

Brazos River Bank Erosion Control Project

Fort Bend County LID 7

June 29, 2018

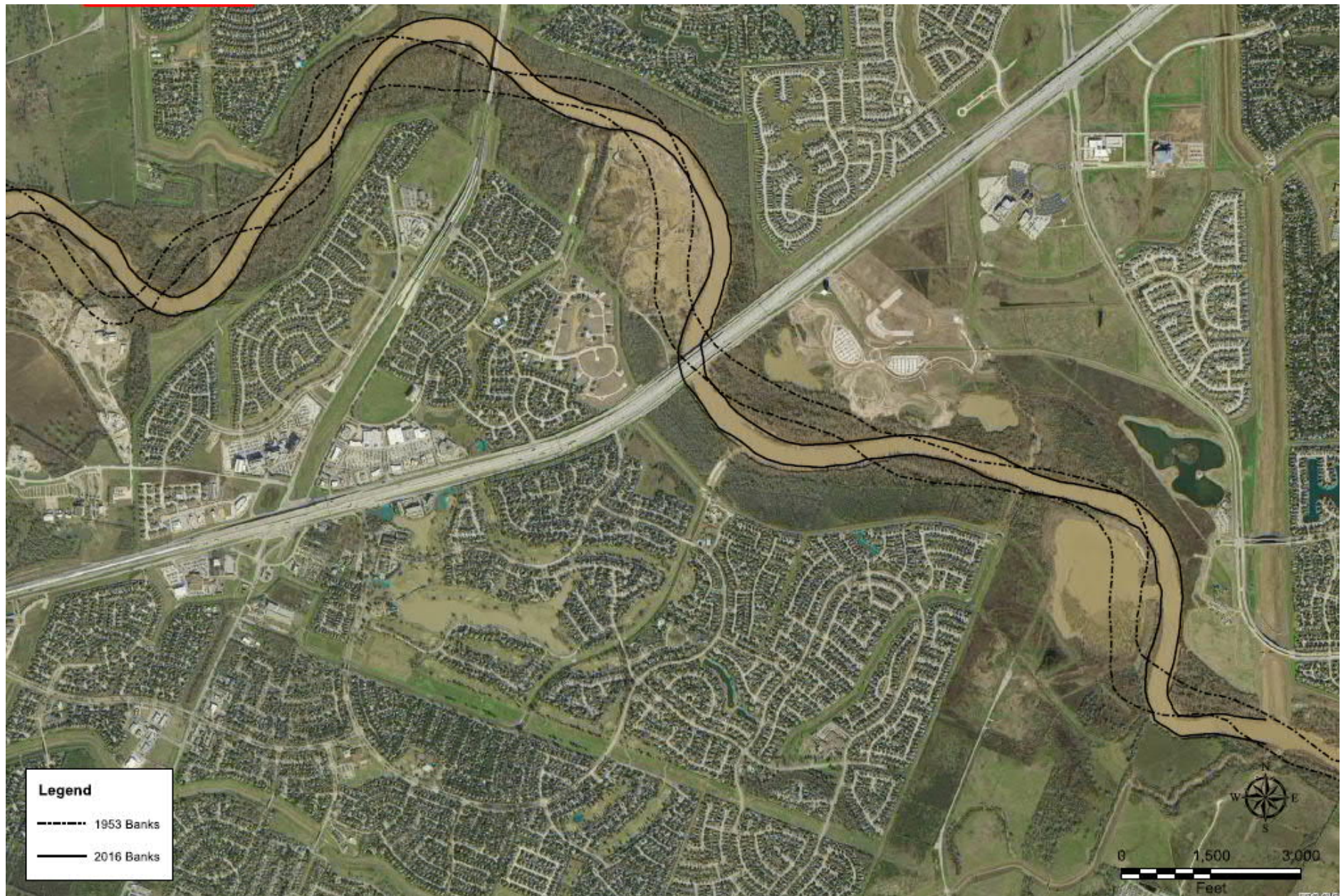
AECOM

Agenda

- Project Overview
- Status of Preliminary Engineering Effort
- Status of USACE Permitting Effort
- Status of Request for Financial Assistance
- Discussion of Implementation Plan

Project Overview

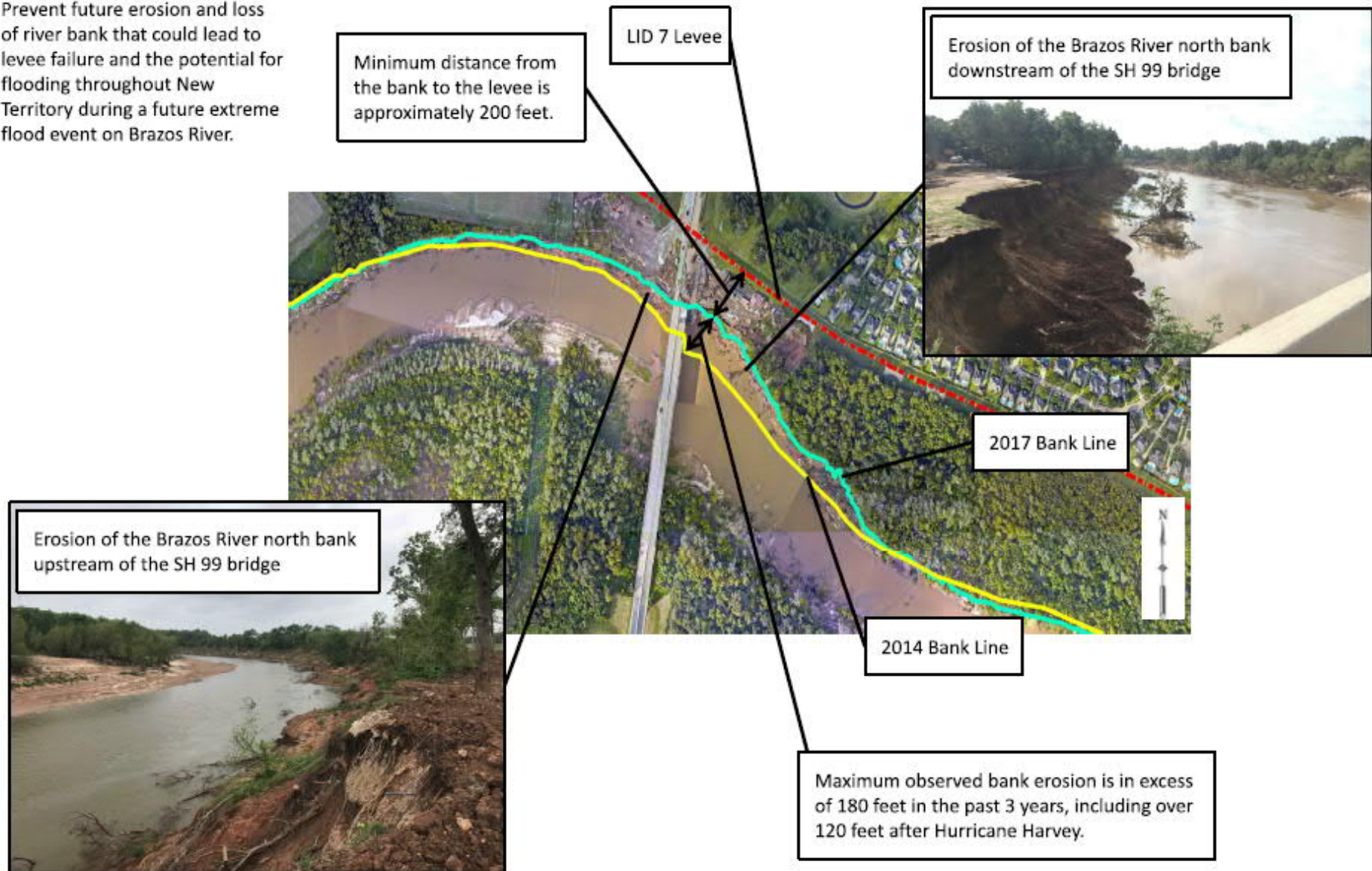


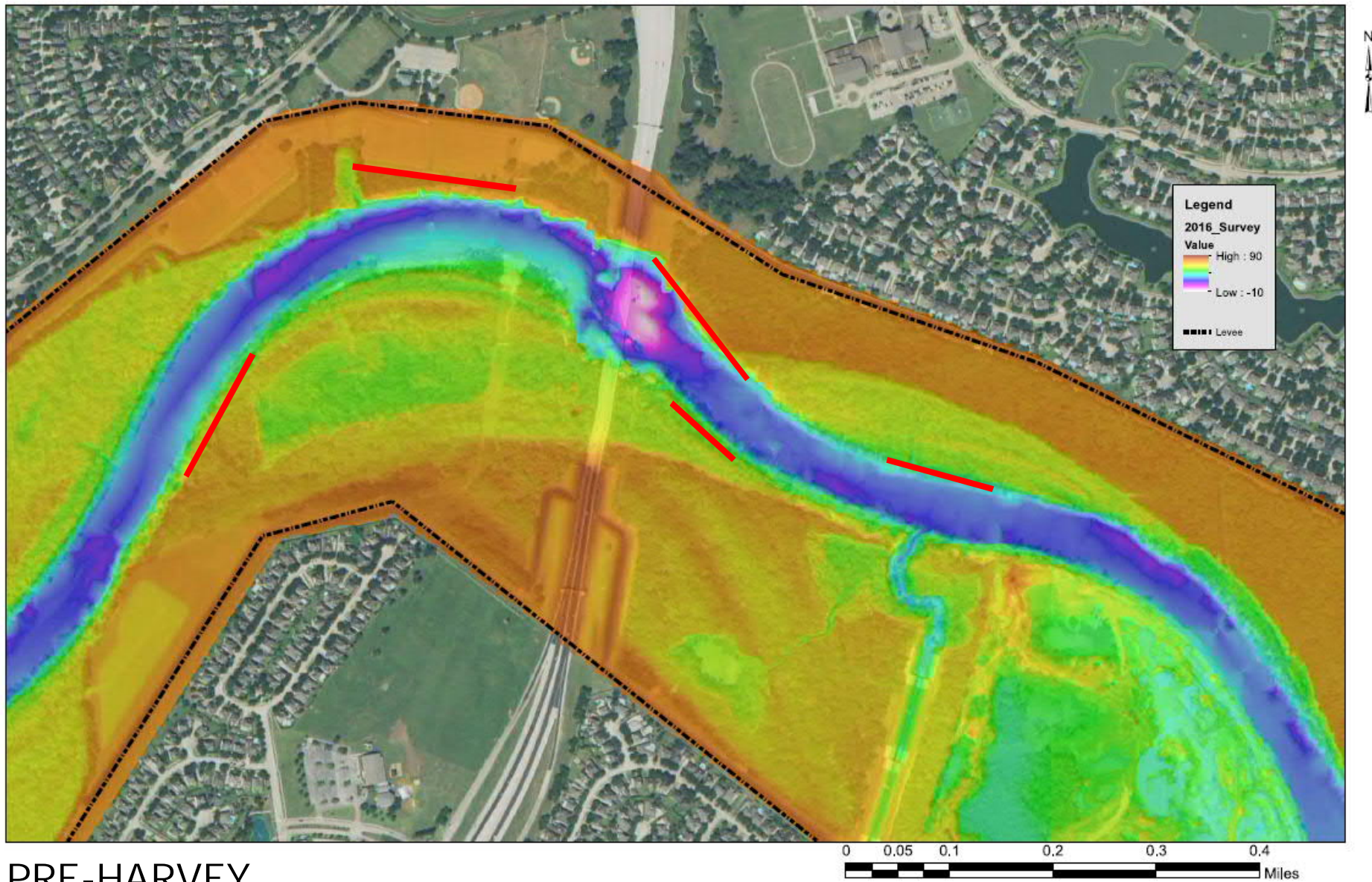


HISTORIC MIGRATION

WHY :

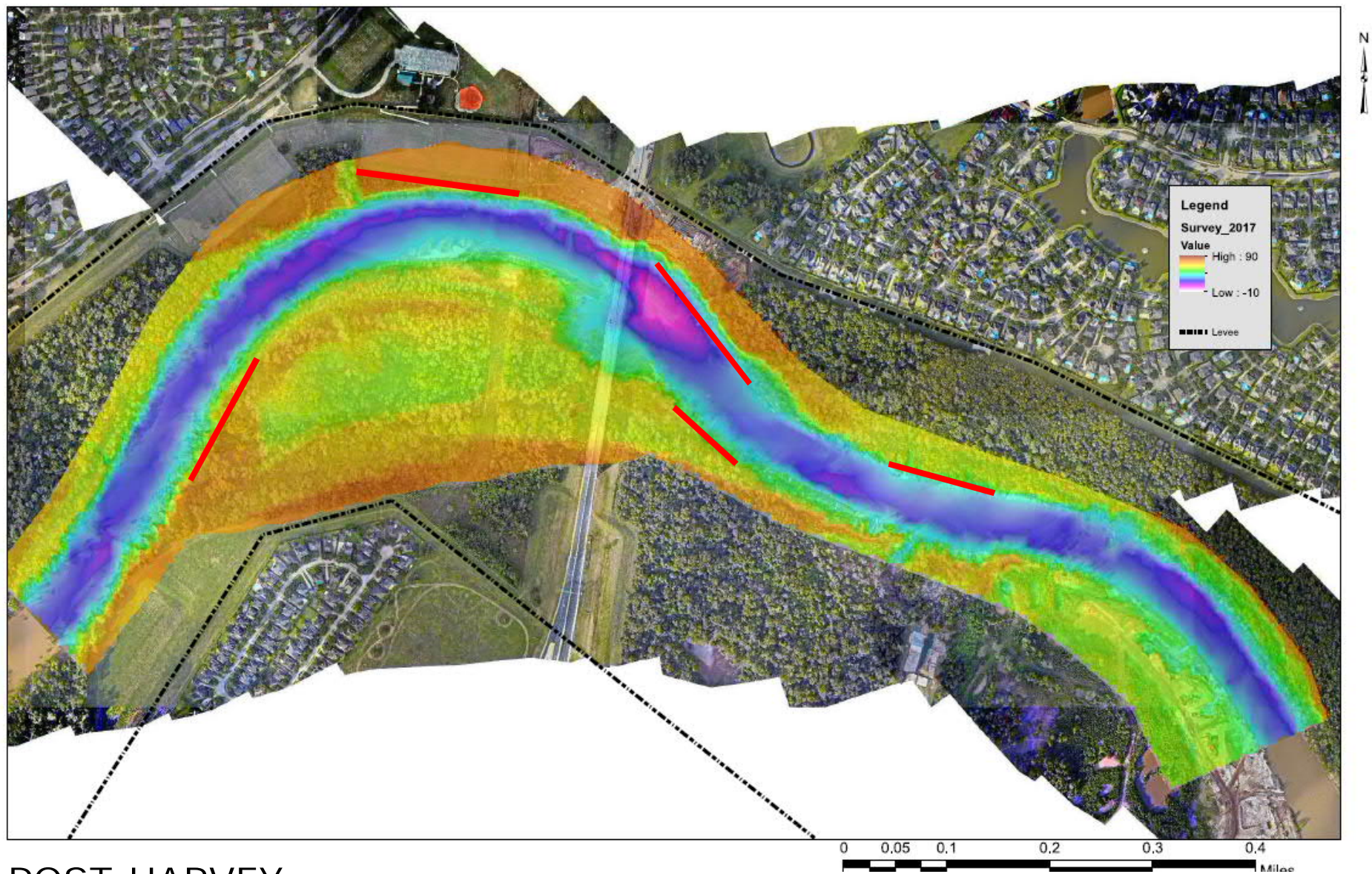
Prevent future erosion and loss of river bank that could lead to levee failure and the potential for flooding throughout New Territory during a future extreme flood event on Brazos River.



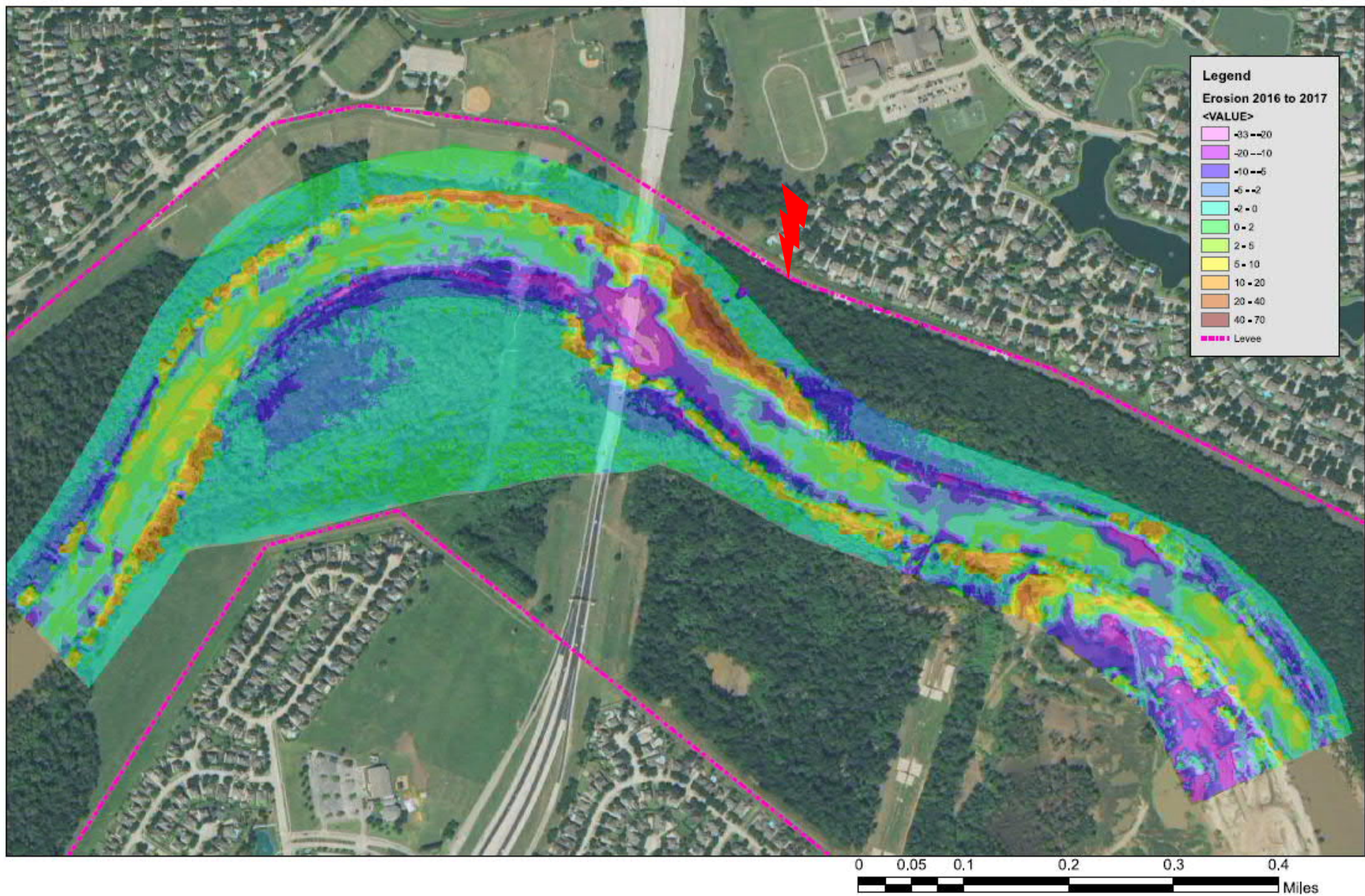


PRE-HARVEY

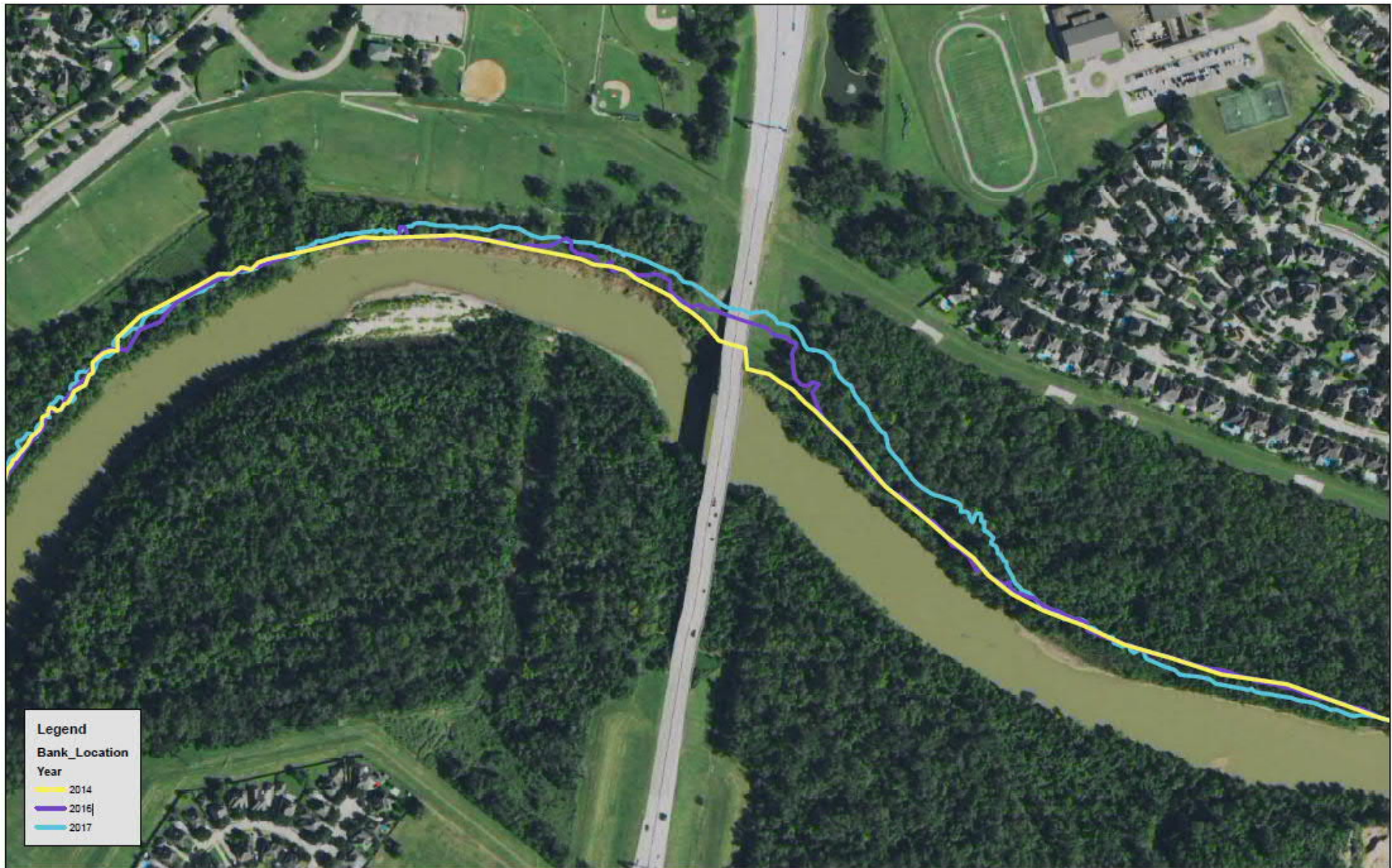
*** 20' scour hole



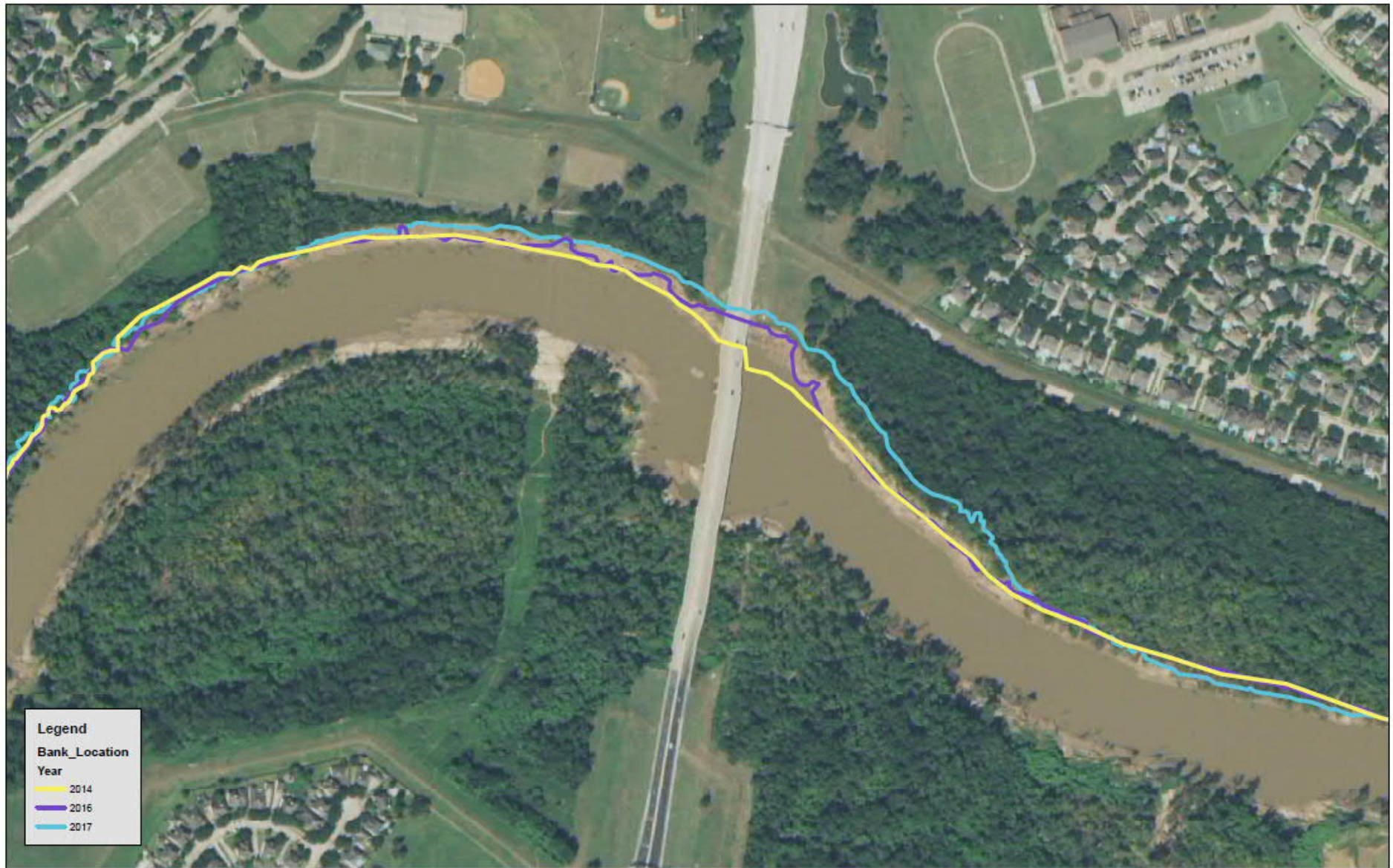
POST-HARVEY



BANK LOSS



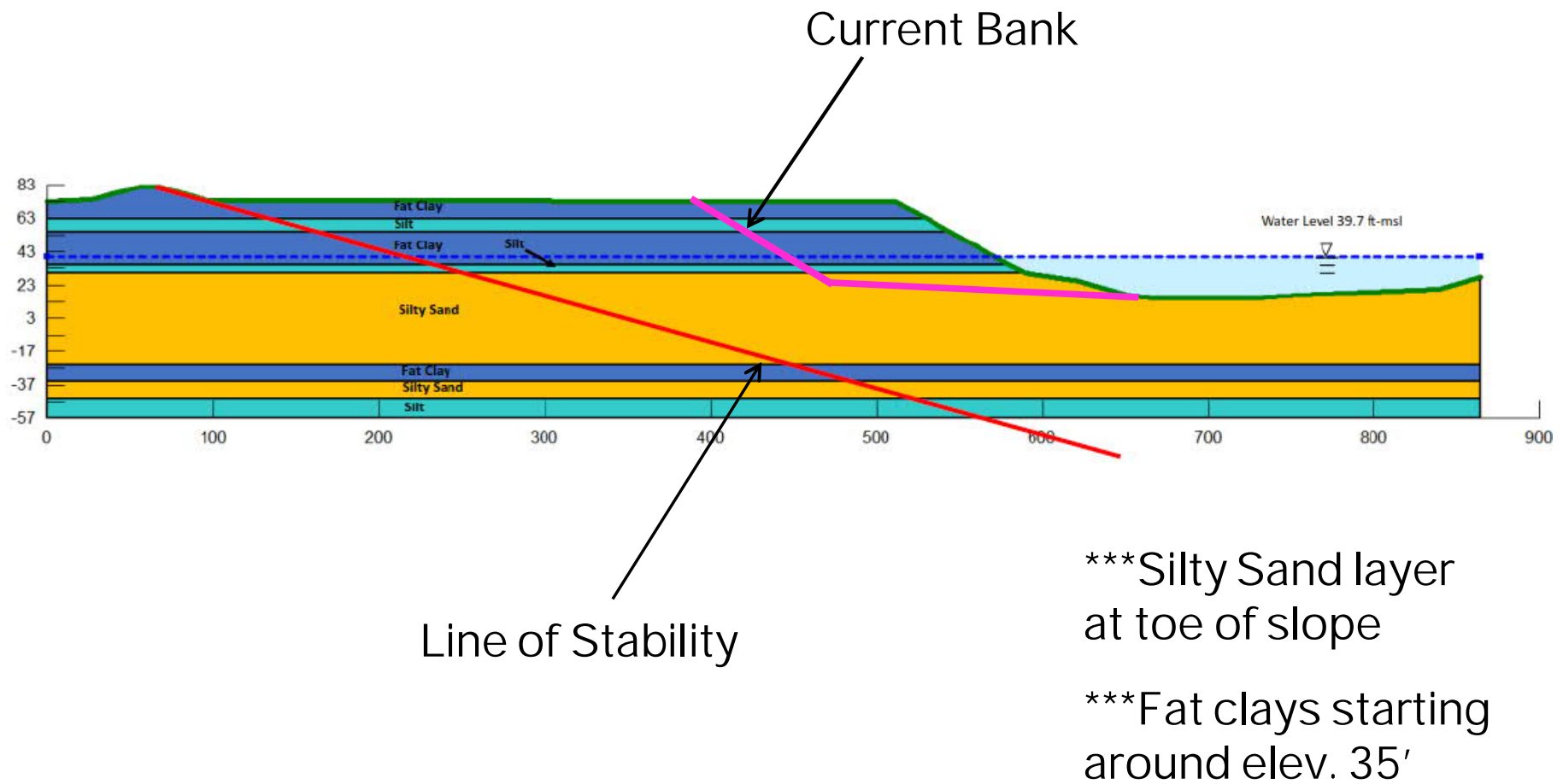
2014 AERIAL



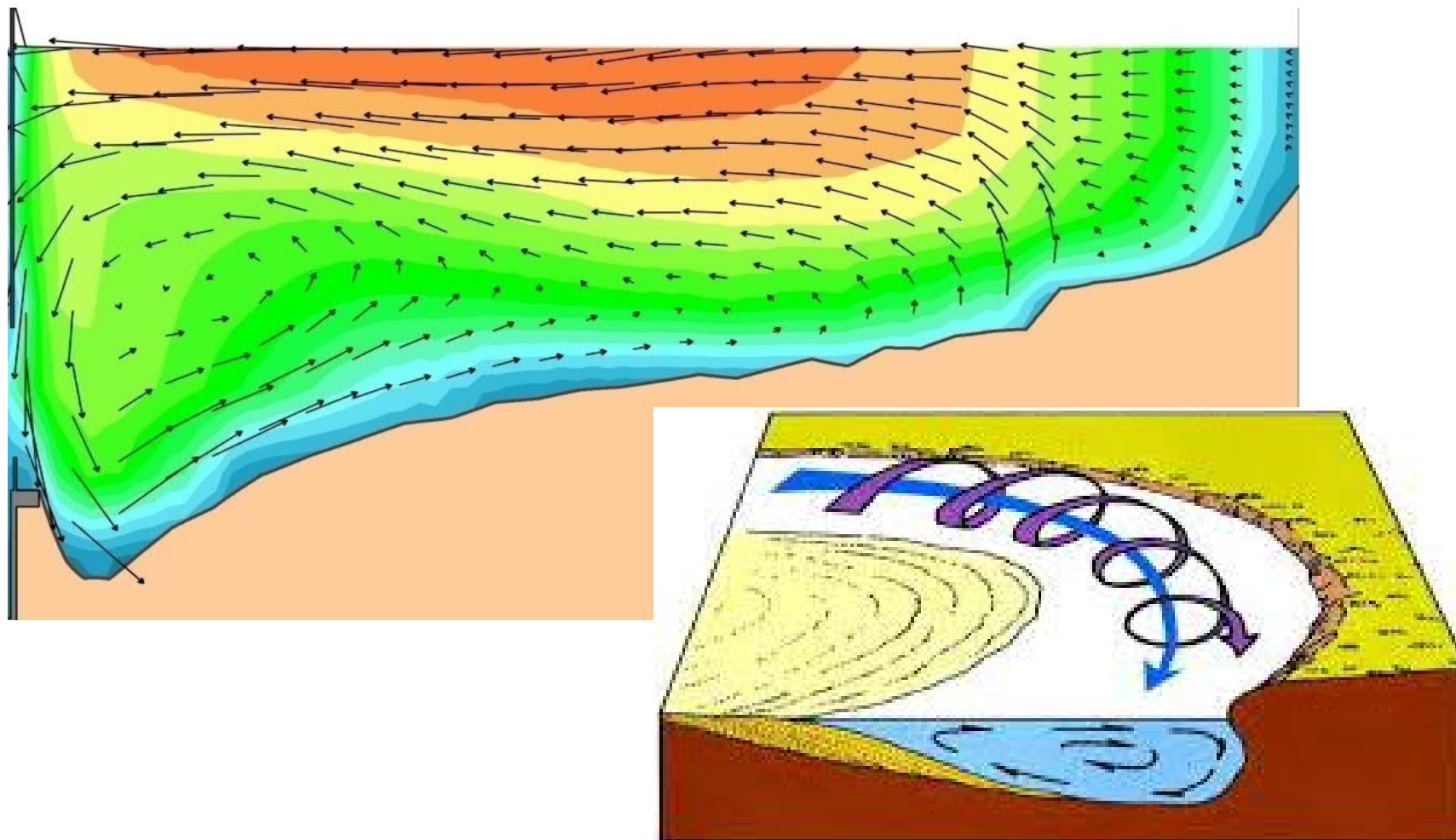
2016 AERIAL



POST-HARVEY AERIAL



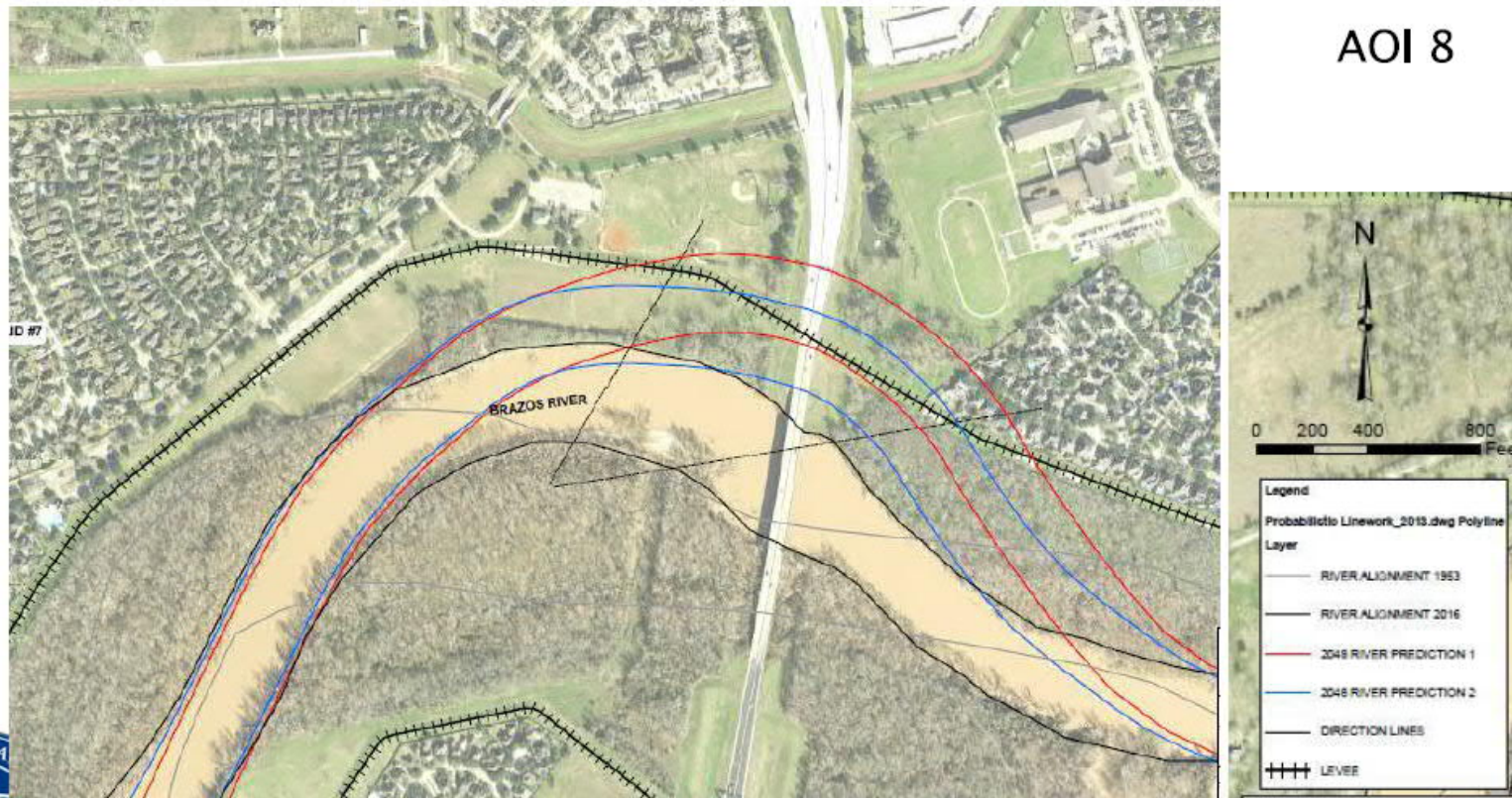
SOIL PROFILE



HELICOIDAL FLOW IN RIVER BENDS

Probable positions of the Brazos River bank in 2048

AOI 8



HUITT-ZOLLARS

Dr. Jean-Louis Briaud, PE,
PhD, TAMU

PROJECTED MIGRATION



Status of Preliminary Engineering Report

Key Considerations

- Protection should be provided along the full extent of the meander bend (from apex to apex) in order to prevent outflanking which could destabilize or undermine the proposed stabilization efforts.
- Armoring alone does not prevent or improve the hydraulic /scour conditions which drive undercutting, bed scour, bank erosion, and channel movement.
- Hydraulic / scour conditions at the bridge will likely not improve unless the bridge is replaced or the angle of approach is improved.
- Anticipated scour conditions drive cost of project
 - River bend scour
 - Bridge induced scour
 - Structure induced scour

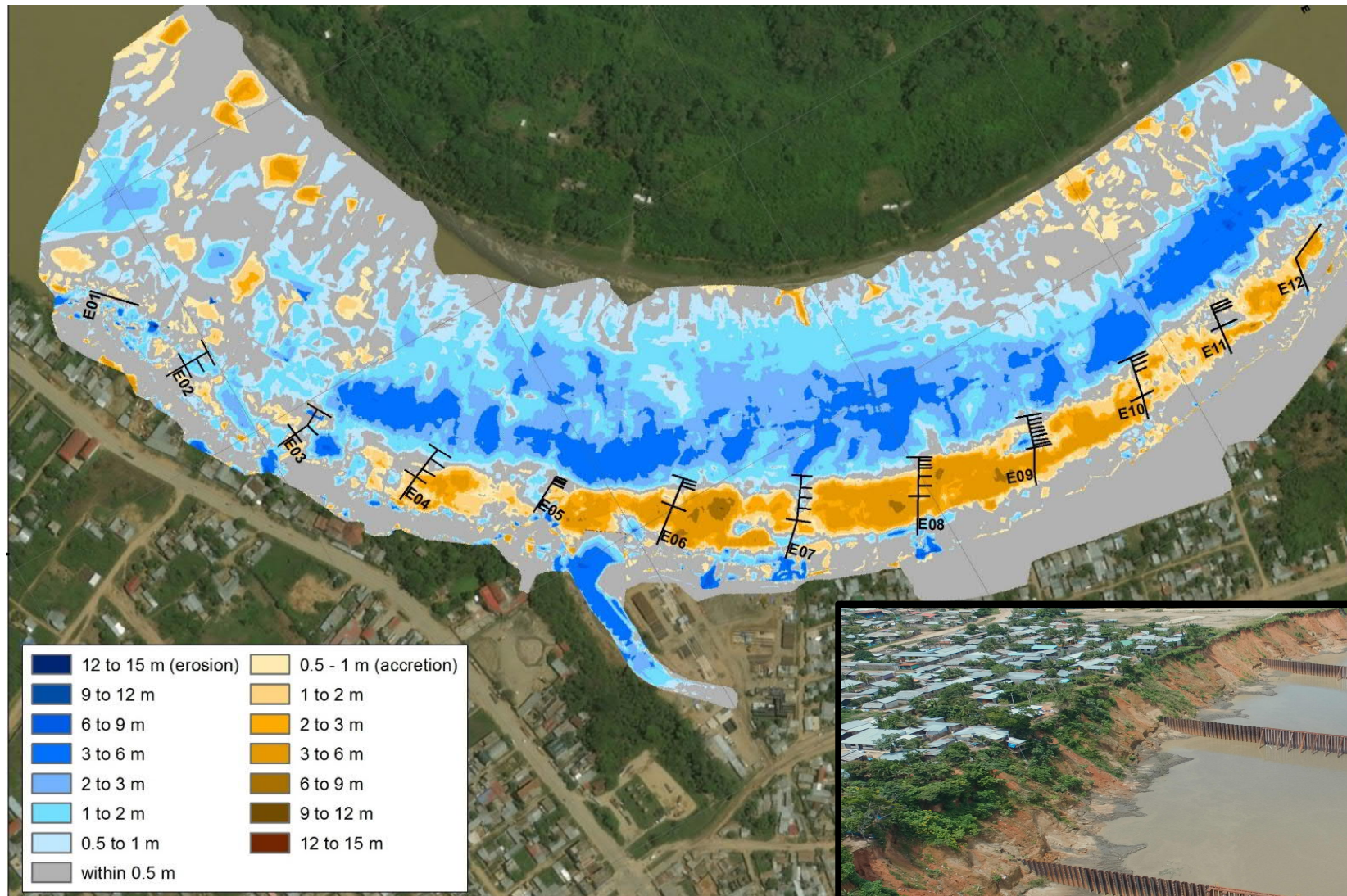
Concept Overview

- Provide stable banks which are sloped adequately and armored sufficiently to withstand high velocities and rapid drawdown conditions.
- Provide toe protection to prevent undercutting of newly established stable banks. Must be designed to withstand extreme event scour conditions.
- Use of river training structures to alter the helicoidal flow within the meander and shift energy away from the outer bank and toward the river centerline.
- These training structures promote deposition along the outer edge of the channel, promoting slope/toe stability, and push the thalweg towards the center of the channel.

Challenges and Costs

- Difficult access / construction means & methods
 - Construction from barge in river
 - Construction from top of bank
 - Preservation of athletic facilities
 - Construction risk due to flood events
 - Interaction with TRA erosion control wall and bridge piers
- Uncertainty in scour conditions
 - Typical channel flowline - ~20'
 - Scour hole after Harvey - ~0'
 - Can scour be worse than ~0'?
- Estimated construction cost: \$30M to \$60M
 - Dependent on risk tolerance
 - Dependent on design optimization

River Training - Overview



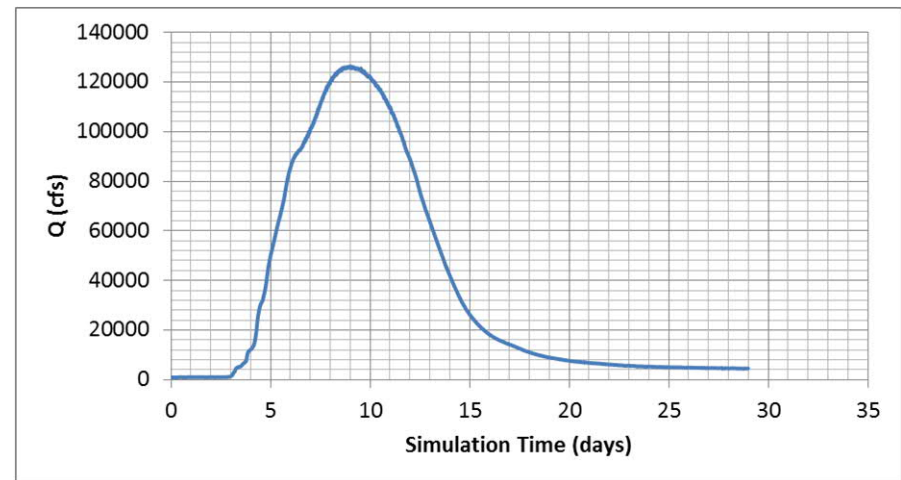
HYDRAULIC MODELING - OVERVIEW



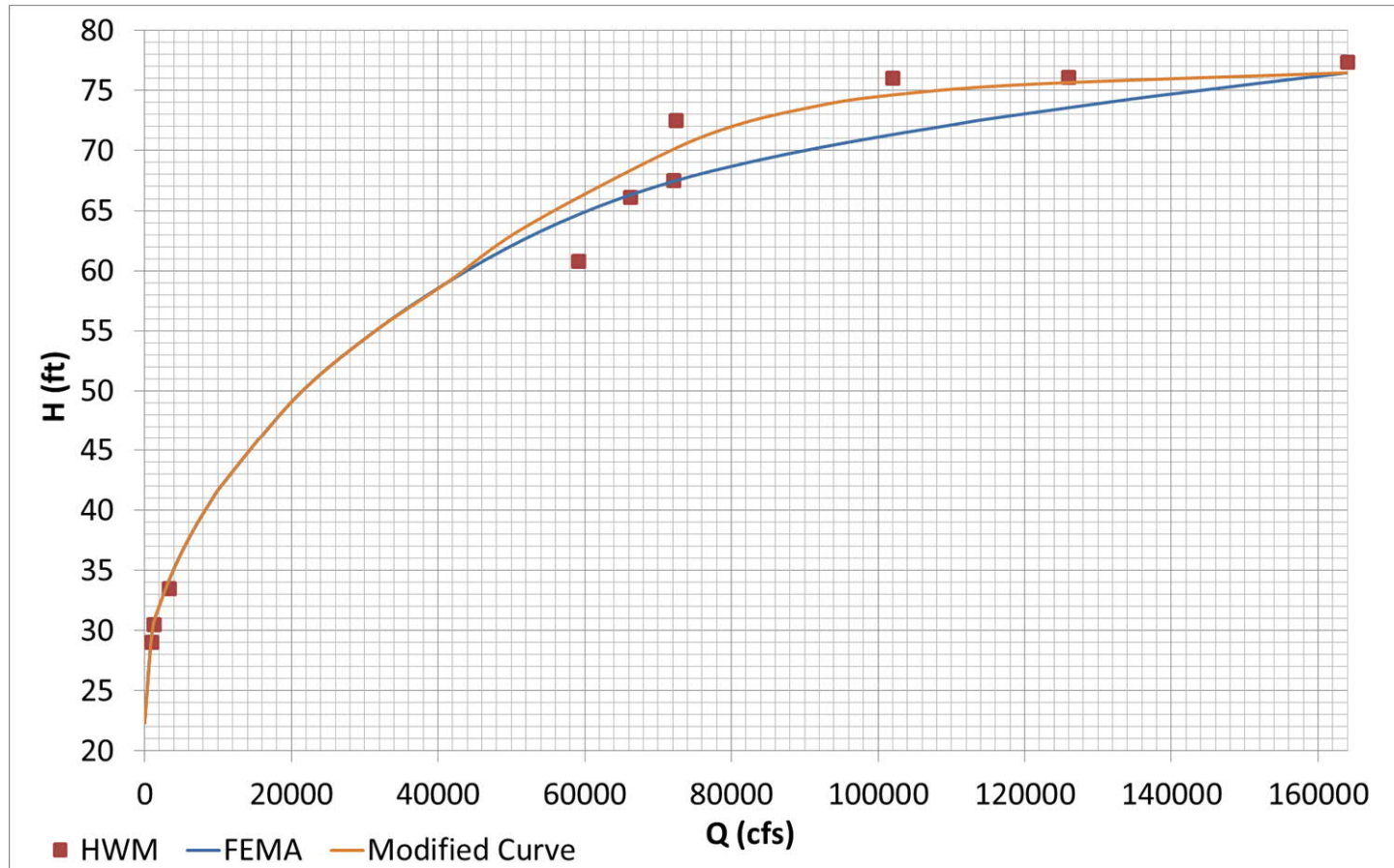
MODELED AREA

HYDRAULIC MODELING – INFLOW HYDROGRAPHS

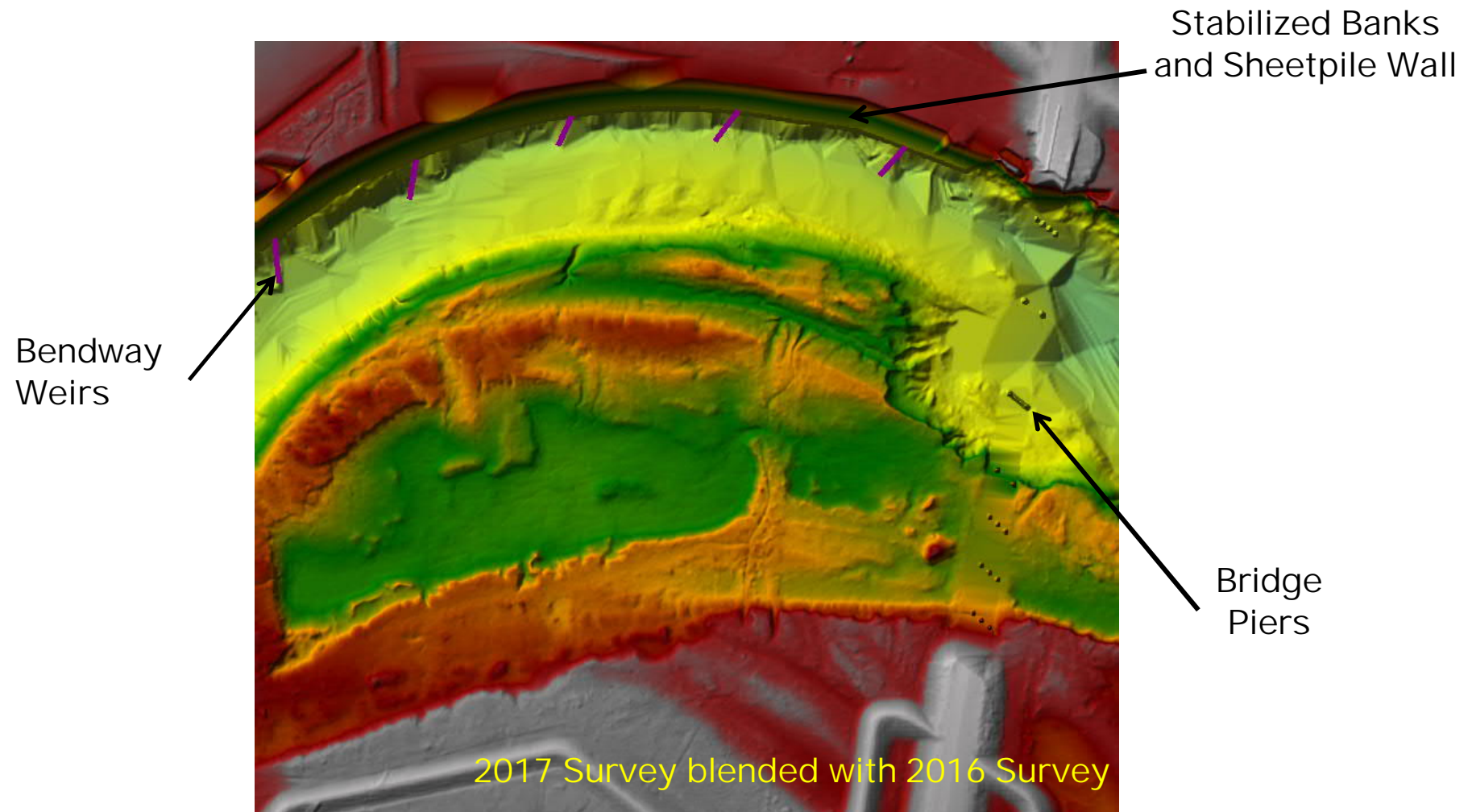
Scenario	peak Q (cfs)	Source	Hydrograph
Mean Low Daily Flow	2,350	USGS gage	Steady
Mean Average Daily Flow	7,700	USGS gage	Steady
Mean High Daily Flow	16,100	USGS gage	Steady
Effective Flow	53,000	TWDB report	Steady
10 Year	103,000	FEMA model	Steady
50 Year	147,000	FEMA model	Steady
100 Year	164,000	FEMA model	Steady
Harvey	126,000	USGS gage	Unsteady



HYDRAULIC MODELING – RATING CURVE

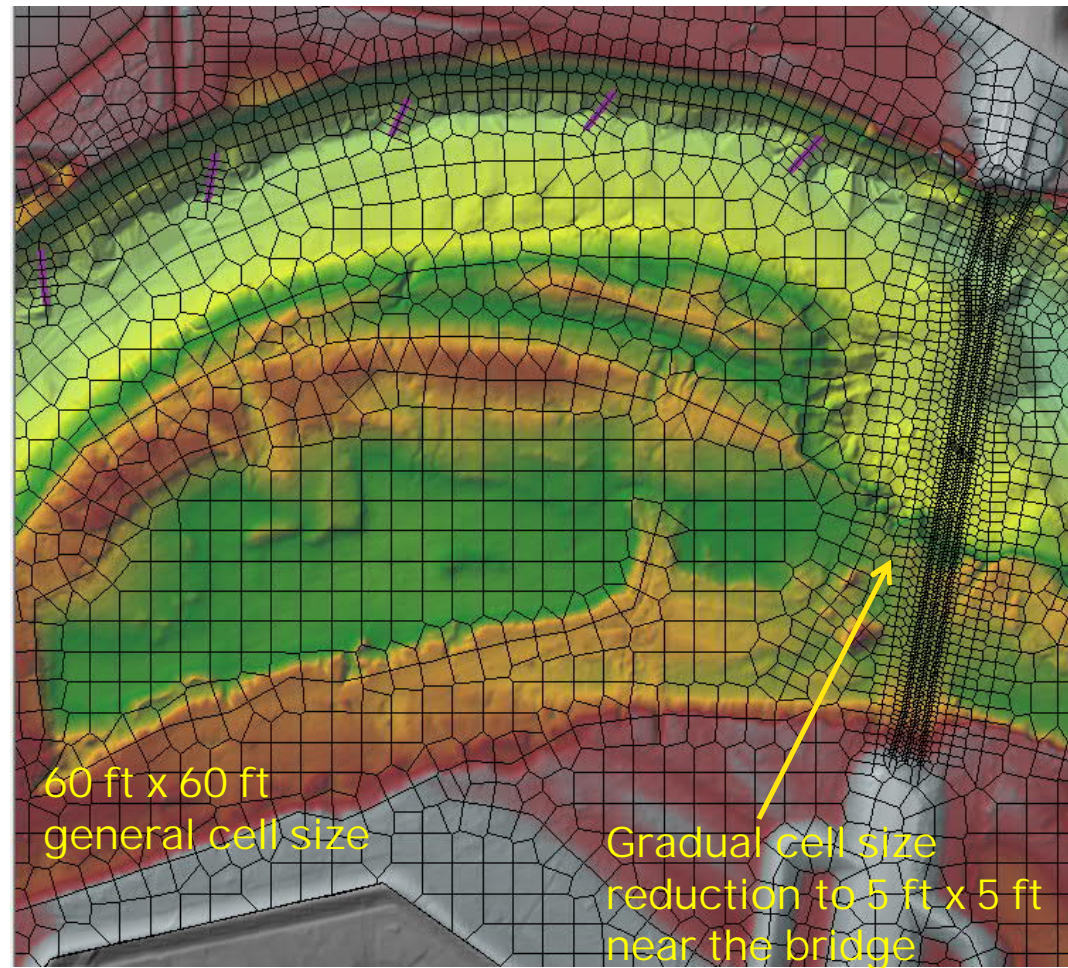


HYDRAULIC MODELING – TERRAIN



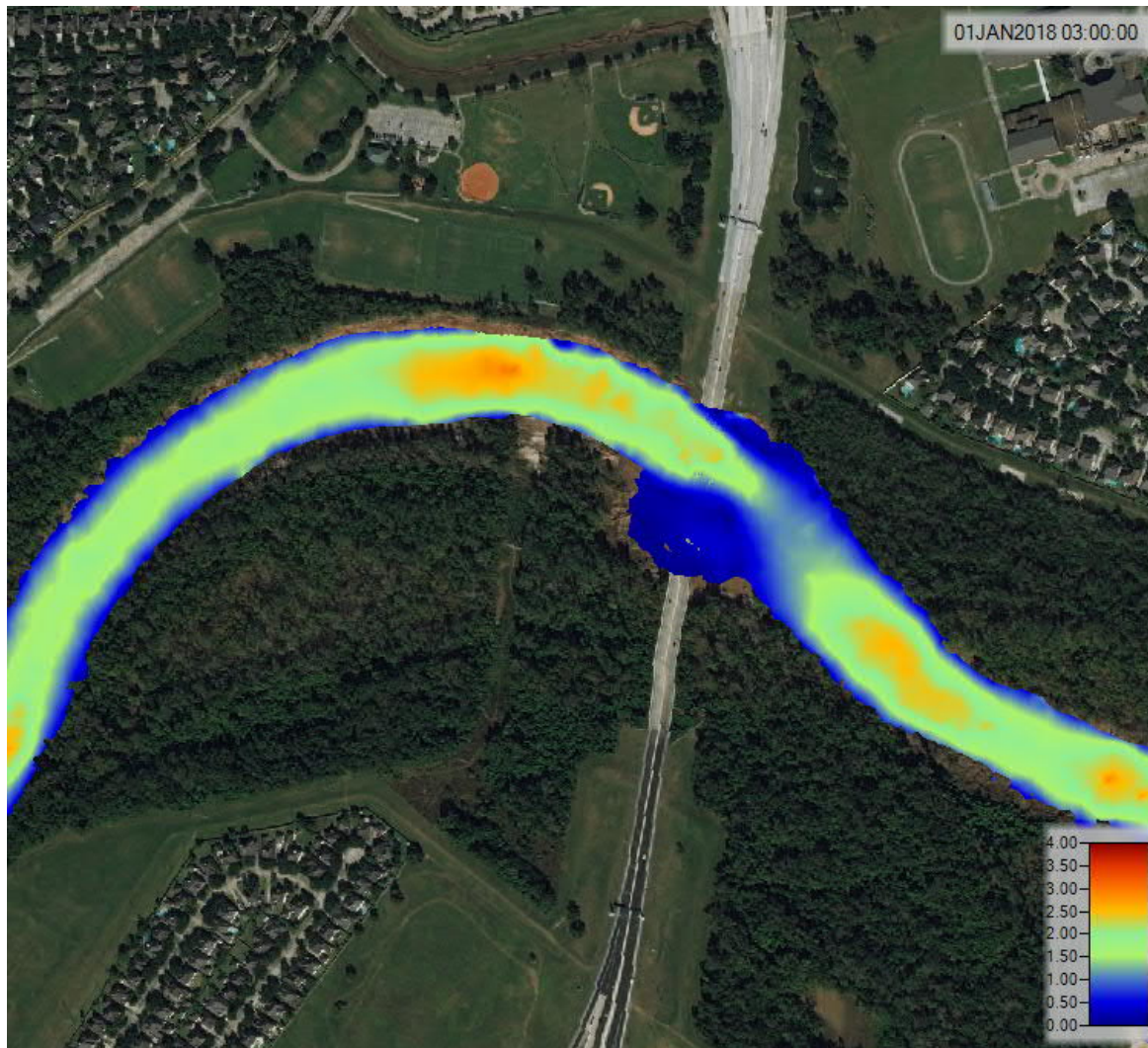
PROPOSED CONDITIONS TERRAIN

HYDRAULIC MODELING – 2D MESH



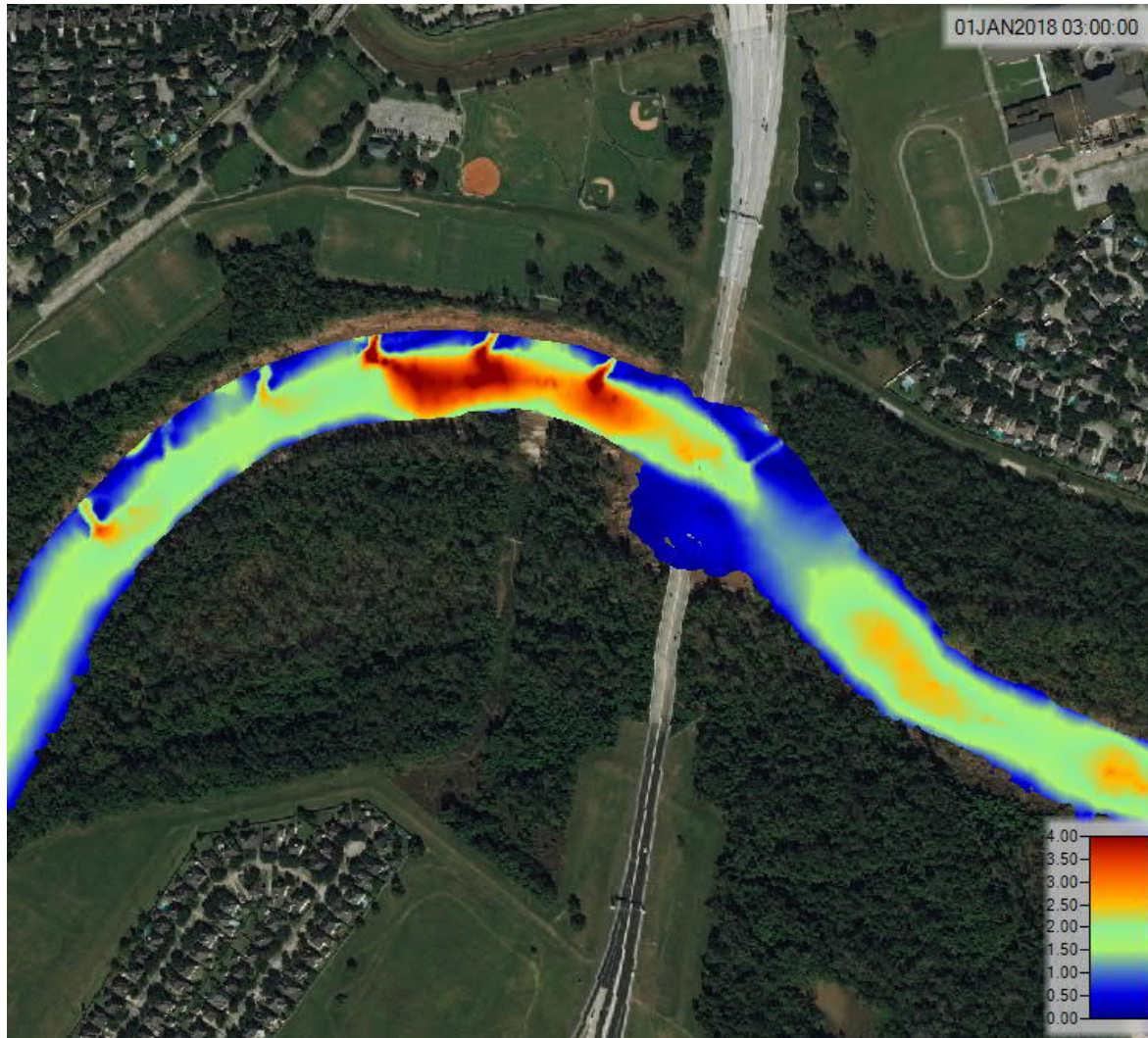
PROPOSED CONDITIONS MESH

HYDRAULIC MODELING – RESULTS



EXISTING VELOCITY MAP FOR MEAN DAILY CONDITIONS

HYDRAULIC MODELING – RESULTS



*** Dissipate energy at the outer bank

*** Promote deposition along outer bank

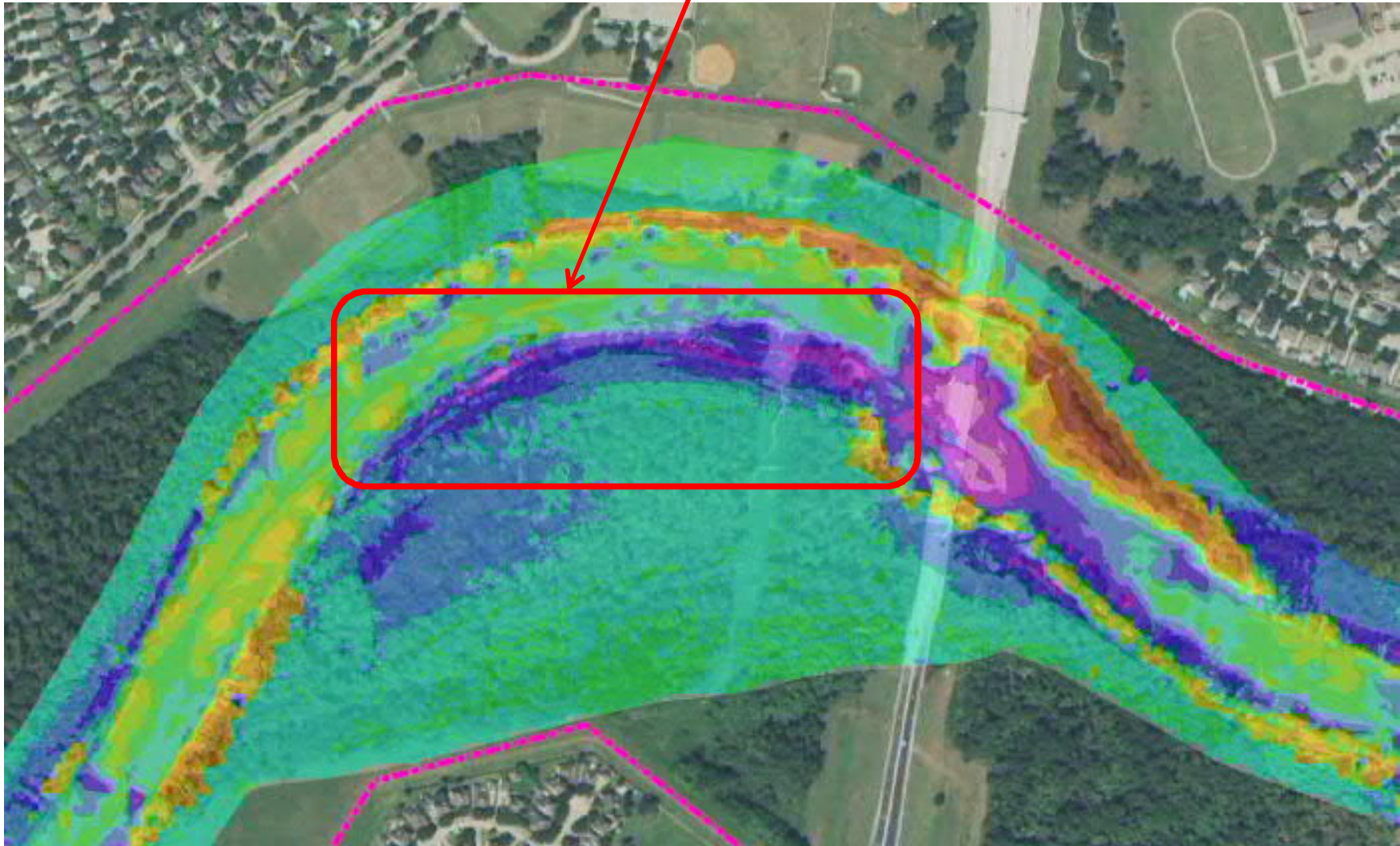
*** Promote scour of inner bank

*** Complex flow conditions through bridge

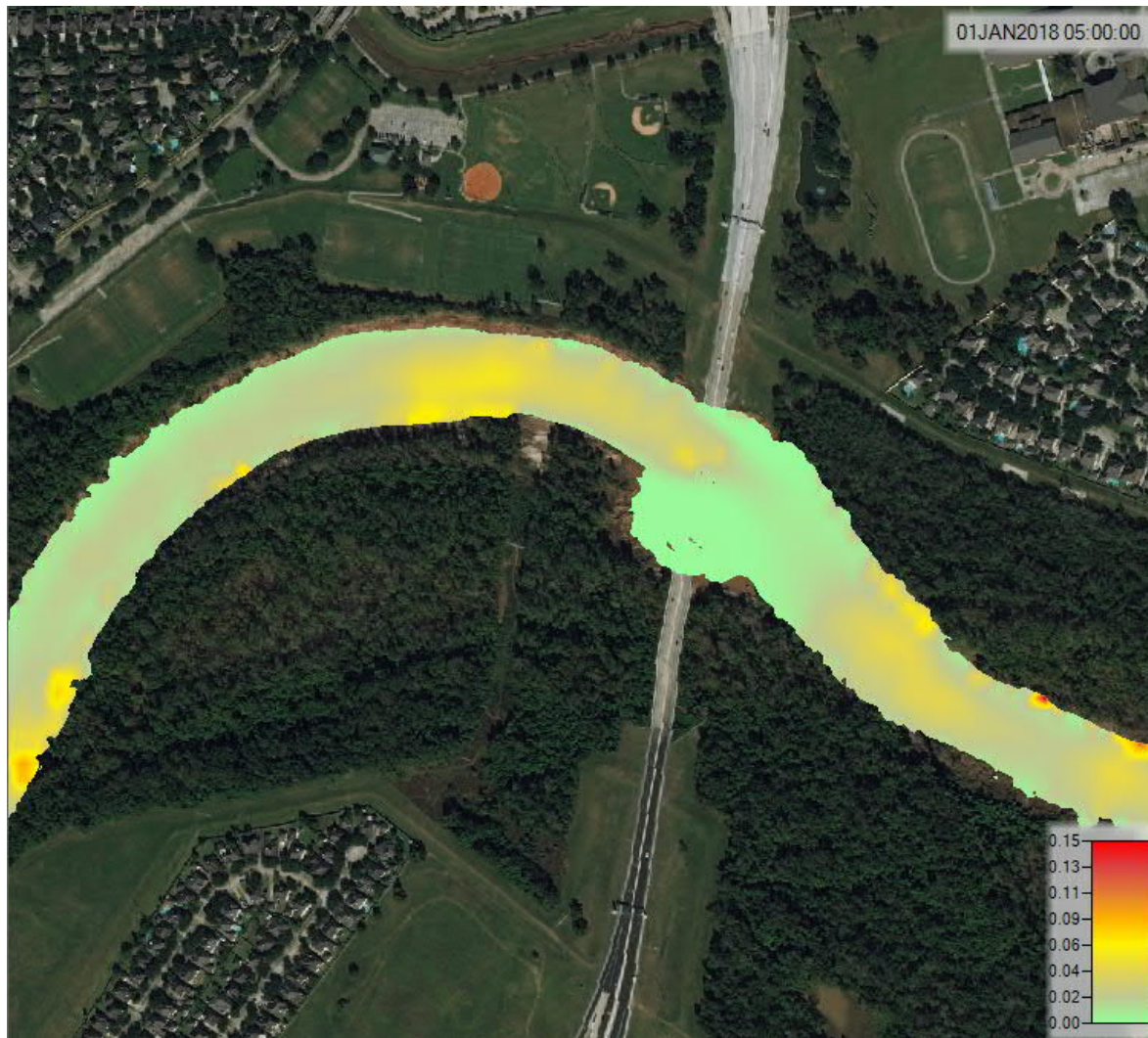
PROPOSED VELOCITY MAP FOR MEAN DAILY CONDITIONS

EXPECTED IMPACTS TO POINT BAR

Recent accretion / expected erosion

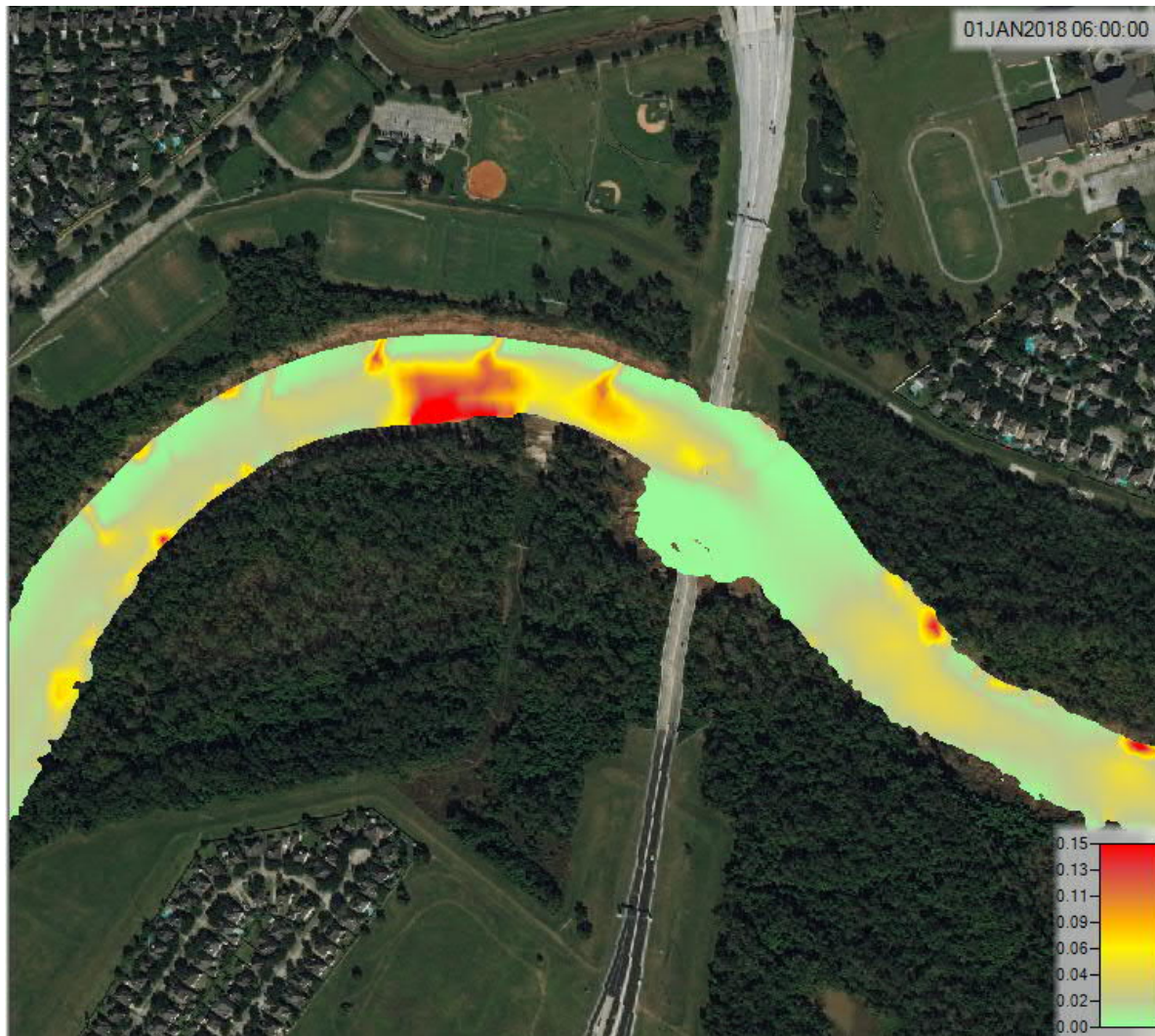


HYDRAULIC MODELING – RESULTS



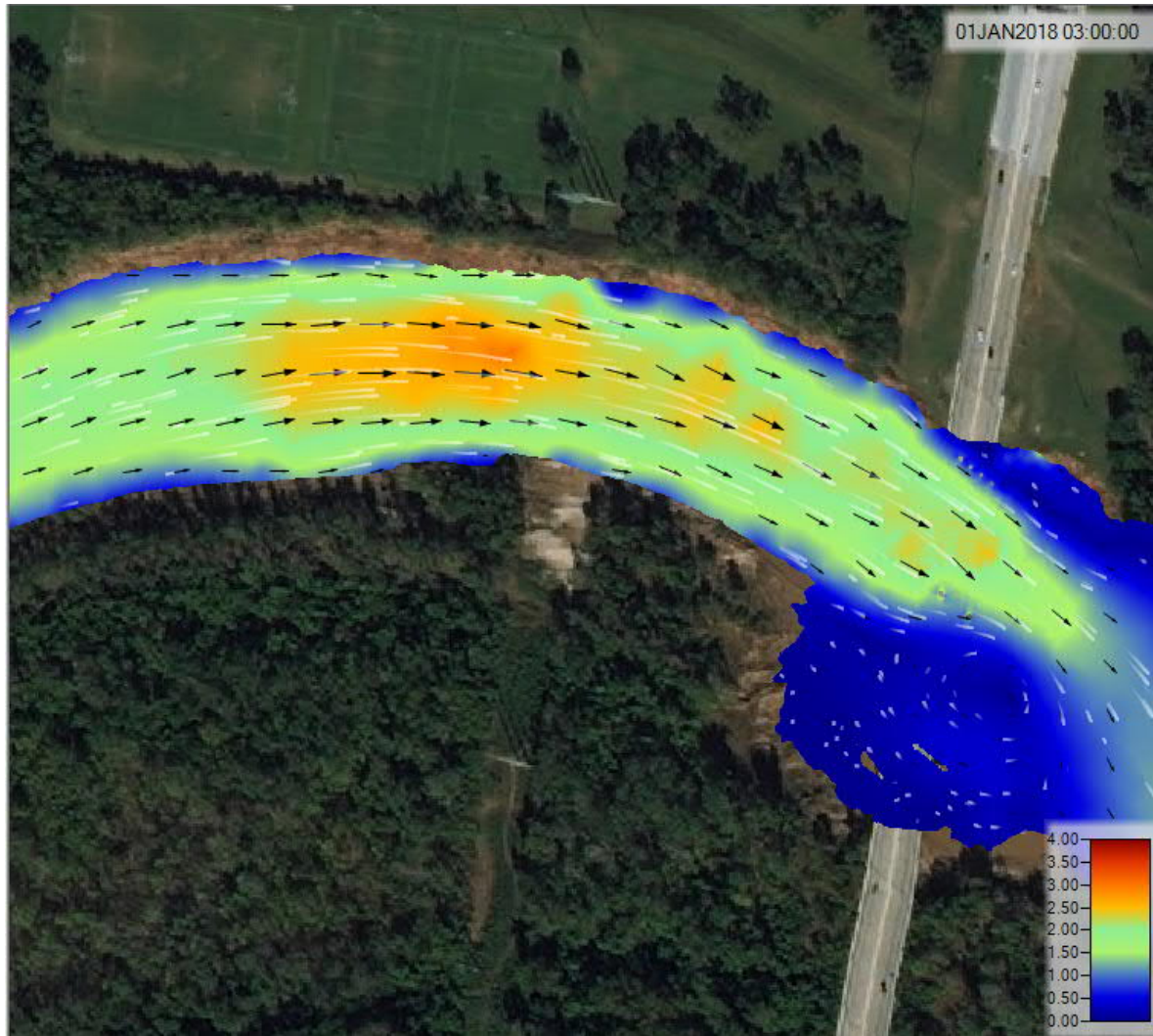
EXISTING SHEAR STRESS MAP FOR MEAN DAILY CONDITIONS

HYDRAULIC MODELING – RESULTS



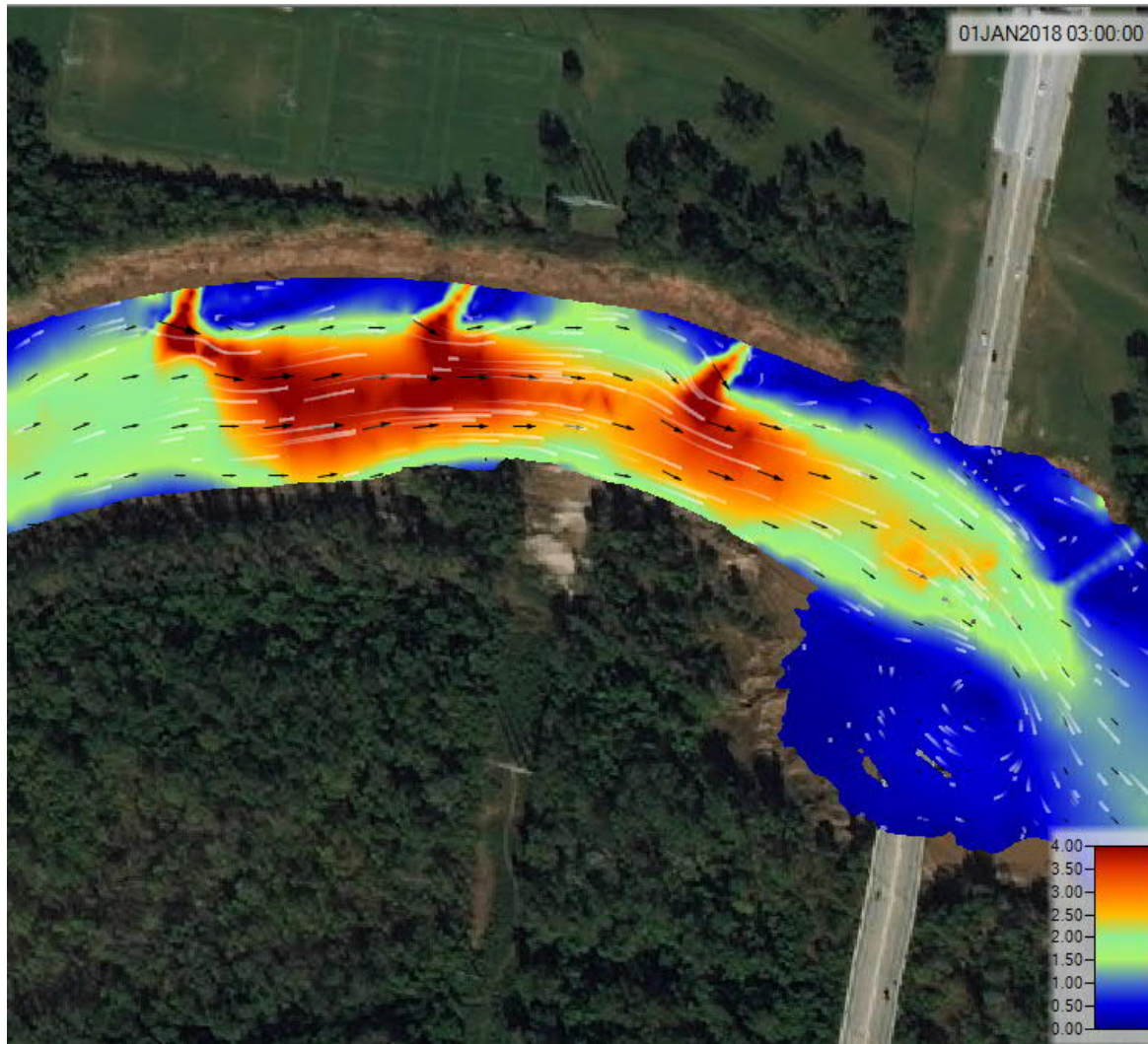
PROPOSED SHEAR STRESS MAP FOR MEAN DAILY CONDITIONS

HYDRAULIC MODELING – RESULTS



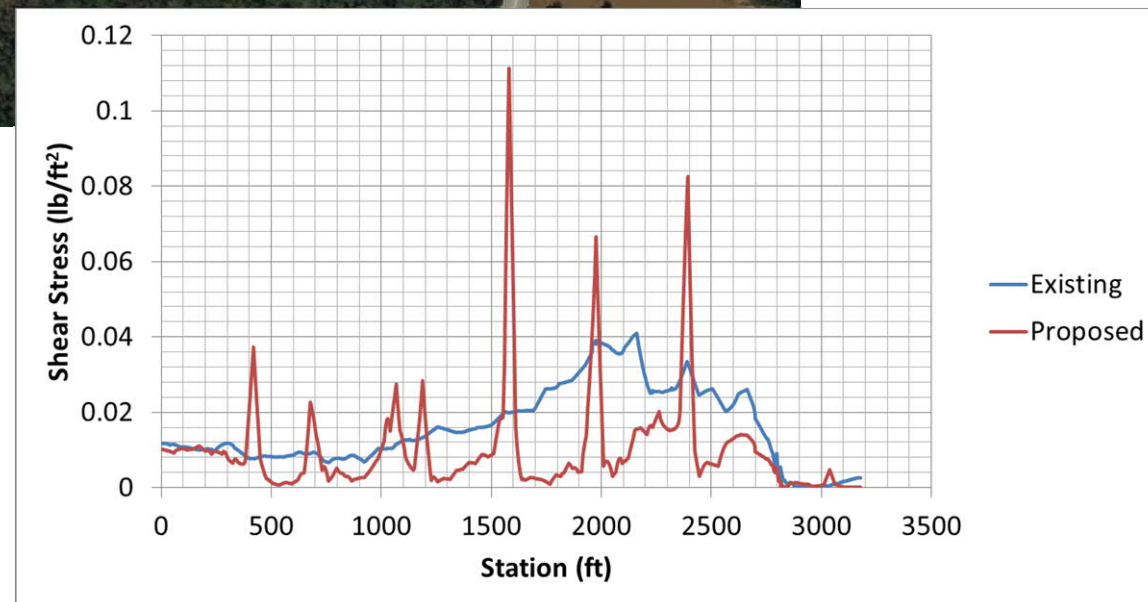
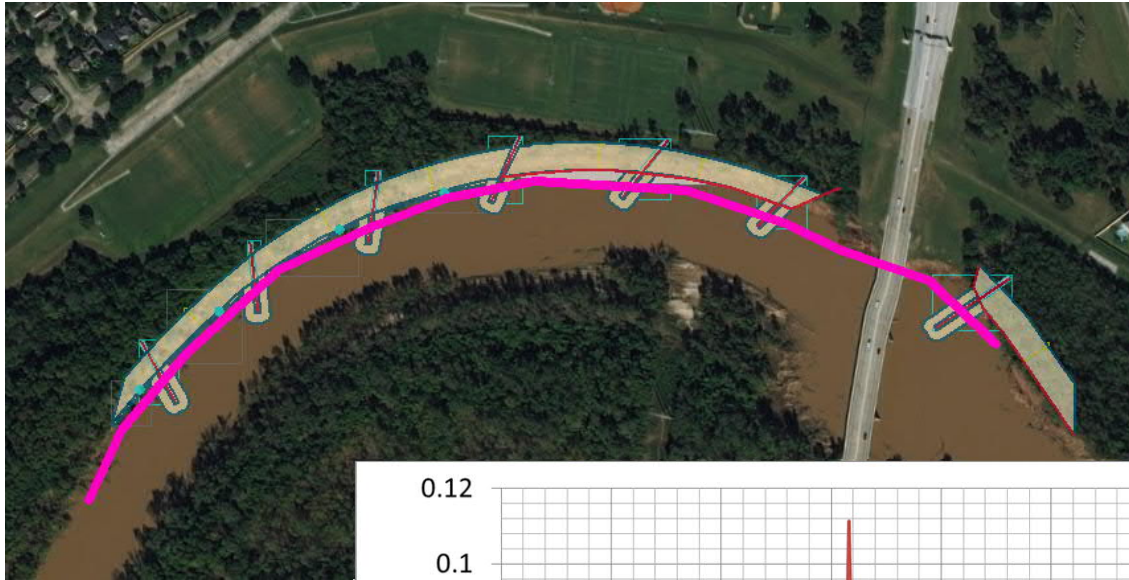
EXISTING CONDITIONS FLOW FIELD

HYDRAULIC MODELING – RESULTS

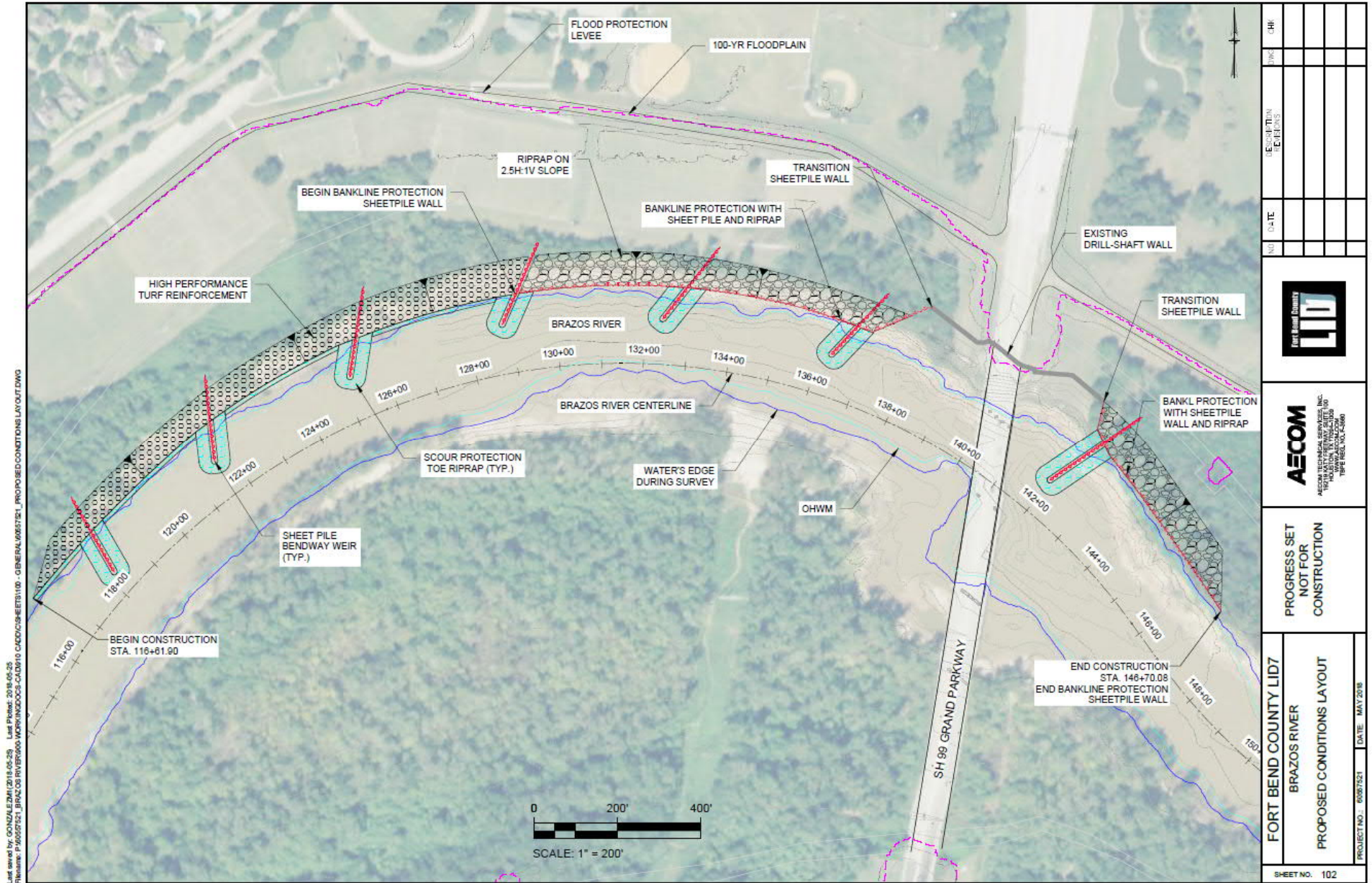


PROPOSED CONDITIONS FLOW FIELD

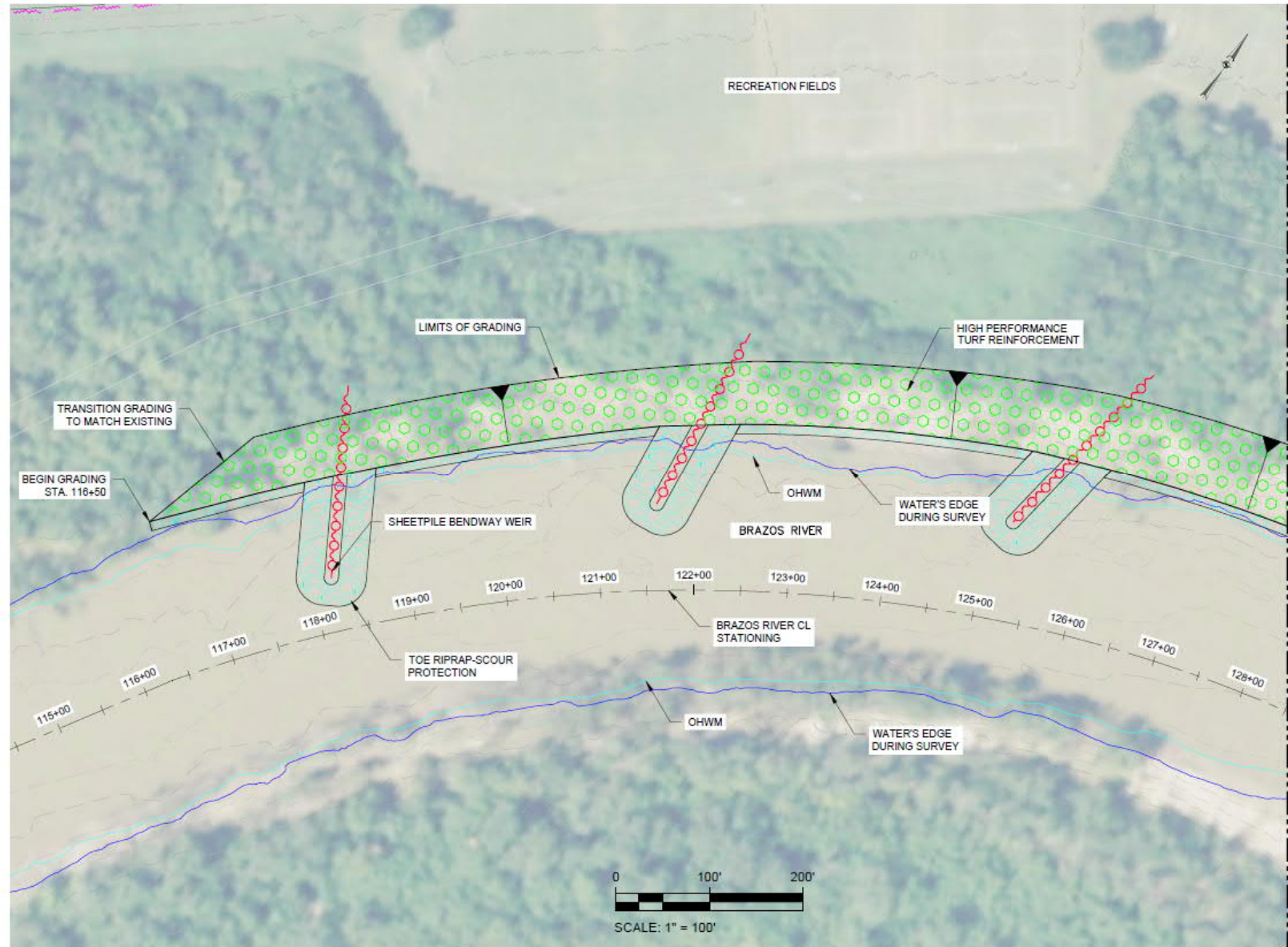
HYDRAULIC MODELING – RESULTS



SHEAR STRESS PROFILE NEAR THE BANK



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 Revision: 1 P:\0507521_BRAZOS RIVER\0507521-000\WORKING\DWGS-CA3810-CA3810-000\PROPOSED CONDITIONS III.DWG

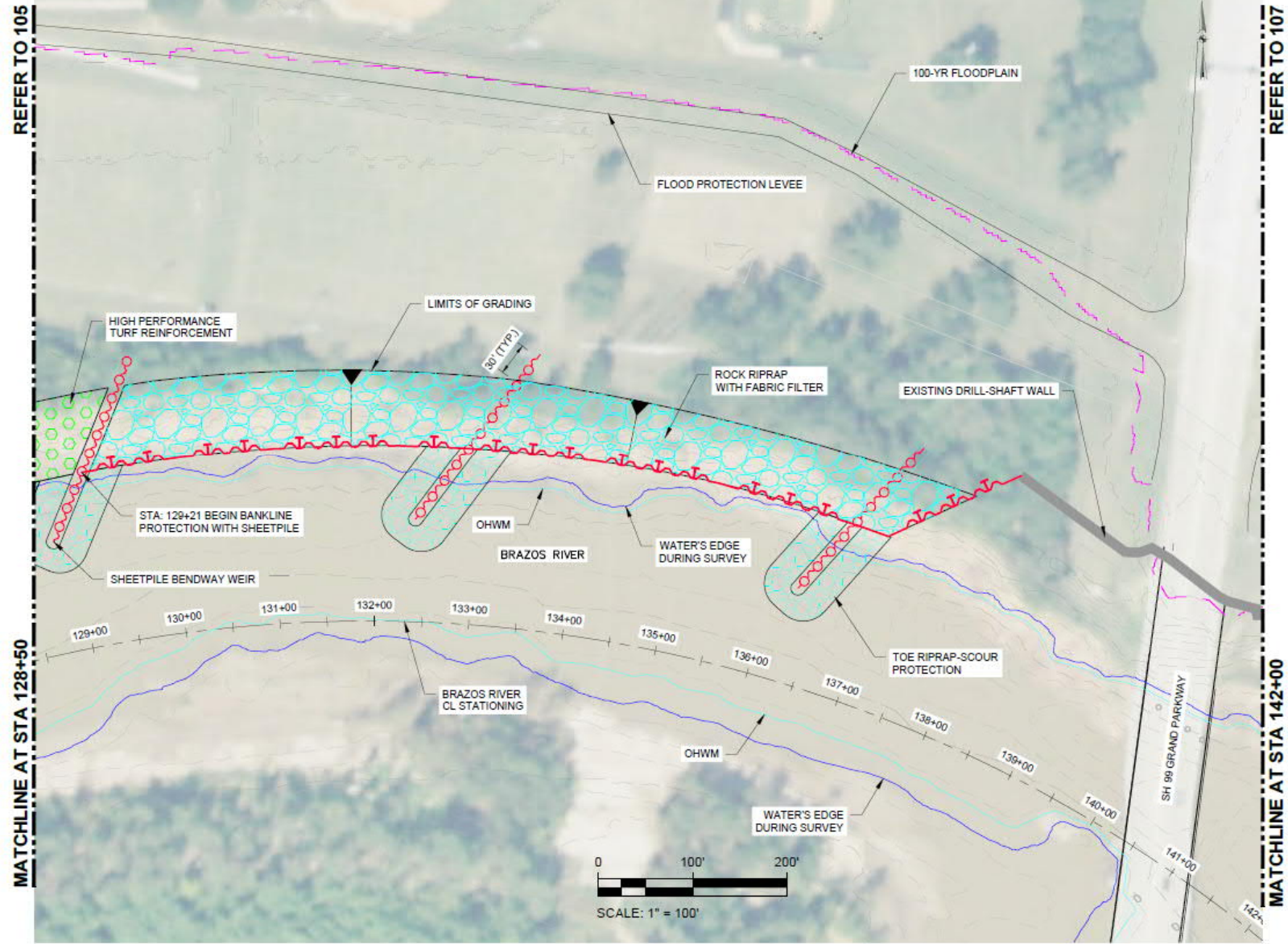


MATCHLINE AT STA 128+50
 REFER TO 106

FORT BEND COUNTY LID7 BRAZOS RIVER PROPOSED CONDITIONS STA 114+50 TO 128+50	PROJECT NO. : 60567521	DATE: MAY 2018	PROGRESS SET NOT FOR CONSTRUCTION	AECOM AECOM TECHNOLOGICAL SERVICES, INC. FORT BEND COUNTY LID7 STA 114+50 TO 128+50 WWW.AECOM.COM TYPE: RFP NO. 4-2008		NO.	DATE	DESCRIPTION REVISIONS	DATE	CHK

SHEET NO. 105

Last saved by: GONZALEZ, J. Last Plot: 2018-05-25
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FORT BEND COUNTY LID7 BRAZOS RIVER PROPOSED CONDITIONS STA 128+50 TO 142+00	PROJECT NO.: 6087521 DATE: MAY 2018	PROGRESS SET NOT FOR CONSTRUCTION			 AECOM <small>AMERICAN ENGINEERING CONSULTANTS, INC. 1400 WESTERN AVENUE, SUITE 100 HOUSTON, TEXAS 77060 TEL: 713.866.1000</small>		NO. DATE DESCRIPTION REVISIONS	DATE BY CHK

SHEET NO. 106

DOCUMENT IS FOR
CONCEPTUAL REVIEW AND
NOT INTENDED FOR
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Base JWD/2018 P.E.
Texas Serial No. 119902



SITE PLAN
250 125 0 250 500

CONCEPT - MARCH 2018

**BRAZOS RIVER
BANK REPAIR**

**TITLE: OPEN CELL SHEET PILE SCOUR WALL
SITE PLAN**

DESIGNED BY:	HC	PROJECT NO:	18H008	SHEET NO:	1 OF 3
DRAWN BY:	DM	DATE:	MARCH 2018		
CHECKED BY:	RJ	SCALE:	NOTED		



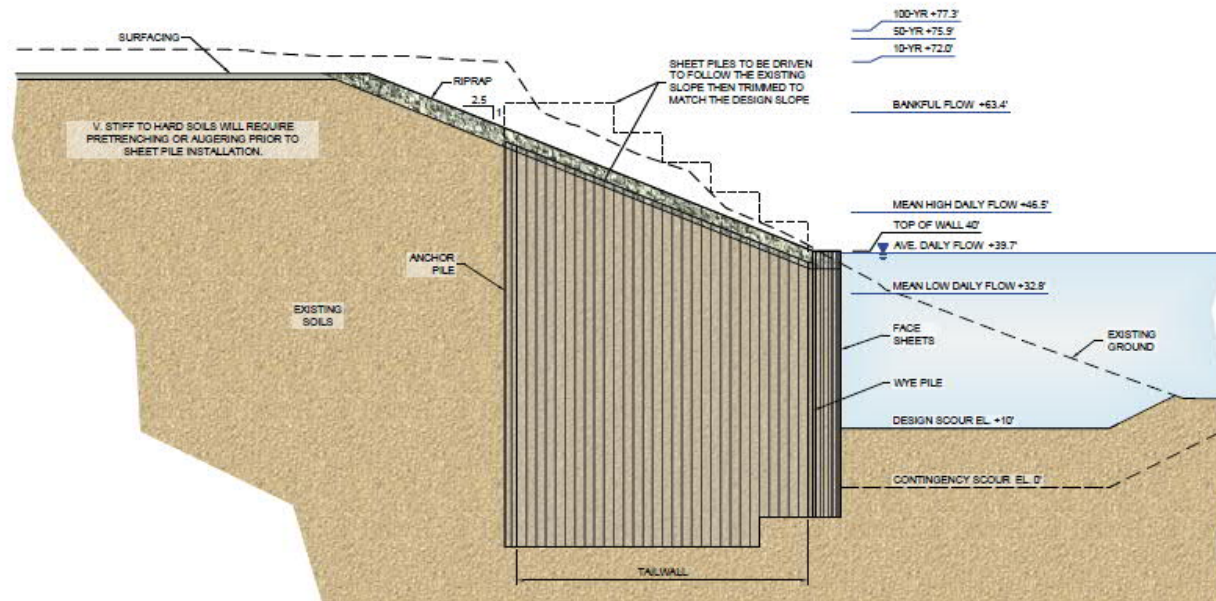
10497 Town & Country Way
Suite 250
Houston, Texas 77024
Phone: 832.930.4830
www.pndengineers.com

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PATENT - US 8,950,981 B2
PATENT PENDING - CANADA CA2,714,579

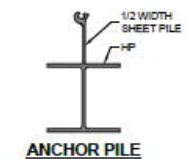
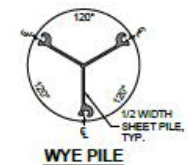
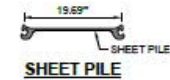
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REVISIONS		
REV	DATE	DESCRIPTION

ALTERNATIVE SHEET PILE DESIGN



TYPICAL SECTION



TYPICAL WALL COMPONENTS

CONCEPT - MARCH 2018

**BRAZOS RIVER
BANK REPAIR**

**OPEN CELL SHEET PILE SCOUR WALL
CONCEPTUAL DETAILS**

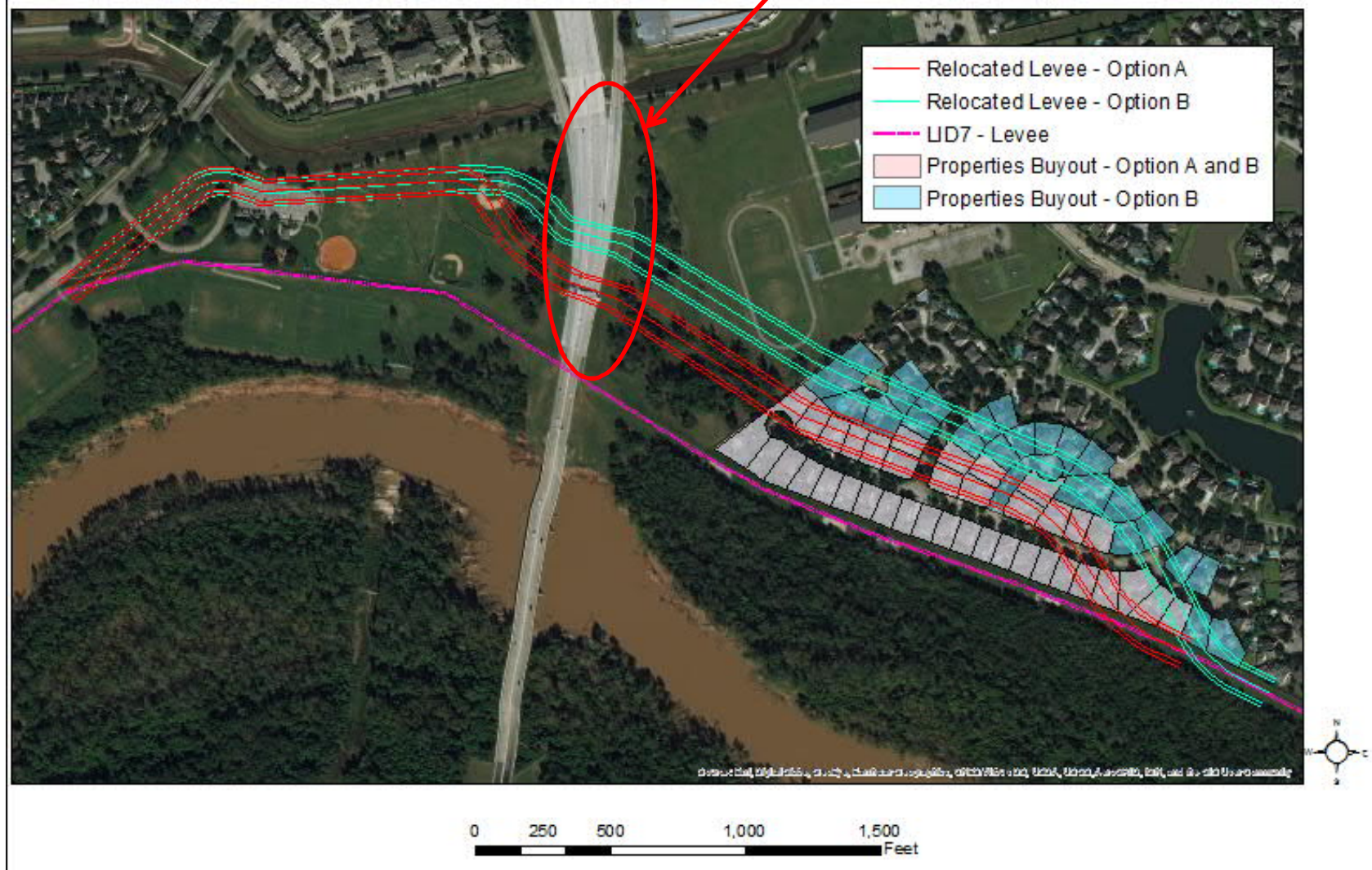
DESIGNED BY: VIL PROJECT NO: 19H-008 SHEET NO:
DRAWN BY: DM DATE: MARCH 2018
CHECKED BY: RJ SCALE: NOTED

2 OF 3

ALTERNATIVE SHEET PILE DESIGN

LEEVE RELOCATION SCENARIO

SH-99 Reconstruction





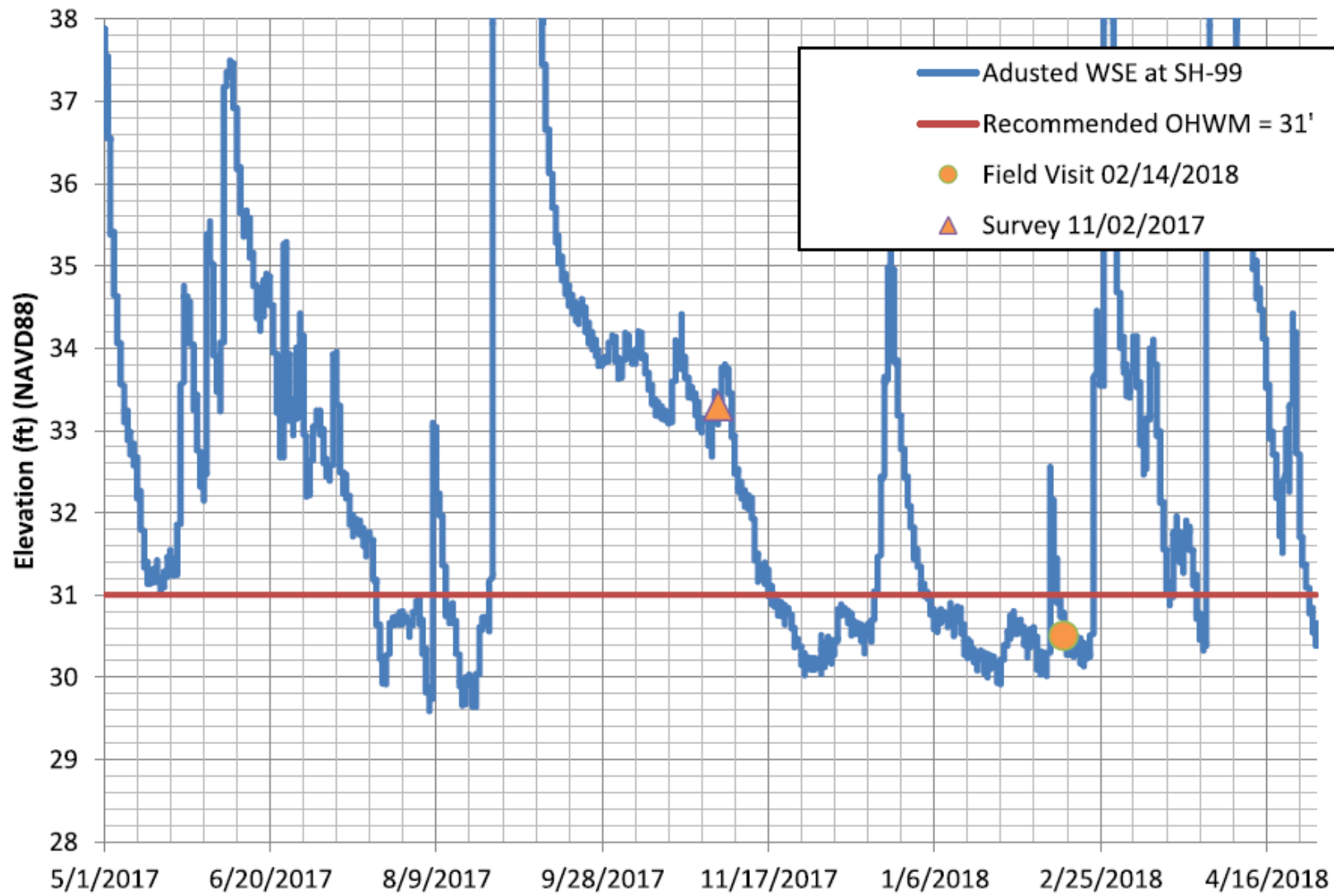
Status of Preliminary USACE Permitting

Permitting Approach

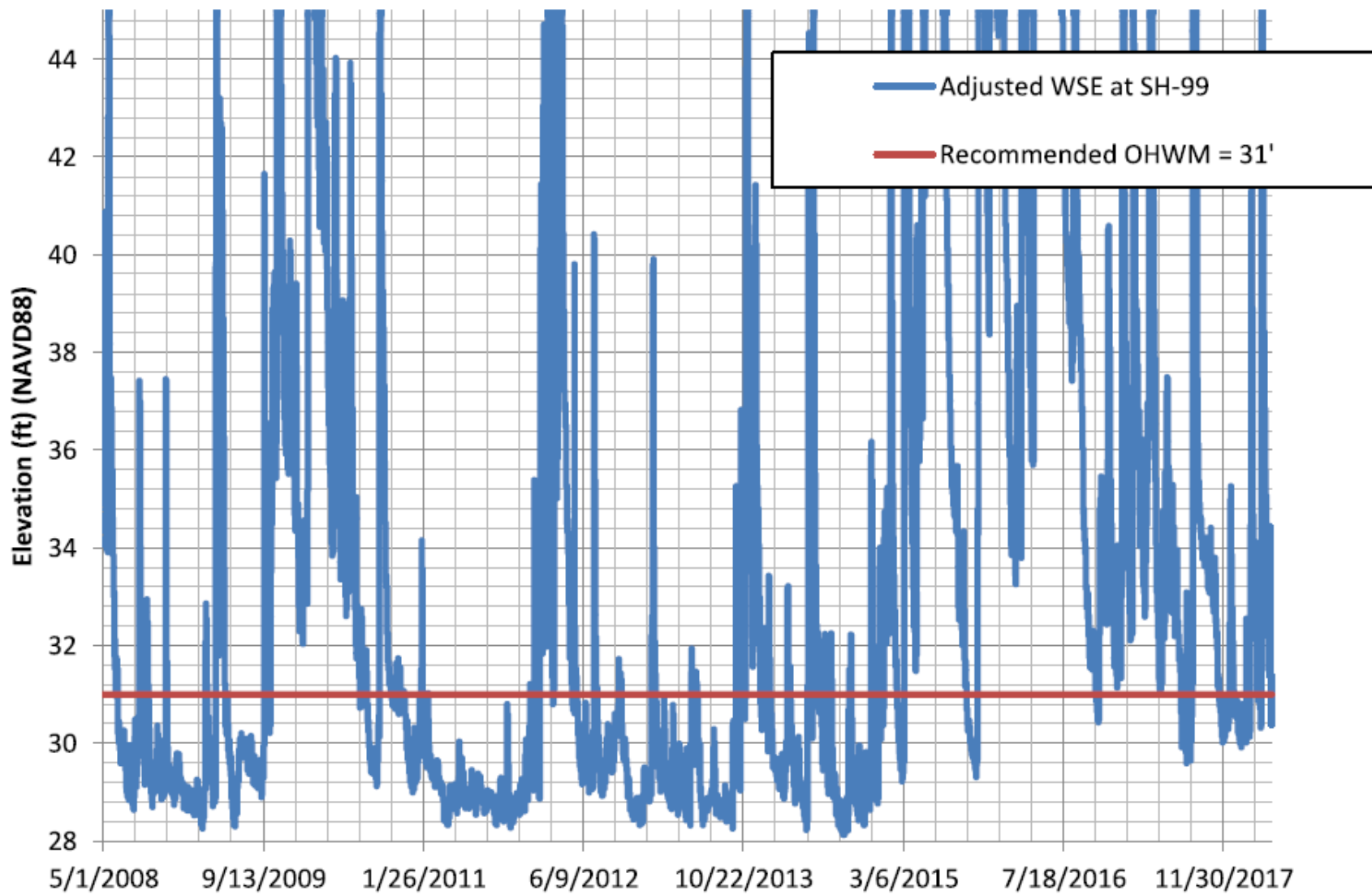
- Work within the OHWM would require USACE approval
- Possible to construct portions, but likely not all, of the project outside the OHWM
- Nationwide permits likely cannot cover extent of work, and can not be piggy-backed
- Standard Permit likely required if significant impacts below the OHWM are expected
- Brazos River is very high profile – lots of interested stakeholders. Concerns over:
 - Hydraulic impacts / Geomorphic impacts
 - Environmental impacts
 - Mitigation obligations

Coordination to Date

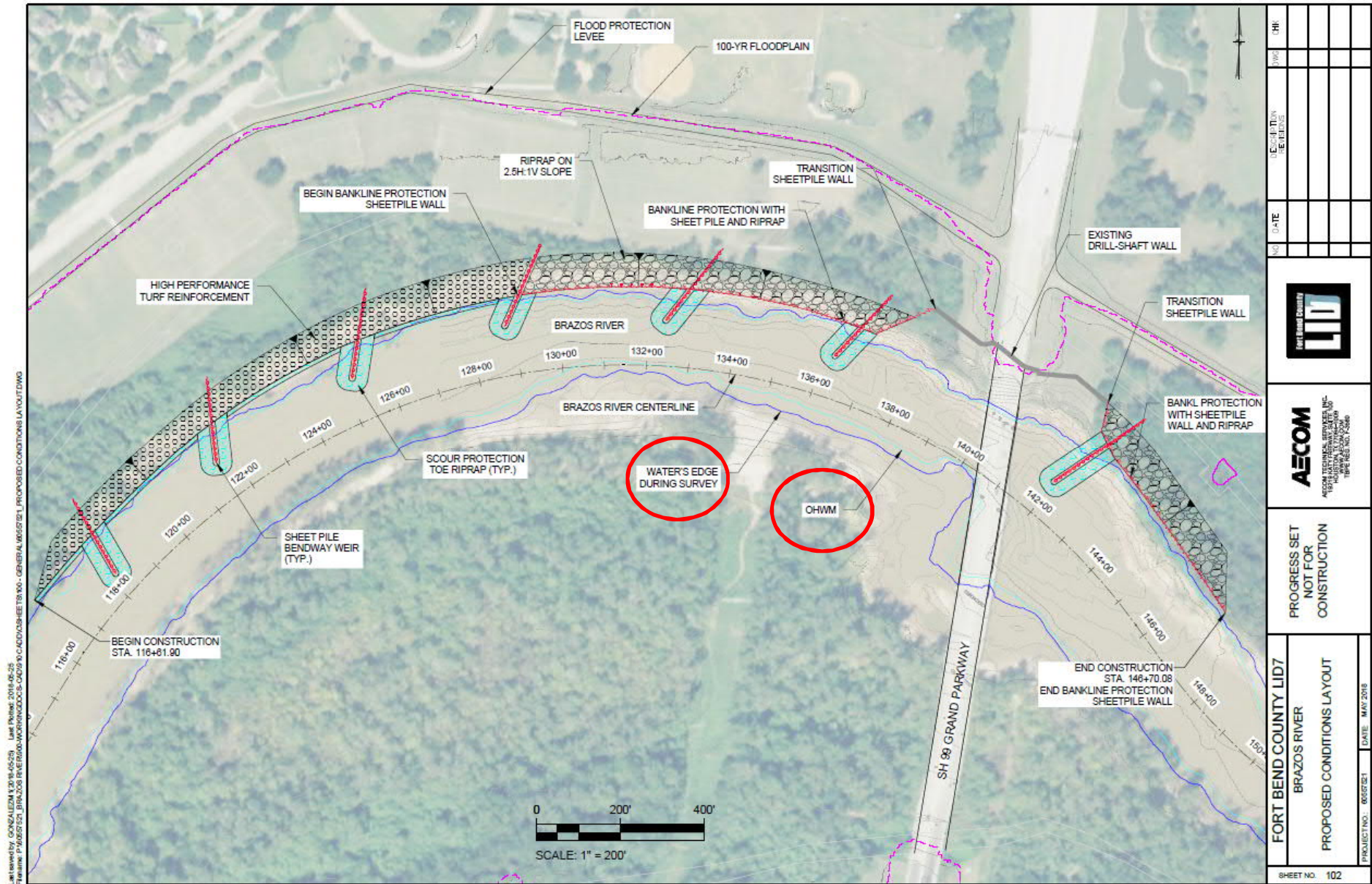
- Pre-application meeting with USACE Regulatory in November 2017
- Completed preliminary research on environmental and cultural resources
- Follow-up meeting with USACE Regulatory in May 2018
 - Concurrence on need for project
 - Concurrence on appropriateness of proposed solutions
 - Concurrence on permitting options / strategy
- Obtained preliminary agreement on proposed OHWM



LAST ONE YEAR



LAST TEN YEARS



PROPOSED OHWM

Phasing Alternatives

– Single Phase Project

- Pursue Standard Permit encompassing all aspects of the project
- Anticipated schedule for permit acquisition: +/- 1 year
- POS: Streamlines implementation approach, providing consistency
- POS: Provides for efficiency in contracting
- NEG: Longer delay until work begins

– Two Phase Project

- First Phase: Construct items outside OHWM without permit (or with a limited nationwide permit)
- Second Phase: Pursue Standard Permit for all aspects of the project below the OHWM
- Anticipated schedule for permit acquisition: +/- 1 year
- POS: Allows incremental improvements to be constructed sooner
- NEG: May not be as efficient or cost effective
- NEG: Potential issues with phasing / approvals

Phasing Considerations / Recommendations

- Due to design effort / coordination required, it may not be feasible to fast-track interim improvements that much in advance of the complete improvements
- Preference to initiate construction outside of Hurricane Season complicates proposed schedule
 - Winter 2018 is ambitious
 - Fall/Winter 2019 would be similar to timeline for Standard Permit
- Preliminary Recommendation:
 - Proceed ahead with Single Phase Project
 - If permitting process gets delayed, extract interim phase from the permit and shift to two phase project

Permitting: Next Steps

- Obtain official verification of OHWM elevation with USACE. Critical to have in case we decide to do work without a permit. Dependent on field visit during low water.
- Prepare and issue Public Notice
 - Shoot for August/September time-frame
 - Do not need final design, concept design is sufficient
 - Solicits comments/inputs from Resource Agencies and adjacent stakeholders
 - Starts the clock on the permitting process
- Advance design and continue coordination with USACE for permit issuance (needs 50% design)
- If design changes significantly, may need to re-do Public Notice. Minor changes can be accommodated internally.
- Potential schedule: 9 months to 24 months from Public Notice

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Status of Requests for Financial Assistance

USACE Continuing Authorities Program (CAP)

- Allows USACE to plan, design, and construct projects of limited size, cost, scope and complexity. Applicable to flood risk management, ecosystem restoration, erosion control, and streambank protection
- Does not require specific congressional authorization
- Can be completed without the lengthy study and authorization process typical of most larger USACE projects
- Section 14: Streambank Erosion Protection
- https://www.swf.usace.army.mil/Portals/47/docs/ContinuingAuthoritiesProgram/Section14-Streambank_Erosion_Protection.pdf
- Federal participation capped at \$5M
- LID 7 send letter to USACE requesting assistance on July 12, 2016

USACE Continuing Authorities Program (CAP)

PROCESS TO DATE:

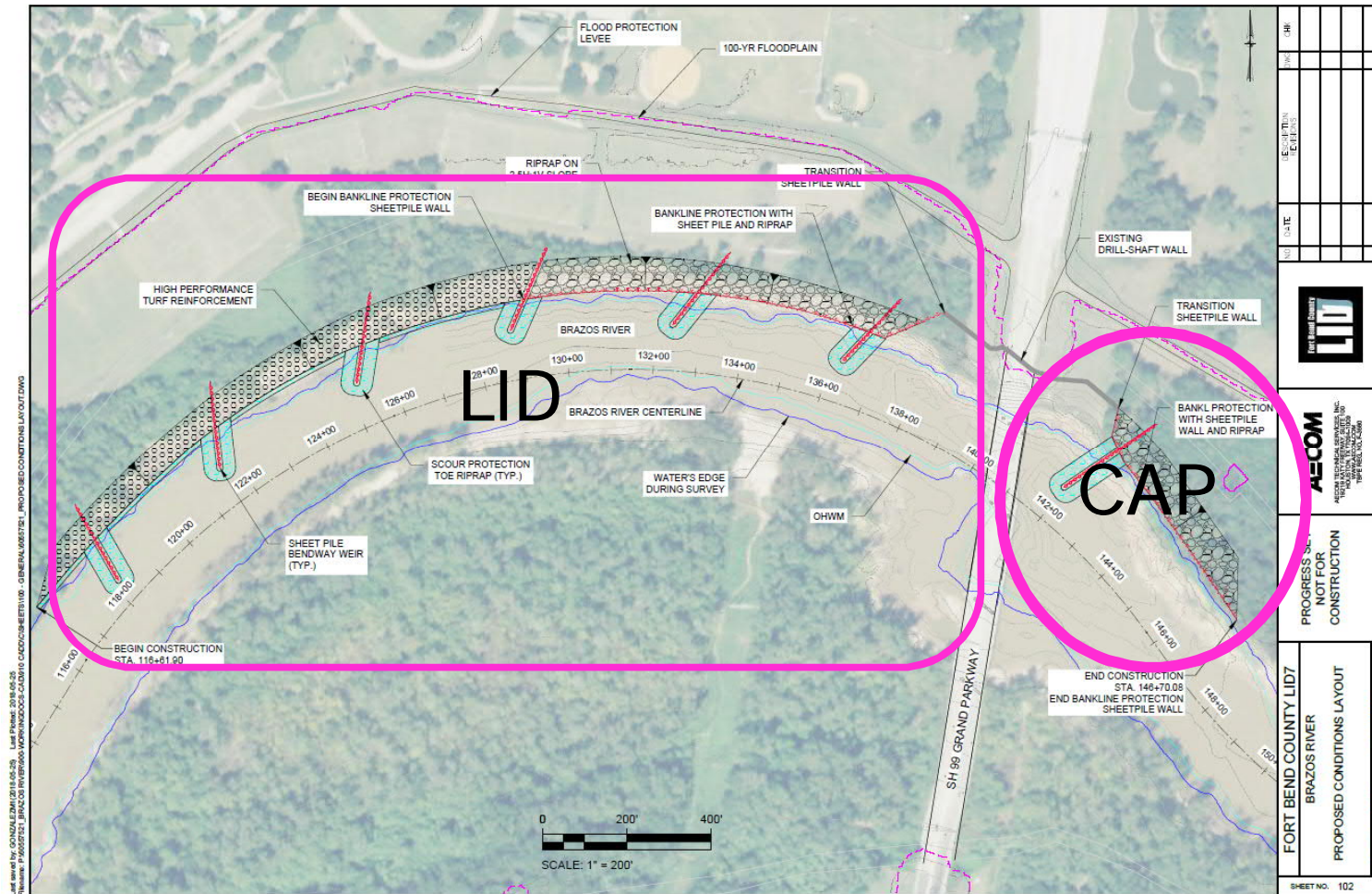
- LID 7 sent letter to USACE requesting assistance on July 12, 2016
- USACE SWG initiated a “determination of Federal interest”
- USACE SWG determined there was Federal interest, and submitted their recommendations to USACE SWD (2017 time frame)
- Process caught in an internal USACE legal loophole regarding eligibility for months
- June 28th Update:
 - Legal issue supposedly resolved
 - Approval still pending – USACE SWD approval needed

USACE Continuing Authorities Program (CAP)

IF WE ACCEPT SUPPORT:

- Study Phase: 9-12 months to figure out what to do (50/50 cost share)
- Design / Construction Phase: 12-24 months (65/35 cost share)
- Likely 2-3 years to complete construction
- Design and construction administration effort to be led by the USACE, but local sponsor could potentially provide “in-kind services” (engineering support)
- Federal interest capped at \$5M, which based on cost share’s equates to a \$8-10M project. Local sponsor could contribute above the difference between cap and actual cost. However, USACE would still control the project.
- Could segment project into different components. But USACE component would have to provide a complete and definable benefit.

USACE Continuing Authorities Program (CAP)



USACE Continuing Authorities Program (CAP)

CONSIDERATIONS:

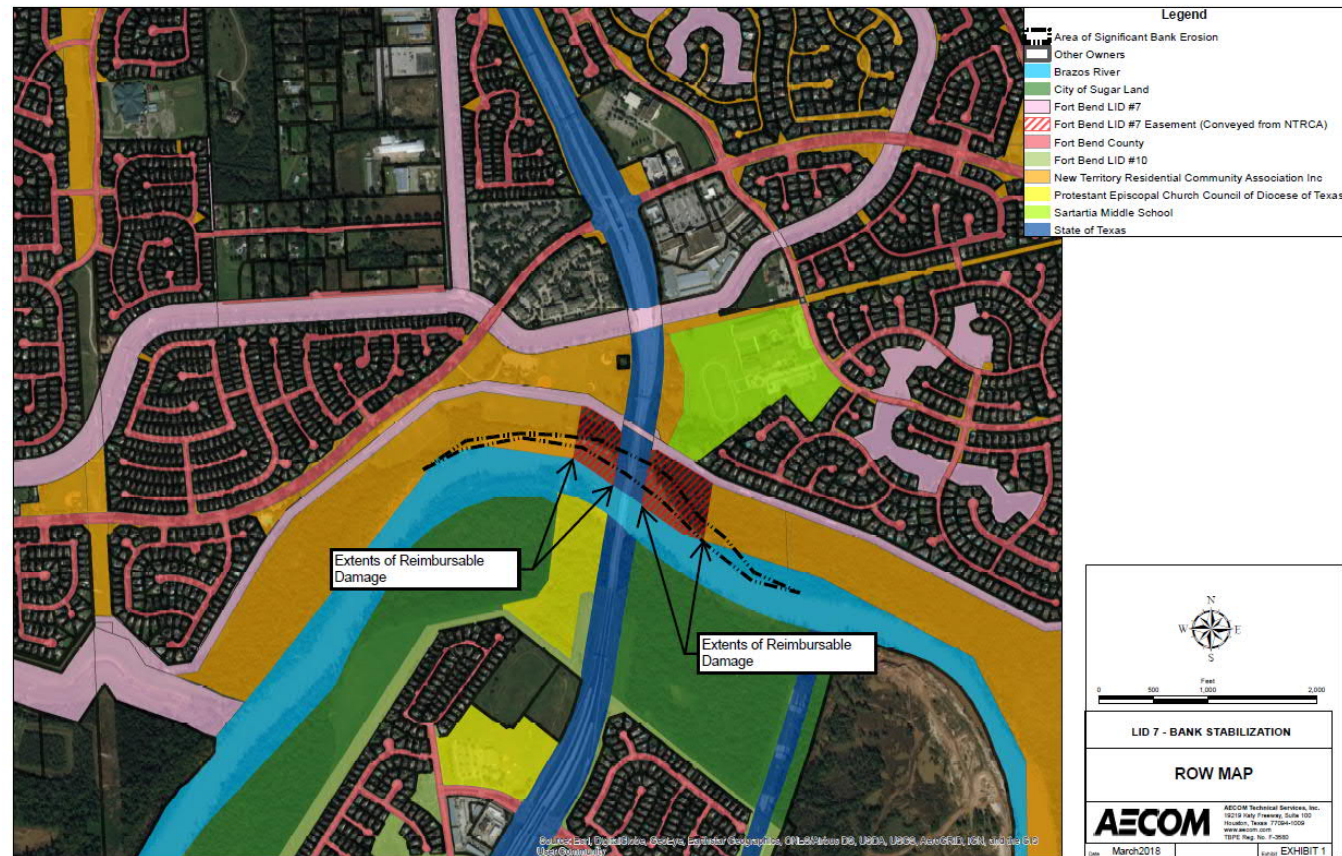
- Possibility to obtain \$5M in funding support
- Brings in expertise of USACE to support effort
- Could be slower implementation process (~3 years)
- May limit the LID's ability to “control” the project
- Could break off a discrete portion for the USACE to manage
- Could push for switch to “General Investigation” project with USACE, removing the \$5M cap, but that would drag out timeline even further

FEMA Hazard Mitigation Grant Program (Section 404)

- \$1.1B being made available to Texas for this competitive mitigation program (75/25 cost share)
- No specific funding cap per project, but selection will be dependent on benefit cost analysis
- [Notice of Intent](#) submitted and accepted earlier this summer.
- LID 7 prepared Hazard Mitigation Plan, which would make the LID eligible to be the applicant for these funds. At TDEM for review.
- AECOM preparing HMGP Application currently, including Benefit Cost Analysis per FEMA requirements
- Likely best option for a single source funding solution, but it will be very competitive (500+ NOIs have been submitted)
 - <https://www.dps.texas.gov/dem/ThreatAwareness/appsRecvd.pdf>

FEMA Public Assistance

- Reimbursement program intended for the repair of public infrastructure to pre-storm conditions. Tied to the Section 406 mitigation program.
- LID 7 determined eligible for Public Assistance within the easements obtained by LID 7 from NTRCA



FEMA Public Assistance

- Reimbursement cost would be capped at the cost of restoring the bank to pre-storm conditions within those limits
- Given that exact restoration is not feasible or ideal, cost could be applied to an alternate project.
- June 20 Update: FEMA audited eligibility and reversed previous decision. The LID is no longer [eligible](#) as:
 - The river bank is not considered an “improved or maintained natural feature”.
 - An eligible facility owned by the applicant (such as the levee) was not damaged. In certain instances the repair of a natural feature would be considered eligible if it was “related to restoring the structural integrity of an eligible facility” which was damaged during the storm event.
- The LID has 60 days from the date of determination to appeal.

NRCS EWPP

- Grant program for emergency repair following a natural disaster
- Required to complete construction within 220 days of award
- Not intended nor ideal for large and complex projects
- LID 7 submitted request for assistance to NRCS
- NRCS conducted damage survey
- NRCS determined that the project is not a good fit for the program, due to the scale, complexity, schedule and potential number of partners.
- ACTION: Circle back to re-assess eligibility now that potential partners may be reduced and funding is available. Schedule challenges would persist.

HUD CDBG Disaster Recovery

- Infrastructure / mitigation funds available through CDBG-DR program
- Wave 1: \$130M for Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Liberty, Matagorda, Montgomery, Waller, Walker, and Wharton counties
- Wave 2 (2019): could be five times as much funding available
- <http://www.h-gac.com/harvey/cdbg-disaster-funds/documents/CDBG-June-19-2018.pdf>
- Public Hearing held 6/28 to discuss method of distribution
- 70% of funding must address LMI communities impacted by Harvey (estimated at family income < \$60K)
- Likely not applicable, but worth tracking

USACE Funding

- 3rd Supplemental provided \$17B+ for USACE nationwide
- Primarily intended to fund Federal projects already in the pipeline, or select “new start” studies
- Not a blank check to do whatever they want. Use of money is strictly controlled.
- Not likely to push any money LID 7’s way any time soon



Discussion of Implementation Plan

The Plan Forward

– General Items:

- USACE permitting
- ROW / easement acquisition
- Stakeholder / partner coordination

– Engineering Items:

- Additional field investigation (survey / geotechnical)
- Additional modeling / optimization (3D modeling)
- Final design / bidding

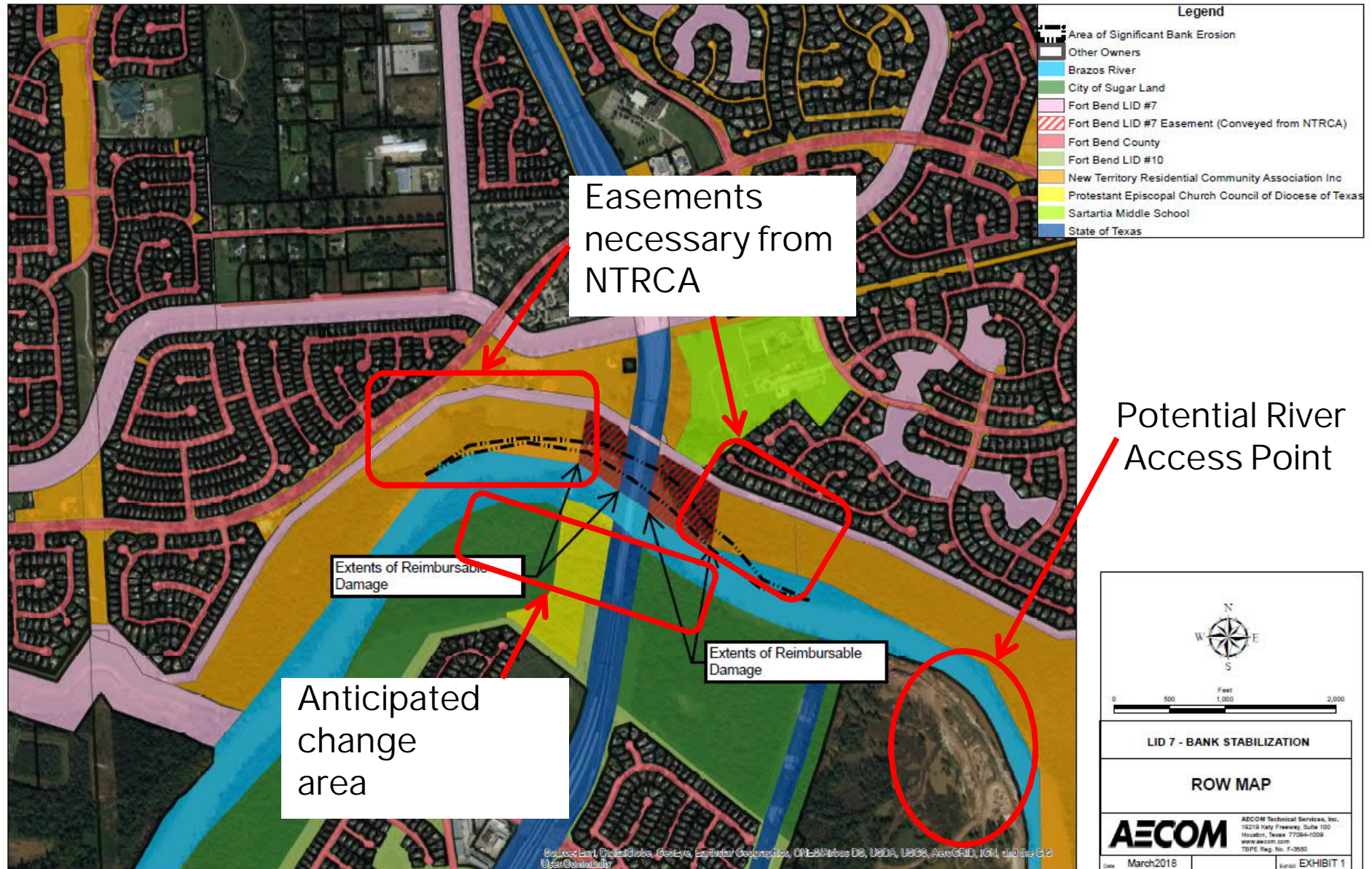
– Schedule Considerations:

- Urgency to provide protection
- Avoid construction during high flow season (hurricane season)

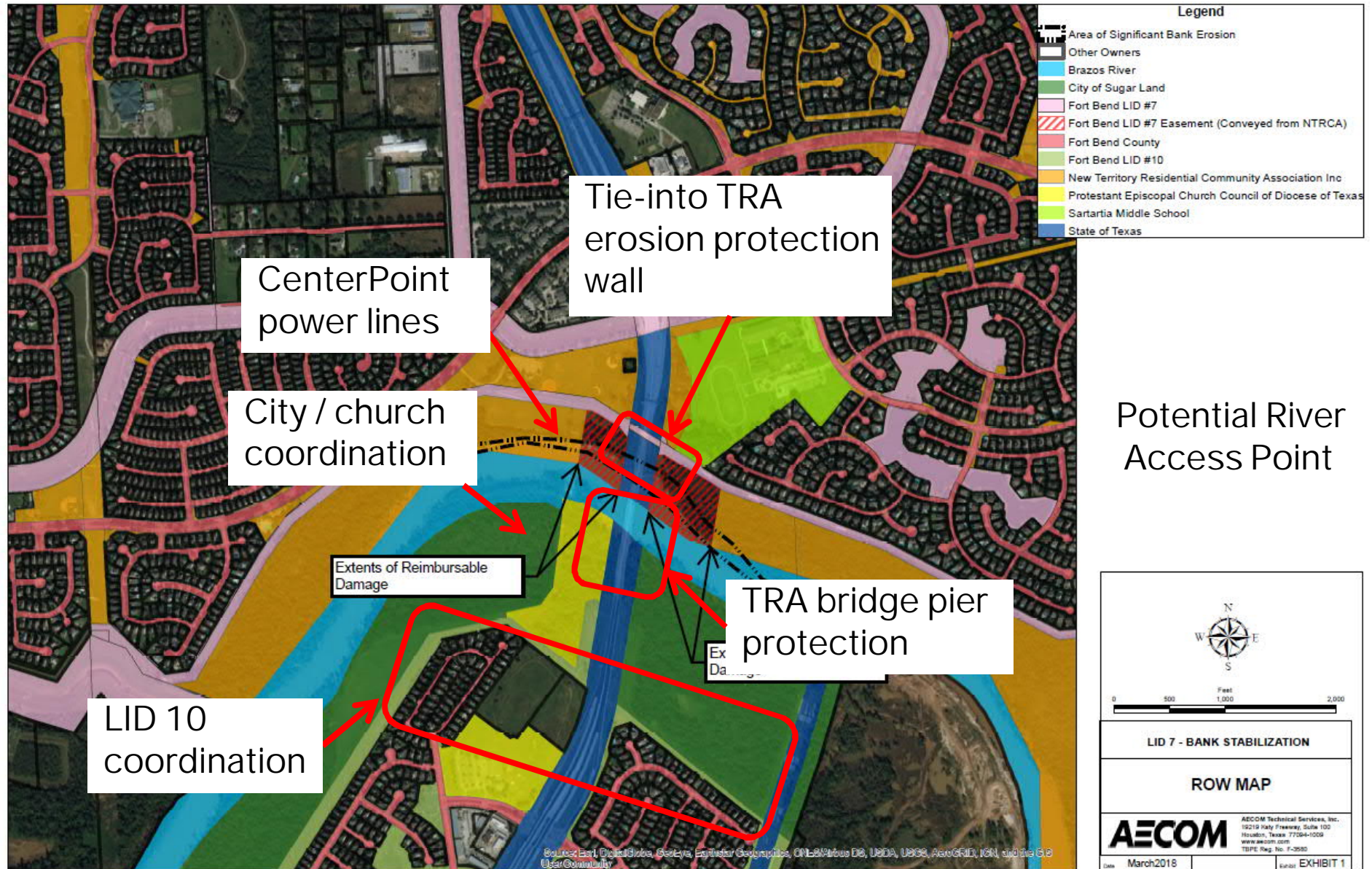
– Phasing / Funding

- Partner requirements / schedule constraints
- Reimbursement vs. grant funds

ROW / Easement Acquisition



Stakeholder / Partner Coordination



Additional Field Investigation

– Geotechnical

- In-river borings / samples
- South-bank borings / samples
- Sediment sampling upstream/downstream
- Additional north-bank borings (potential)

– Survey:

- OHWM verification
- Revised topo/bathymetric survey for primary area (capture changes since last survey)
- Additional US / DS survey to reflect post-Harvey conditions for input into hydraulic models

Additional Modeling / Optimization

– 3D hydrodynamic modeling is absolutely necessary

- Empirical scour equations not appropriate for complex conditions
- 2D modeling not sufficient in areas of complex 3D flow
- Supports assessment of scour / geomorphic changes
- Supports optimization of hydraulic structures

– Impacts of design optimization

- Scour depth for design of sheet-pile toe
- Scour depth for design of bendway weirs
- Benefit of bendway weirs on sheet-pile toe
- Spacing, angle, length, height, and porosity of bendway weirs
- Scour conditions for bridge pier protection

Schedule Considerations

SINGLE PHASE IMPROVEMENTS

	Fall 2018	Winter 2018	Spring 2019	Summer 2019	Fall 2019	Winter 2019	Spring 2019	Summer 2019	Fall 2019	Winter 2019
Permitting	H			H	H			H	H	
Investigation / Modeling	H			H	H			H	H	
Final Design	H			H	H			H	H	
Bidding	H			H	H			H	H	
Construction	H			H	H			H	H	

INTERIM IMPROVEMENTS

	Fall 2018	Winter 2018	Spring 2019	Summer 2019	Fall 2019	Winter 2019	Spring 2019	Summer 2019	Fall 2019	Winter 2019
Investigation / Modeling	H			H	H			H	H	
Interim Design	H			H	H			H	H	
Bidding	H			H	H			H	H	
Construction	H			H	H			H	H	

Schedule Concerns

- Conditions will continue to change
 - TRA erosion control wall is case-in-point
 - Changes may force revisions to design, impacting both feasibility and cost
- Sooner the better, but being over-conservative in design can be very costly
- Interim improvements may provide more timely protection, but risk failure in extreme events
- Interim improvements would have to be constructed above the OHWM, limiting possibilities

Partner Requirements

– USACE CAP

- Potentially longer schedule
- USACE controls design / construction

– FEMA PA

- Reimbursement only
- Complexity and uncertainty

– FEMA HMGP

- Grant program
- Funding not guaranteed
- Availability of funding: Spring / Summer 2019?

– NRCS

- Accelerated schedule
- Limited purview

Funding Considerations

- Permitting / design phase funding needed immediately
- Construction funding needed in 6 – 18 months
 - Interim / ultimate improvements
 - Exact needs unknown – dependent on optimization and detailed design
- Reimbursement programs do not reduce bond sale needs
- Grant funding is not guaranteed, may not be able to plan for it when considering cash flow
- Potential local partners:
 - Toll Road Authority
 - City of Sugar Land
 - Fort Bend County
 - CenterPoint Energy
 - Brazos River Authority

Next Steps

- Develop consensus on implementation plan / schedule
- Submit proposals for permitting, field work, modeling, and design
- Plan for bond sales to fund project development and construction
 - Consider interim authorizations using other funding sources
- Continue pursuit of grant funding
- Prepare and issue Public Notice through USACE
- Initiate next phase of study / design
- Start ROW / easement acquisition
- Pursue cooperative agreements with partners / stakeholders

Thank You

June 29, 2018

AECOM