Glen Forest Detention Basin

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One Company. Unlimited Potential.
A suite of flood damage reduction projects currently active in the Greens Bayou Watershed, including:

- Kuykendahl /Glen Forest Detention Basins
  - $63 million construction cost
- Greens Bayou Federal Project
  - $58 million construction cost

- Glen Forest Detention Basin
  - $18 million construction cost
Project Need
Existing Conditions

**Existing Conditions Diagram**

**Notations**

1. **COORDINATE AND BEARING BASE PER TEXAS STATE PLAN COORDINATE SYSTEM, SOUTH CENTRAL ZONE NUMBER 2004, MARTHINS 200 mol.**
   - DISTANCES AND COORDINATES SEPARATE AND MAY BE CONVERTED TO GRID BY APPLYING A COMBINED SCALE FACTOR OF 0.9999999993.

2. **BOUNDARY INFORMATION TAKEN FROM DRAWING TITLED "TOPOGRAPHIC SURVEY OF APPROXIMATELY 107.6 ACRES PREPARED BY MONTGOMERY & ASSOCIATES LAST REVISED 9/15/06. IT DOES NOT REPRESENT A BOUNDARY SURVEY."**

3. **ONLY THE EXTERIOR BOUNDARY AND ROAD 520-520-520 OF GLEN FOREST ESTATES SUBDIVISION, AS RECORDED UNDER VOL. BY P.S. 37 OF R. F. HALL, ARE SHOWN. THERE IS AN APPROXIMATE BOUNDARY DELINQUENCY FROM THE SUBDIVISION MAP WAS PLACED HEREON FROM LIMITED INFORMATION FROM THE HEALTHY PROPERTY OWNER OF GLEN FOREST ESTATES SUBDIVISION, IN ACCORDANCE WITH THE CLIENTS COMMUNICATION THAT SUCH DATA HAS NOT BEEN PROVIDED.**

4. **BOUNDARY SHOWN HEREIN ARE REFERENCED TO AERIAL PHOTOGRAPHIC REPORT FROM GESTETT ENGINEERING, INC., ENCLOSED.**

**Request for Service No. 01**

- **MARION COUNTY PURCHASE ORDER NO. PHOENIX**
- **ON-CALL GEOLOGICAL ENGINEERING REPORT**
- **GLEN FOREST REGIONAL DEVELOPMENT BOARD**
- **MARION COUNTY ASSESSMENT DISTRICT**
- **MARION COUNTY REPORT NO. 1460710971A**

**Scale:** 1" = 400'

**Date:** 2/28/2014

**Sheet Number:** 5 of 75

**Jones Carter**
• 160-acre site near Greens Road and I-45
• Former neighborhood buy-out
• 3-Cell detention basin system
• Provides 894 Ac-ft of storage when complete
• Removes approximately 2.15 million CY of soil
• Construction underway now
Weir Configuration

Original Weir Locations
Weir Configuration

- Basin modeled with HEC-HMS and off-line weir calculation spreadsheet by another consultant
- Three – 50’ structures
- Directed to be installed at low spots along P159

Original Weir Locations
$375,000 Construction Cost
Uncertainty about how they would operate or whether they would actually fill the basins
Uncertainty about overtopping velocity outside of weirs
• Weirs appeared to function in a narrow storm event range
• Permit wouldn’t allow disturbance below OHWM, which set the weir throat elevations
• HMS model said ~1900 cfs was average flow rate into basin, which would overwhelm the weirs
• Overtopping outside of weirs was occurring during 10-year event
Weir Optimization

Another HCFCD consultant prepared xpstorm 2D model to identify overflow hot spots.

Three areas identified, none of which had proposed weirs or bank hardening.
Weir Optimization - Criteria

- Minimize the length of embankment overtopped by $V > 5$ ft/s in 10-year
- Minimize the construction cost of embankment protection
- Minimize the effect of weir configuration on the basin inflow hydrograph
Weir Optimization – xpstorm

- xpstorm 2D model
- 93,218 cells
- 8 hour average run time
- Multiple domain model
- 150’ cell size in low resolution area
- 10’ cell size in high resolution area
Weir Optimization – xpsstorm
Weir Optimization – xpstorm

- Three weirs
- 350’ total weir length
- 450’ rip rap
- High velocity flows contained
- $577,100 construction cost
Weir Optimization – xpstorm

- Three weirs – Weir on Basin C moved
- 350’ total weir length
- High velocity overflows not contained
- $479,600 construction cost
**Weir Optimization – xpstorm**

- Three weirs
- 400’ total weir length
- Weir A shorter, Weir C longer
- 120’ rip rap
- High velocity overflows contained
- $531,000 construction cost
Weir Optimization – xpstorm

- Three weirs
- 250’ total weir length
- Weir A shorter, Weir C shorter
- 120’ rip rap
- High velocity overflows contained
- $424,900 construction cost
Weir Optimization – xpstorm

- Three weirs
- 325’ total weir length
- Weir A shorter, Weir C longer
- 120’ rip rap
- High velocity overflows contained
- $466,600 construction cost
Weir Optimization – xpstorm

- Three weirs – Back to Optimization 4
- 230’ total weir length
- Weir B shorter
- 120’ rip rap
- High velocity overflows contained
- $411,100 construction cost
Weir Optimization – xpstorm

- Two weirs
- 200’ total weir length
- Weir B removed
- 120’ rip rap
- High velocity overflows contained
- $323,800 construction cost
Hydrology Comparison

Storage - time 10-yr storm

- Optimization 7 model
- HEC-HMS model
- Original Reconfiguration from other consultant

Storage (Ac-ft)

Time (min)

0 500 1000 1500 2000
Conclusions/Lessons Learned

- Basin configuration still not tied back to hydrology of watershed
- HEC-RAS 5.0 unsteady
- Saved 14% on construction cost
- $50,000 construction cost savings
- Much higher level of erosion protection
- Increased confidence in how the basin will function
Questions?