

CITY OF NORMAN

City Council Conference

Tuesday, July 11, 2017

Lower Imhoff Creek Study

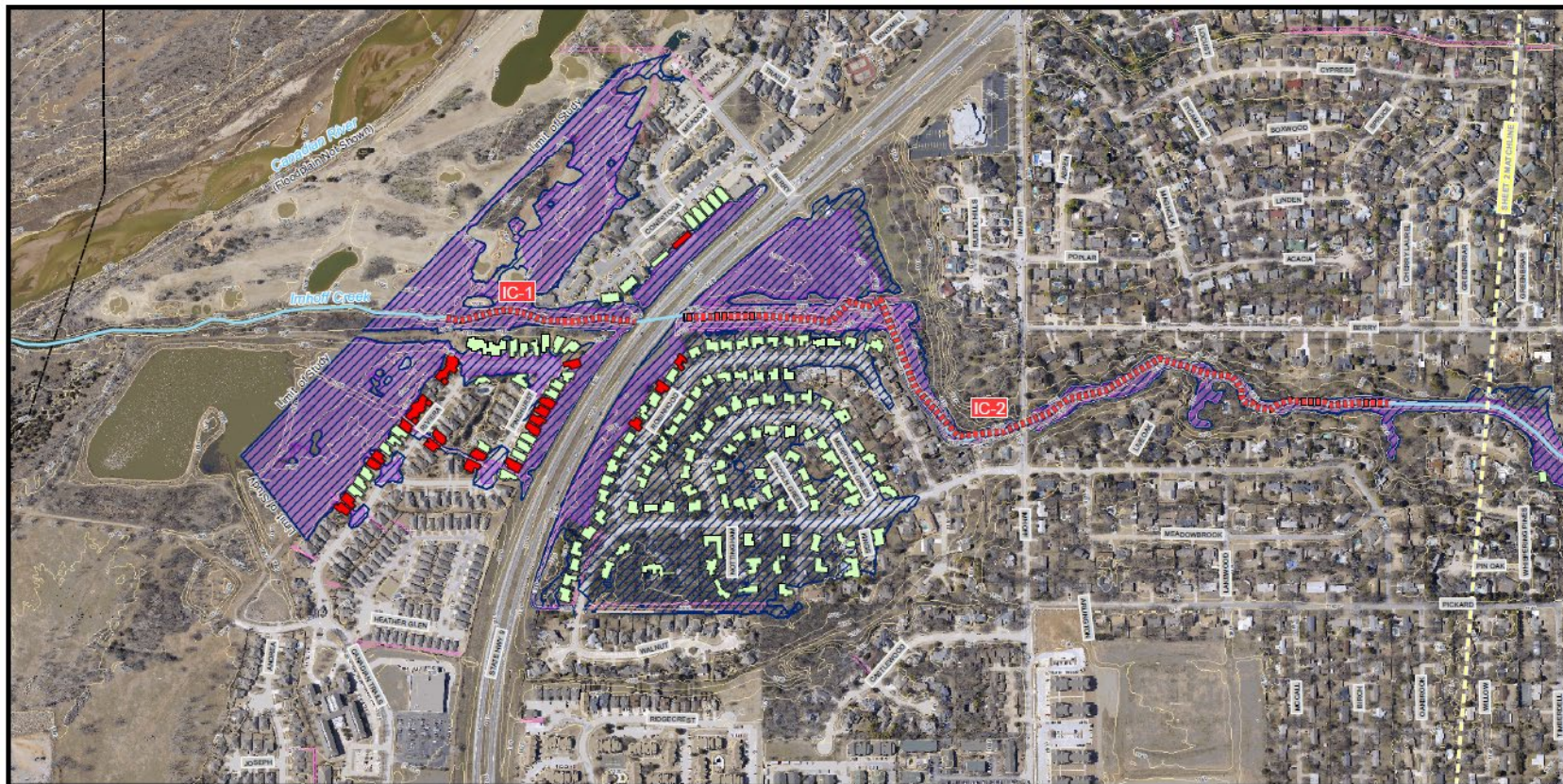
Presented By: Carrie Evenson, City Stormwater Program Manager
Brandon Claborn, Principal Engineer, Meshek & Associates



History of Lower Imhoff Creek

- SWMP identified problem in 2009 as:
 - 4,200 LF of severe bank erosion along both banks
 - Led to trees and fences falling into creek
- Listed as IC-2
 - Watershed priority ranking: 2
 - Overall City priority ranking: 5
 - SWMP Cost: \$6,563,091
- Solution: Prevent further erosion and loss of property by stabilizing streambanks upstream of Hwy 9





0 250 500 1,000 Feet

Aerial Photography: 2007
Coordinate System: Oklahoma State Plane,
South Zone
Horizontal Datum: NAD 1983
Vertical Datum: NAVD 1988

Legend

- City Boundary
- Existing Drainage Easement

- Stream Centerlines
- Level 1 and 2 (Detailed)
- Level 3 and 4 (General)

Floodplains

- 100-year Baseline
- 100-year Solution

Buildings in Floodplain

- 100-year Baseline
- 100-year Solution

Recommended Solutions

- Road Crossing Upgrade
- Property Buyouts
- Floodwall
- Channel Stabilization
- Channel Improvements
- Storm Sewer Improvements
- Storm Water Detention



Storm Water Master Plan

Exhibit 6-7a

Baseline Floodplain and Recommended Solutions Overview Imhoff Creek

Sheet 1 of 3

Job No: 044194100 Date: 12-11-08 Scale: 1 inch = 500 Feet
File: W:\R\proj\441941\Norman\Report\Figures\Imhoff_1.mxd


History of Lower Imhoff Creek

- How do we stabilize streambanks?
 - Traditional approach: Hard armoring of channel
 - Pros: Protects property, Addresses immediate erosion problem
 - Cons: Increases velocity, Makes downstream erosion worse, Reduces natural stream functions
 - Alternative approach: Natural stream restoration techniques
 - Pros: Protects property, Restores or maintains natural stream functions
 - Cons: Can't be used in all stream conditions




History of Lower Imhoff Creek



- Purpose of Lower Imhoff Creek Study
 - Address concerns of adjacent property owners
 - Refine design options from SWMP
 - Preference is for use of natural stream restoration techniques
 - Update SWMP cost estimate
 - Provide plan conceptual design and plan for future projects to be considered in annual Capital budget process
- 


History of Lower Imhoff Creek



- 2009 – present
 - Streambank erosion continues
 - 2014
 - City contacted by property owner at 2802 Walnut Drive concerning property damage and loss due to erosion
 - Council adopts FYE 2015 Capital Budget – includes \$200,000 for Lower Imhoff Creek Study
 - 2015
 - Council authorizes Contract No. K-1415-134 with Meshek & Associates on May 26, 2015, for Lower Imhoff Creek Study
 - Goal: To provide conceptual engineering design and phasing of stream improvements using more natural stream restoration techniques where possible
- 

History of Lower Imhoff Creek

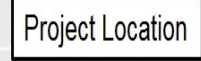


- 2015
 - Flooding leads to damage channel liner immediately upstream of the study area
 - Requires emergency repair
 - Application submitted to FEMA for funding
 - Meshek & Associates and Freese & Nichols, Inc. (consultant for liner repair) worked with City staff to ensure designs were compatible
 - 2016
 - Design work on Channel Liner Repair and Lower Imhoff Creek study continue
 - 2017
 - Lower Imhoff Creek Study
 - Final report completed
 - Channel Liner Repair
 - Final design completed and bid opening
 - Additional damage to channel liner at upstream segment
 - Final design for repair has been completed
 - Contract award scheduled for July 25th Council Meeting
- 

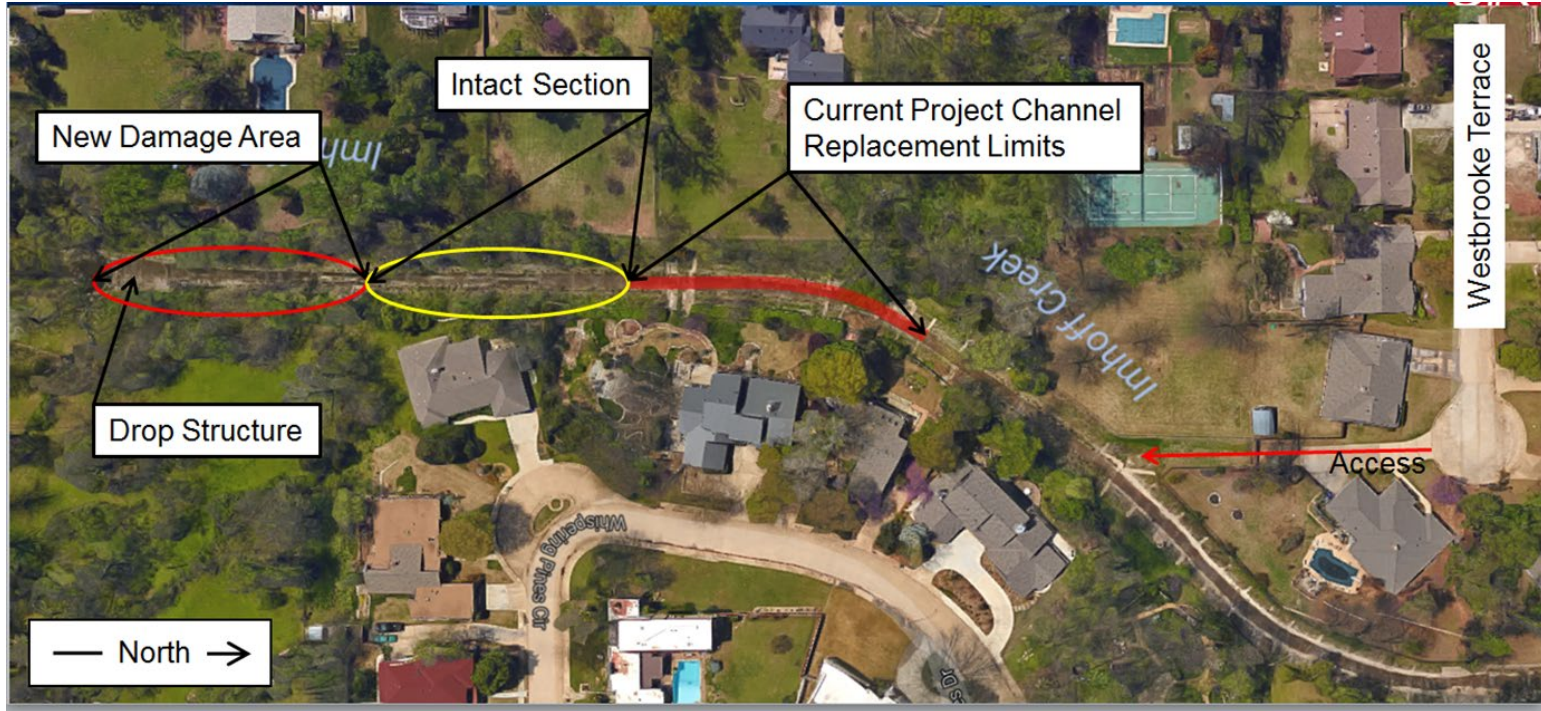


Repair

-
- Beneficial



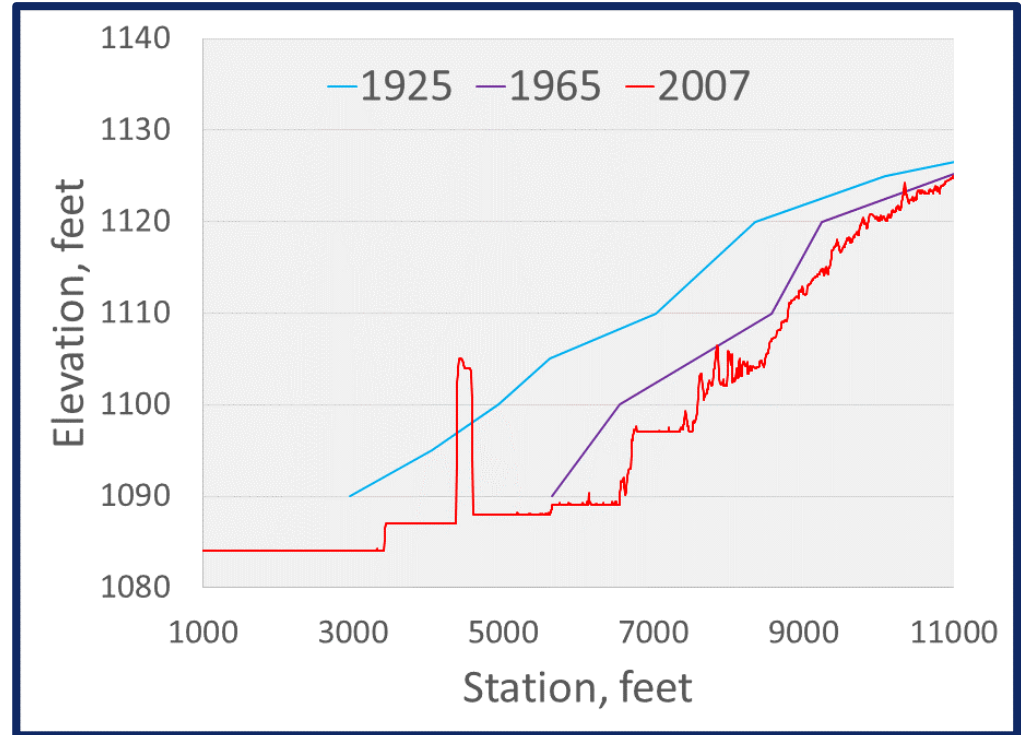
Project Location





Imhoff Creek

- Channel flow line has dropped over time

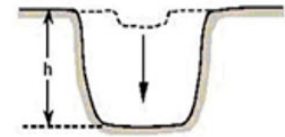


Imhoff Creek Historical Flow Line

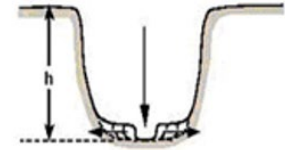
Imhoff Creek

- Channel Evolution Model
- Stage II (disturbance)
- Future damage of the bridge structure if not properly addressed
- Downstream channel is transitioning through Stage III (incision) to Stage IV (widening)
 - Becomes “U” shaped
 - Down cutting
 - Bank erosion

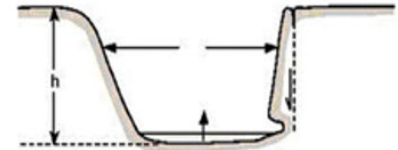
Stage I



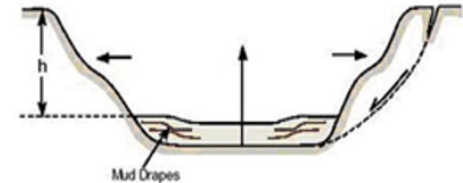
Stage II



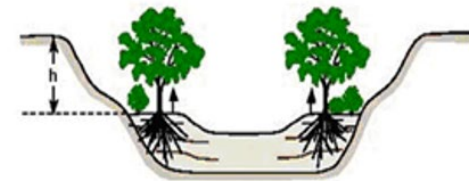
Stage III



Stage IV



Stage V



Imhoff Creek



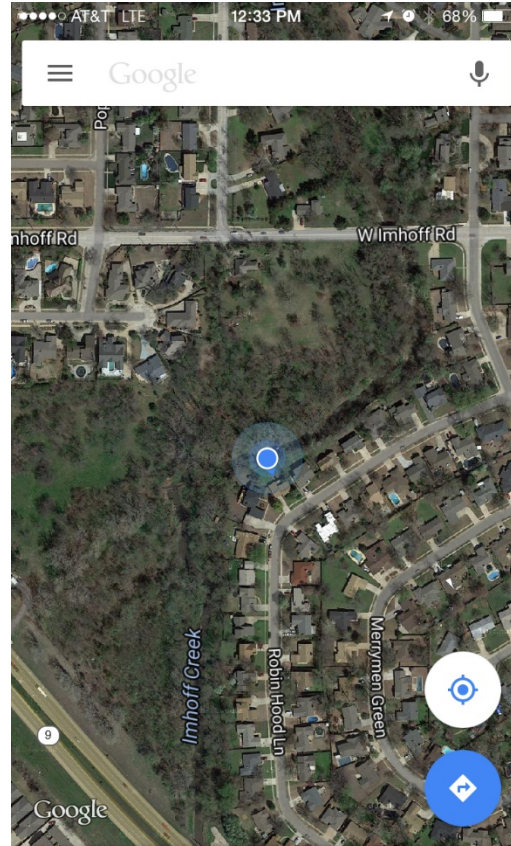
Imhoff Creek



Imhoff Creek

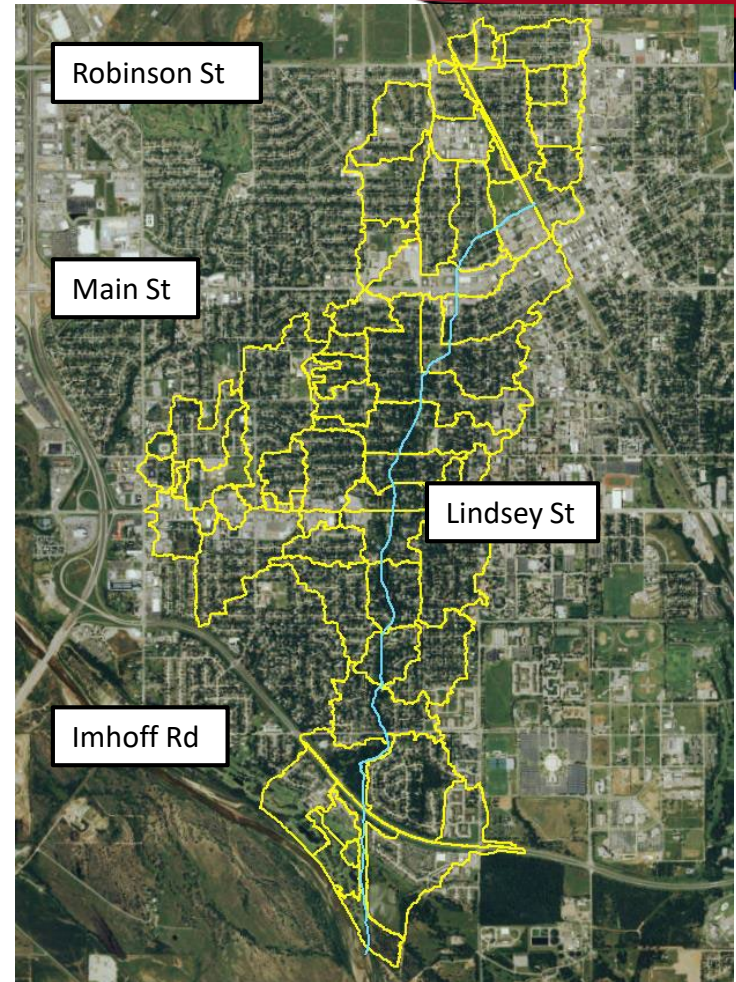


Imhoff Creek



Imhoff Creek

- Updated Basin Hydrology
 - 0.8 mi² at Main
 - 2.16 mi² at Lindsey
 - 3.15 mi² at Imhoff
 - 3.21 mi² at SH-9




Imhoff Creek

- Updated Hydraulic Model
 - Detailed Channel Survey
 - Analyzed 2014 & 2015 Storms
 - Updated Floodplain Mostly Smaller

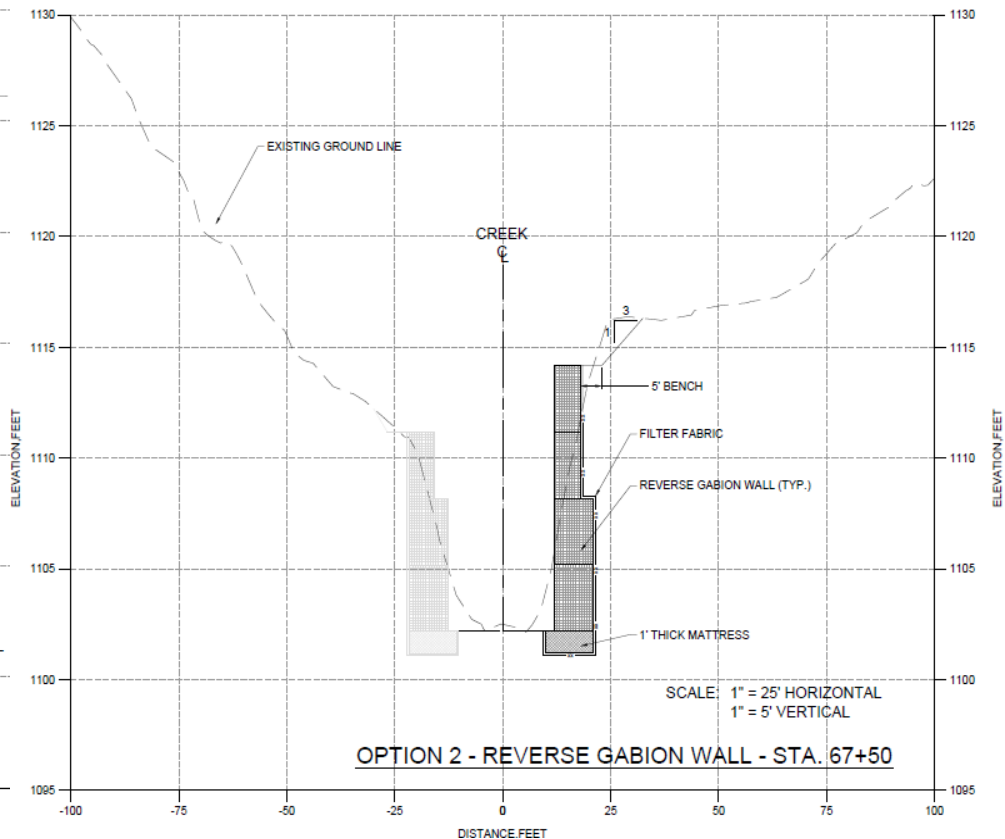
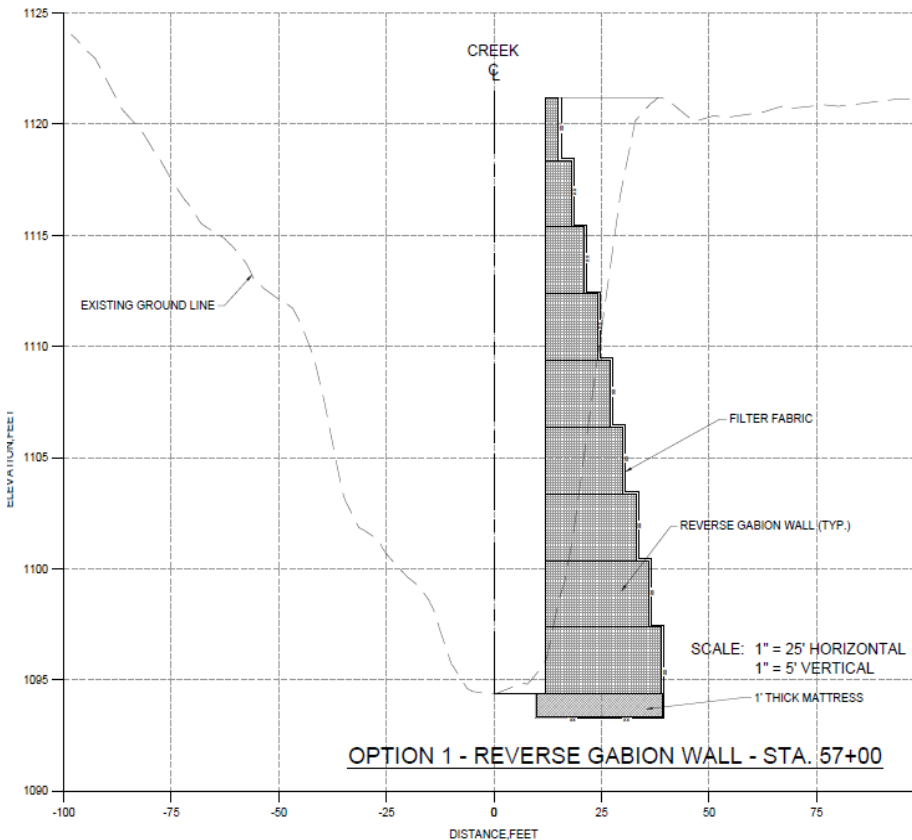


Design Alternatives

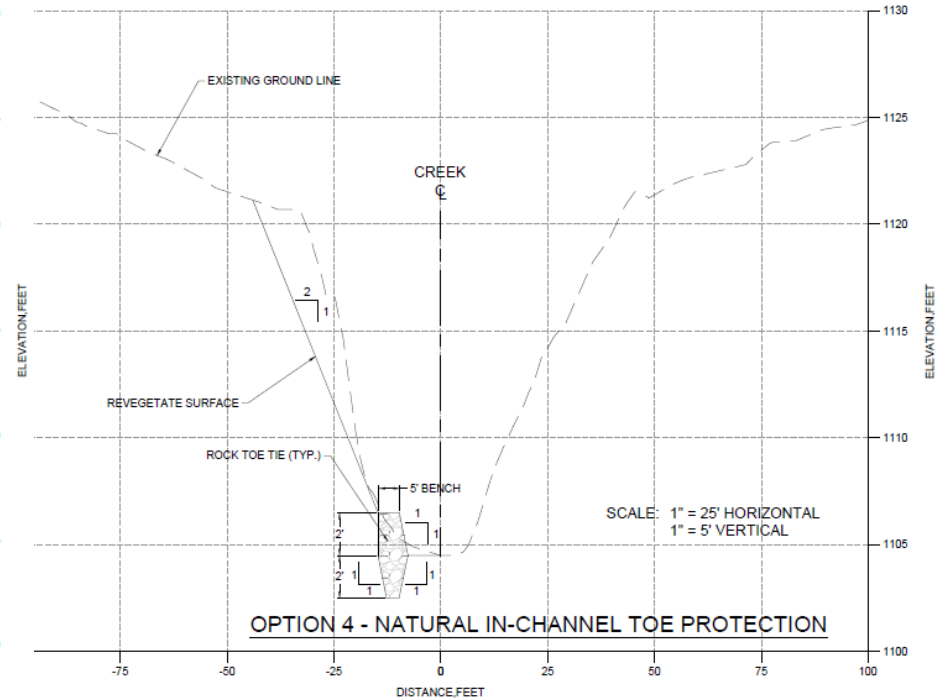
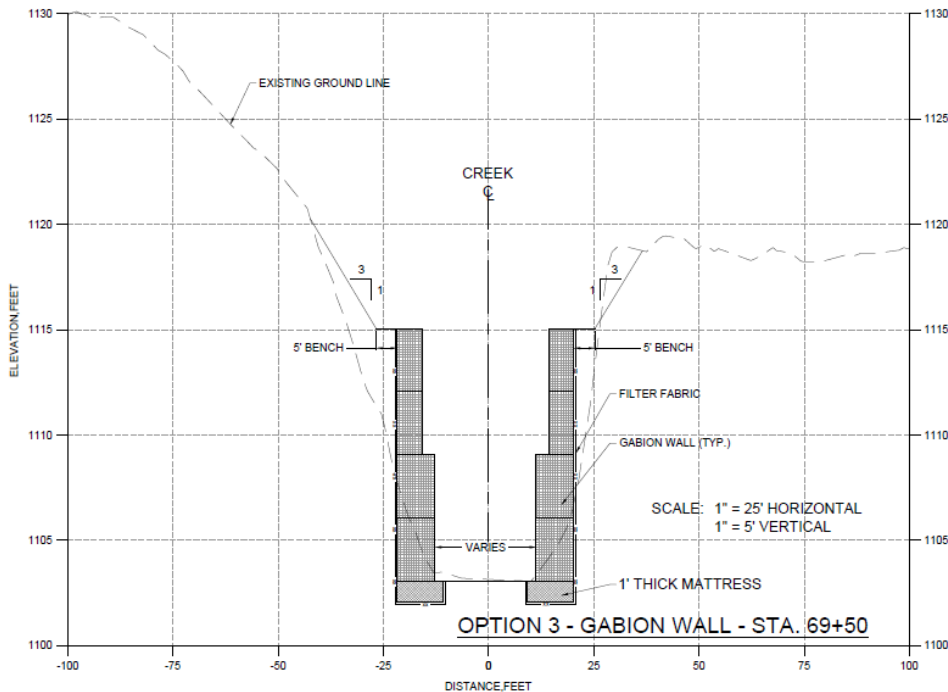


- Bank Stabilization
 - Less Structural: Stabilize the toe with large rock, flatten the slopes and vegetate
 - More Structural: Where space is limited, use gabion baskets or other structural measures to stabilize the slope
- 

Design Alternatives




Design Alternatives

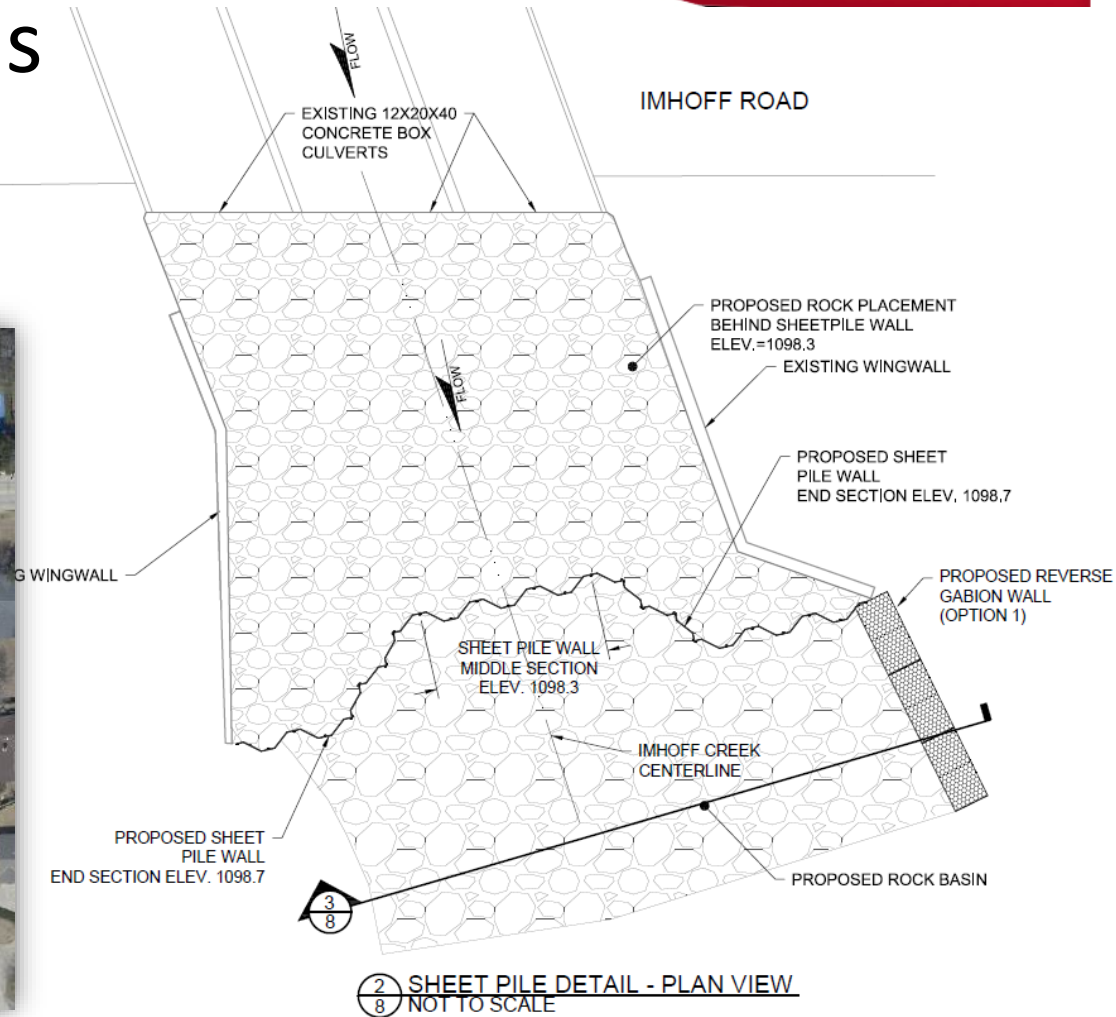




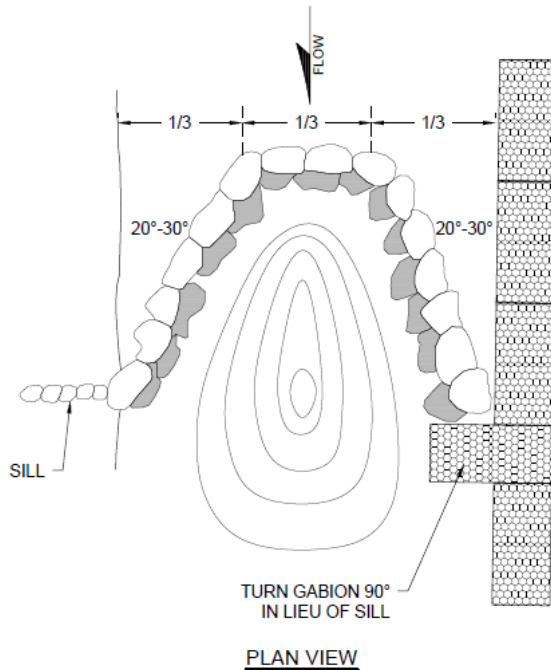
Recommendations

- Monitoring Plan
 - Document Rate of Change
 - Use to Prioritize Improvements
 - Stream Maintenance
 - Train City Staff in Stream Restoration and Bank Stabilization Techniques
- 

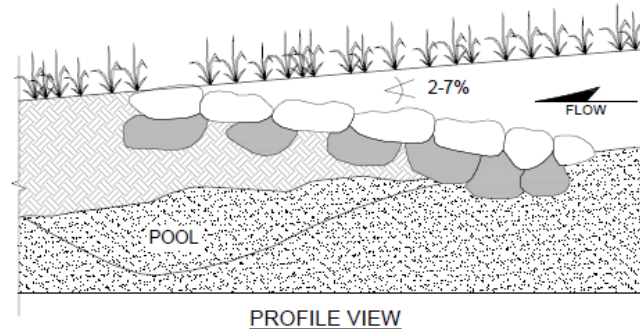
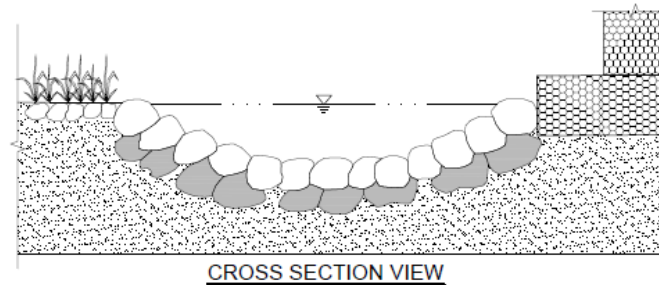
Recommendations Lower Segment



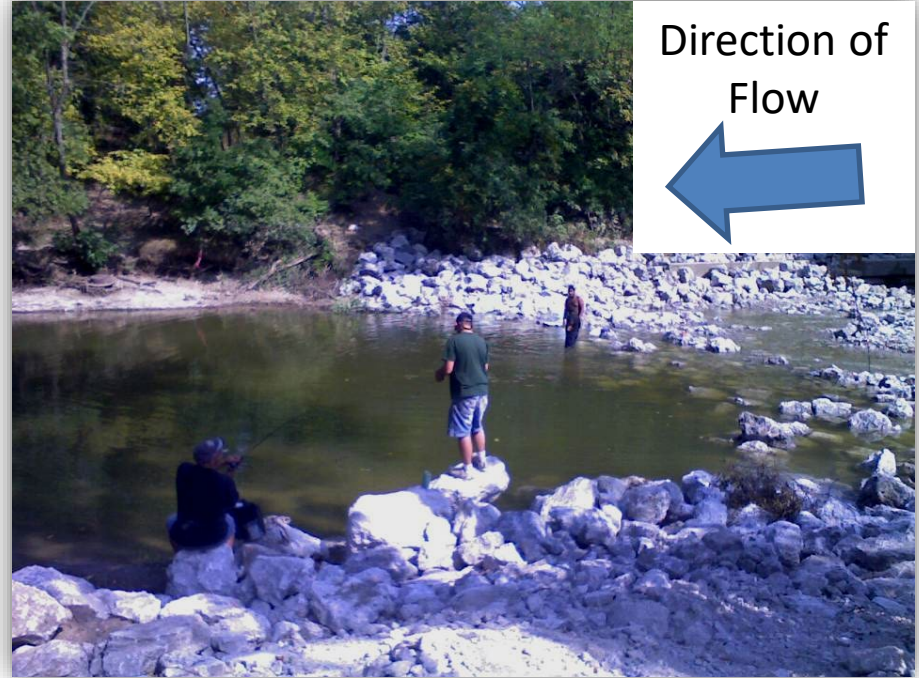
Recommendations – Downstream Segment



① CROSS-VANE DETAIL
⑧ NOT TO SCALE



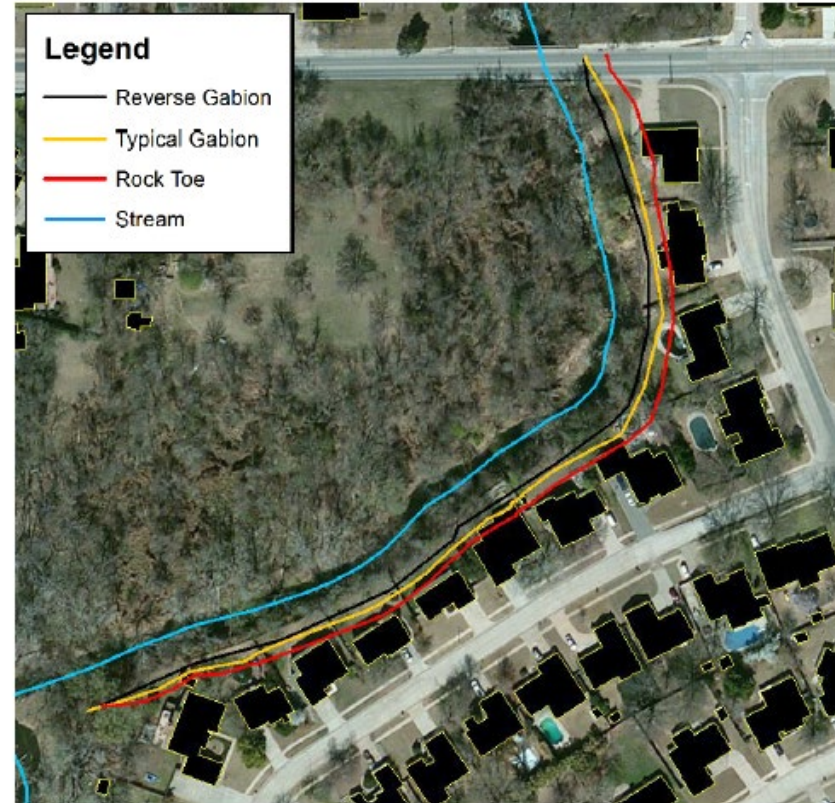
Rock Vane Examples



Recommendations – Downstream Segment

Figure 12: Estimated Impact Limits Downstream Imhoff Road

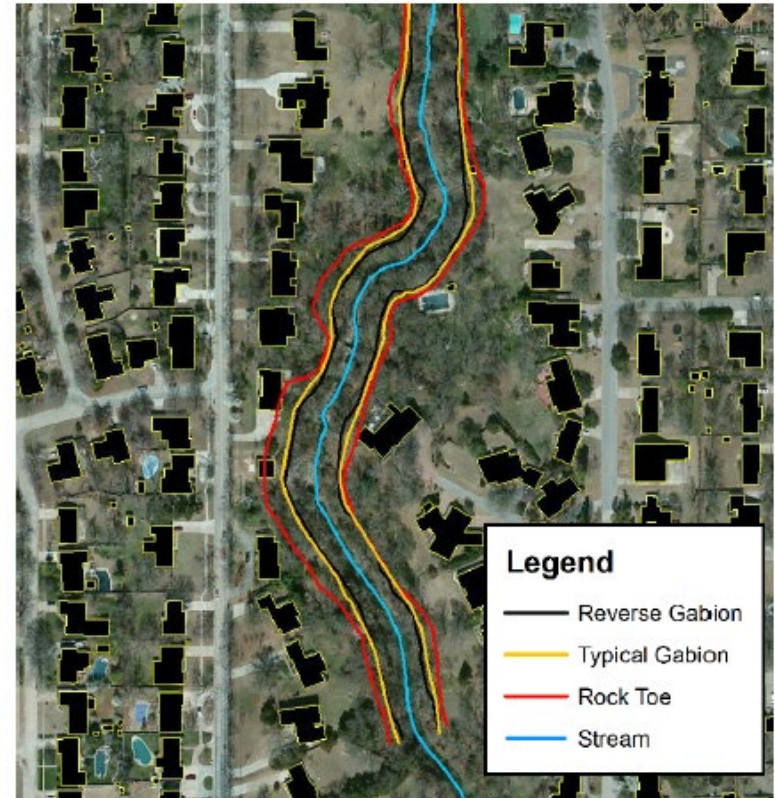
- Bank stabilization options
- Limited availability
- Additional detailed analysis required



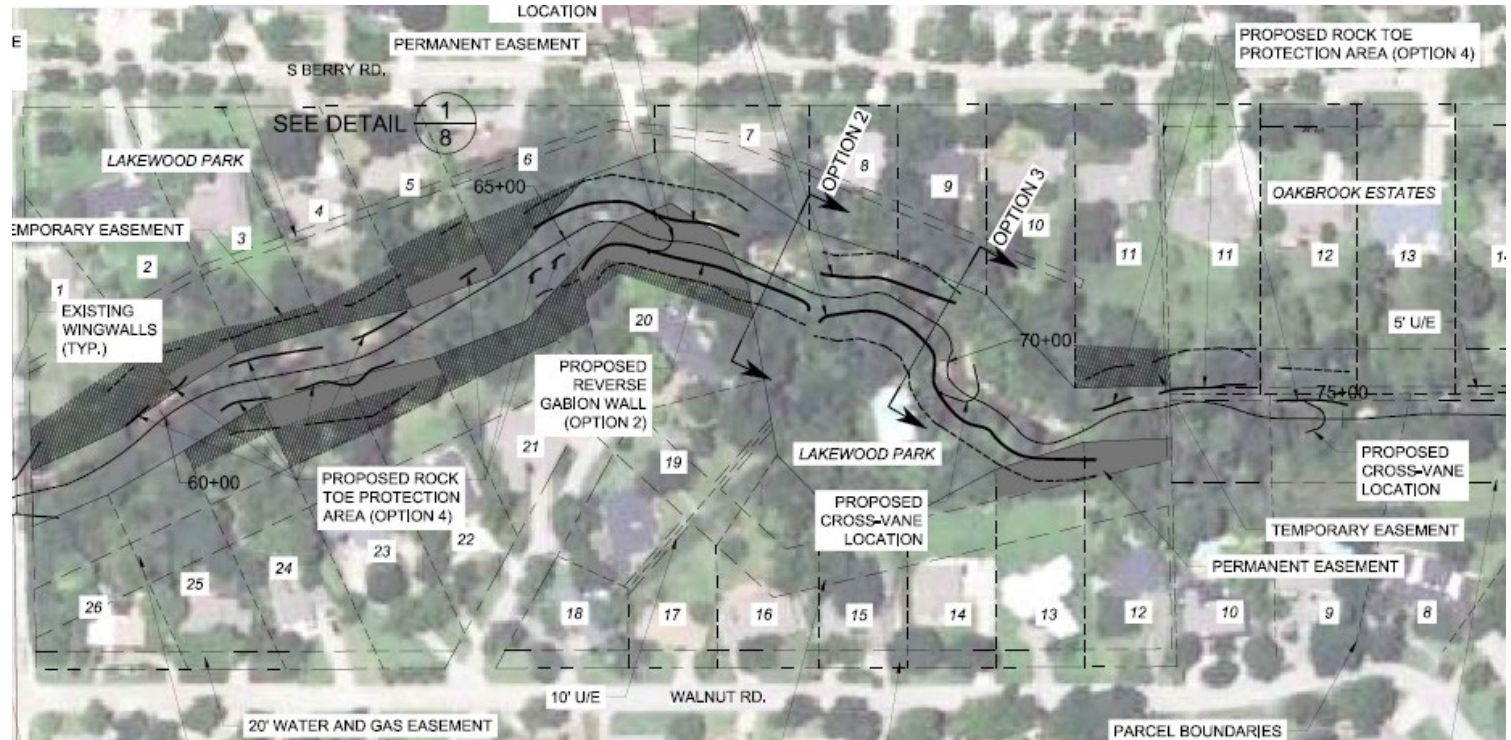
Recommendations – Upstream Segment

Figure 13: Estimated Impact Limits Upstream Imhoff Road

- Bank stabilization options
- Limited availability
- Additional detailed analysis required




Detailed Recommendations – Additional Easements Required





Summary

- Current Study – Analysis and Conceptual Design
 - Next Step – Final Design and Construction (funding needed)
 - Phase I
 - From Imhoff Road south approximately 1,200'
 - Greatest risk to existing infrastructure
 - Cost estimate: \$3,150,300
 - Phase 2
 - Upstream of Imhoff Road to end of Channel Liner Repair project
 - Cost estimate: \$4,347,950
- 

QUESTIONS?

