



Fort Bend County Levee Improvement District No. 7

New Stormwater Pump Station Presentation

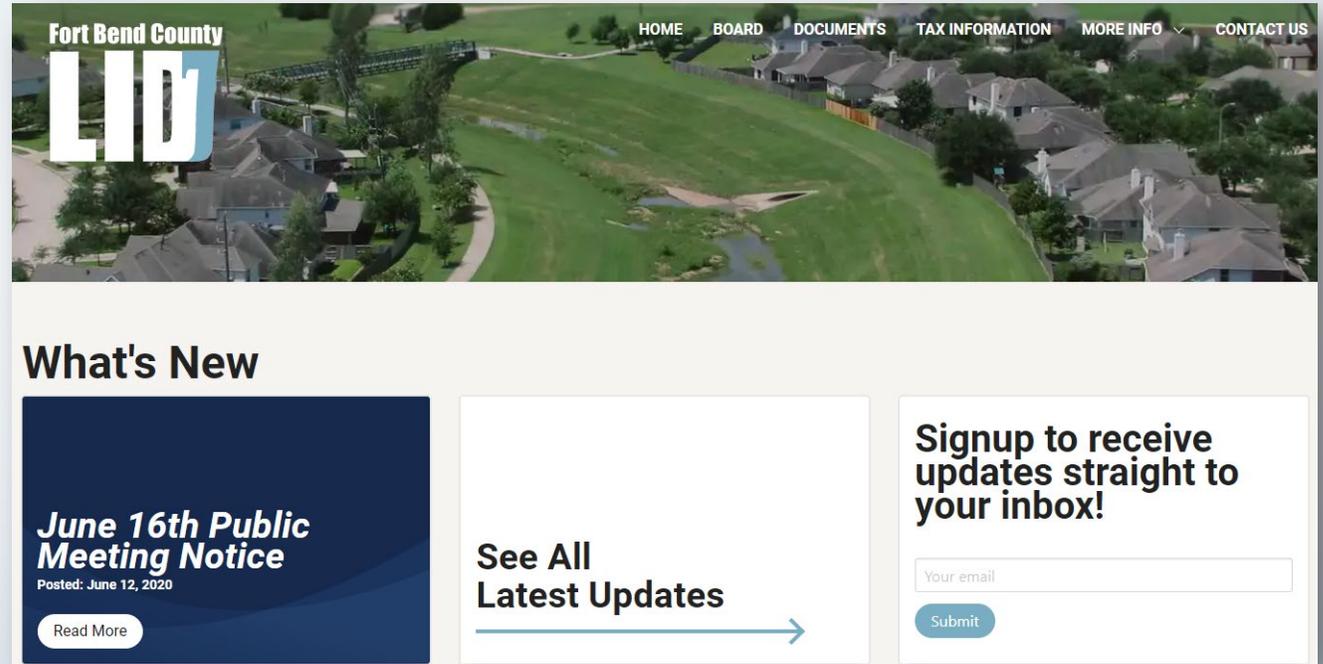
July 2020

Overview

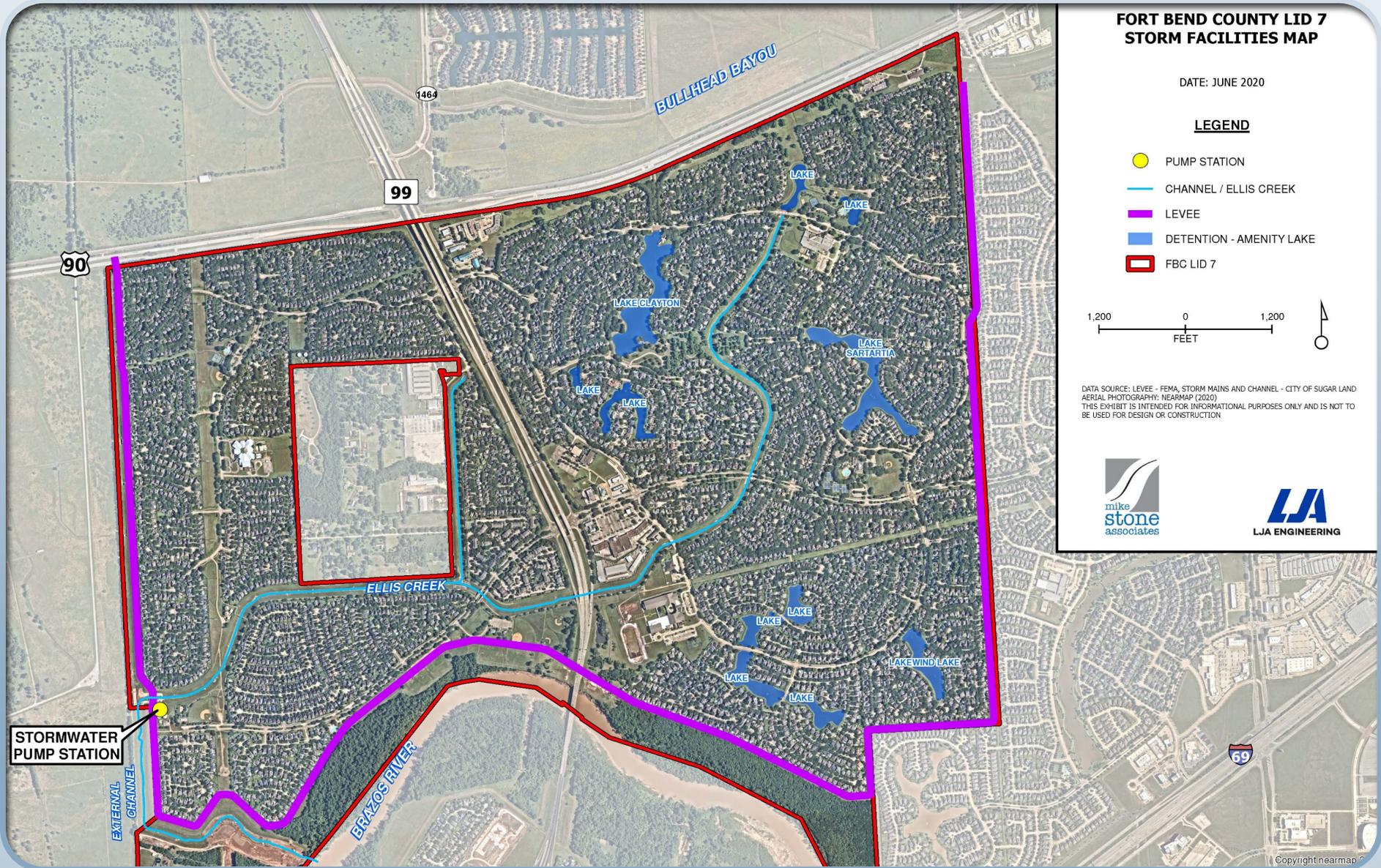
- About FBCLID 7
 - Understanding the District and its facilities
- How Levees Work
 - Overview of levee operations
- What's Been Happening
 - Timeline of District experiences and events
- Drainage Study
 - Engineering recommendations to alleviate flood risk
- New Pump Station
 - Review of how decision to build new was determined
- What to Expect
 - Construction timeline
- Financials
- Summary

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**FORT BEND COUNTY LID 7
STORM FACILITIES MAP**

DATE: JUNE 2020

LEGEND

- PUMP STATION
- CHANNEL / ELLIS CREEK
- LEVEE
- DETENTION - AMENITY LAKE
- FBC LID 7



DATA SOURCE: LEVEE - FEMA, STORM MAINS AND CHANNEL - CITY OF SUGAR LAND
AERIAL PHOTOGRAPHY: NEARMAP (2020)
THIS EXHIBIT IS INTENDED FOR INFORMATIONAL PURPOSES ONLY AND IS NOT TO
BE USED FOR DESIGN OR CONSTRUCTION



**STORMWATER
PUMP STATION**

EXTERNAL
CHANNEL

ELLIS CREEK

BRAZOS RIVER

BULLHEAD BAYOU

LID 7 Map

LID 7 Services and Facilities

- LID 7 provides two essential services
 - Brazos River flood protection for 2,050 acres
 - 6 miles of levees
 - 9 floodgates on gravity outfalls into External Channel
 - Drainage for rainfall runoff in areas protected by LID 7
 - 5 miles of drainage channels
 - 66,000 GPM existing pump station
 - 10 Ponds/Detention
- City of Sugar Land also provides drainage inside LID 7
 - City owns and maintain public streets and storm sewers

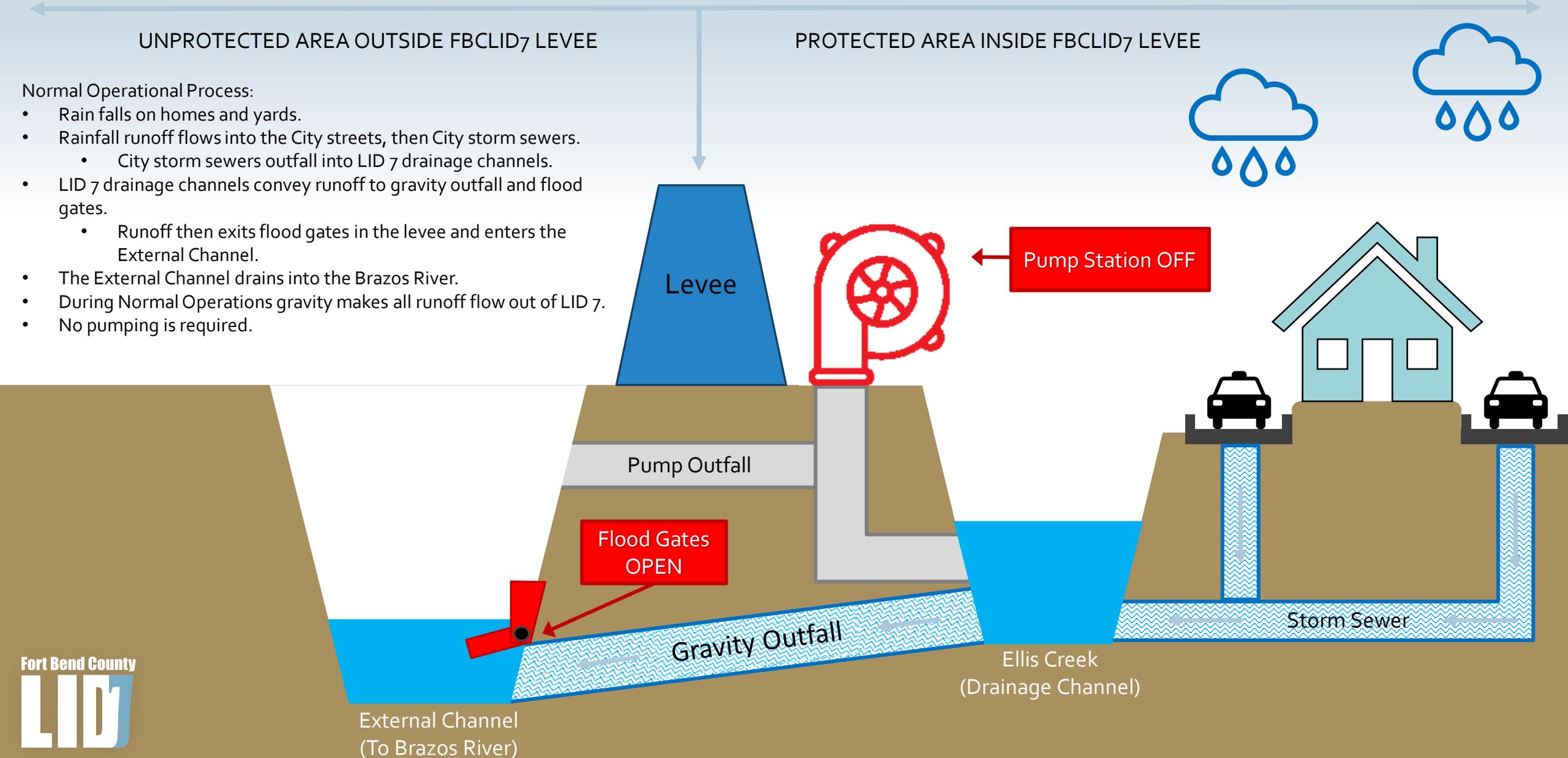
LID 7 Normal Operations - Gravity Outfall

UNPROTECTED AREA OUTSIDE FBCLID7 LEVEE

PROTECTED AREA INSIDE FBCLID7 LEVEE

Normal Operational Process:

- Rain falls on homes and yards.
- Rainfall runoff flows into the City streets, then City storm sewers.
 - City storm sewers outfall into LID 7 drainage channels.
- LID 7 drainage channels convey runoff to gravity outfall and flood gates.
 - Runoff then exits flood gates in the levee and enters the External Channel.
- The External Channel drains into the Brazos River.
- During Normal Operations gravity makes all runoff flow out of LID 7.
- No pumping is required.



LID 7 Normal Operations - Pump Outfall

UNPROTECTED AREA OUTSIDE FBCLID₇ LEVEL

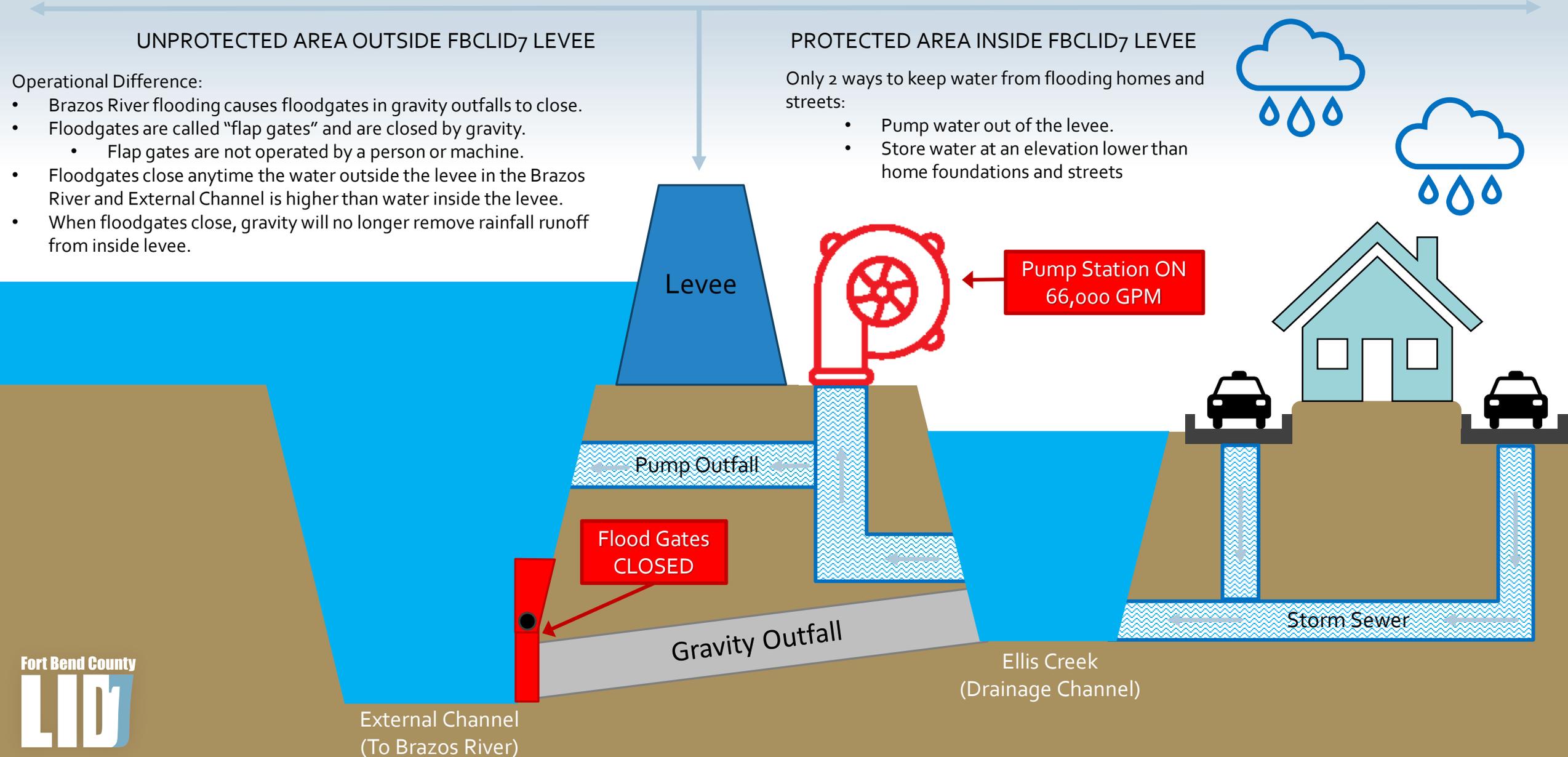
Operational Difference:

- Brazos River flooding causes floodgates in gravity outfalls to close.
- Floodgates are called "flap gates" and are closed by gravity.
 - Flap gates are not operated by a person or machine.
- Floodgates close anytime the water outside the levee in the Brazos River and External Channel is higher than water inside the levee.
- When floodgates close, gravity will no longer remove rainfall runoff from inside levee.

PROTECTED AREA INSIDE FBCLID₇ LEVEL

Only 2 ways to keep water from flooding homes and streets:

- Pump water out of the levee.
- Store water at an elevation lower than home foundations and streets



Recent Flood Events

Hurricane Harvey (Aug 27 – Sep 1, 2017)

- LID 7 received 30 inches of rain over 4 days.
- Brazos River reached record flood levels.
 - 55.2' Brazos River Gage at Richmond, TX
- 3 structures flooded (4,600+ structures in LID 7)
- Widespread street flooding



May 7, 2019

- LID 7 received 8-10 inches of rain over 4 hours
- Brazos River at flood stages that restrict gravity outfall
 - 41'-47' Brazos River Gage at Richmond, TX
- Widespread street flooding
- Flood damage to dozens of vehicles



Images above are from Hurricane Harvey. Left image (home/structure) did not flood during event.

Increasing Standards

1987 – Fort Bend County adopted design standards used to develop LID 7.

- Provide 12 inches of freeboard for all structures

2011 – Fort Bend County updated design standards.

- Provide 18 inches of freeboard for all structures

2018 – National Oceanic and Atmospheric Administration (NOAA) increased rainfall totals used for “design storms” (Atlas 14).

- 100-year, 24-hour rainfall increased from 12.5 to 16.5 inches
- 10-year, 24-hour rainfall increased from 8.2 to 8.55 inches

2020 – Fort Bend County adopts Atlas 14 discharge volumes.

Providing additional 6 inches of freeboard reduces available flood storage inside the levee.

- Additional freeboard and additional rainfall increases the need for pump capacity and flood storage

What is "Atlas 14" and what is the effect on LID7?

- On October 2018, the National Oceanic and Atmospheric Administration (NOAA) released Volume 11 of the Atlas 14 Point Precipitation Frequency Estimates (Atlas 14).
 - This technical paper redefined and increased the rainfall values for storm frequencies which were used to design the LID 7 flood protection system.
- Various local governments such as Fort Bend County and the City of Sugar Land have adopted Atlas 14 in their drainage criteria.
- Atlas 14 estimates that for Fort Bend County the amount of rainfall volume increases for various storm events (as mentioned in previous slide)
- The District requested that LJA prepare a drainage analysis of the existing District system based on the Atlas 14 rainfall and to propose improvements to increase the freeboard to 18-inches relative to the lowest slab elevations within the District.
 - Based on the results of the analysis, the following improvements are recommended by LJA:
 - Construction of an additional 115 acre-feet of storage
 - Construction of an additional 210,000 gpm pump station
 - Increase the level of protection to the 10-year coincident storm event

Current LID 7 freeboard design (pre-Atlas 14)

73' Lowest Home Foundations



12" Existing Freeboard*

72' Current Critical Flood Elevation

Existing Flood Storage

* - Freeboard is the vertical distance between the *top* of a structure foundation and the anticipated water surface elevation for a certain "Design Storm", as required by the governing entities.

Proposed LID 7 freeboard design (post-Atlas 14 requirements)



73' Lowest Home Foundations

72' Current Critical Flood Elevation

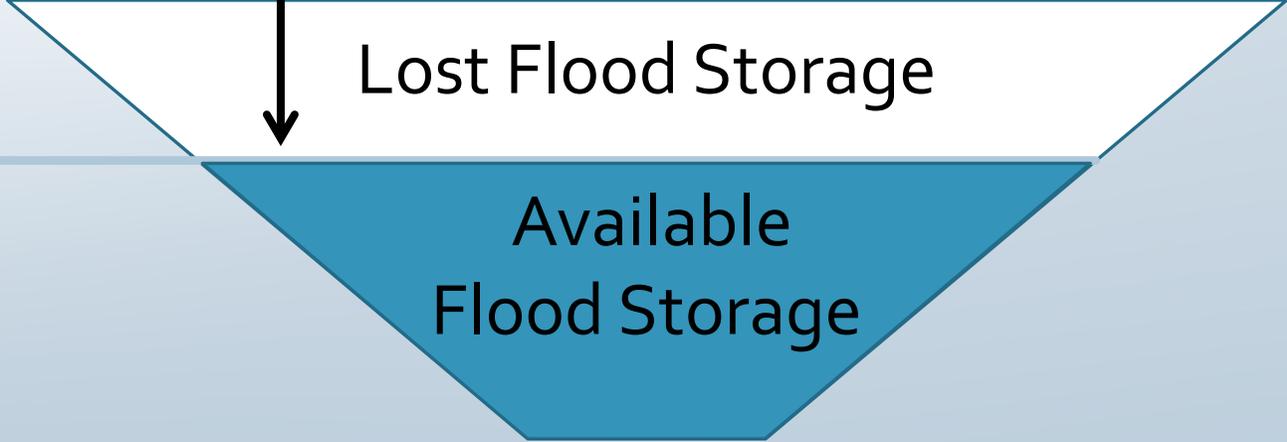
71.5' New Critical Flood Elevation



18" Proposed Freeboard

Lost Flood Storage

Available
Flood Storage



What's Been Done?

June 2019

- Begin Drainage Study.

February 2020

- Begin Pump Station design and analyze alternatives.

May 2020

- Complete Drainage Study. Submit for City of Sugar Land and Ft. Bend County review.
- Complete Pump Station design alternatives.

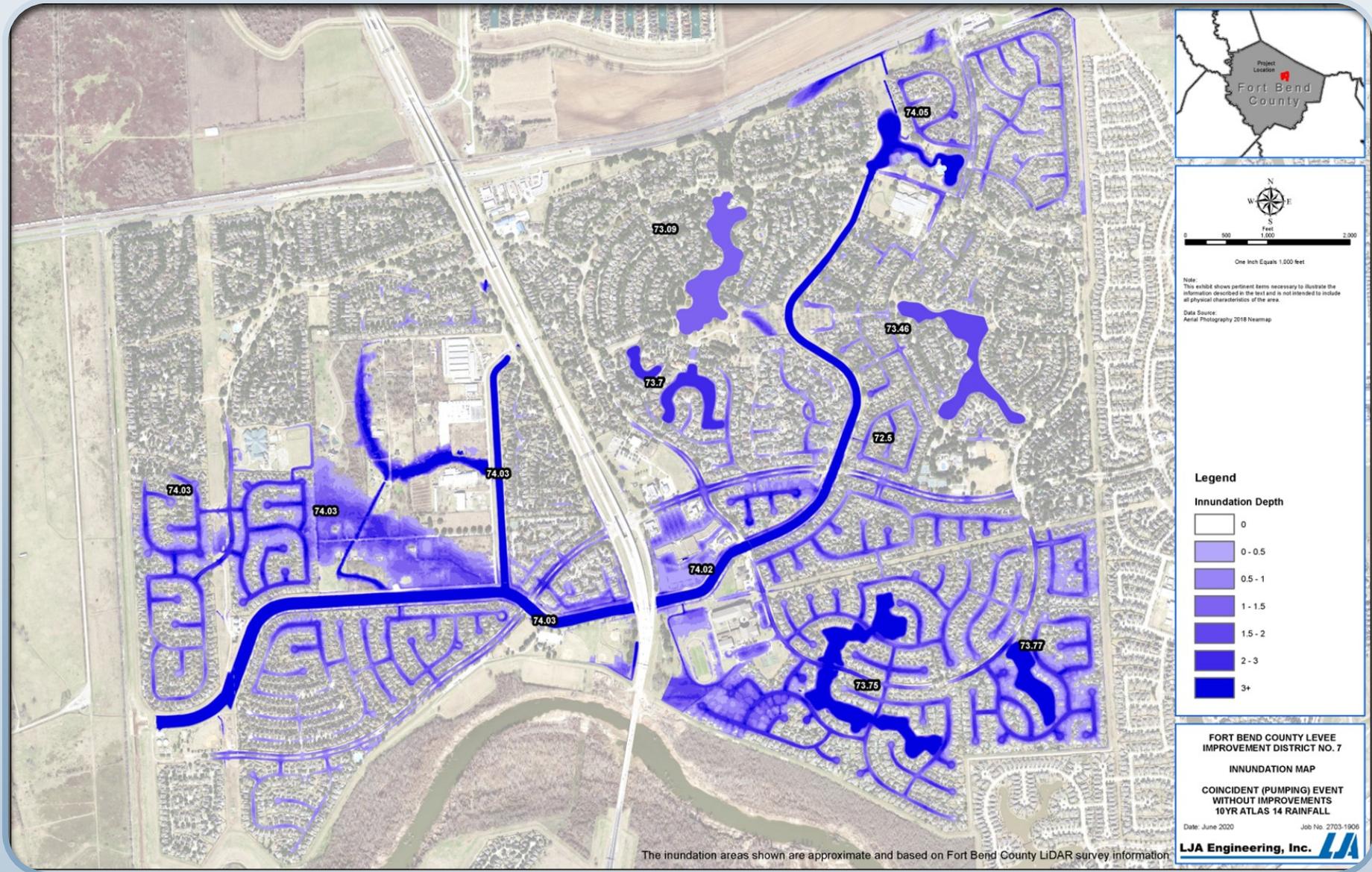
June 2020

- Finalize Pump Station design recommendations.
- LID 7 Board of Directors approval of Pump Station recommendations.

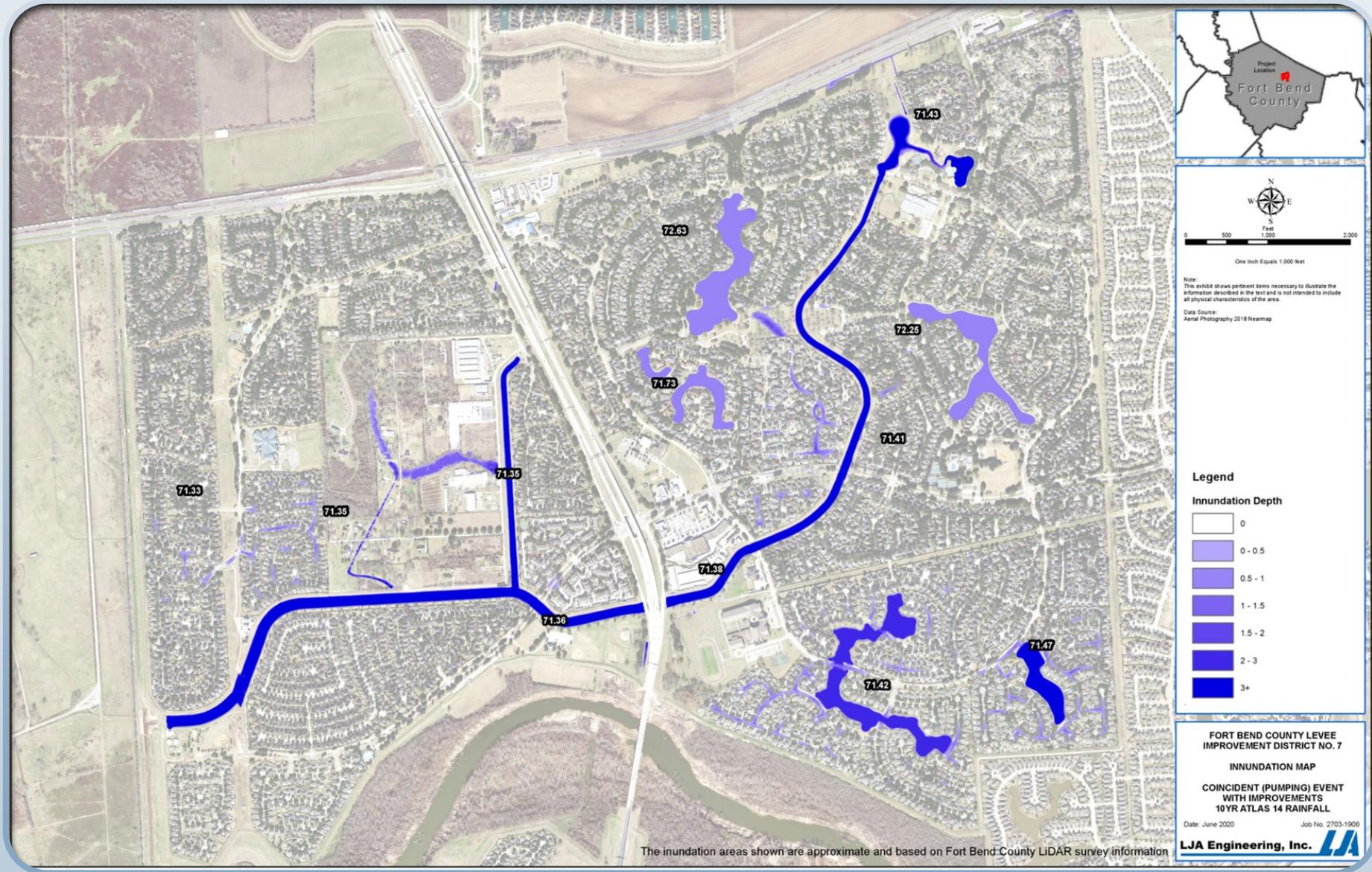
Drainage Study Recommendations

- Model and design LID 7 improvements using Atlas 14 required storm volumes to increase flood protection for all residents.
- LID 7 will increase freeboard by 6 inches of additional flood protection during the design storm, from 12 to 18 inches (meets FBCDD 2011 standards).
- Increase pump capacity from 66,000 to 276,000 gallons per minute (GPM).
 - Increasing pump capacity helps reclaim storage during multi-day events.
- Increase flood storage inside levee by 115 acre-feet (37,470,000 gallons).
- Increase level of protection to the 10-year coincident event.

Improvements to the District's pumping and flood storage capacity will help reduce frequency and duration of street flooding and the potential of structural flooding inside levee.



Before Drainage Study Recommendations



After Drainage Study Recommendations

Why Construct a New Stormwater Pump Station?

- Existing Plant is approximately 28 years old and nearing its useful life.
- Must maintain existing plant operational while constructing additional pumping capacity.
- Limited room between outfall structure and Sugar Land water plant to significantly expand the plant.
- Increased cost and lower quality of final product to retrofit an old plant compared to building a new more modern plant.
- Increased reliability and efficiency of electrical components and structures.

Determined by these characteristics, a new Pump Station location would be required.

New Pump Station Location Considerations

- Located at the lowest point in the drainage system – Ellis Creek gravity outfall.
- Located next to the LID 7 levee to efficiently move water from within the leveed area into the External Channel and Brazos River.
- Existing LID 7 pumps must remain in operation during construction.
- Adequate street access and space for construction and emergency operations.
- Requires electrical facilities capable of supplying adequate power.
- Minimize impact to residents from noise of operations and community aesthetics.
- Consolidate all proposed new equipment and infrastructure in one area.



New Pump Station: Concept Design

New Pump Station Options

Multiple locations and options were considered for the New Pump Station

- Refurbish and expand existing pump station
- New Pump Station on baseball fields next to existing Pump Station
- New Pump Station with expansion of West Levee
- New Pump Station on north side of Ellis Creek

New Pump Station Design Recommendation

- Construct New Pump Station on the north side of Ellis Creek
- Design recommendation requires LID 7 to purchase three homes for construction.



New Pump Station Timeline

- Begin Detailed Design – July 2020
- Finalize Financing – April 2021
- Complete Property Acquisition – May 2021
- Receive Permit Approvals – May 2021
- Complete Design – May 2021
- Bid Pump Station Construction – June 2021
- Begin Construction – July 2021
- Construction Complete – October 2022

What to Expect During Construction

- Demolition of 3 existing homes.
- Deep excavation required to construct pump intake structure.
- Deep excavation will require installation of shoring.
- Several large concrete pours will require continuous delivery, potentially outside general work hours.
- Large cranes will be delivered and assembled on site.
- Pump delivery will require multiple trucks for each pump.
- General work hours:
 - 7:00 am to 6:00 pm, Monday - Saturday

Neighborhood Concerns

- Construction Traffic and Parking
 - Large vehicles will access site through neighborhood streets.
 - Includes concrete trucks, dump trucks, material and equipment delivery
 - Temporary road or alternate route around neighborhood are not viable
 - Contractor will not be allowed to use neighborhood streets for employee parking.
- Street cleaning and sweeping
 - Daily cleaning of streets will be required.
- Safety and Security
 - Temporary: Security fencing and cameras will be installed when construction begins.
 - Permanent: Brick wall and driveway gates will be installed in front of facility.



What to Expect After Construction

Pump Station building and fences finished design will resemble homes and blend well with residential neighborhood aesthetic

- Brick building facade
- Standing seam metal roof
- Architectural features to compliment neighborhood
- Landscaping and street trees in front of building pump station
- Preventive measures to limit noise pollution



* Sample rendering of FBCLID 2 Third Pump Station

Sample Rendering - proposed view from Evandale Lane/Hayden Creek Drive

- New Pump Station will be designed to blend into neighborhood
- Updated rendering for LID 7 project to be developed during design

New Pump Station: Preliminary Budget

Construction

- Pumps \$1,825,000
- Generators and Electrical \$3,100,000
- Structures \$3,813,150
- Construction Contingency \$1,747,630

Engineering, Design, and Testing \$1,887,440

Property Acquisition, Legal, and Other Expenses \$1,200,000

Total Cost - New Pump Station \$13,573,220

New Pump Station – Tax Rate Impact

2018

- LID 7 voters approved a \$121,150,000 bond authorization for flood control projects.

2019

- LID 7 Tax Rate = \$0.43 per \$100 of assessed value
- Current Tax Rate supports construction of New Pump Station

Benefits to New Territory Community

Property Values:

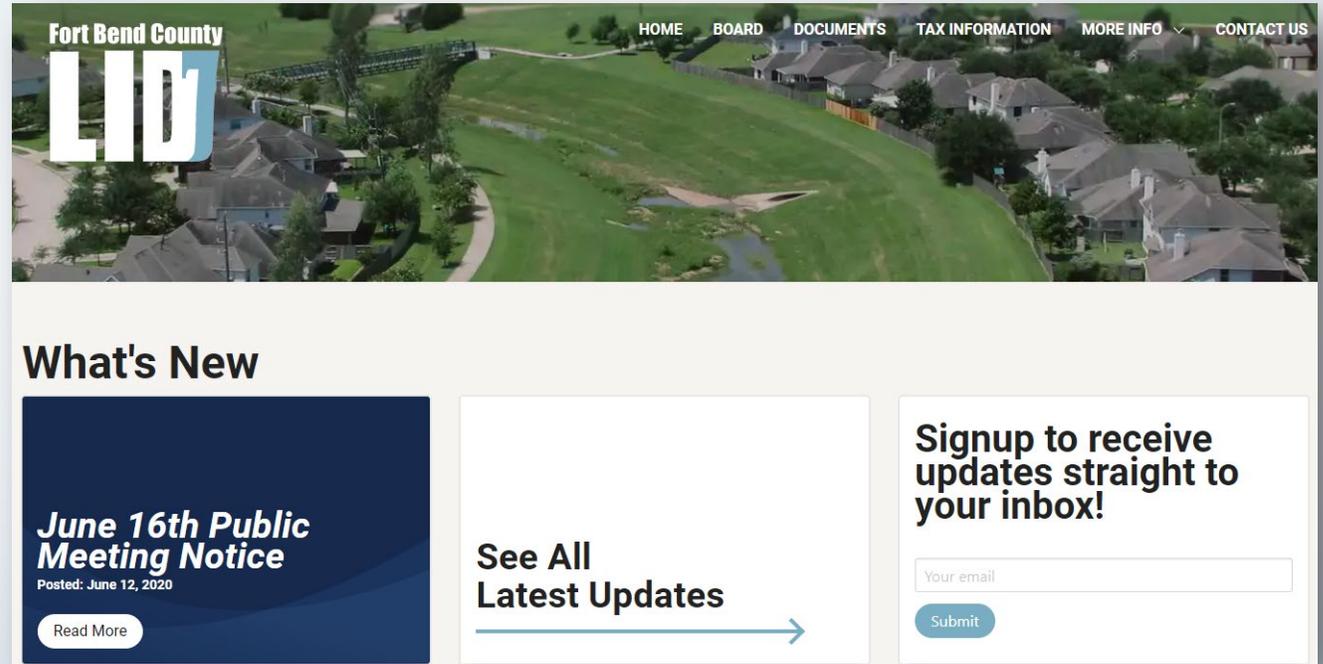
- FBCLID 7 currently protects over \$1.5 billion in assessed taxable value.
- Protecting against flooding and decreased property values is highest priority for FBCLID 7 Board of Directors.
- Improved flood protection will benefit all residents and maintain property values.

Finalized project features:

- Accommodates Atlas 14 rainfall volumes
- Increase freeboard to 18 inches (Meets FBCDD 2011 standards)
- Increase pumping capacity by 210,000 GPM
- Creates more storage for back-to-back rain events
- Reduced structure and vehicle flood risk

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Questions?

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