



Low Impact Development

Lessons over the Years

Presenter:
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A man wearing a cowboy hat and a patterned shirt is playing an acoustic guitar. He is standing in front of a large Texas flag, which is partially visible on the left side of the frame. The background is dark, and the lighting is focused on the man and his guitar. The text "Don't mess with Texas®" is overlaid at the bottom of the image in a white, serif font.

Don't mess with Texas®

Low Impact Development

- 
- Exceeds Local Water Quality Requirements
 - Eases Burden on Support Entities
 - Prevents Downstream Erosion
 - Mitigates Flash Flooding
 - Aesthetically Appealing
 - Mimics Nature
 - Absorbs Greenhouse Gases
 - Solves Tough Engineering Challenges



But Do
Developers
Care?



WHY: VISION





Single Family Residential





CAMELLIA

RESIDENTIAL

DEVELOPMENT



Side By Side Comparison

Conventional Costs

- Based on 80 Acres and 224 lots
- Cost per Developable Acre - \$97,132
- Cost per Lot - \$34,690

LID Construction Costs

- Based on 80 Acres and 323 lots
- Cost per Developable Acre - \$85,417
- Cost per Lot - \$21,156

44% increase

But...does this
correlate to 44%
higher costs?

99 MORE
LOTS!

Side By Side Comparison

ITEM	CONVENTIONAL	LID
Clearing, Grubbing and Site Preparation	\$400,000	\$400,000
Water Distribution System	\$672,071	\$509,196
Wastewater Collection System	\$697,032	\$839,784
Storm Water Collection System	\$449,106	\$1,598,016
Detention Basin	\$296,235	\$0
Amenity Basin	\$2,875,275	\$0
Irrigation System	\$0	\$248,093
Landscaping for LID Features	\$0	\$31,437
Paving and Grading	\$2,295,889	\$3,044,378
SWPPP	\$84,959	\$162,468
	\$7,770,567	\$6,833,372



Commercial & Retail

Easton Commons

WHY Low Impact Development in Commercial?

- Economics
- Economics
- Economics
- Economics
- Economics
- Economics
- Economics

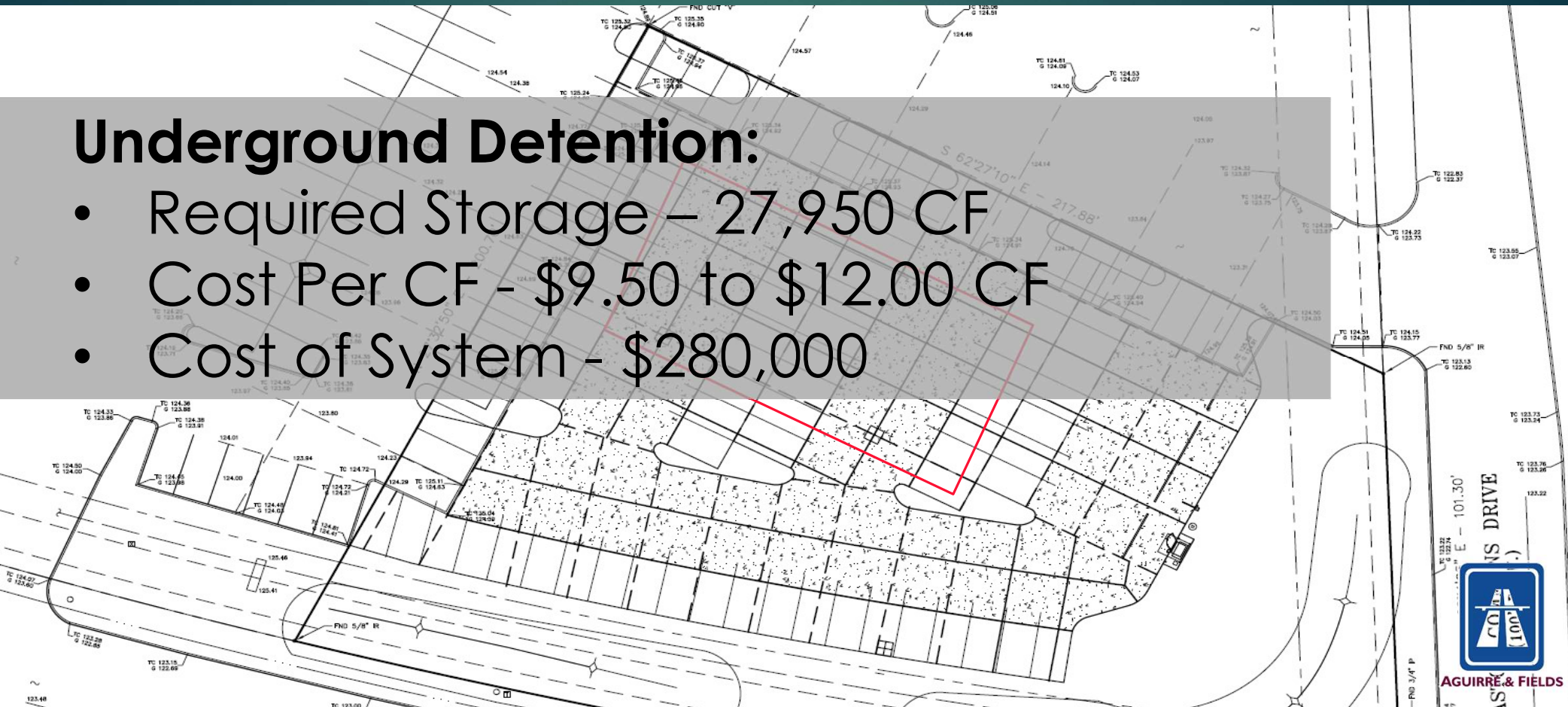


AGUIRRE & FIELDS

Easton Commons – Economics

Underground Detention:

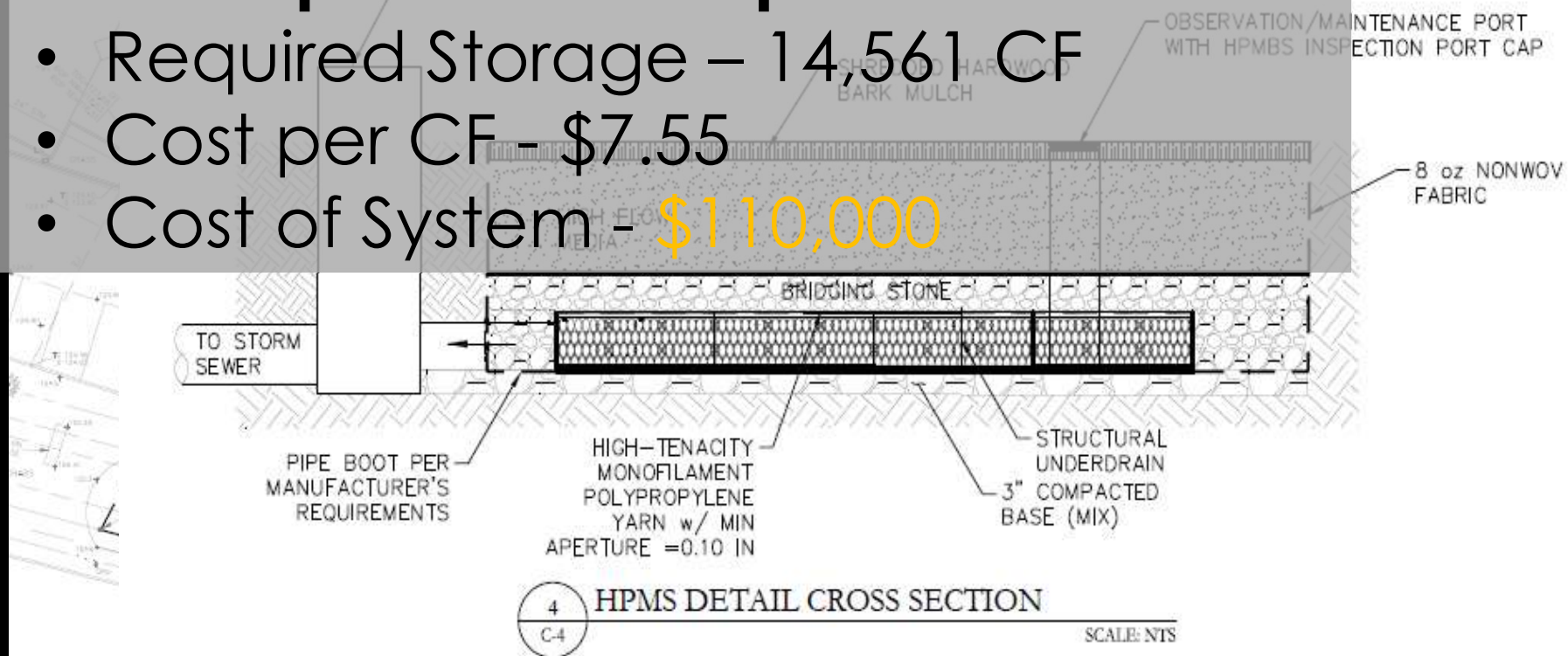
- Required Storage – 27,950 CF
- Cost Per CF - \$9.50 to \$12.00 CF
- Cost of System - \$280,000



Easton Commons – Economics

Low Impact Development Solution:

- Required Storage – 14,561 CF
- Cost per CF – \$7.55
- Cost of System – **\$110,000**



Easton Commons – Economics







A One and
Done
Commercial
Example?

LID Map

490 views

Last edit was 6 days ago

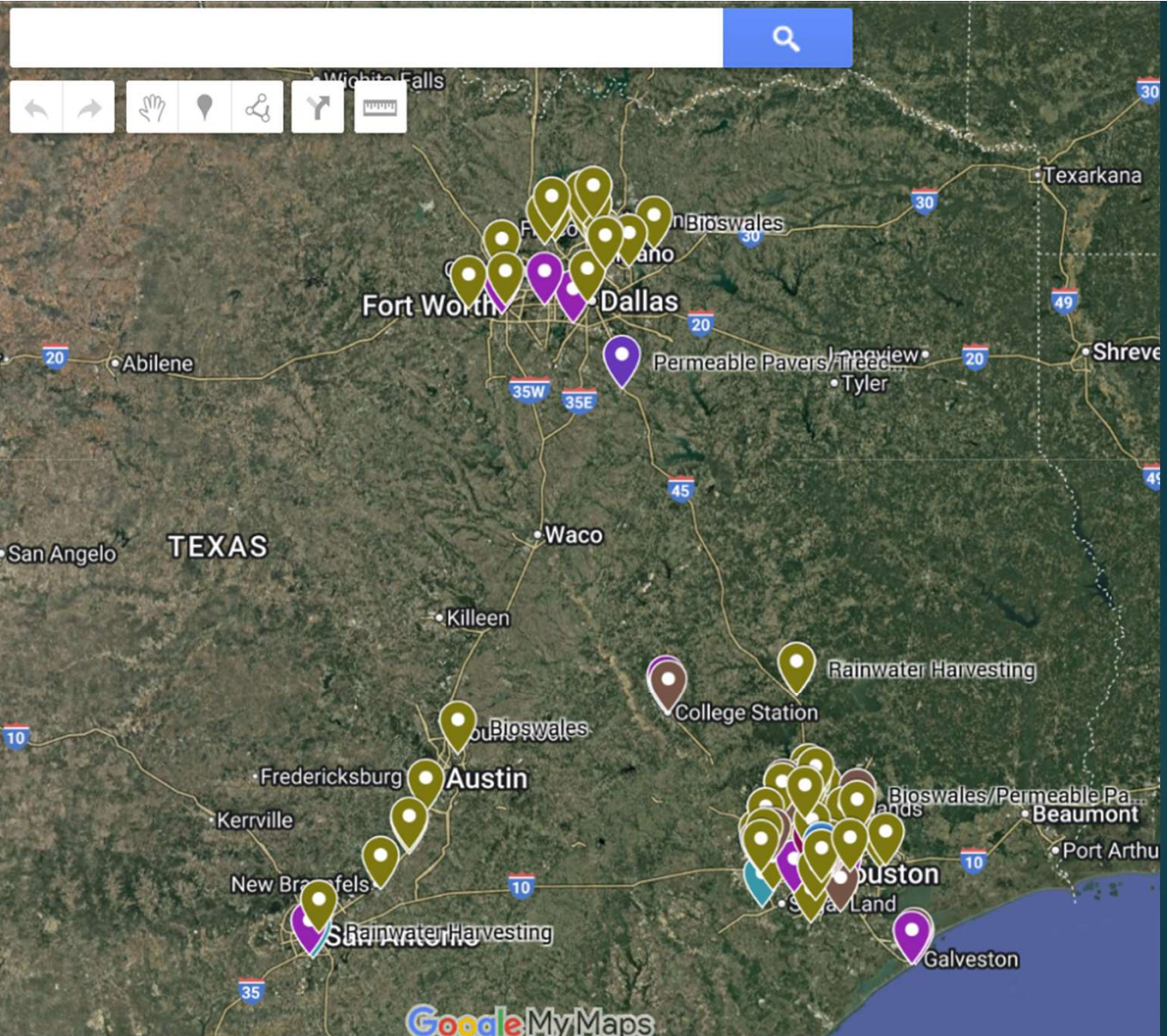
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☒ Greenrise LID Projects

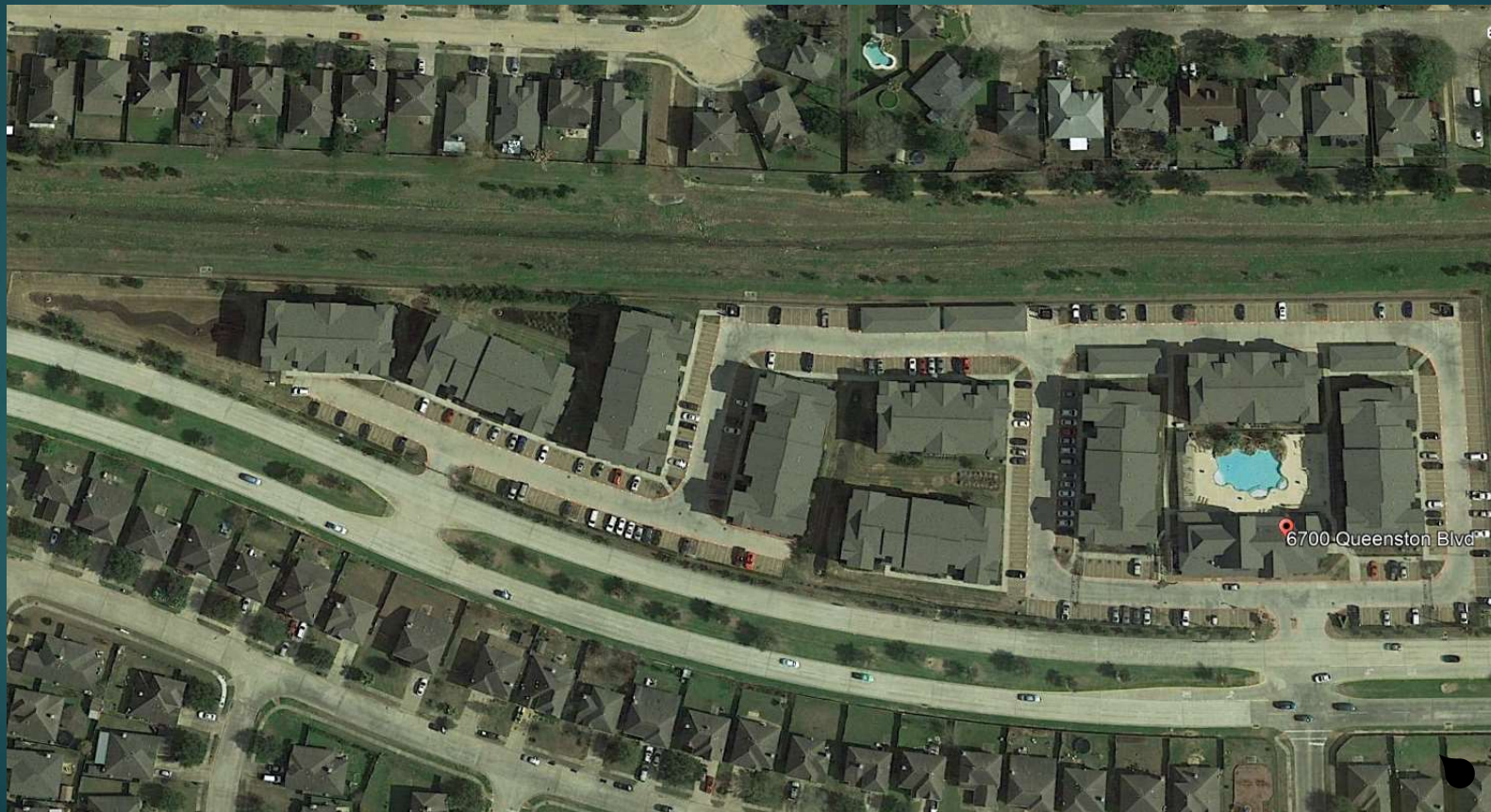
 Stylized by Features

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Fix errors highlighted red in the data
table. [Open data table](#) [Dismiss](#)

-  Bioswales (83)
-  Permeable Pavers (44)
-  Bioswales/Permeable Pavers (14)
-  Rainwater Harvesting (10)
-  Treecells (3)
-  Bioswales/Rainwater Harves... (2)
-  Bioswales/Treecells (1)
-  Permeable Pavers/Treecells (1)



Queenston Manor Apartments – Academy Development Corp.



Queenston Manor Apartments - Economics



Queenston Manor Apartments - Economics



Queenston Manor Apartments - Economics

Hard Costs

- 7 Acres @ .35 ACFT/AC = 106,000 CF

Integrated Design Approach

- 43,560 SF Porous Pavers @ \$12 SF = \$522,720 (-\$217,800) = \$304,920
- 21,000CF UG Detention / Drainage @ \$6 = \$126,000 (-\$50,000)= \$76,000
- 600 SF Biofiltration System @ \$100 SF = \$60,000
- 50,000 CF @ \$.50 CF (Bioswale Excavation & Hauloff) = \$25,000
- 2,500 SY Sod @ \$1.30SY = \$3,250

Total Cost = \$469,170

Opportunity Seized – ROI = 10 Months

Queenston Manor Apartments - Economics





Capital Improvement Projects



Birnamwood Drive

Harris County

WHY Low Impact Development?

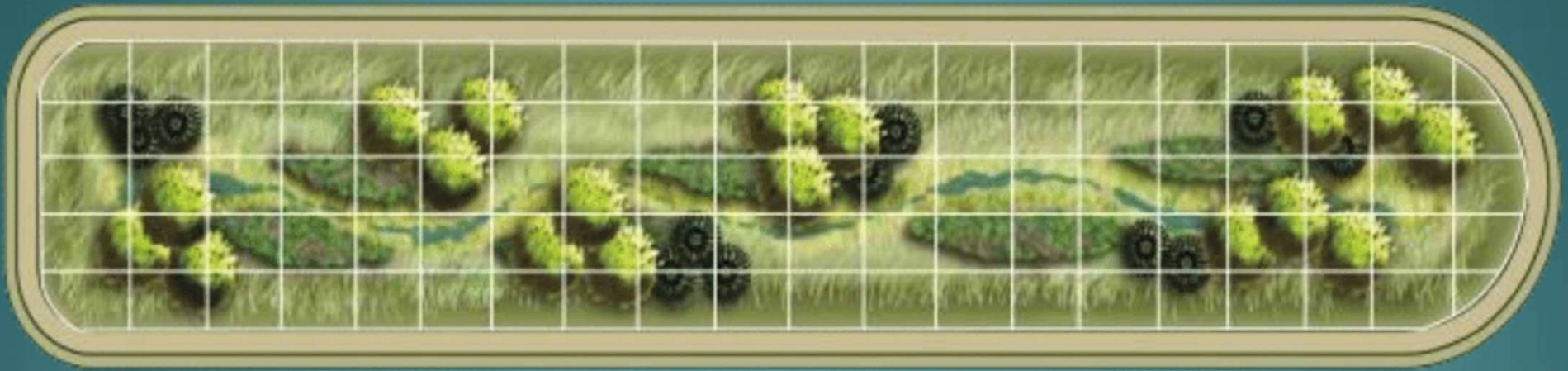
- Reduced Construction Costs
- Reduced Maintenance Costs
- Safety
- Practice What We Preach
- Proof of Concept



1-Mile Long 4 lane Concrete Boulevard with Median

	Traditional (estimated)	LID (actual)
Site Prep & Earthwork	\$391,634.00	\$449,060.00
Drainage	\$400,000.00	\$288,432.00
SWPPP	\$69,600.00	\$87,000.00
Landscape Planting	\$30,000.00	\$66,140.00
Landscape warranty/Maint	\$0.00	\$34,630.00
Bridge	\$208,517.00	\$208,517.00
Subgrade & Paving	\$1,139,791.00	\$1,139,791.00
Traffic	\$9,000.00	\$9,000.00
Signing & Striping	\$25,461.00	\$25,461.00
Traffic Signal	\$128,010.00	\$128,010.00
Utilities	\$16,140.00	\$16,140.00
Extra Work Items	\$15,650.00	\$36,650.00
Biofiltration System	\$0.00	\$132,931.00
SWQ System	\$30,000.00	\$0.00
Detention Basin	\$350,000.00	\$0.00
Total	\$2,813,803.00	\$2,621,762.00
estimated cost benefit:	\$192,041.00	7% Cost Reduction Per Mile

Traditional Bioretention



Soil Type	Low Flow Rate Soils	Medium Flow Rate Soils	High Flow Rate Soils
Infiltration Rate	5 in/hr	30 in/hr	100 in/hr
Flow Rate in CFS/SF	.000115 CFS/SF	.00069 CFS/SF	.0023 CFS/SF
Area of Bioretention Required for 3 CFS	26,086 SF of Bioretention	4,347 SF of Bioretention	1,304 SF of Bioretention
Cost Per SF	\$15 SF	\$45 SF	\$150 SF
Cost of Solution	\$391,290.00	\$195,615.00	\$195,600.00
Cost of Maintenance Assuming \$1 SF / 2X YR	\$52,172.00	\$8,694.00	\$2,608
10-Yr Life Cycle	\$913,010.00	\$282,555.00	\$221,680.00

Bagby Street

City of Houston

WHY Low Impact Development?

- Green Roads Certification
- Increased Storm Sewer Capacity
- Decreased Size of Storm Sewer Conveyance Pipe
- Proof of Concept

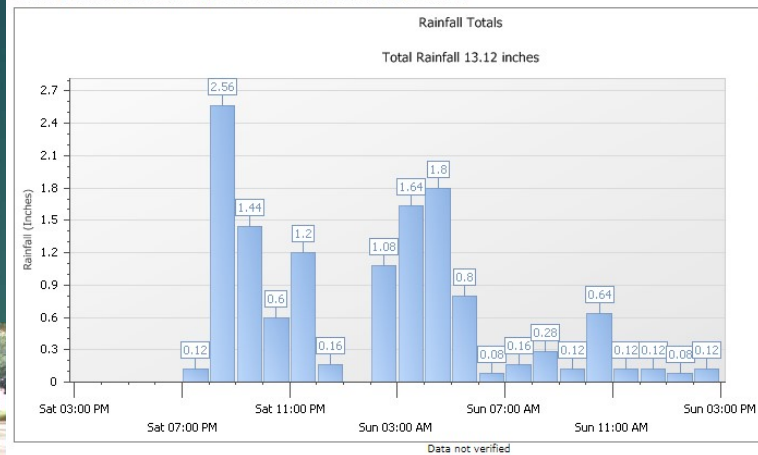
WALTER P MOORE



Bagby rain gardens

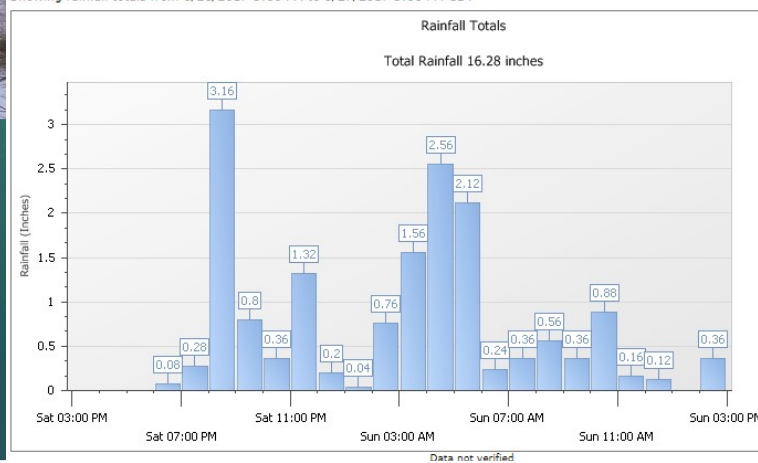
WALTER P MOORE

Showing rainfall totals from 8/26/2017 3:00 PM to 8/27/2017 3:00 PM CDT



> 100 yr over previous 24 hours

Showing rainfall totals from 8/26/2017 3:00 PM to 8/27/2017 3:00 PM CDT



Bagby Street

City of Houston

“During Memorial Day, Tax Day and Hurricane Harvey Floods, Bagby Street **Out Performed Every Street in the Midtown District”**

- Marlon Marshal
Director, Engineering & Construction
Midtown Redevelopment Authority

WALTER P. MOORE



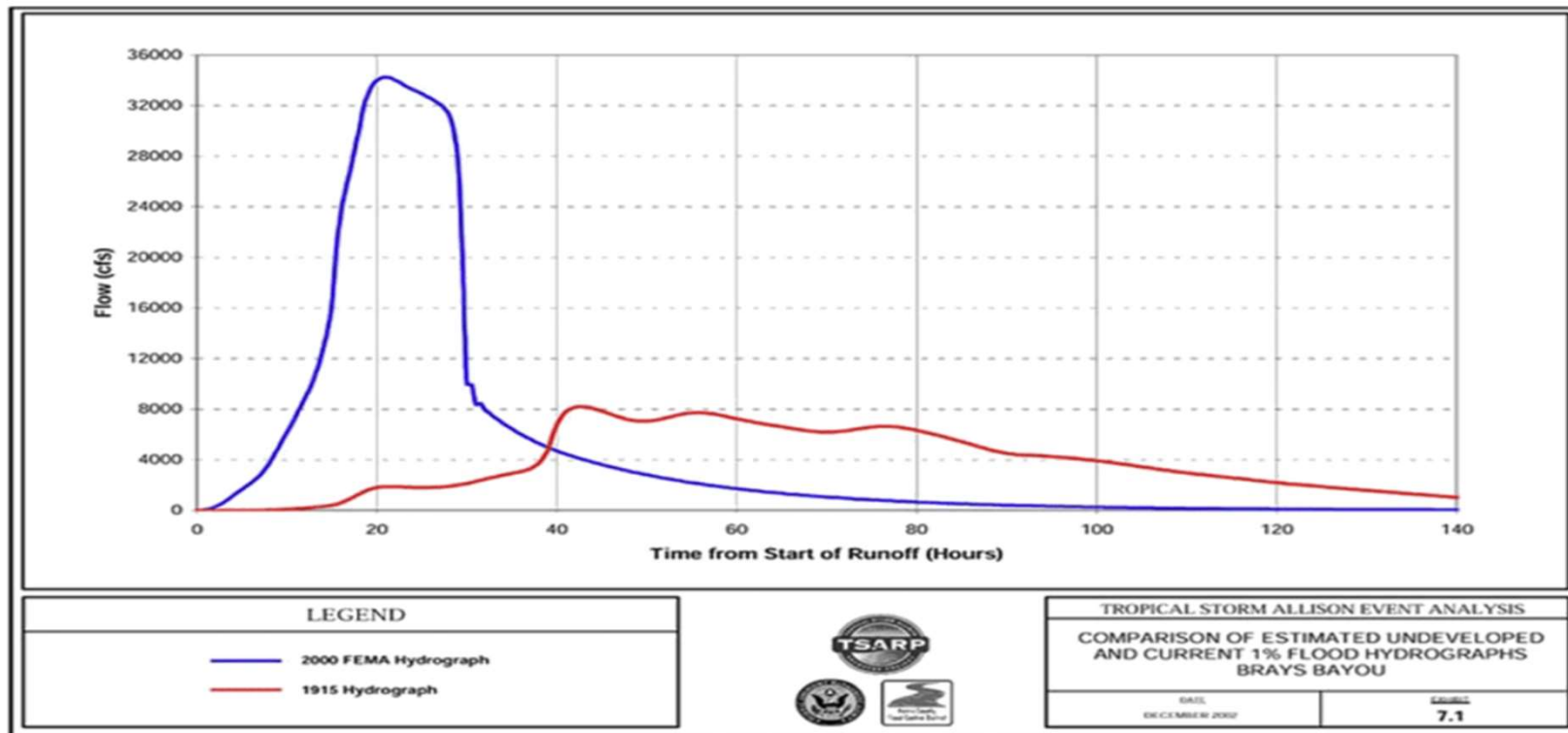
SAN **MARCOS** **RIVER**

WHY FOCALPOINT FOR WATER QUALITY

An aerial photograph of a modern urban development. The scene features a wide, dark asphalt road with white lane markings and a large white arrow pointing left. To the left of the road is a sidewalk and a landscaped area with green grass and small trees. To the right of the road is another sidewalk and a landscaped area with green grass and small trees. In the background, there are several multi-story buildings, including a large one with a red roof and a smaller one with a brown roof. The sky is blue with scattered white clouds. The text "WHY FOCALPOINT FOR WATER QUALITY" is overlaid on the image in large, bold, yellow, green, and blue letters.

HOW: BELIEFS





White Oak and Brays Hydrographs: 1915 & 2000

Blue line shows 2000 concentrated urban runoff; red line shows 1915 pre-urbanized runoff

Resilient Design





Resilient Design – Tax Day > 16”



Resilient Design– Harvey > 29”



Thank you!

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