impacts
- Lowered impacts to business revenues

## Costs

- Construction Cost
- Annual Operation and Maintenance Cost

- Calculate benefits over lifetime of proposed project

- Benefit Cost Ratio =  $\frac{\text{Net Present Value Benefits}}{\text{Project Cost}}$

- Project Cost =  $(\text{Capital Cost}) + (\text{Net Present Value Operations and Maintenance Costs})$



# Phase 1 Planning Services

- FEMA Hazard Mitigation Grant Award - \$4,375,199
- Hydrologic & Hydraulic Modeling
- Geotechnical Investigations
- Environmental Field Studies (Wetlands, Threatened & Endangered Species)
- Preparation of Permit Applications (COE 404 Permit)
- Development of Engineering Alternatives
- Evaluation of Engineering Alternatives (Cost/Benefit, Non-Cost Factors)



**BLACK & VEATCH**



**HOLLAWAY**  
ENVIRONMENTAL + COMMUNICATIONS



**GRAY & PAPE, INC.**  
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Knudson, LP



5Engineering



Concentric  
Construction



# Hydrologic & Hydraulic Analyses

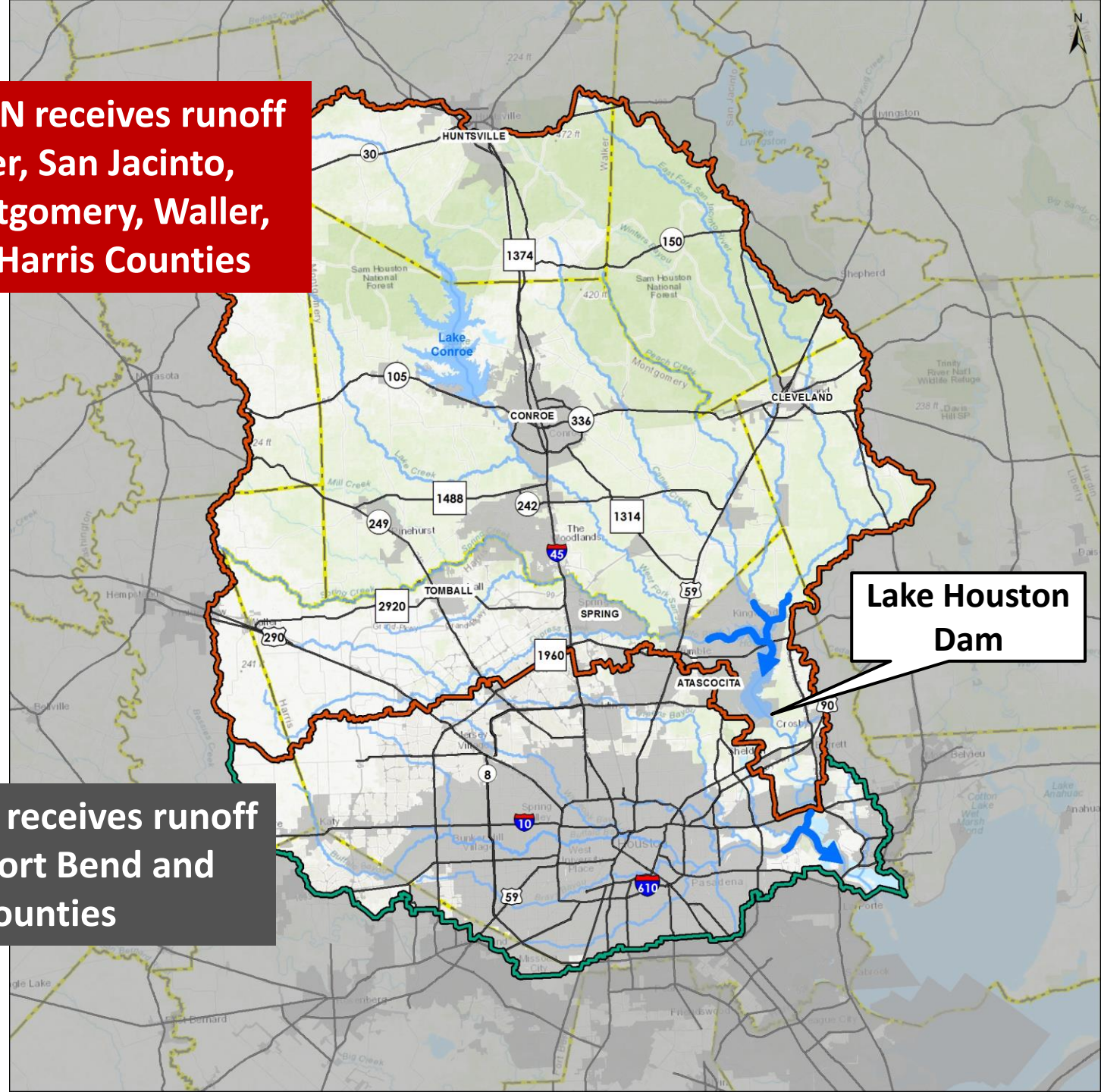
- **Develop a computer model of the San Jacinto River Watershed including Buffalo Bayou**
- **Calibrate model to historical storm events**
- **Calculate lake flows and levels in response to rain events**
- **Evaluate benefits and impacts of recommended projects**



# Hydrologic & Hydraulic Analyses

**LAKE HOUSTON** receives runoff from Walker, San Jacinto, Grimes, Montgomery, Waller, Liberty and Harris Counties

**BUFFALO BAYOU** receives runoff from Waller, Fort Bend and Harris Counties





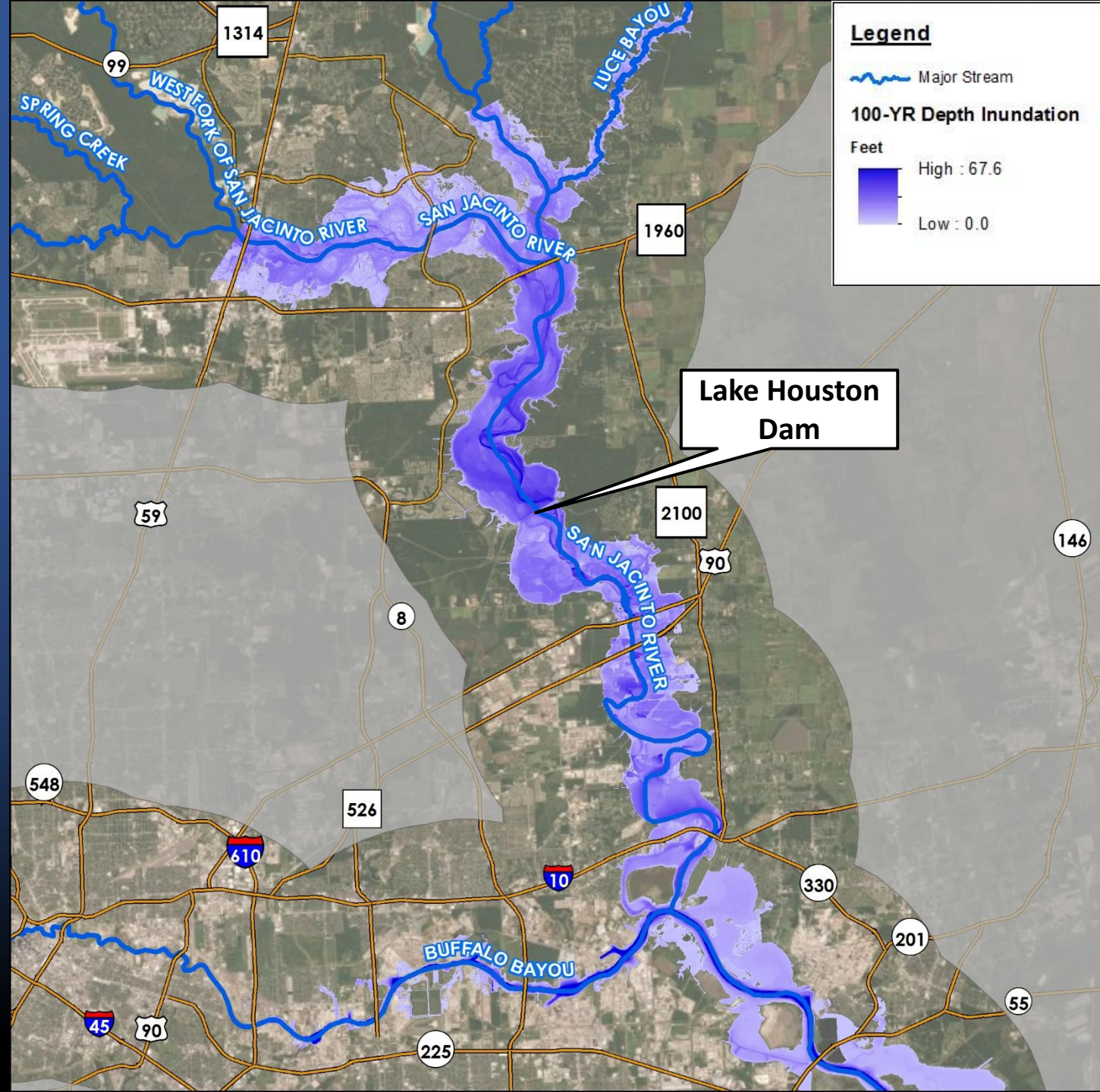
# Hydrologic & Hydraulic Analyses

## Inundation Analysis 100-Year Storm Event

- Peak 100-year inflow is 286,000 ft<sup>3</sup>/s
- This inflow would fill the Astrodome in three minutes
- This inflow causes the lake water elevation to rise 10 feet above normal pool
  - 42.4 ft to 52.4 ft



\*100-year storm event: a rainfall event that has a 1 percent chance of happening in any year (USGS) most recently Tropical Storm Imelda



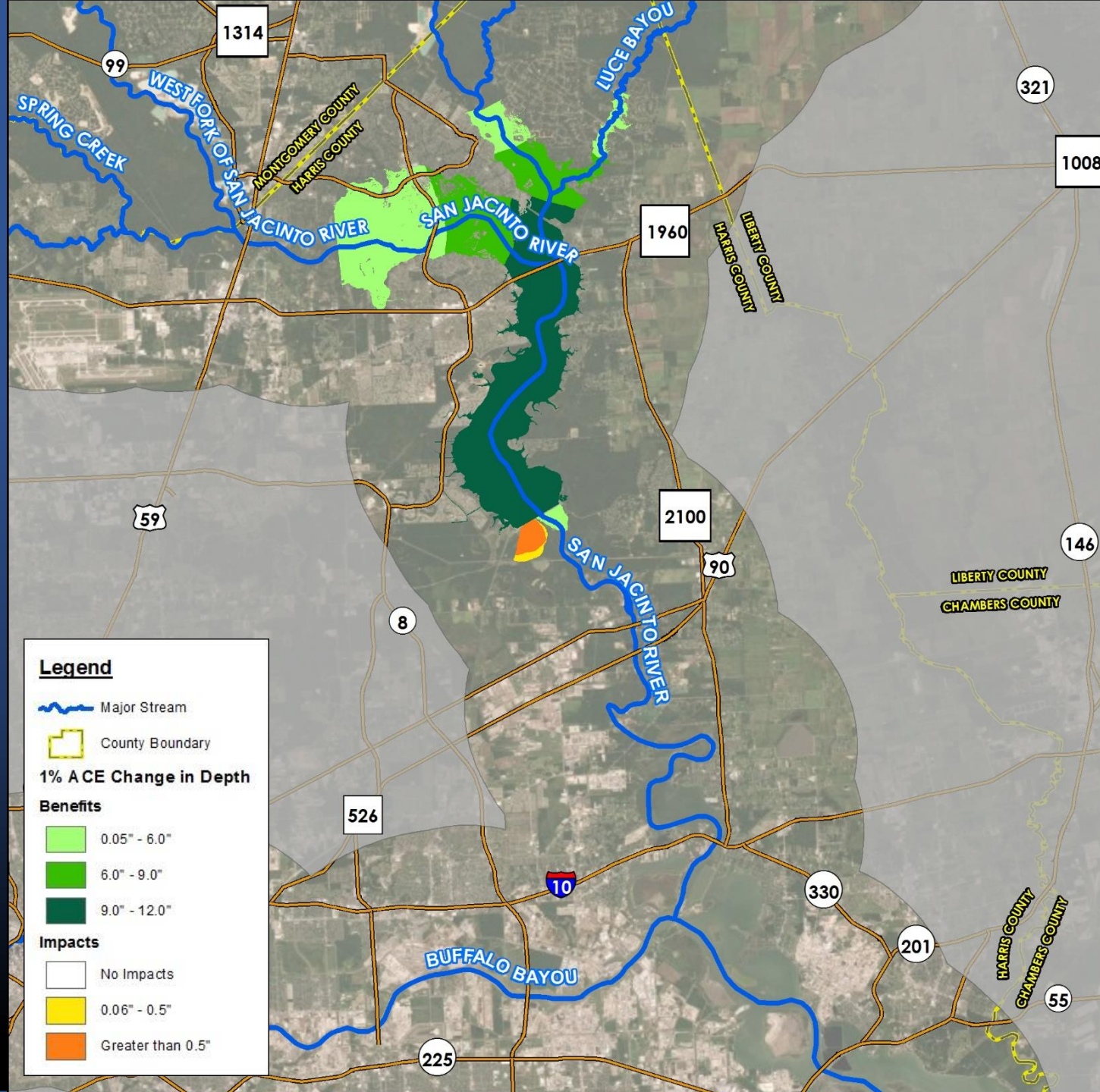


# Hydrologic & Hydraulic Analyses

## Benefits and Impacts 100-Year Storm Event

- Additional spillway capacity of 45,000 ft<sup>3</sup>/s (25%)
- Maximum benefit will be closest to the Lake Houston Dam of 11 inches

*\*100-year storm event rainfall is similar to Tropical Storm Imelda*





Alternative 1A



Addtl. Six Tainter Gates  
(Bright Rendering)

Expanded Stilling Basin

Portion of Ambursen Spillway Modification  
Obermeyer Crest Gates



Alternative 4A

Planning  
Study Phase -  
Engineering  
Concepts



Google Earth

Alternative Proposed Design Locations

© 2020 Google

1000 ft





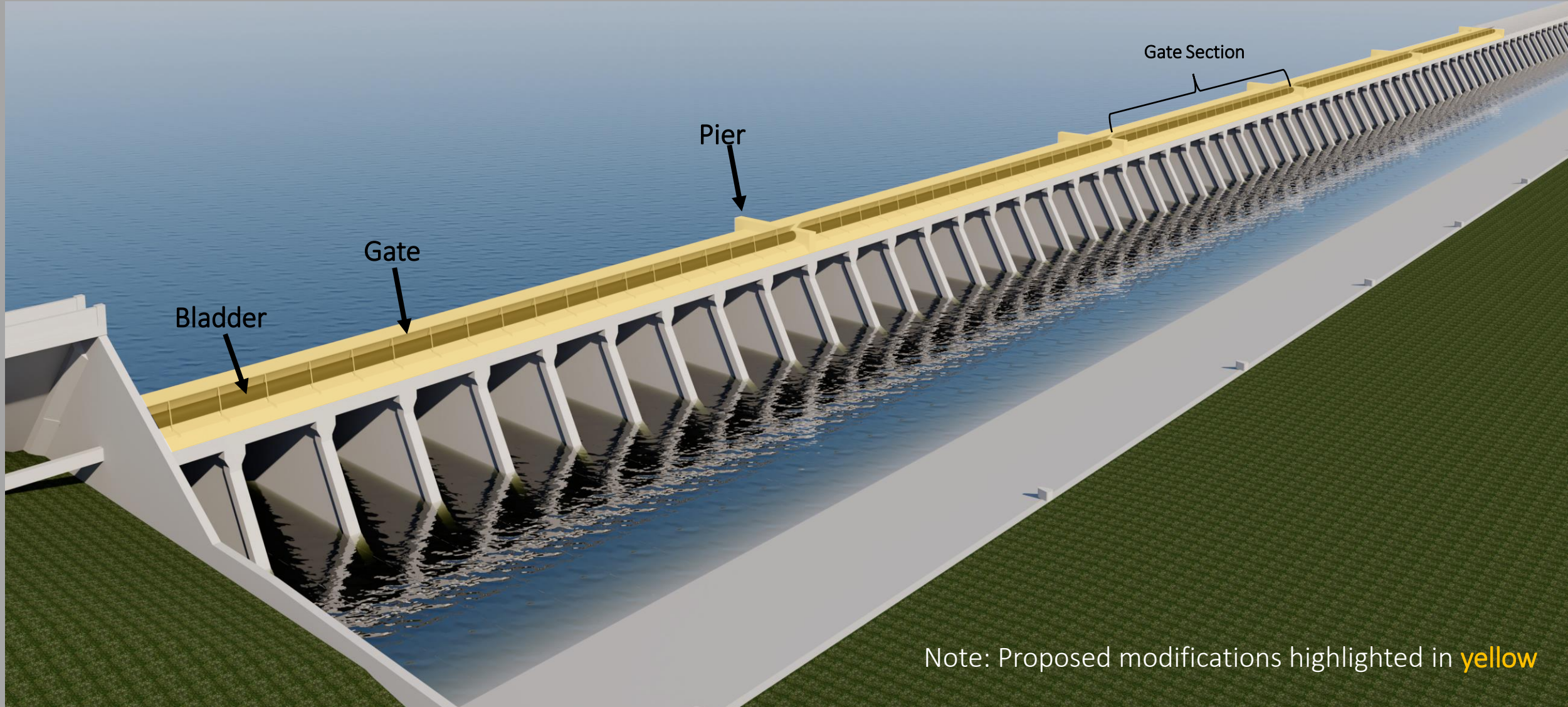
# Planning Study Phase - Engineering Concepts

- Cost Factors
  - Construction Costs (AAEC, Class 5)
  - O&M Costs
  - Cost Uncertainty (Risks)
  - Benefit Cost Ratio (FEMA Toolkit)
- Non-Cost Factors
  - Dam Safety
  - Environmental Impacts & Permitting
  - Water Supply/Water Quality
  - Reservoir Operations & Maintenance
  - Flood Risk Reduction Benefits
  - Downstream Impacts
  - Constructability
  - Construction Schedule
  - Stakeholder Consensus



# Recommended Engineering Alternative

Computer Simulation of Proposed Improvements





# Cedar Falls, WI - Obermeyer Gates

Crest Gates Closed

**DANGER WARNING**  
THE GENERATORS IN THIS PLANT WILL AUTOMATICALLY  
OPERATE SHORTLY AFTER YOU HEAR THE ALARM  
OR SEE THE FLASHING LIGHT. THOSE PEOPLE NEAR THE PLANT  
ALONG THE RIVER BANKS, OR IN BOATS WILL SEE A  
DANGEROUS RISE IN THE WATER LEVEL.  
THE WATER MAY BECOME VERY ROUGH.  
YOU MUST GO TO HIGHER GROUND TO BE SAFE.  
THERE IS THE DANGER OF DROWNING.  
NEAREST PHONE NUMBER 774-462-4450







Crest Gates Closed



Crest Gates Open

**Ozark Beach, MO - Obermeyer Gates**

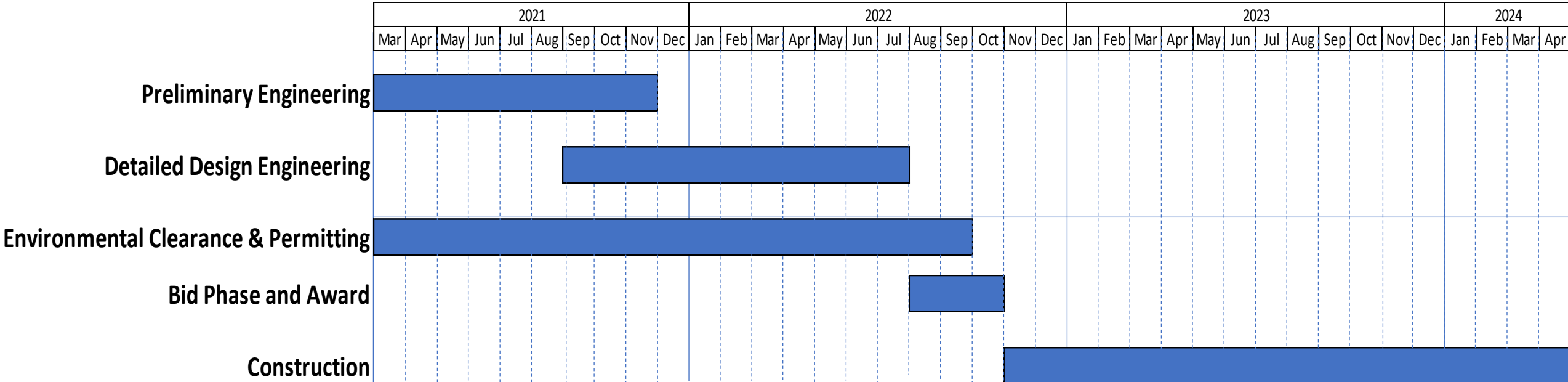


Preliminary  
and Detailed  
Design

- Evaluate Construction Impacts to Stability of Existing Concrete Dam
- Evaluate Downstream Hydraulics
- Determine Gate Operations Protocols that Maximize U/S Benefits and Limit D/S Impacts
- Mitigation of D/S Impacts



# Project Schedule





# Thank You

## Contact Us

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