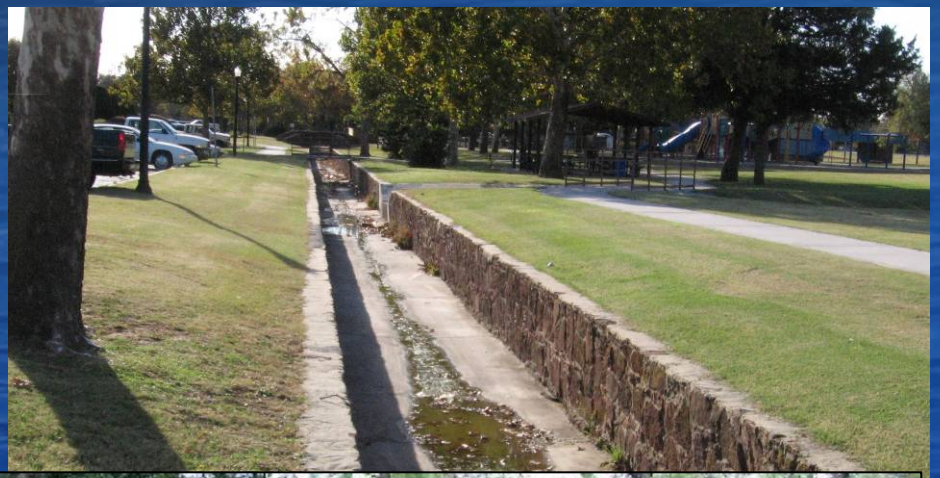
Storm Water Master Plan

City of Norman
Cleveland County,
Oklahoma

Public Meeting
April 6, 2009

Presentation Overview

- Introductions
- Goals and Objectives
- Approach
- Final Draft Report Overview
- Key Project Work Items
  - Greenway Master Plan
  - Stream/Watershed Assessments
  - Hydrologic and Hydraulic Analyses
  - Problems and Solutions
  - Financial Analyses
  - Key Issues
  - Possible Future Action Items
- Questions & Comments



Primary Goals and Objectives

- Obtain public input
- Provide public education on important issues
  - Formal public outreach program needed to:
    - Raise awareness of storm water needs
    - Convey the necessity of developing funding sources
    - Stress the importance of supporting a sustained City storm water program
- Build consensus and support
- Address water quality and drainage challenges in an environmentally sound manner
- Enhance recreational opportunities and develop a Greenway Master Plan
- Define funding solutions

Primary Goals and Objectives

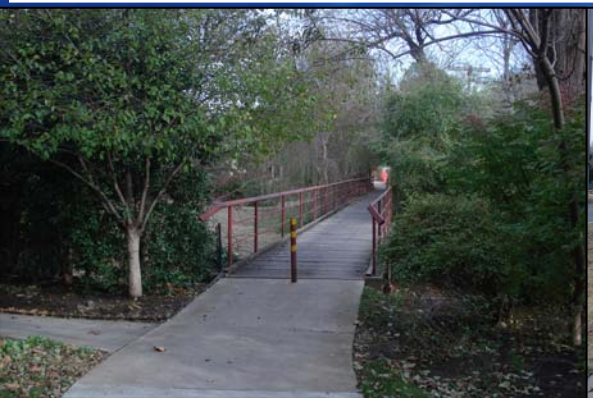
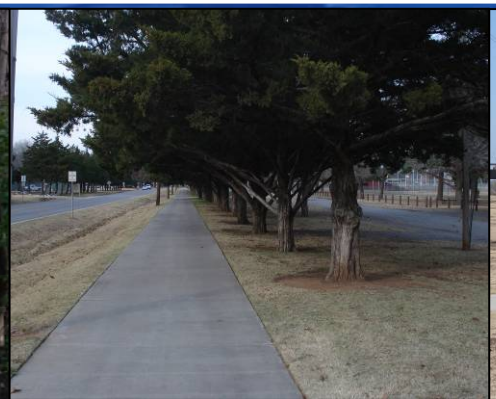
- Address water quality and drainage challenges in an environmentally sound manner
  - » Protect Lake Thunderbird – Norman's Drinking Water Supply!
  - » Comply with storm water quality requirements
    - — MS4 ("Phase II")
    - — Canadian River/Bishop Creek Bacteria TMDL
    - — Near Future ODEQ Lake Thunderbird Watershed Plan
  - » Flooding/Drainage
    - — Provide for public safety
    - — Protect public and private property
    - — Integrate with recreational opportunities

Greenways & Trails Master Plan

Jim Carrillo, ASLA, AICP
Halff Inc.

Why Plan for Greenways in Norman?

- Greenways offer something for all ages.
- Greenways provide alternative ways to get to key city destinations.
- Greenways support economic development by revitalizing areas and enhancing neighborhoods.
- Greenways promote a healthy lifestyle by providing opportunities to engage in exercise.

Purpose of The Greenway Master Plan

- The greenway plan will provide guidance for the preferred locations of trail corridors.
- The greenway plan will help the city acquire corridors for trail use.
- The greenway plan will provide a framework for the City of Norman and the private sector to work together to create beautiful and meaningful trail corridors.
- The greenway plan will help the city make informed decisions as to how to fund trail development.
- The greenway plan can help guide grant opportunity decisions

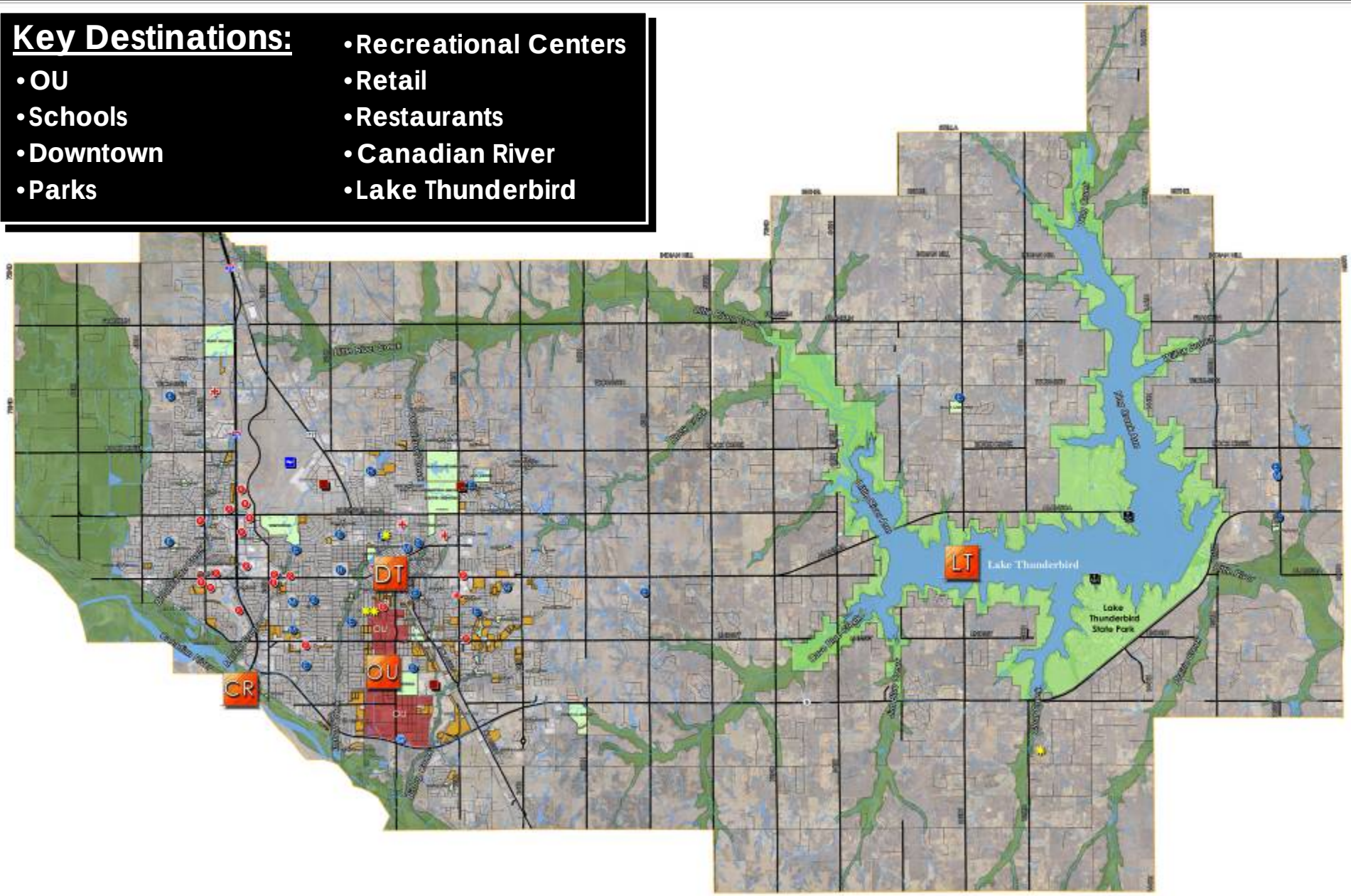
Key Guiding Principles for the Norman Greenways Plan

1. **Focus on the eventual creation of an interconnected system throughout the city** – focus on the goal of a balance system that provides access to and from all parts of the city. Eventually, link the urban areas to the rural sector of the city.
2. Provide for a variety of trail opportunity types – provide trails that are suitable for a variety of activities, including running, walking, cycling and in-line skating. Create nature trail opportunities, and consider equestrian opportunities where feasible. use a variety of trail types, such as greenbelt trails, wide "parkway" sidewalks, and even bicycle lanes to connect all parts of the urban area of Norman.
3. Consider both recreational and transportation uses for trail corridors – create facilities that closely link neighborhoods to key destinations such as schools, parks, employment, and other destinations
4. Use greenbelts to preserve "green" corridors throughout Norman – emphasize the preservation of existing natural corridors, or the re-introduction of green areas into urbanized areas of the city. Use greenbelts to promote the benefits of preserving green areas.
5. Make greenbelt corridors aesthetically pleasing corridors that add to the beauty of Norman – whether through preservation or through added enhancement, ensure that greenbelt corridors include features that help to beautify the City, and through their repetition help make greenbelts one of the signature features of Norman.

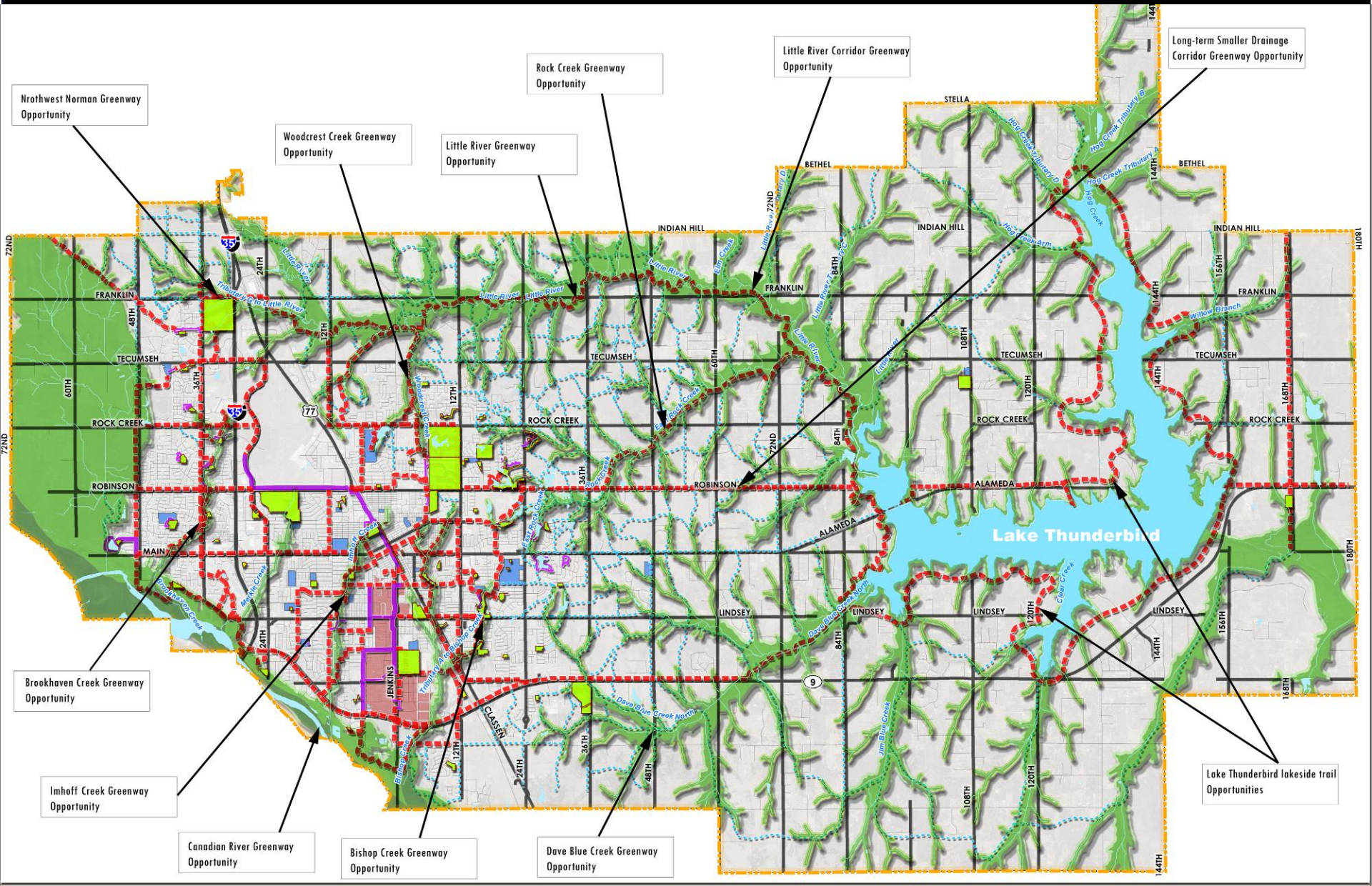
Greenway Destinations

Key Destinations:

- OU
- Schools
- Downtown
- Parks
- Recreational Centers
- Retail
- Restaurants
- Canadian River
- Lake Thunderbird



City wide Greenway Opportunities

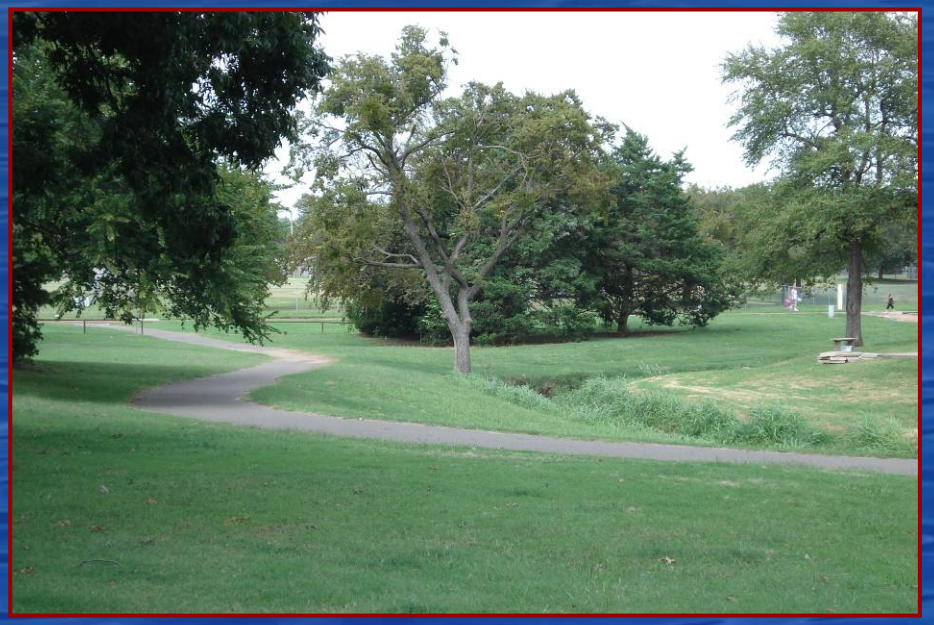


Public Review of Opportunity Corridors….

What do we want?

- Accessible, attractive corridors

Merkel Creek



Bishop Creek

What do we want?

- More Preservation of Natural Corridors to add Value to Surrounding Homes and the City

Brookhaven Creek

Bishop Creek

Integration with the Storm Water Master Plan

Missed Opportunities for Trails and Green Space Corridors

Integrate Trails and Green Space into Drainage Corridors

Evaluation of Greenway Corridors….

- Suitability Analysis Criteria included:
  - Connectivity – number of schools, parks, businesses or civic destinations that could be linked by this corridor
  - Ownership – public control of the corridor, or will permission to allow access be required?
  - Compatibility – will this trail work with adjacent land uses?
  - Physical Characteristics – in an attractive natural area? Does this corridor help preserve a needed drainage corridor?
  - Public Support – is there voiced support for this trail? Any specific citizen input?

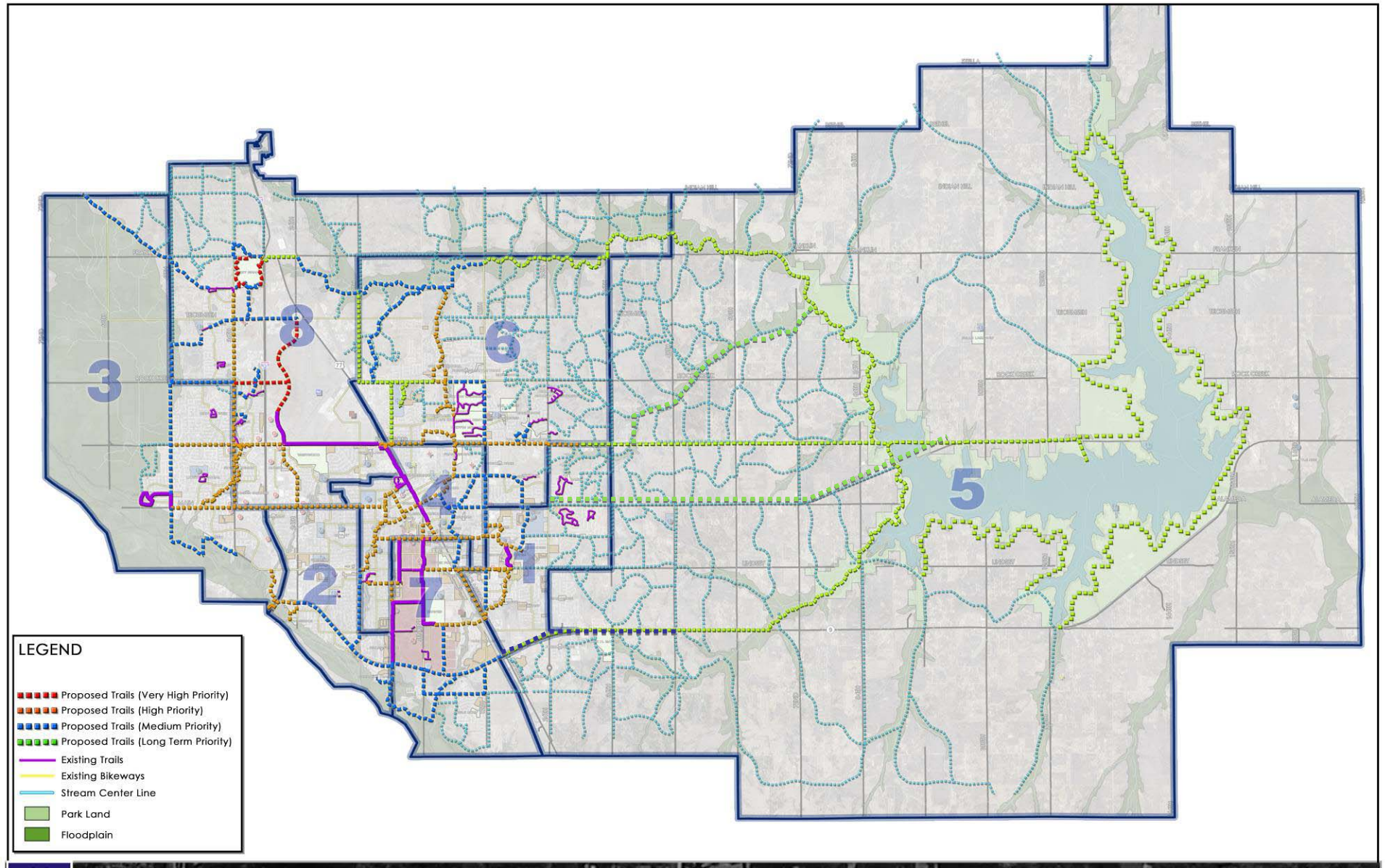
Evaluation of Greenway Corridors….

- Five key areas to evaluate the “suitability” of each corridor
- Intent is not to disallow any corridors, but to highlight opportunities or constraints associated with each corridor.
- Score from 1 to 5, with 5 having the best suitability, and 1 having constraints that will have to be addressed before using the corridor as a greenbelt

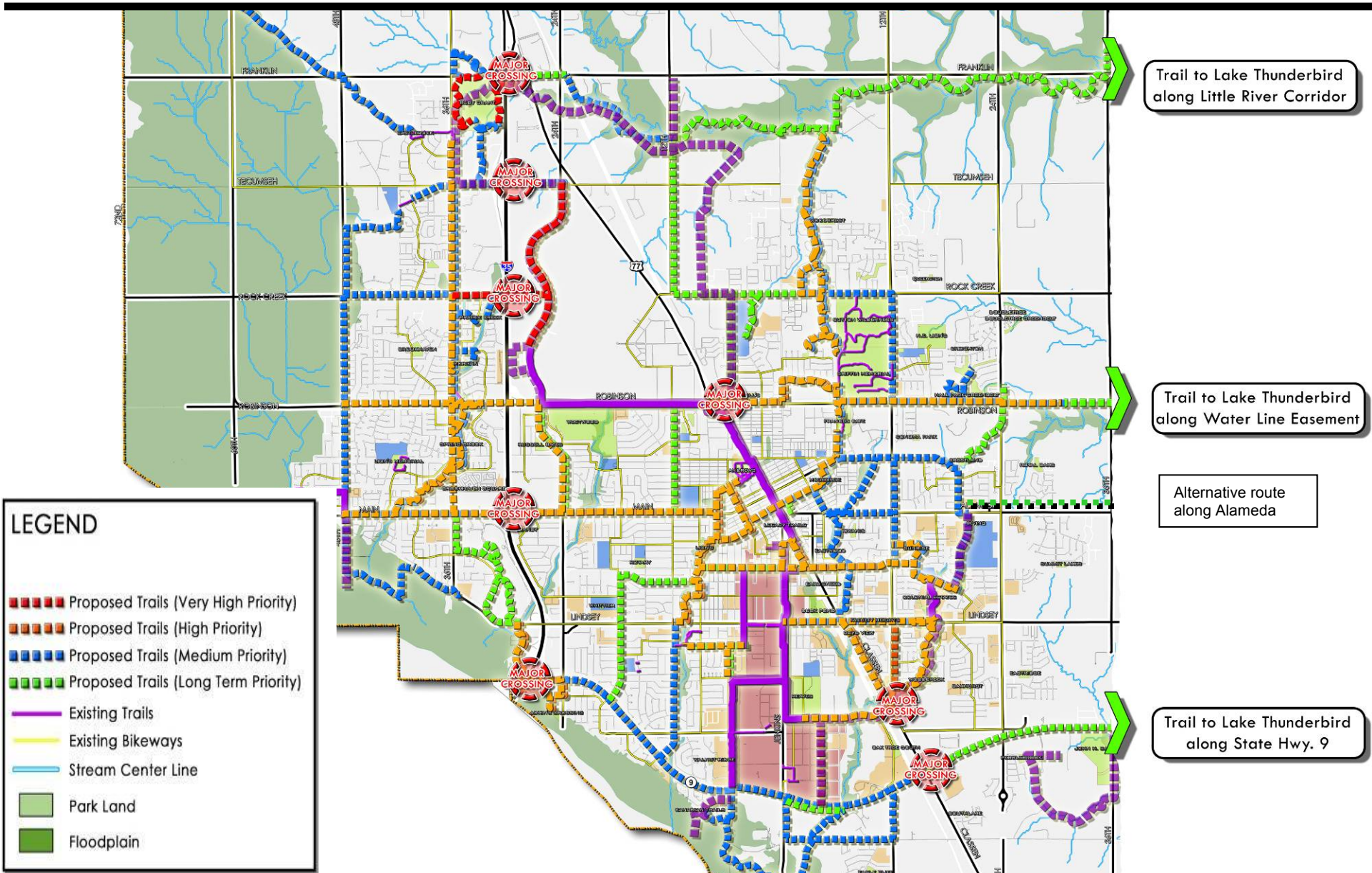
Preliminary Prioritization Criteria….

- Eight Key Criteria to help assess Prioritization
  - Suitability Evaluation Score
  - Level of Connectivity from Evaluation
  - Potential Level of Use
  - Contribution to Greenway and Open Space Network
  - Presents a Critical Immediate Opportunity
  - Integration with Storm Water Master Plan
  - Funding Availability
  - Project Readiness

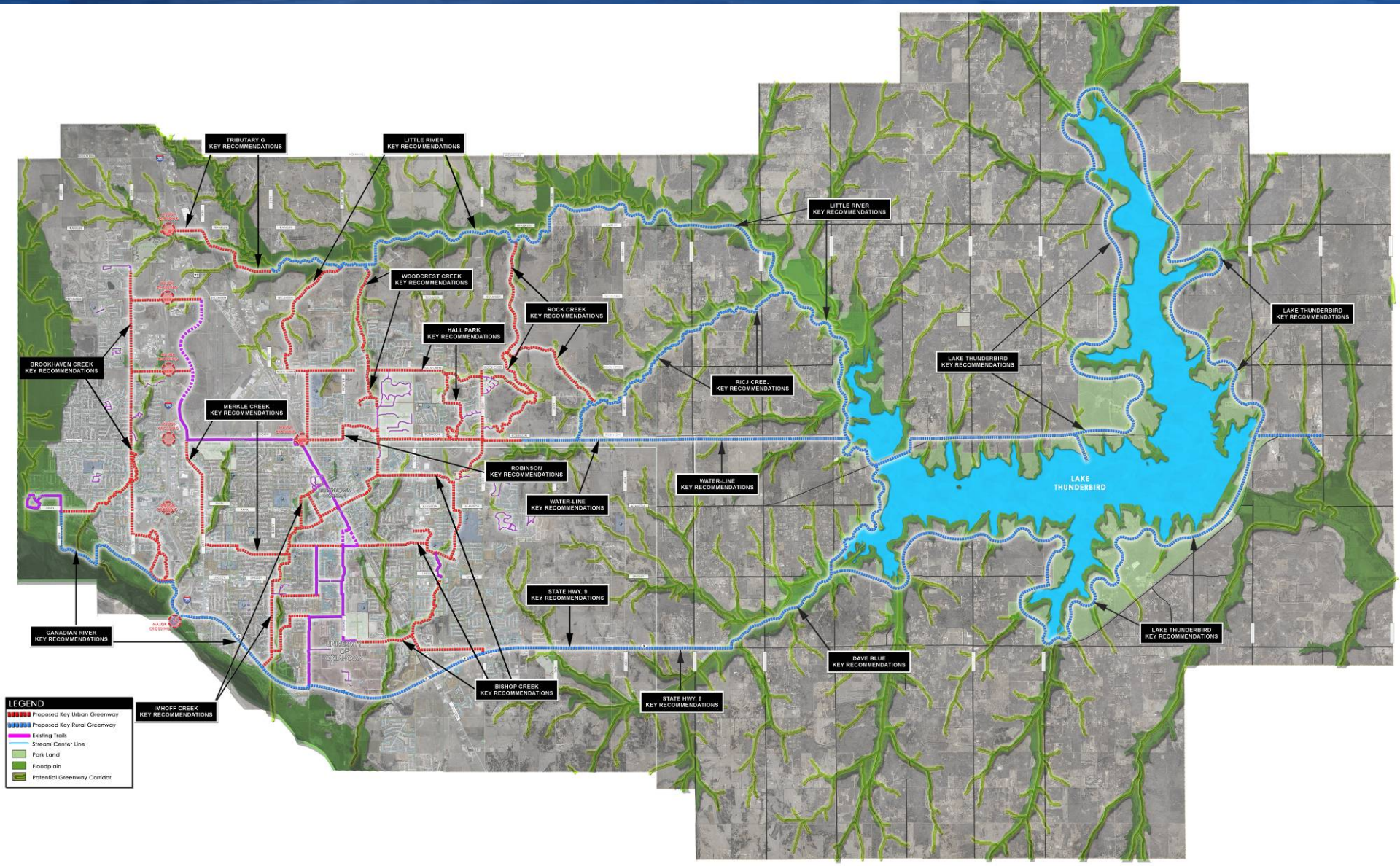
City wide Greenway Trails Map



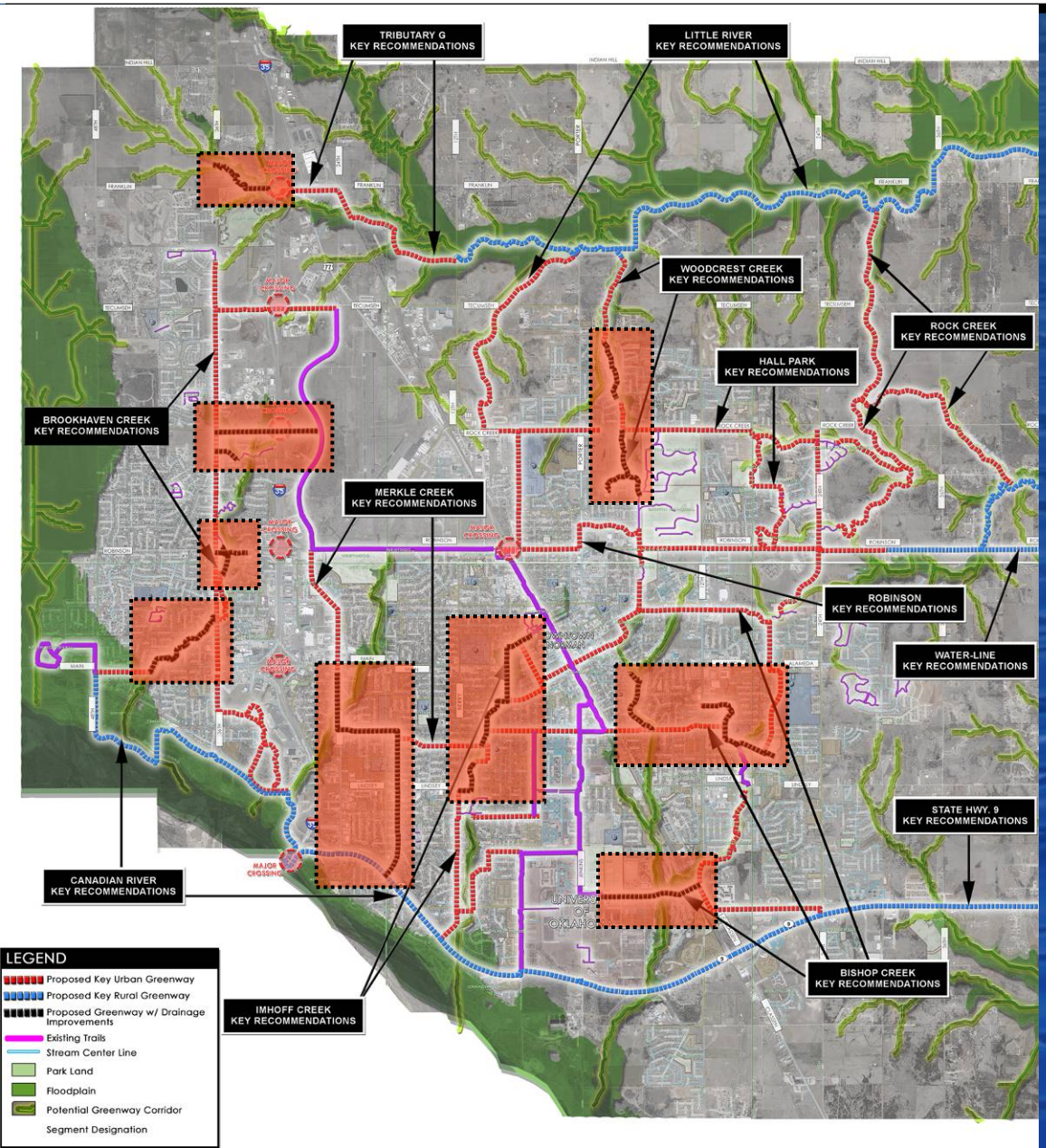
Urban Core Greenway Trails Map



Key Greenway Recommendations

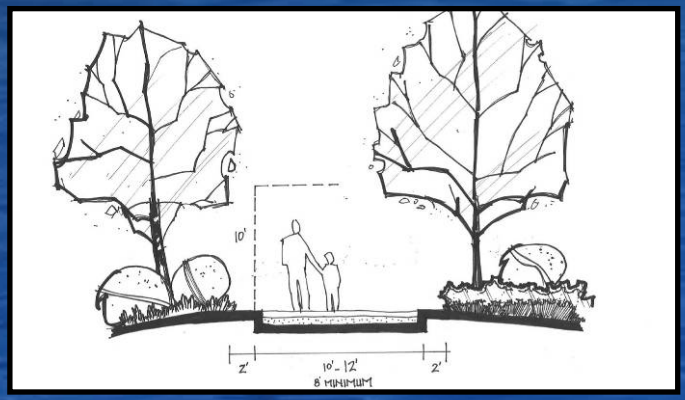


Potential Greenways with Drainage Improvements



Trail Standards – Off Street Trail

- 8’ minimum width, 10’ width preferred
- 12’ width for designated major “arterial” trails
- Concrete surface preferred
- 2’ minimum shoulder on both sides
- 20’ minimum clear height



Summary- Trail Cost per Linear Foot	
10 to 12' wide community trail - concrete	$150 to $175 per linear foot
8' wide neighborhood trail - concrete	$125 to $140 per linear foot
8' wide parkway trail - concrete	$110 to $135 per linear foot
6' wide sidewalk	$80 to $90 per linear foot
8' wide decomposed granite trail	$70 to $140 per linear foot
8' wide nature trail	$65 to $110 per linear foot

Greenway Implementation Process

- Potential Greenway Funding Portion of Storm water Fee if approved by Citizens:
  - Current or upcoming Bond funds for greenways or trail improvements
  - Capital Improvements and Bond Program
  - Sales Tax Revenue
  - Voluntary private construction as part of housing communities
  - Development assessment for trail construction (as component of park dedication)
  - Construction of trails by private development
- Implementation strategies for Future Development
  - Greenway Trail Ordinance Development
  - Develop trail “cost sharing” ordinance revisions that create developer incentive participation in trail development
  - Promote preservation and free access to creek and major drainage corridors
- Greenway and Trail Maintenance
  - What part of the city is responsible for up keeping and maintenance of the trails
  - Additional vegetation
  - Surfacing repair
  - Littering and illegal dumping
  - Informative signage along the trails

Greenway Implementation Process

Key Recommendations (Urban Greenways)

Segment	Watershed	Ward	Segment Start	Segment End	Trail Corridor Along	Potential Prioritization	Length (in linear feet)	Overall Potential Cost per Segment
	Brookhaven							
BH-1	Brookhaven	8	Tecumseh	Rock Creek Rd.	W 36th Ave.	High	5,400	$1,000,000
BH-3	Brookhaven	8	Rock Creek Rd.	Crossroads	W 36th Ave.	High	2,700	$510,000
BH-6	Brookhaven	8	Crossroads	Existing Sidewalk	W 36th Ave.	High	1,000	$210,000
BH-7	Brookhaven	8	Existing Sidewalk	Robinson	W 36th Ave.	Medium	1,700	$340,000
BH-9	Brookhaven	8	Robinson	Havenbrook	W 36th Ave.	Medium	1,000	$270,000
BH-11	Brookhaven	8	Havenbrook	Quail	W 36th Ave.	Medium	4,500	$720,000
BH-12	Brookhaven	8	Havenbrook	Quail	Brookhaven Creek	High	2,500	$470,000
BH-13	Brookhaven	3	W 36th Ave.	Willow Branch	Brookhaven Creek	High	3,000	$570,000
BH-14	Brookhaven	3	Willow Branch	Main Street	Brookhaven Creek	High	1,400	$300,000
BH-15	Brookhaven	3	Brookhaven Creek	48th St.	Main St.	Medium	2,500	$480,000
RS-2	Brookhaven	8	W. 36th Ave.	W.24th Ave.	Rock Creek Rd.	High	4,500	$640,000
	Tributary G					Total	30,200	$5,510,000
TG-2	Tributary G	8	IH-35	US 77	Franklin	High	5,200	$2,400,000
TG-3	Tributary G	8	US 77	12th Ave.	Tributary G Creek	High	7,000	$1,300,000
TG-5	Tributary G	8	Bridgeport	Tecumseh	W 36th Ave.	High	2,600	$470,000
	Merkle					Total	14,800	$4,170,000
MC-1	Merkle	8	Main St.	Robinson	W. 24th Ave.	High	5,730	$1,100,000
	Woodcrest					Total	5,730	$1,100,000
WC-1	Woodcrest	6	Little River Creek	Nantucket St.	Woodcrest Creek	High	4,100	$720,000
WC-2	Woodcrest	6	Nantucket St.	Sequoyah Trails	Woodcrest Creek	High	2,700	$490,000
WC-4	Woodcrest	6	Sequoyah Trail Park	Rock Creek	Woodcrest Creek	High	1,200	$300,000
WC-5	Woodcrest	6	Rock Creek	Robinson Rd.	Griffin Memorial Park	High	4,700	$900,000
WC-6	Woodcrest	6	Woodcrest Creek	W. 12th Ave.	Rock Creek Rd.	Medium	3,300	$650,000
WC-7	Woodcrest	6	Robinson Rd.	Frances Cate Park	Frances Cate Park	High	1,800	$350,000
WC-8	Woodcrest	4	Frances Cate Park	Main Street	Carter St.	High	1,300	$300,000
	Imhoff					Total	19,100	$3,710,000
IM-1	Imhoff	4	Andrews Park	Lion's Park	Road Corridor	High	4,100	$820,000
IM-1A	Imhoff	4	Andrews Park	Lion's Park	University	High	4,000	$680,000
IM-2	Imhoff	4	Lion's Park	McNamee	Lion's Park	High	800	$200,000
IM-3	Imhoff	4	McNamee	Cruce	Imhoff Creek	High	1,400	$400,000
IM-4	Imhoff	4	Cruce	Brooks Ave.	Pickard St.	High	1,550	$350,000
IM-5	Imhoff	4	Brooks Ave.	Lindsey St.	Imhoff Creek	High	1,900	$390,000
IM-8	Imhoff	4	Berry Rd.	Chautauqua	Road Corridor	High	5,200	$1,000,000
OU-1	Imhoff	4	Imhoff Creek	Classen	Boyd	High	4,700	$1,100,000
OU-2	Imhoff	4	Imhoff Creek	Maple (OU Campus)	3rd St.	High	3,100	$720,000
RB-1	Imhoff	6	Flood	Griffin Memorial Park	Robinson	High	7,700	$1,400,000
RB-2	Imhoff	6	Griffin Memorial Park	Water Treatment Area	Robinson	Medium	11,000	$1,900,000
	Bishop					Total	45,450	$8,960,000
BC-2	Bishop	4	University	Carter	Eufaula/Main St.	High	6,000	$1,100,000
BC-9	Bishop	1	12th Ave.	Vicksburg	Street Corridor	High	5,300	$920,000
BC-10	Bishop	4	Trout	12th Ave.	Boyd	High	4,700	$830,000
BC-15	Bishop	1	Lindsey	Classen	Bishop Creek Tributary A	High	5,800	$1,100,000
BC-16	Bishop	7	Monitor	Classen	Constitution	High	3,700	$750,000
BC-18	Bishop	7	State Hwy 9	Bishop Creek	Bishop Creek	Medium	4,600	$790,000
	Rock Creek					Total	30,100	$5,490,000
HP-1	Rock Creek	6	W. 12th Ave.	Hall Park	Hall Park	Medium	7,600	$1,300,000
HP-2	Rock Creek	6	Hall Park	Hall Park	Hall Park	Medium	1,200	$260,000
HP-3	Rock Creek	6	Hall Park	Robinson	Hall Park	Medium	2,500	$510,000
						Total	11,300	$2,070,000
						Overall Total	156,680 30 Miles	$31,010,000

- Costs represent key recommendations. Additional greenways will be determined for future funding

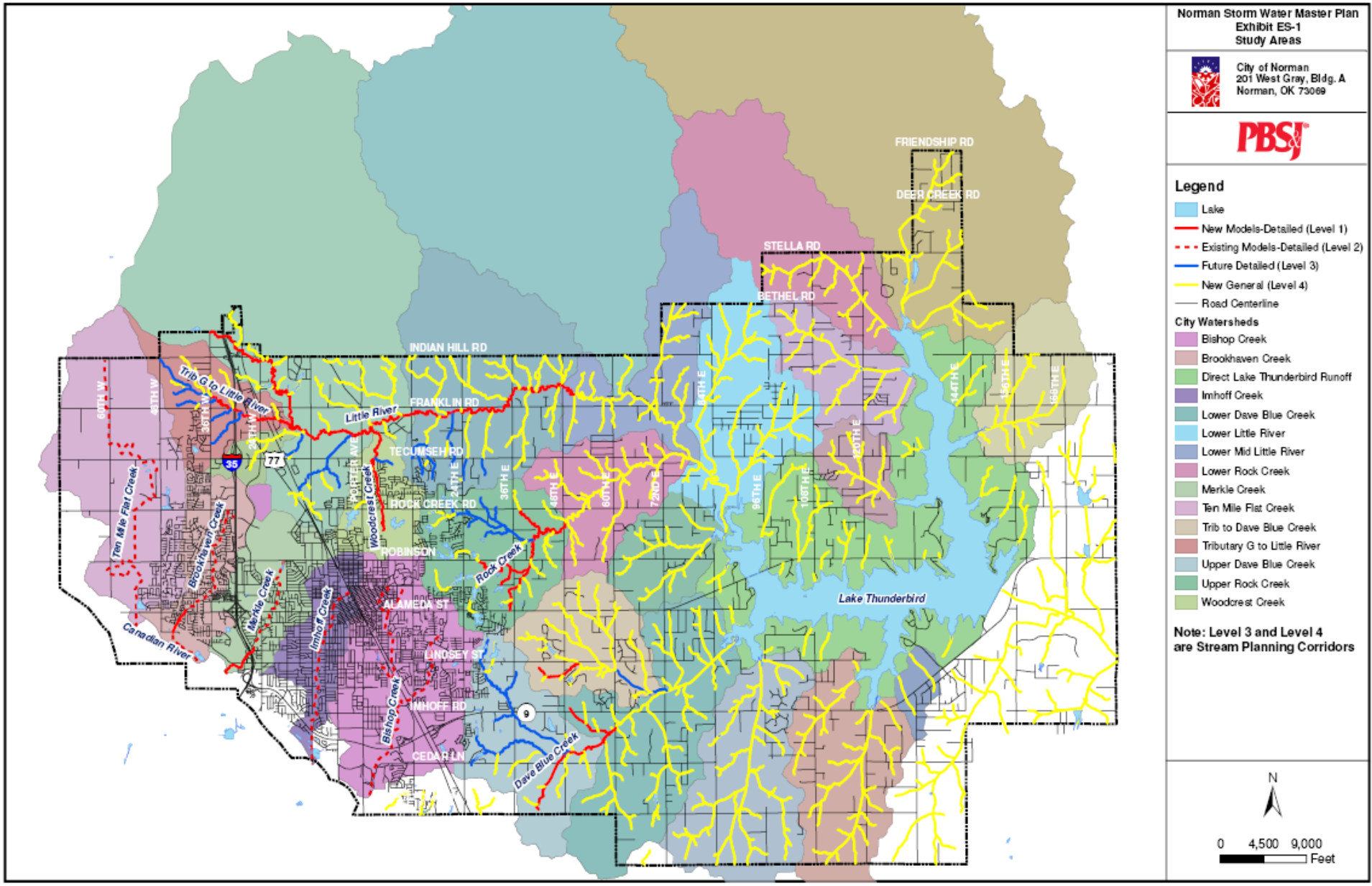
Key Greenway Recommendations:

- **Ensure that** new trails are wide enough to accommodate extensive use (8’ wide in neighborhoods, 10’ to 12’ along key spine segment trails).
- Incorporate greenbelt preservation and trail construction component in storm water fee.
- Focus on high priority trail segments.
- Encourage development community to incorporate trails along drainage corridors in new developments.
- Maintain very high emphasis on preserving existing trees along drainage corridors.
- Where feasible, avoid lots backed up to drainage on both sides.

Approach

- Maximize Use of Existing Information
- Supplemental Information Developed
- Meetings and Coordination
- Levels of Analysis
  - Level 1 – New Detailed Modeling/Assessment Areas
  - Level 2 – Existing Detailed Modeling/New Assessments - Urban Core
  - Level 3 – Future Detailed Modeling/Assessment Areas
  - Level 4 – New General Modeling/Assessment Areas

Norman Priority Study Areas



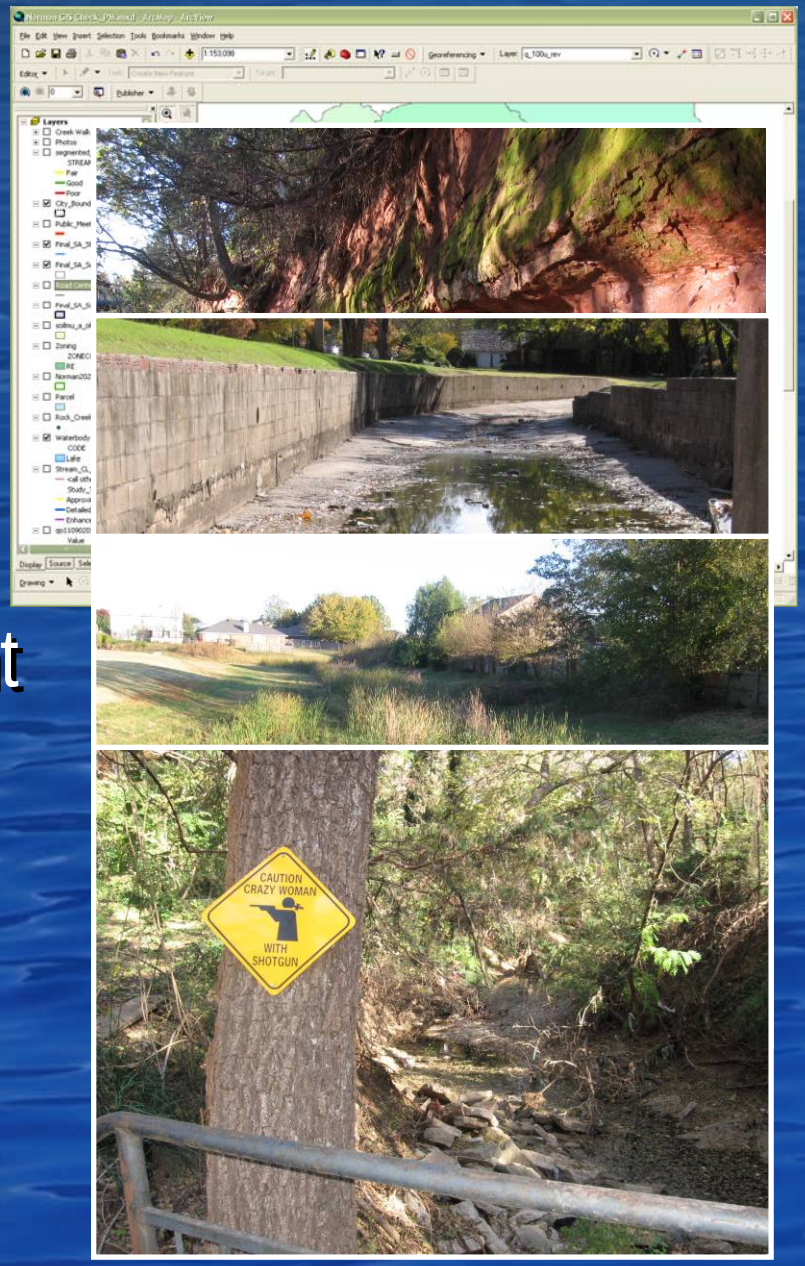
Approach - Team Meetings and Coordination

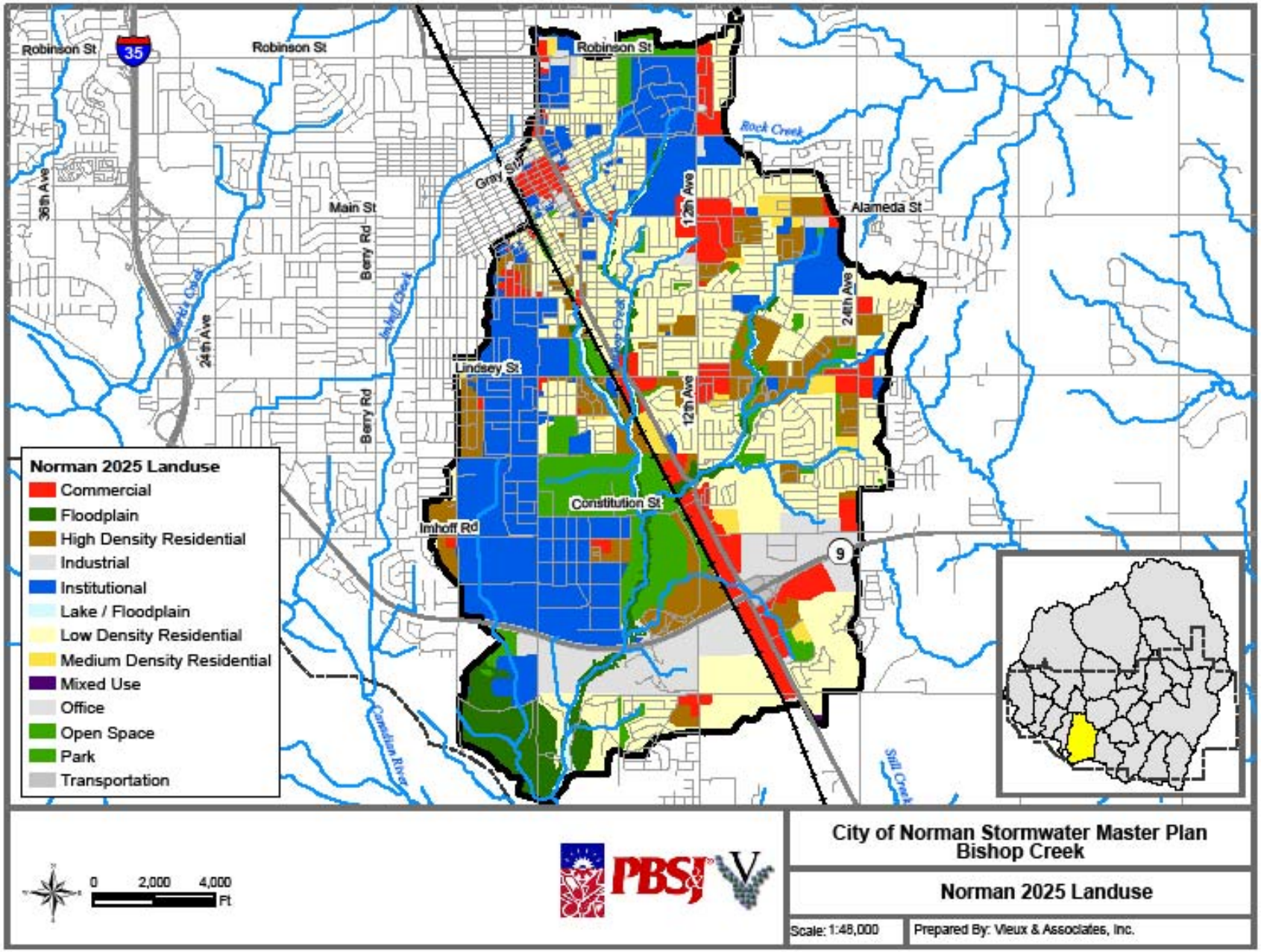
- Bi-weekly conference calls with City staff
- Public Forum Meetings
  - September 18, 2007
  - February 21, 2008
  - May 28, 2008
  - April 6, 2009
- SWMP Task Force Meetings
  - September 18, 2007
  - November 7, 2007
  - November 28, 2007
  - February 22, 2008
  - April 17, 2008
  - May 27, 2008
  - June 19, 2008
  - July 31, 2008
  - August 13, 2008
  - April 4, 2009
- Individual Council Ward Meetings – July 31 and August 1, 2008
- Council Study Sessions
  - August 12, 2008
  - April 7, 2009
- Four Greenbelt Commission Meetings

Watershed and Stream Assessments

Watershed & Stream Assessments

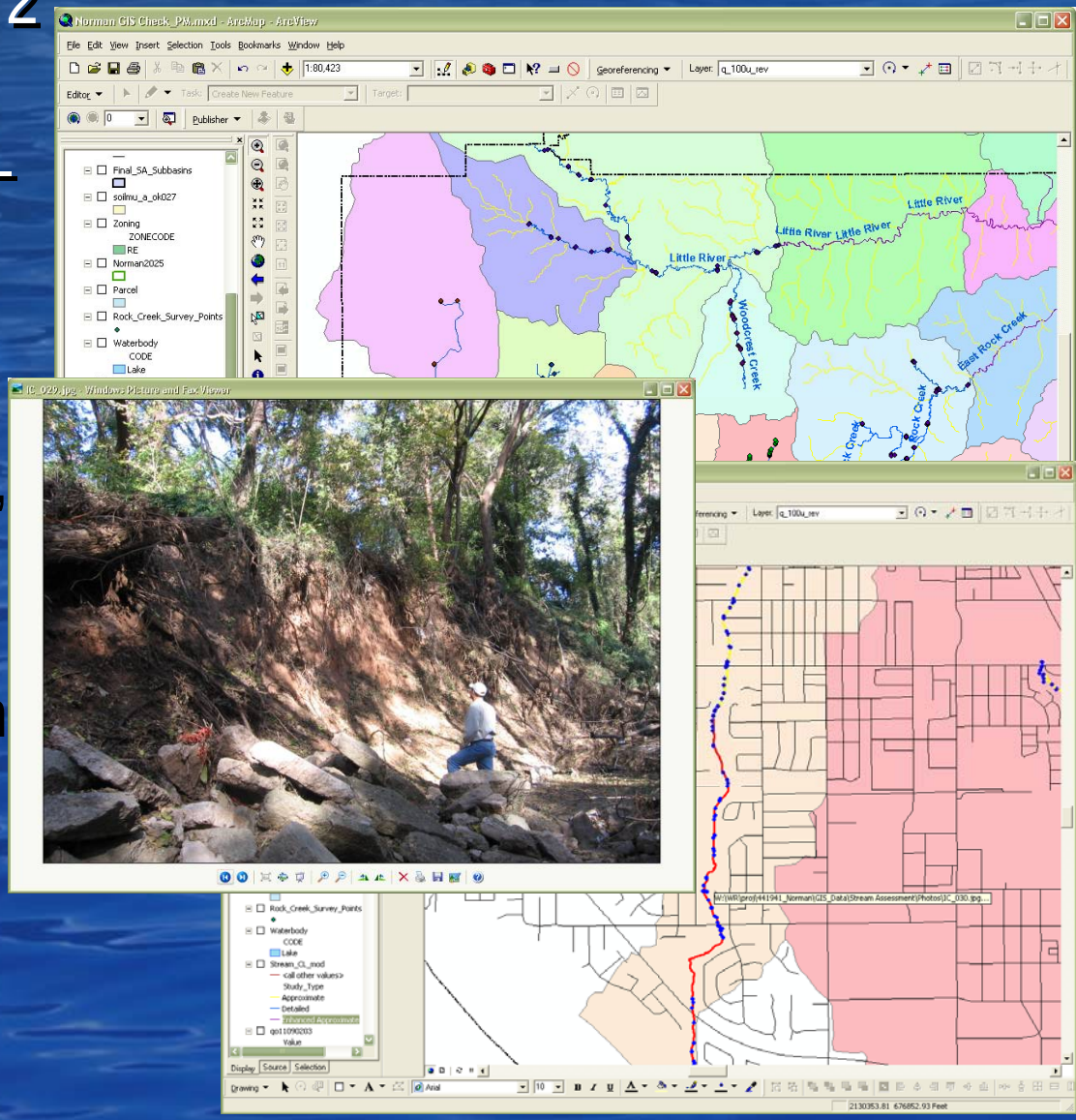
- Assess existing watershed conditions
  - » Land use
  - » Hydrologic soil groups
  - » Floodplains
  - » Impervious cover
- Stream corridor assessment
  - » Channel type
  - » Erosion problem areas
  - » Floodplain vegetation
  - » FEMA flood zones
  - » Storm water outfalls
- Document in GIS/database




Robinson St
35
Robinson St
Robinson St
Rock Creek
36th Ave
Main St
Gray St
Berry Rd
Bishop Creek
24th Ave
12th Ave
Alameda St
24th Ave
Lindsey St
Berry Rd
12th Ave
Constitution St
Imhoff Rd
9
Canadian River
Still Creek
Norman 2025 Landuse
Commercial
Floodplain
High Density Residential
Industrial
Institutional
Lake / Floodplain
Low Density Residential
Medium Density Residential
Mixed Use
Office
Open Space
Park
Transportation
0
2,000
4,000
Ft
PBS&J
City of Norman Stormwater Master Plan
Bishop Creek
Norman 2025 Landuse
Scale: 1:48,000
Prepared By: Vieux & Associates, Inc.

Stream Corridor Assessments

- Creeks walks for Level 1 & 2 streams
- Unified Stream Assessment – Reach Level Assessment
- Evaluate bed and bank stability, riparian habitat, vegetation, adjacent landuse, and watershed/floodplain connectivity
- Creek walk photos viewed on desktop (geo-referencing)



Bishop Creek – Reach Assessment Scoring

Reach ID	Sub Total: In-stream	Buffer/ Floodplain	Total Survey Reach
BC-1	60	59	119
BC-2	48	45	93
BC-3	29	38	67
BC-4	47	36	83
BC-5	55	53	108
BC-6	58	50	108
BC-7	51	51	102
BC-8	56	49	105

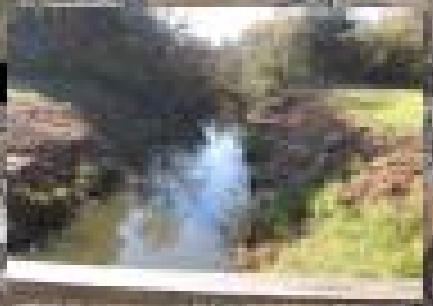
Good (110-160)

Fair (70-109)

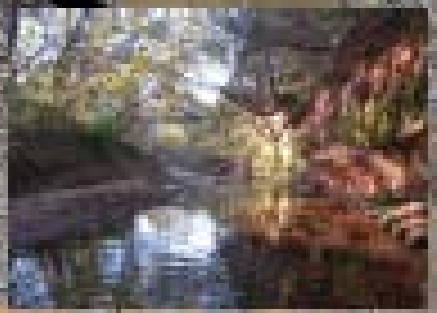
Poor (0-69)

Stream Reach Classifications – Lower Bishop Creek

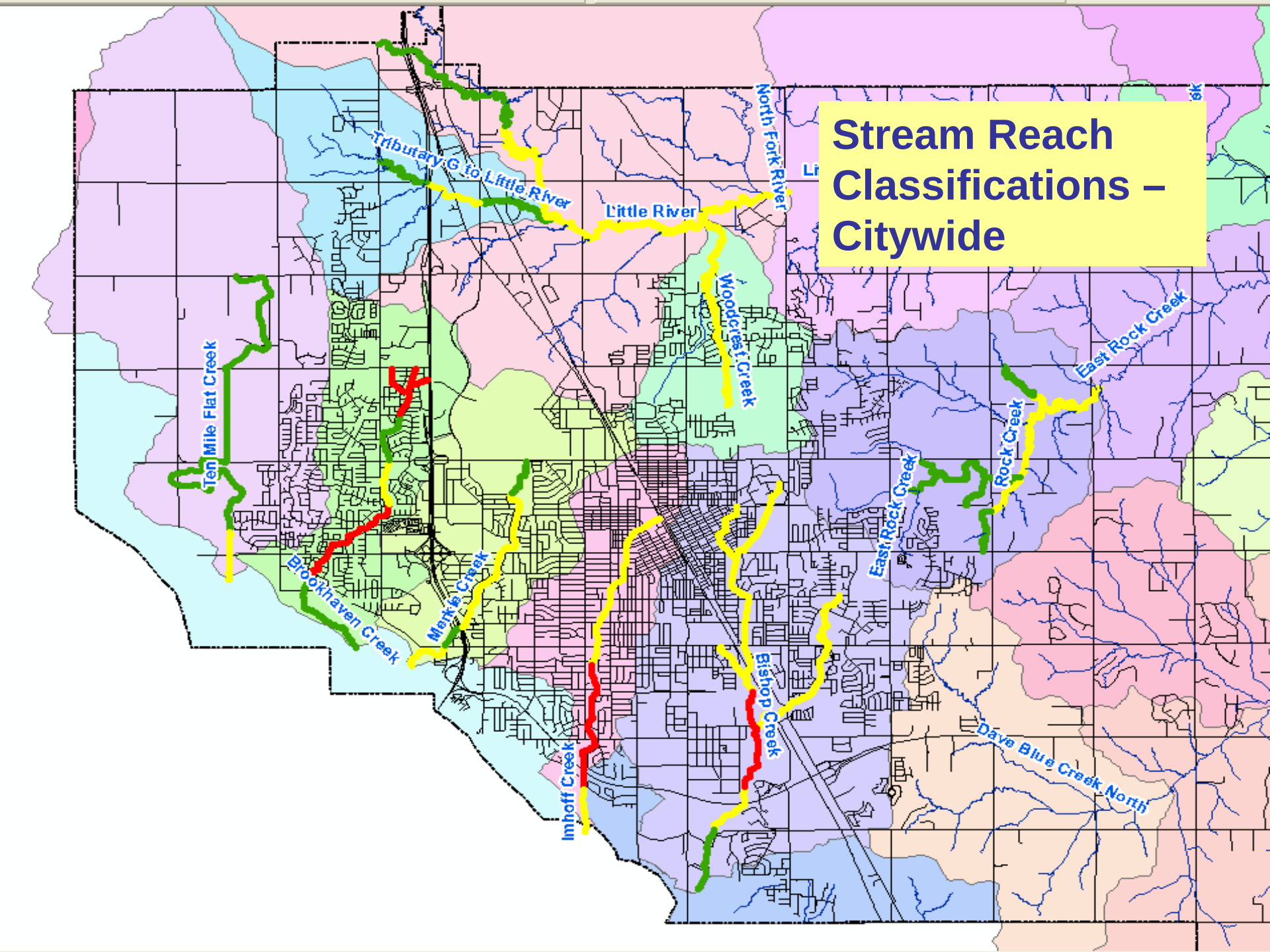
Poor



Fair



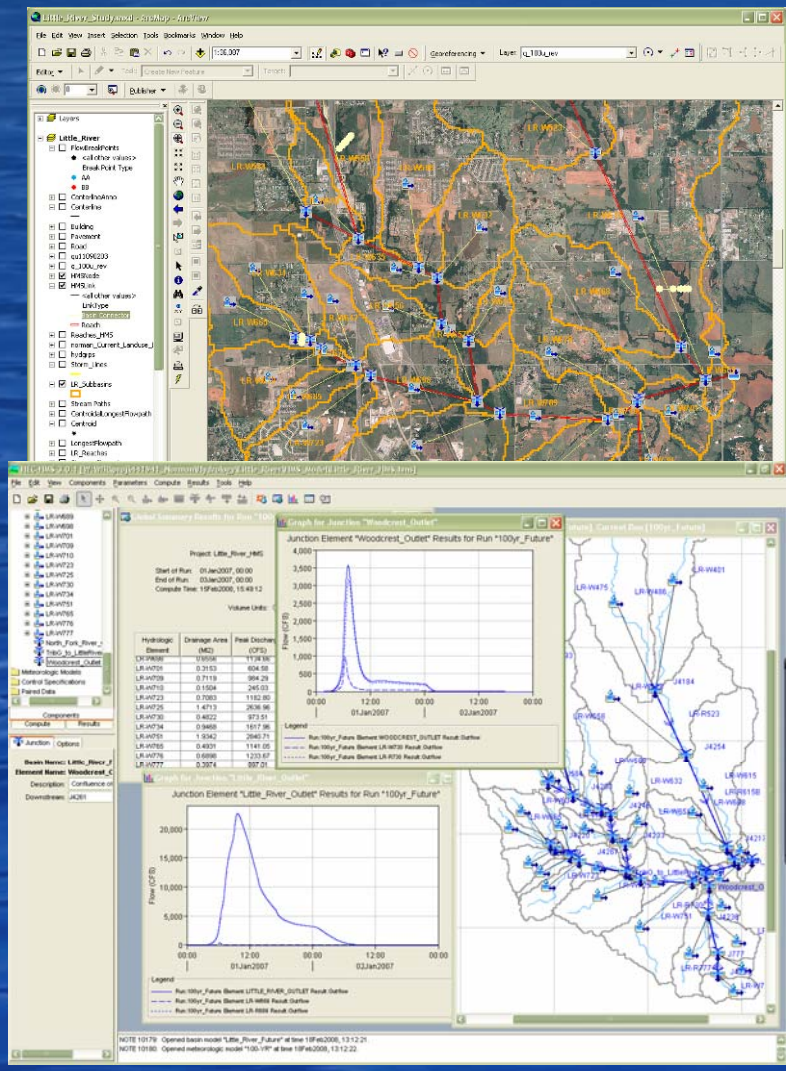
Good


Stream Reach Classifications – Citywide
Tributary G to Little River
Little River
North Fork River
Woodcrest Creek
Ten Mile Flat Creek
Brookhaven Creek
Merkle Creek
East Rock Creek
Rock Creek
East Rock Creek
Bishop Creek
Imhoff Creek
Dave Blue Creek North

Hydrologic and Hydraulic Analyses

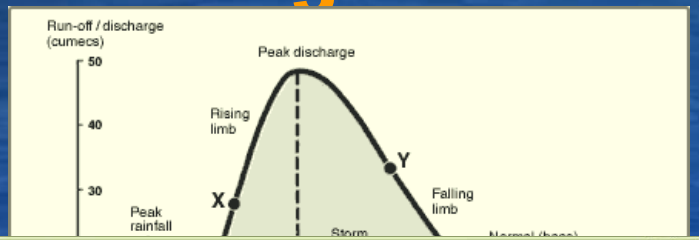
Hydrologic & Hydraulics Analyses

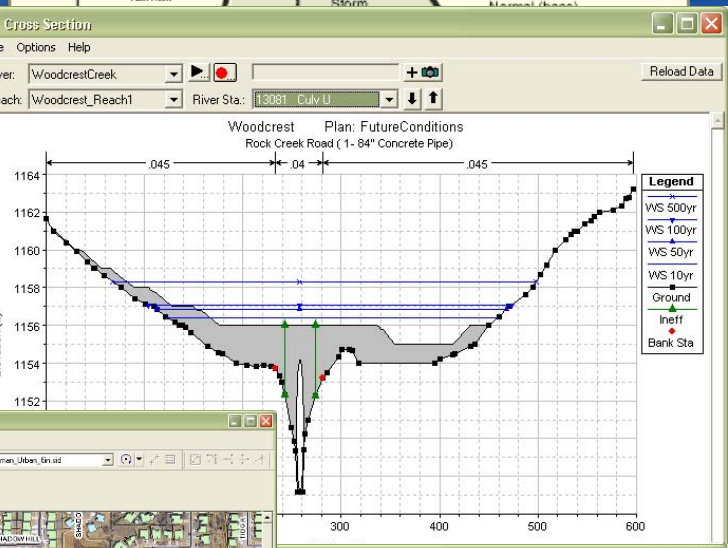
- Level 1 & 2 streams – Detailed H&H analyses
  - » 94 square miles hydrologically modeled
  - » Approx. 60 stream miles hydraulically modeled
- Level 3 & 4 streams – General H&H analyses (Stream Planning Corridors)
  - » 213 square miles hydrologically modeled
  - » Over 330 stream miles hydraulically modeled
- Existing and future or baseline (Norman 2025) development conditions
- Identify storm water problems areas for solutions development

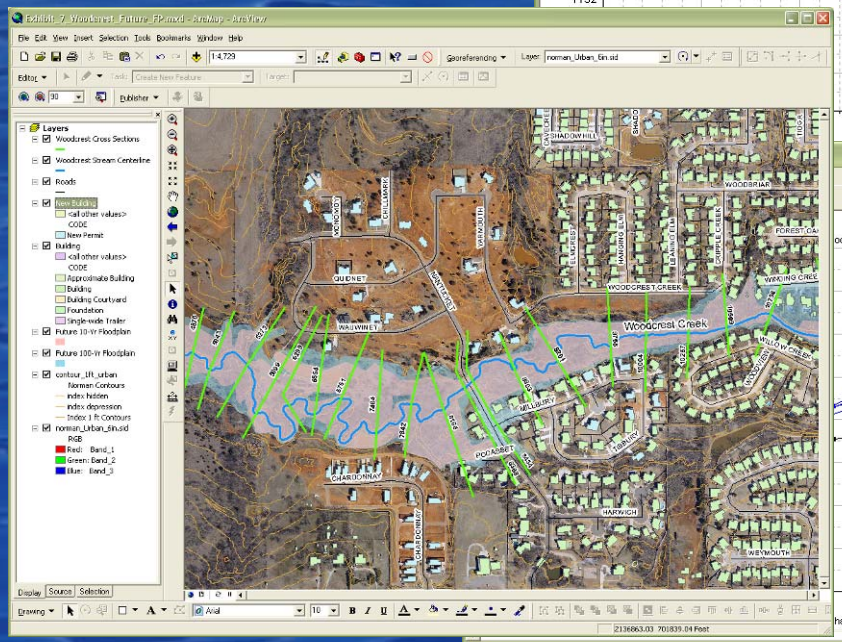


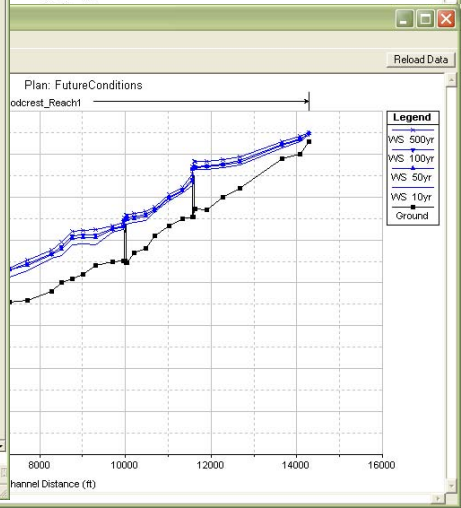
Hydrologic and Hydraulic Modeling

- Level 1 and 2 - Existing and full buildout 10-, 50-, 100-, 500-year storm events
- Level 3 and 4 – Full buildout 100-year event only
- Stream stabilization improvement areas - 2-year event



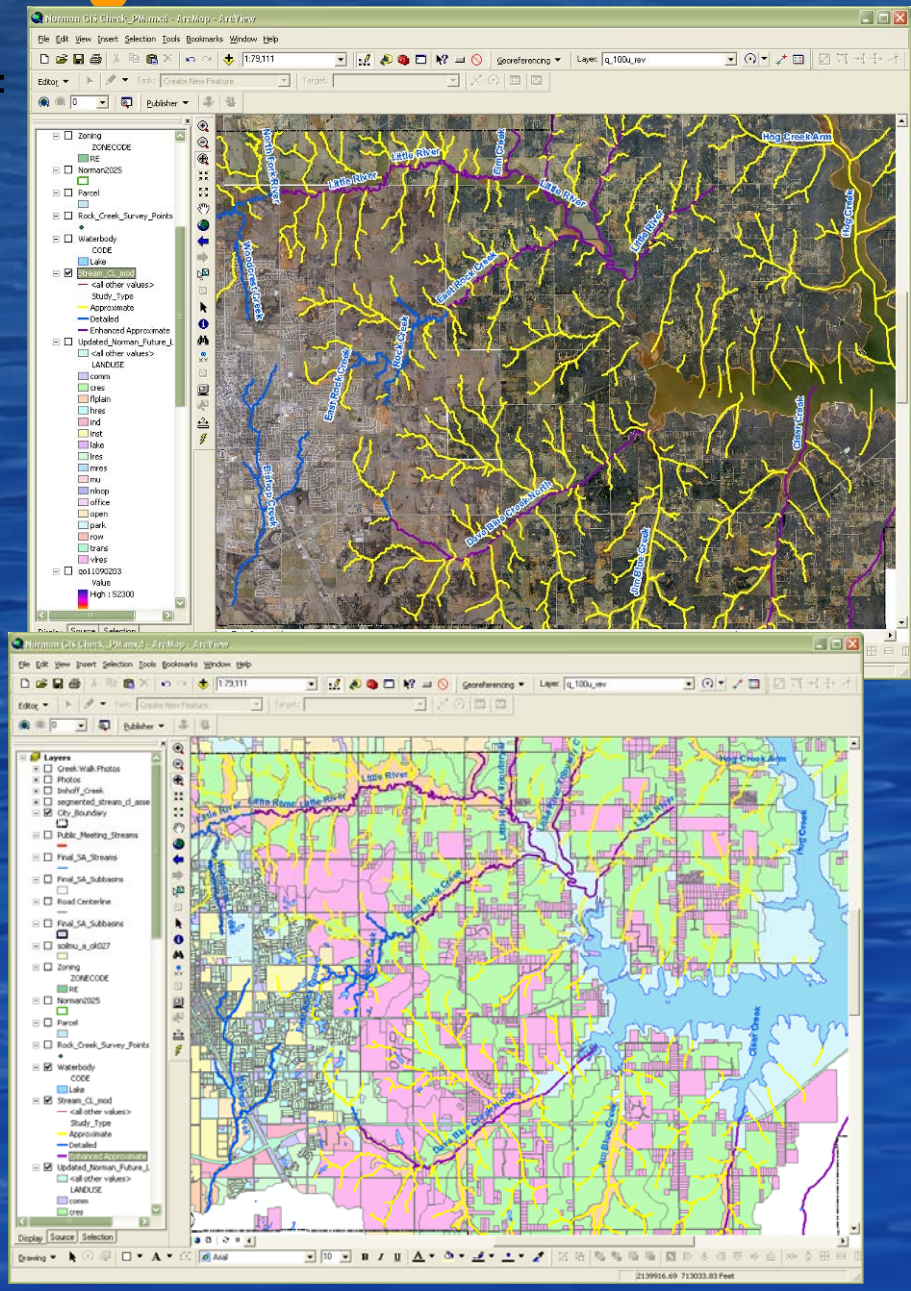






Stream Planning Corridors

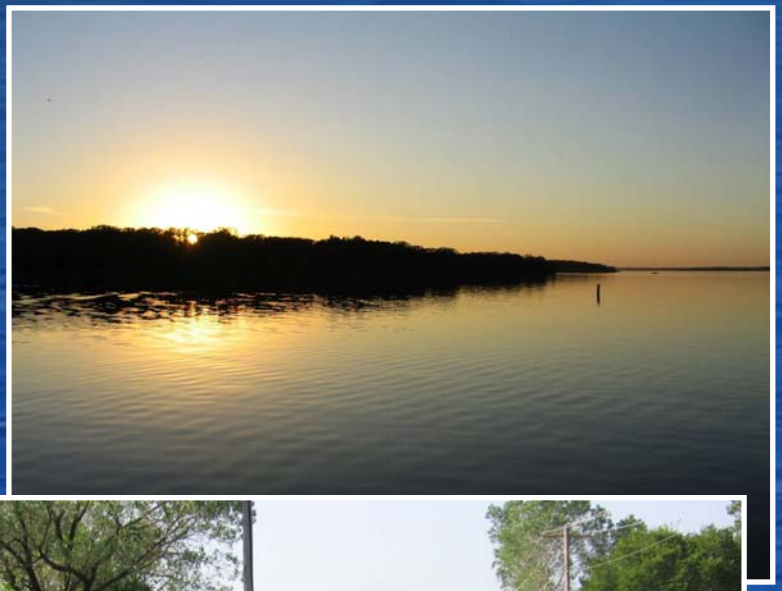
- Level 3 & 4 streams - 333 miles of Stream Planning Corridors
- Corridor defined by the 100-year future (Norman 2025) floodplain
- Streams draining greater than 40 acres in the Lake Thunderbird watershed
- Assists in planning future development
- Provides for:
  - » Water quality benefits
  - » Storm water conveyance
  - » Riparian habitat
  - » Greenbelt/trails opportunities



Problem Identification and Solution Development

Watershed Problems and Opportunities

- Water quality/Water supply protection
- Flooding
- Erosion / stream stability
- Recreation



Water Quality Problems Previously Studied / Identified

- Lake Thunderbird
  - ODEQ Watershed Plan Development (ongoing)
  - OCC Watershed Water Quality Modeling Results (Vieux, Inc.)
  - COMCD Rock Creek Watershed Study (Vieux, Inc.)
- Urban Core
  - EPA / OPDES MS4 Program
  - ODEQ Canadian River / Bishop Creek Bacteria TMDL

Recommended Water Quality Solutions

- Lake Thunderbird
  - Continuation of development density limitations in watershed
  - Proposed structural and nonstructural water quality controls
  - Stream Planning Corridors for streams with 40 acres or more of drainage area
  - Add 15 ft buffer strip for areas in Suburban Residential and Country Residential areas (per Norman 2025 Plan)
  - Educate public on fertilizer use and control fertilizer overuse
  - Monitor septic tank installation and operation
  - Norman's MS4 Program
  - Norman's Water Quality Monitoring Program
  - Low Impact Development

Recommended Water Quality Solutions

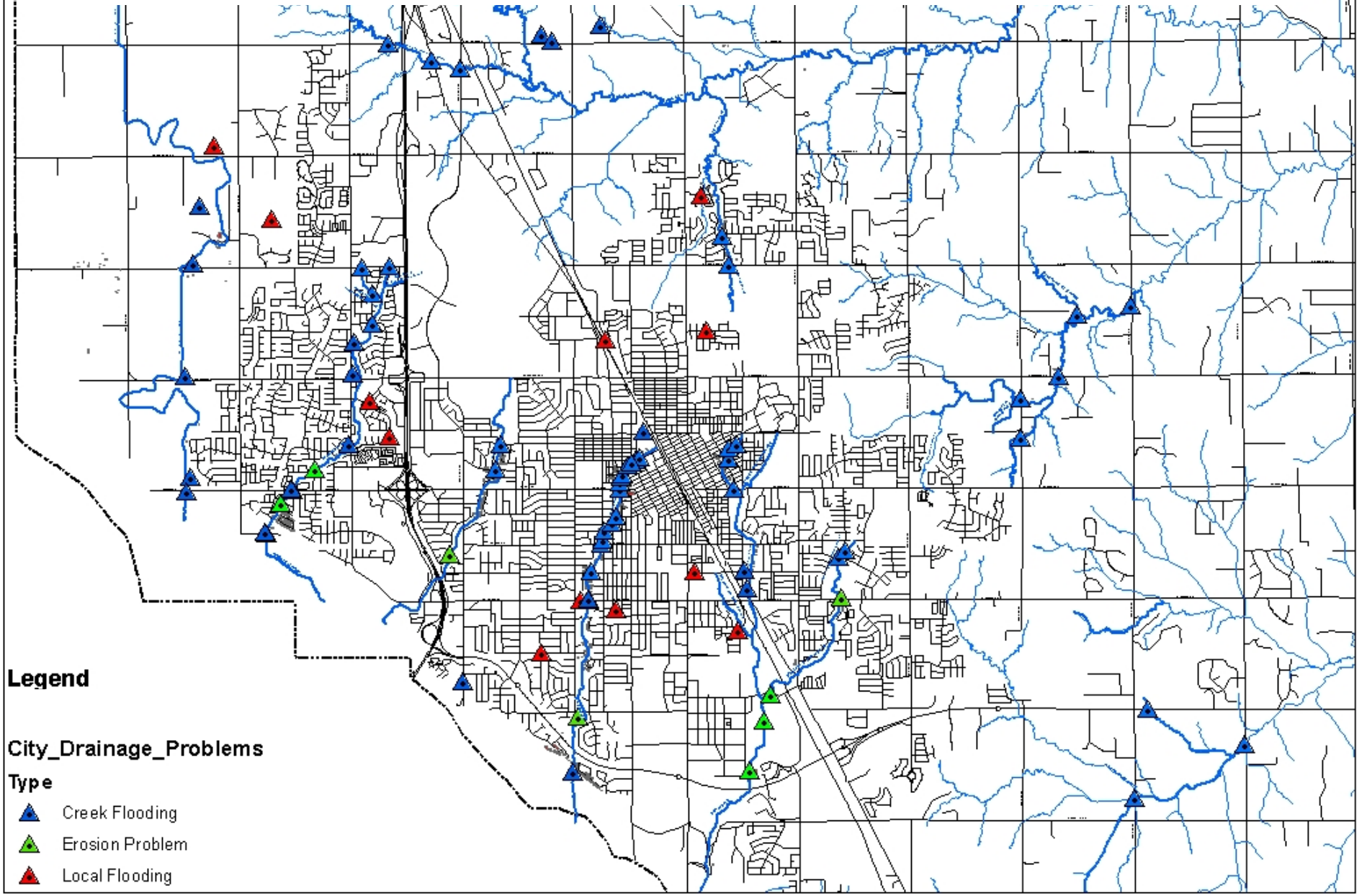
- Urban Core / Direct to Canadian River
  - Complying with Norman's MS4 Program including Minimum Control Measures
  - Complying with Canadian River / Bishop Creek Bacteria TMDL
  - Structural and nonstructural water quality controls
  - Low Impact Development
  - Norman's Water Quality Monitoring Program

MS4 Program Components

"SIX MINIMUM CONTROL MEASURES"

- Public Education and Outreach
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water
- New Development and Redevelopment
- Pollution Prevention & Good Housekeeping

Potential Flooding Problems



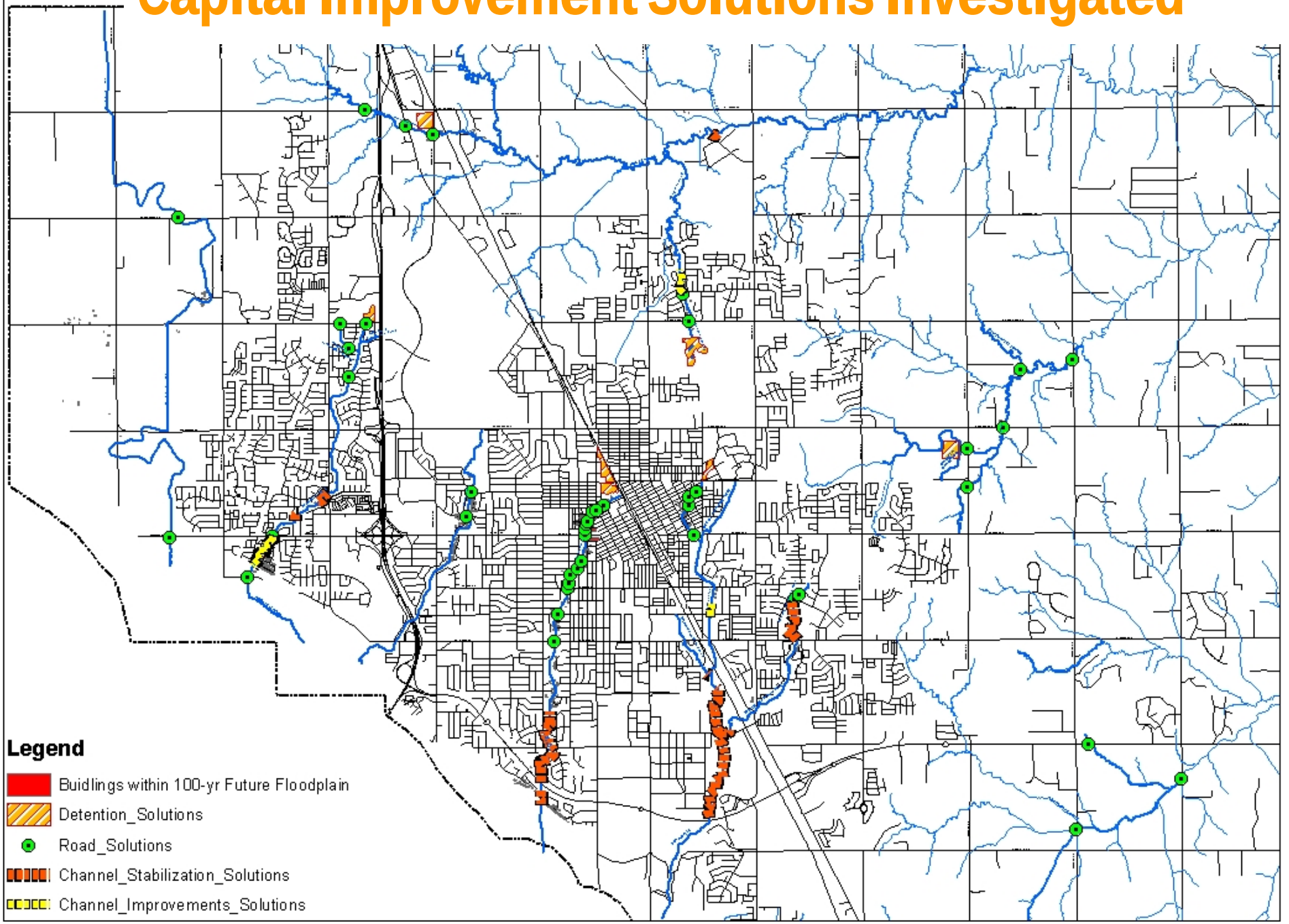
Solution Investigations/Recommendations

- Flood solutions being considered:
  - Detention ponds
  - Road crossing improvements
  - Channel conveyance Improvements
  - Flow diversion
  - Buyout/Acquisition
  - Flood proofing
- Erosion solutions being considered:
  - Bio-engineered MSE walls/Soil lifts
  - Grade controls (rock)
  - Rock rip rap to protect channel toes and banks
  - Streambank shaping

Greenbelt / Trail Integration

- Combine with CIP projects where possible
- Possible maintenance overlap with storm water system

Capital Improvement Solutions Investigated

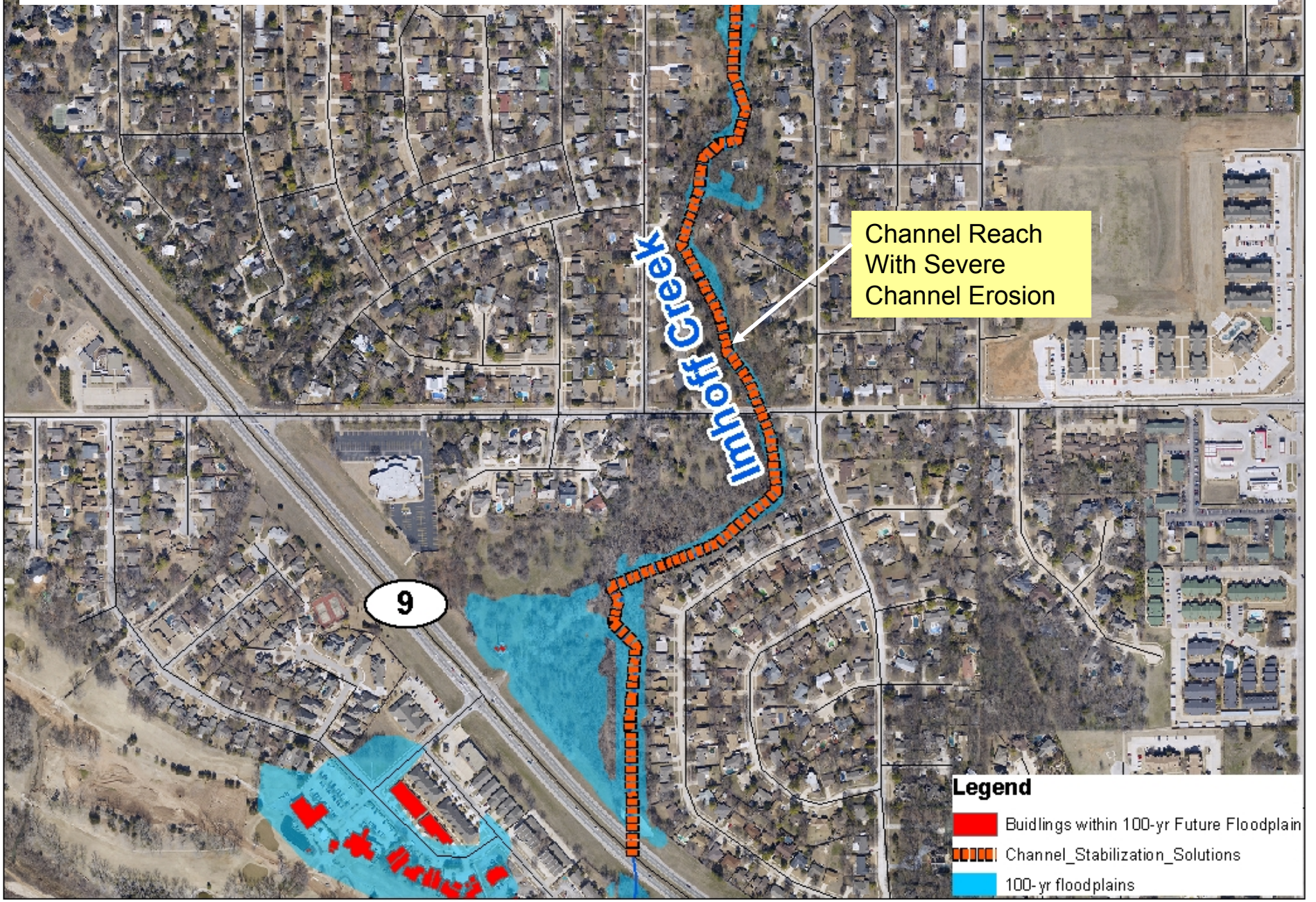


Identification of Problem Areas
Lower Bishop Creek

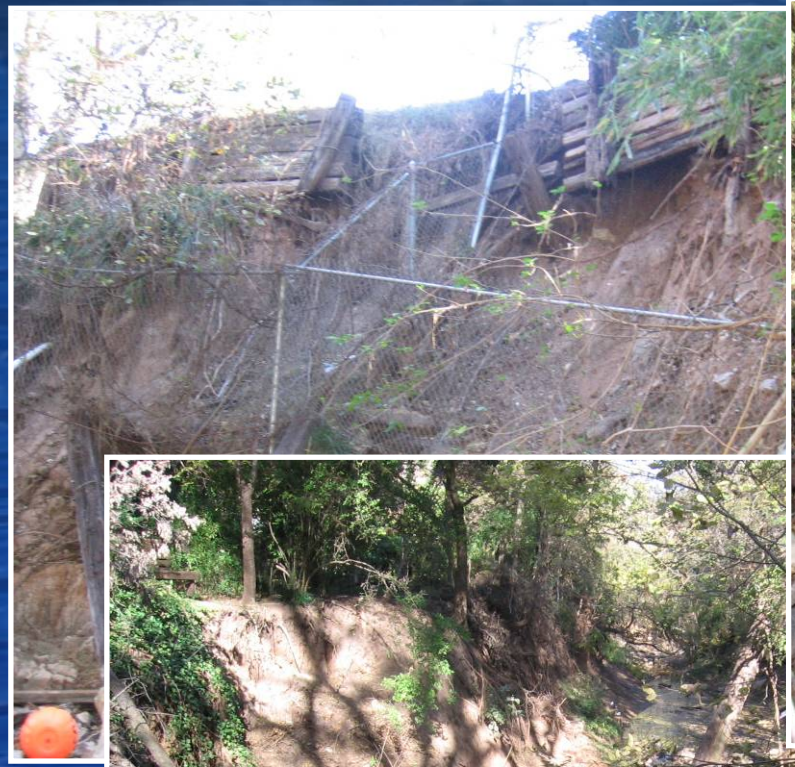
Legend

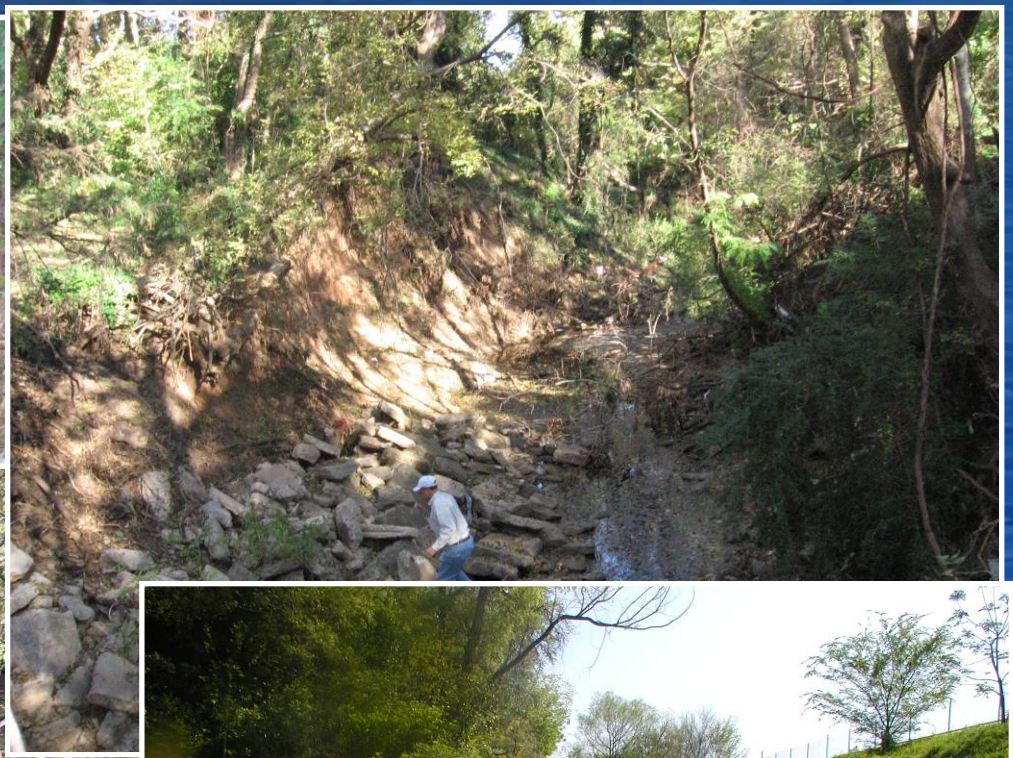
- Buildings in 100-yr Future Floodplain
- Identified Channel/Bank Erosion

Channel Stabilization Option on Imhoff Creek

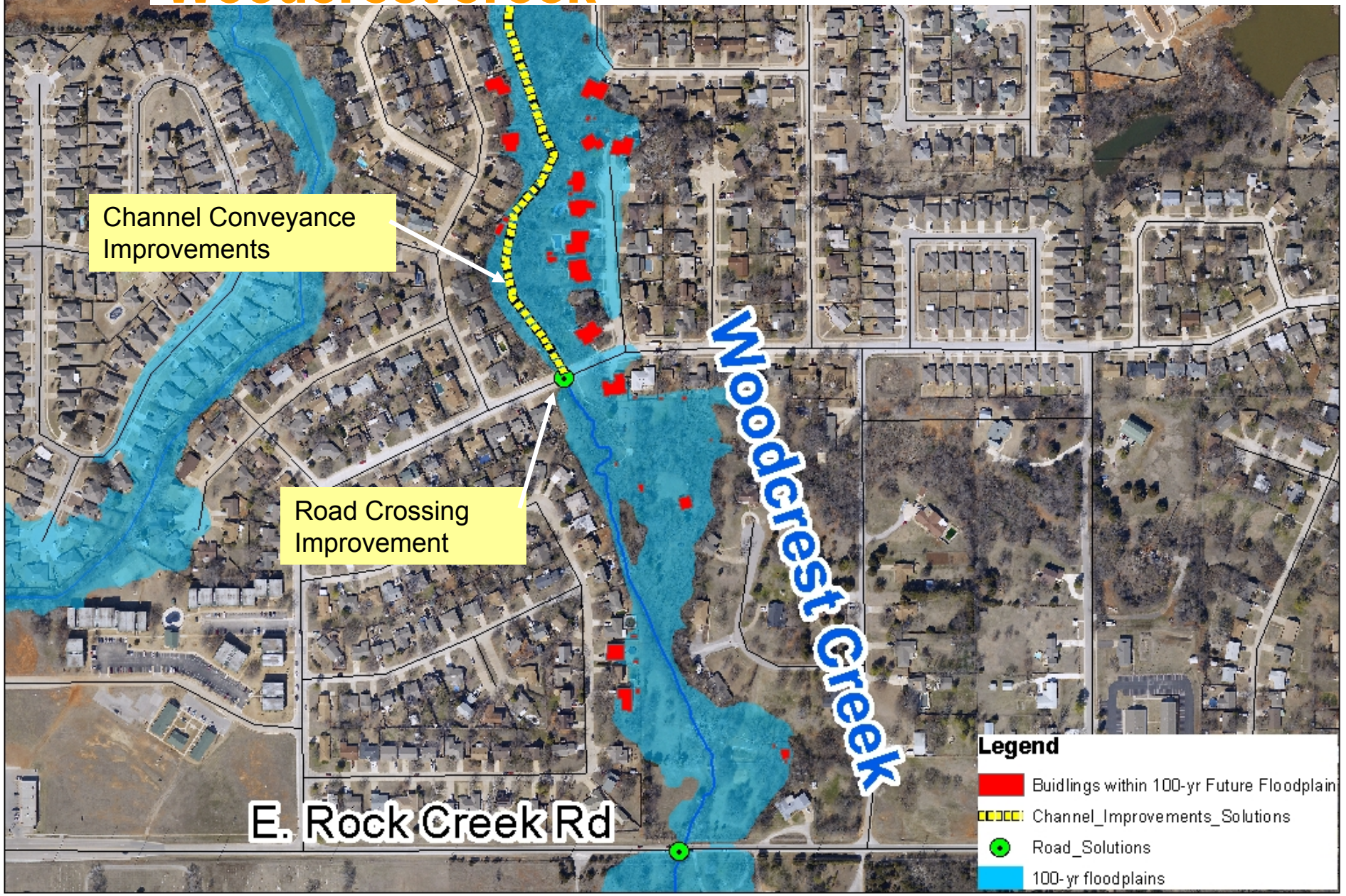


Imhoff Creek Erosion Problem/Possible Solution



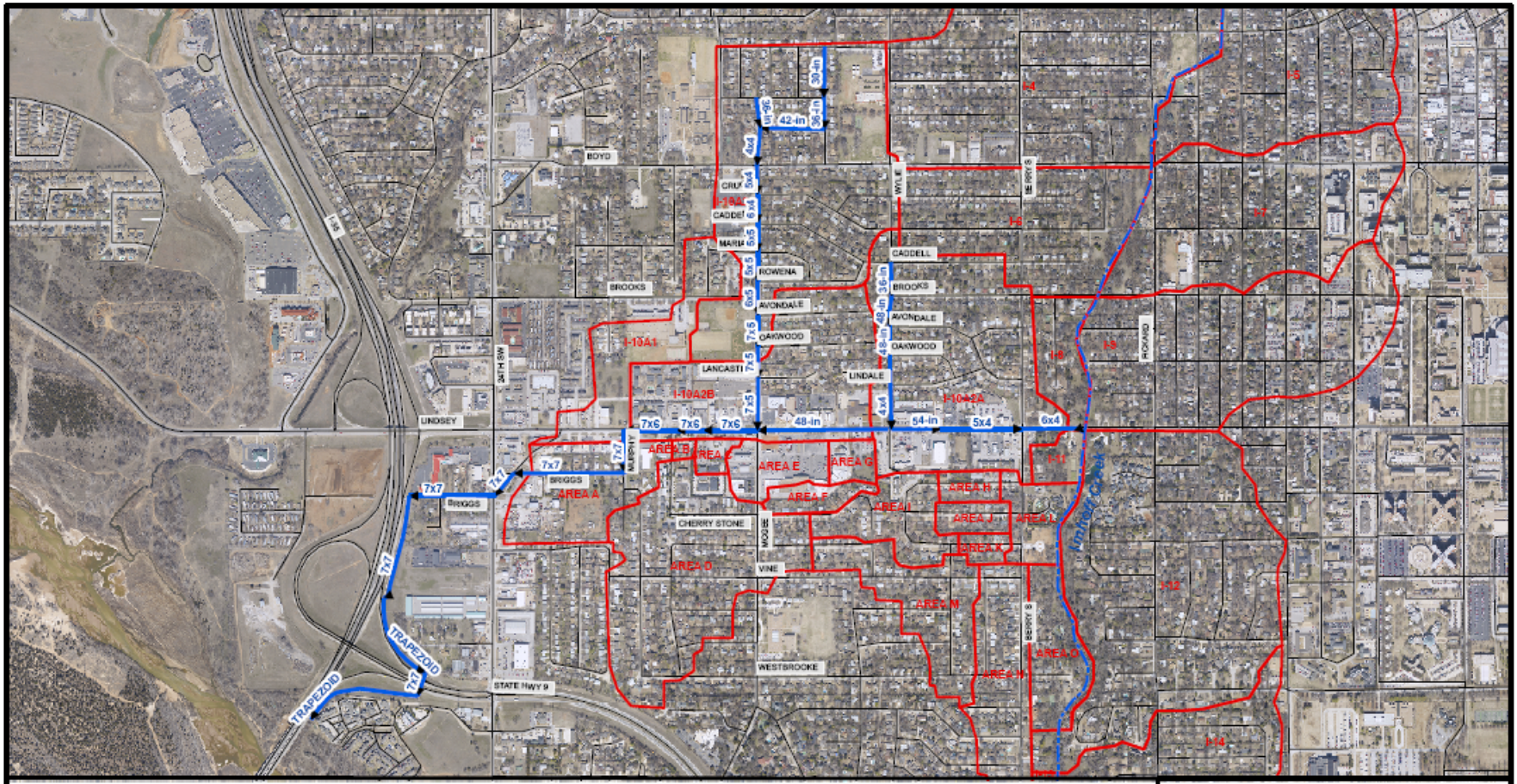


Road and Conveyance Improvement Options on Woodcrest Creek



Road Crossing Improvements

Proposed West Central Imhoff Creek Watershed Drainage Improvements (Lindsey – McGee and More)



0 600 1,200 2,400 Feet

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

Legend

- Storm Drainage Improvements
- Imhoff Creek
- Imhoff Creek Subbasins
- Road Centerlines

Figure 6-1

West-Central Imhoff Creek Watershed Drainage Improvements (10-Year Design)

Job No.: 044194100 | Date: 2-16-09 | 1 inch equals 1,000 feet

File: W:\NR\proj\44194\1_Norman\Report\Figures\Imhoff_Lindsey-McGee-10yr.mxd

Solutions Summary

- 59 solutions developed to alleviate problems
- 34 (58% of solutions) - stream flood protection
  - 26 of the 34 target structure or building flooding
    - 652 of 830 structures removed from 100-year floodplain
  - 29 of the 34 include upgrades to one or more flooded road crossings
    - 36 out of 36 flooded road crossings protected
  - 12 of the 34 involve structure or parcel buyout
    - 62 properties are possible buyouts
- 14 (24% of solutions) - stream erosion stabilization
    - 10,500 ft of eroding streams stabilized
- 12 (20% of solutions) are local drainage problems

APPENDIX I

PROJECT PRIORITIZATION SCORING SHEET - BISHOP CREEK

					BC - 9			BC - 10	
		Maximum Possible Score			Stream Stabilization US Lindsey St. - Trib. A			Creek Modifications/Culvert Upgrades Sinclar Rd. and Beaumont Rd.	
Prioritization Ranking Factors	Ranking Factor Weight	Project Specific Score	Project Specific Weighted Score		Project Specific Score	Project Specific Weighted Score		Project Specific Score	Project Specific Weighted Score
Public safety	4	3	12		1	4		3	12
Flood, erosion, and water quality significance	4	3	12		3	12		3	12
Engineering economy (good benefit/cost relationship)	4	3	12		3	12		3	12
Potential for recreation/open space/connectivity for linear parks	4	3	12		0	0		2	8
Sustainability or low operations & maintenance cost	3	3	9		3	9		2	6
Environmental enhancement	3	3	9		3	9		2	6
Funding sources (leverage of participants available funds)	2	3	6		1	2		2	4
Beneficial neighborhood impacts	2	3	6		2	4		3	6
Degree of economic impact on local businesses	2	3	6		2	4		1	2
Dependency on other projects	1	3	3		3	3		3	3
Improve economic development/redevelopment potential	1	3	3		1	1		1	1
Mobility or effects on transportation system	1	3	3		0	0		3	3
Time to implement or construct	1	3	3		3	3		3	3
Ease of permitting	1	3	3		2	2		2	2
Project Total Specific Score			99			65			80

* Project Specific Scores can be 0, 1, 2, or 3

Project Prioritizations Ranked Citywide,

By Watershed, and By Ward

Proposed Problems/Solutions Summary

Summary of Proposed Storm Water Projects

Watershed	Stream Flooding No.	Stream Flooding Costs	Stream Stabilization No.	Stream Stabilization Costs	Local Drainage No.	Local Drainage Costs	Watershed Total Cost	Percent of City Total
Bishop Creek	6	$5,347,808	6	$1,817,248	5	$4,720,055	$11,885,111	14.4
Brookhaven Creek	4	$2,613,904	4	$2,106,735	3	$1,278,962	$5,999,601	7.3
Clear Creek	---	---	---	---	1	$1,794,023	$1,794,023	2.2
Canadian River	---	---	---	---	1	$400,645	$400,645	0.5
Dave Blue Creek	2	$1,786,733	---	---	---	---	$1,786,733	2.2
Imhoff Creek	9	$24,439,559	2	$6,816,509	1	$12,461,087	$43,717,155	53.0
Little River	1	$305,233	1	$123,682	---	---	$428,915	0.5
Tributary G to Little River	1	$992,182	---	---	---	---	$992,182	1.2
Woodcrest Creek	3	$3,167,165	1	$110,965	---	---	$3,278,130	4.0
Merkle Creek	4	$8,856,558	---	---	---	---	$8,856,558	10.7
Rock Creek	3	$3,136,111	---	---	---	---	$3,136,111	3.8
Ten Mile Flat Creek	---	---	---	---	1	$255,326	$255,326	0.3
Citywide Totals	33	$50,645,253	14	$10,975,139	12	$20,910,098	$82,530,490	100.0

Financial Analyses

Capital Improvement Program
Three Rate Options – FY 2008–2009 Dollars (Uninflated)

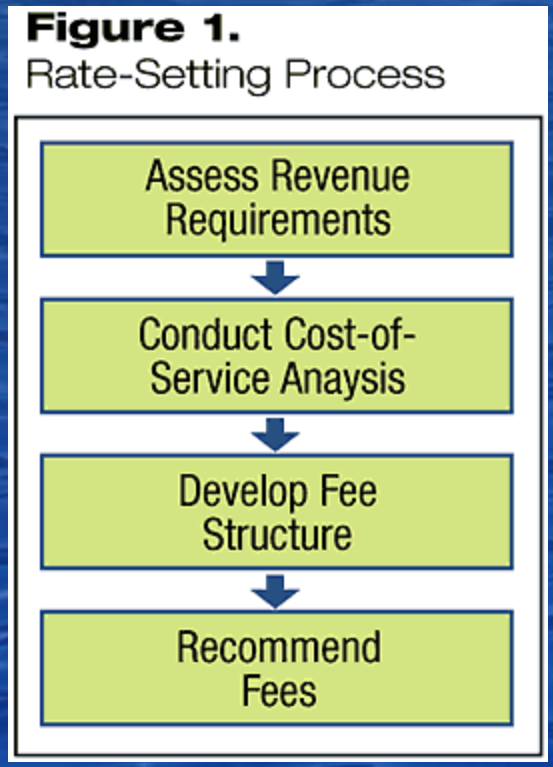
Line No.	Item	Option 1	Option 2	Option 3
1	Capital Improvement Program (20-Year Period)	$83,000,000	$83,000,000	$83,000,000
	Funding Sources			
2	General Obligation Bonds	$30,000,000	$38,500,000	$40,000,000
3	Storm Water User Rates (Pay-go) Financing	$53,000,000	$44,500,000	$43,000,000
4	Total	$83,000,000	$83,000,000	$83,000,000
5	Program Period	20	20	20
6	Capital Improvement Projects per Year Funded by Rates	$2,650,000	$2,225,000	$2,150,000

Task Force Guidance

- Rate Structure
  - Per square foot of impervious surface
- Operations Budget
  - Reserve policy
  - MS4 program
  - City costs
- Include all parcels
  - OU
  - Institutional and government

Rate Setting Process

- Assess revenue requirements
  - Quantifies the annual need for fee-based funding
- Cost of service
  - Basis for the rate-calculation process
- Develop fee structure
  - Approx. 50% nationwide based on impervious surface
  - Non-impervious cover methods
- Recommended user fees
  - Based on equity and acceptability
  - Based on individual impervious surface
  - Approved in concept by Advisory Committee



Rate Calculation

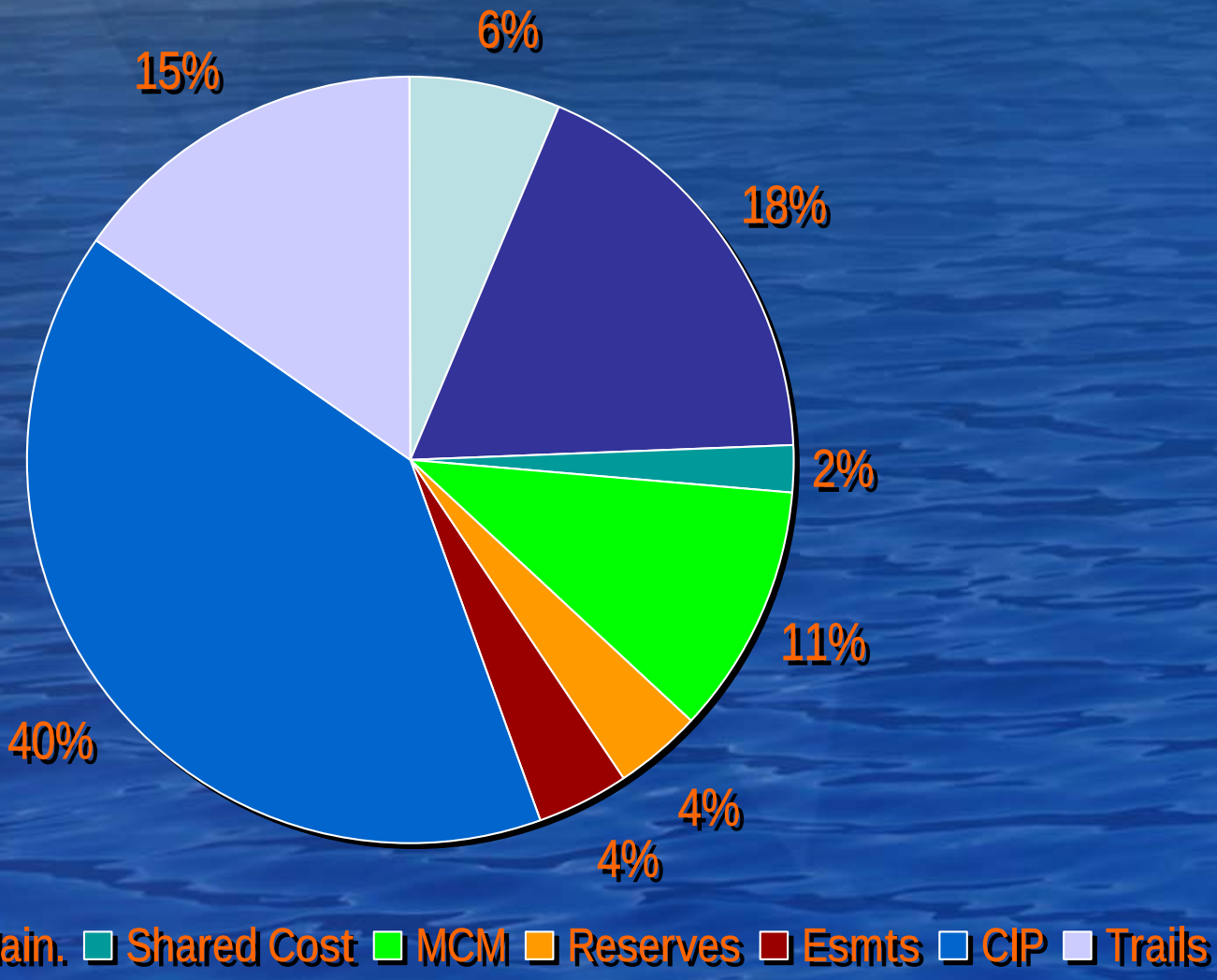
Storm Water Rate = Cash Needs ÷ Impervious Surface

- Storm Water Cash Needs, include:
  - MS4 Minimum Control Measures
  - Utility operations and maintenance budget
  - Enhanced trail, detention pond, and creek maintenance
  - Trail Construction
  - Master Plan capital projects
  - Easement/ROW/Parcel Acquisition
  - Shared City Services
  - Reserve Funding
- Impervious Surface in Square Feet
  - ALL impervious surface identified from City's GIS

Storm Water Utility Revenue Requirement (FY 2011–2012) Dollars

Line No.	Storm Water Revenue Requirement, FY 2011–2012	Option 1	Option 2	Option 3
1	Operation and Maintenance	$459,799	$459,799	$459,799
2	Shared City Services	$129,465	$129,465	$129,465
3	Minimum Control Measures	$748,616	$748,616	$748,616
4	Reserve Funding	$265,000	$265,000	$265,000
5	Subtotal	$1,602,880	$1,602,880	$1,602,880
6	Enhanced Maintenance (Trails, Detention Ponds, Creeks)	$1,273,080	$1,273,080	$1,273,080
7	Capital Improvements Program	$2,866,240	$2,406,560	$2,325,440
8	Trail Construction	$1,081,600	$1,081,600	$1,081,600
9	Easements and Rights- of- Way	$265,225	$265,225	$265,225
10	Less Interest on Cash Accounts	$(25,758)	$(25,758)	$(25,758)
11	Total Revenue Requirement	$7,063,267	$6,603,587	$6,522,467

Budget Needs



Citywide Impervious Data Analysis

All Parcels	(A)	(B)	(C)	(D)	(E)	(F)
User Class	Parcel Count	Total Area Sq Ft	Imp. Area Sq Ft	% of City's Total Impervious Area	Avg Impervious Area Sq Ft	% of Total User Class Area that is Impervious
Single Family	26,078	636,195,726	94,245,445	32%	3,614	15%
Multi-family	6,626	193,751,640	42,293,081	15%	6,383	22%
Comm/Indust/Office	2,314	222,531,361	59,935,187	21%	25,901	27%
Agriculture	4,616	3,854,345,991	72,687,230	25%	15,747	2%
University of Oklahoma	199	76,314,671	15,637,104	5%	78,578	20%
Miscellaneous	18	17,709,556	6,827,420	2%	379,301	39%
Total	39,851	5,000,848,945	291,625,467	100%		

Drainage Basins

Drainage Basin*	Parcel Count	Total Square Feet	Imp. Area (ft^2)	% of Total Impervious Area	Watershed Impervious Area
Bishop Creek	7,936	230,589,142	64,657,416	22%	28%
Brookhaven Creek	4,624	98,010,628	26,629,604	9%	27%
Clear Creek	376	197,001,388	4,030,748	1%	2%
Dave Blue Creek	2,252	540,496,747	18,021,075	6%	3%
Downstream of Lk Thunderbird	2,678	676,191,048	19,894,102	7%	3%
Hog Creek	267	149,704,678	2,323,487	1%	2%
Hog Creek Arm	323	114,115,494	2,506,863	1%	2%
Hog Creek Tributary D	133	91,813,338	1,266,211	0%	1%
Imhoff Creek	5,543	76,757,298	25,479,752	9%	33%
Jim Blue Creek	301	213,448,532	3,295,600	1%	2%
Lake Thunderbird	813	718,101,075	12,205,044	4%	2%
Little River	2,085	756,567,145	24,673,025	8%	3%
Merkle Creek	3,244	106,096,286	34,324,538	12%	32%
Rock Creek	2,910	316,422,198	14,351,647	5%	5%
Ten Mile Flat Creek	1,903	255,059,959	12,611,081	4%	5%
Trib 1 to Lk Thunderbird	218	94,293,700	2,385,787	1%	3%
Trib 2 to Lk Thunderbird	205	62,781,314	1,945,272	1%	3%
Trib G to Little River	1,062	117,308,901	8,457,530	3%	7%
Willow Branch	123	112,285,473	1,233,259	0%	1%
Woodcrest Creek	2,855	73,804,602	11,523,780	4%	16%
Total	**39,851**	**5,000,848,945**	**291,815,821**	**100%**	

* Data in this table includes OU parcels

Watershed Summary

Endpoint*	Parcel Count	Total Square Feet	Imp. Area (ft^2)	% of Total Impervious Area	Watershed Impervious Area
Downstream of Lk Thunderbird	2,678	676,191,048	19,894,102	7%	3%
Lake Thunderbird	13,923	3,558,144,584	108,219,326	37%	3%
Canadian River	23,250	766,513,313	163,702,392	56%	21%
Total	**39,851**	**5,000,848,945**	**291,815,821**	**100%**	

* Data in this table includes OU parcels

Storm Water Rate Calculation for FY 2009–2010 through 2013–2014

	Option 1	Option 2	Option 3
Revenue Requirement	$7,063,267	$6,603,587	$6,522,467
Total Impervious Sq Ft	291,625,467	291,625,467	291,625,467
Yearly Rate ($/Sq Ft)	$0.024	$0.023	$0.022
Monthly Rate ($/Sq Ft)	$0.0018	$0.0017	$0.0017

Average Bill for Each User Class
(Based on Mid-Year, 2011–2012, of 2009–2014 Planning Period)

		Option 1		Option 2		Option 3	
User Class	Average Impervious Surface (Sq Ft)	Average Yearly Bill ($)	Average Monthly Bill ($)	Average Yearly Bill ($)	Average Monthly Bill ($)	Average Yearly Bill ($)	Average Monthly Bill ($)
Single Family	3,614	87.53	7.29	81.84	6.82	80.83	6.74
Multi-family	6,383	154.60	12.88	144.54	12.04	142.76	11.90
Commercial/Industrial/ Office	25,901	627.33	52.28	586.50	48.88	579.30	48.27
Agriculture	15,747	381.40	31.78	356.58	29.71	352.20	29.35
University of Oklahoma	78,578	1,903.19	158.60	1,779.33	148.28	1,757.47	146.46

Storm Water Rates for the Subsequent 5-Year Planning Periods (Option 1)

	5-Year Planning Period		
	FY 14/15 to 18/19	FY 19/20 to 23/24	FY 24/25 to 28/29
Revenue Requirement	$9,596,914	$11,117,910	$13,228,877
Total Impervious Sq Ft	291,625,467	291,625,467	291,625,467
Yearly Rate ($/Sq Ft)	$0.0329	$0.0381	$0.0454
Monthly Rate ($/Sq Ft)	$0.0027	$0.0032	$0.0038
Average Yearly Single Family Bill	$118.93	$137.78	$163.94
Average Monthly Single Family Bill	$9.91	$11.48	$13.66

Single Family Bill for Various Impervious Surface Deciles

		Option 1		Option 2		Option 3	
Single-Family Impervious Surface (sq ft)	Decile – % Properties ≤ sq ft Given	Average Yearly Bill ($)	Average Monthly Bill ($)	Average Yearly Bill ($)	Average Monthly Bill ($)	Average Yearly Bill ($)	Average Monthly Bill ($)
2,500	30	60.55	5.05	56.61	4.72	55.91	4.66
2,800	40	67.82	5.65	63.40	5.28	62.62	5.22
3,100	50	75.08	6.26	70.20	5.85	69.33	5.78
3,400	60	82.35	6.86	76.90	6.42	76.04	6.34
3,800	70	92.04	7.67	86.05	7.17	84.99	7.08
4,400	80	106.57	8.88	99.63	8.30	98.41	8.20

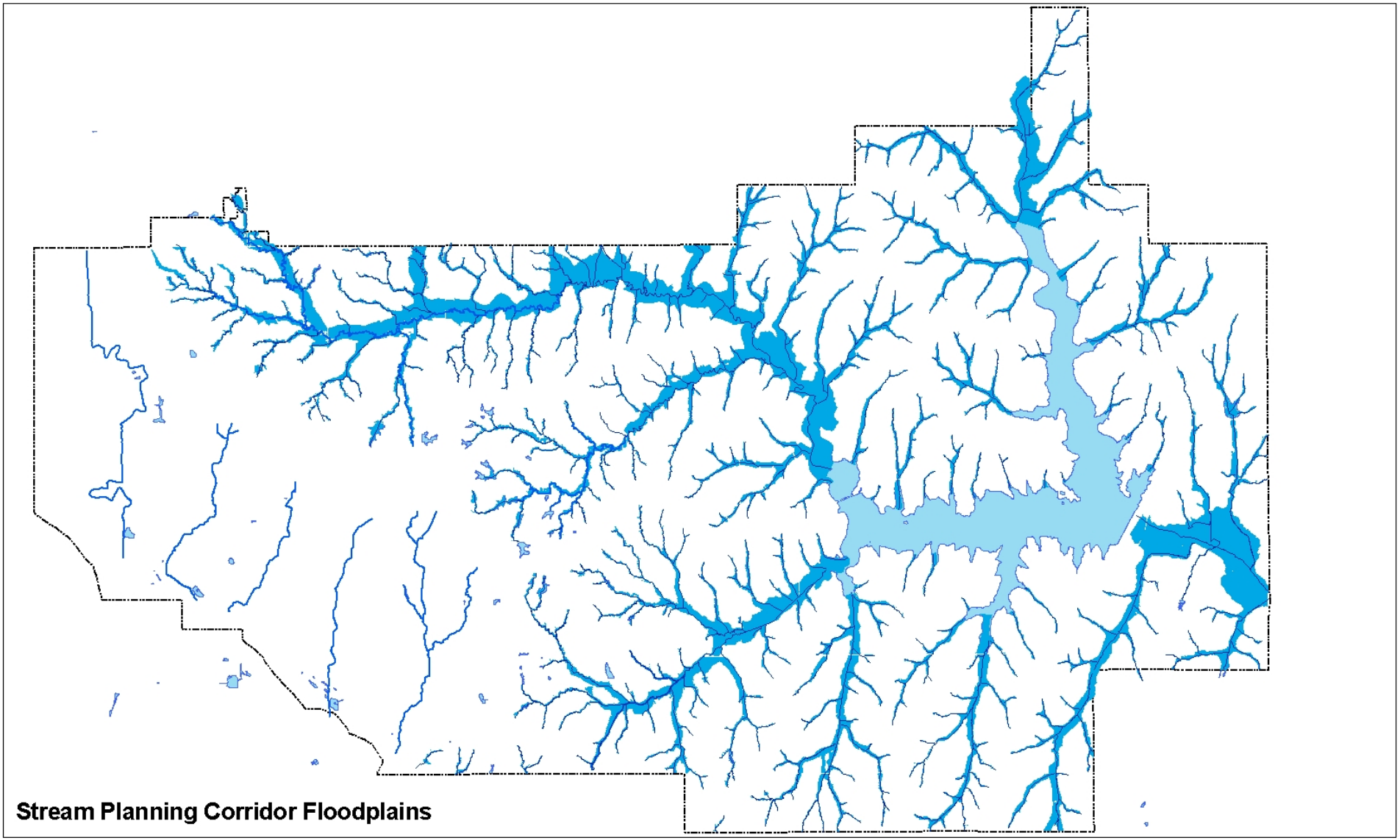
Key Issues

- Stream Planning Corridors and Additional Buffer Strips
- Structural and Nonstructural Storm Water Quality Controls
- Acquisitions of Drainage Easement and Rights-of-Way
- Enhanced Maintenance of Creeks & Detention Facilities
- Dam Safety

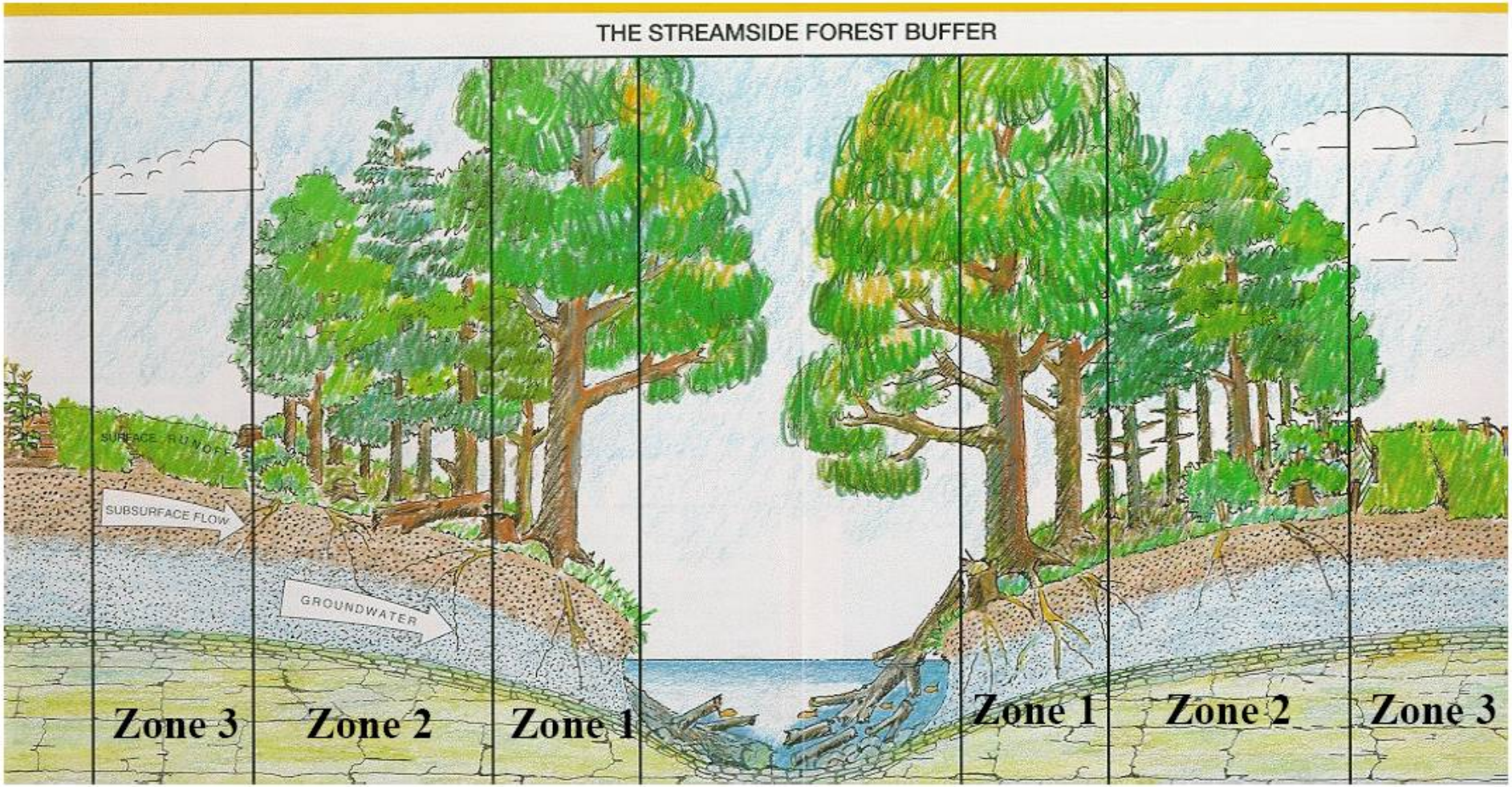
Stream Planning Corridors

- Corridor defined by the 100-year future (Norman 2025) floodplain
- Assists in planning future development
- Provides for:
  - » Water quality benefits
  - » Storm water conveyance
  - » Riparian habitat
  - » Greenbelt/trails

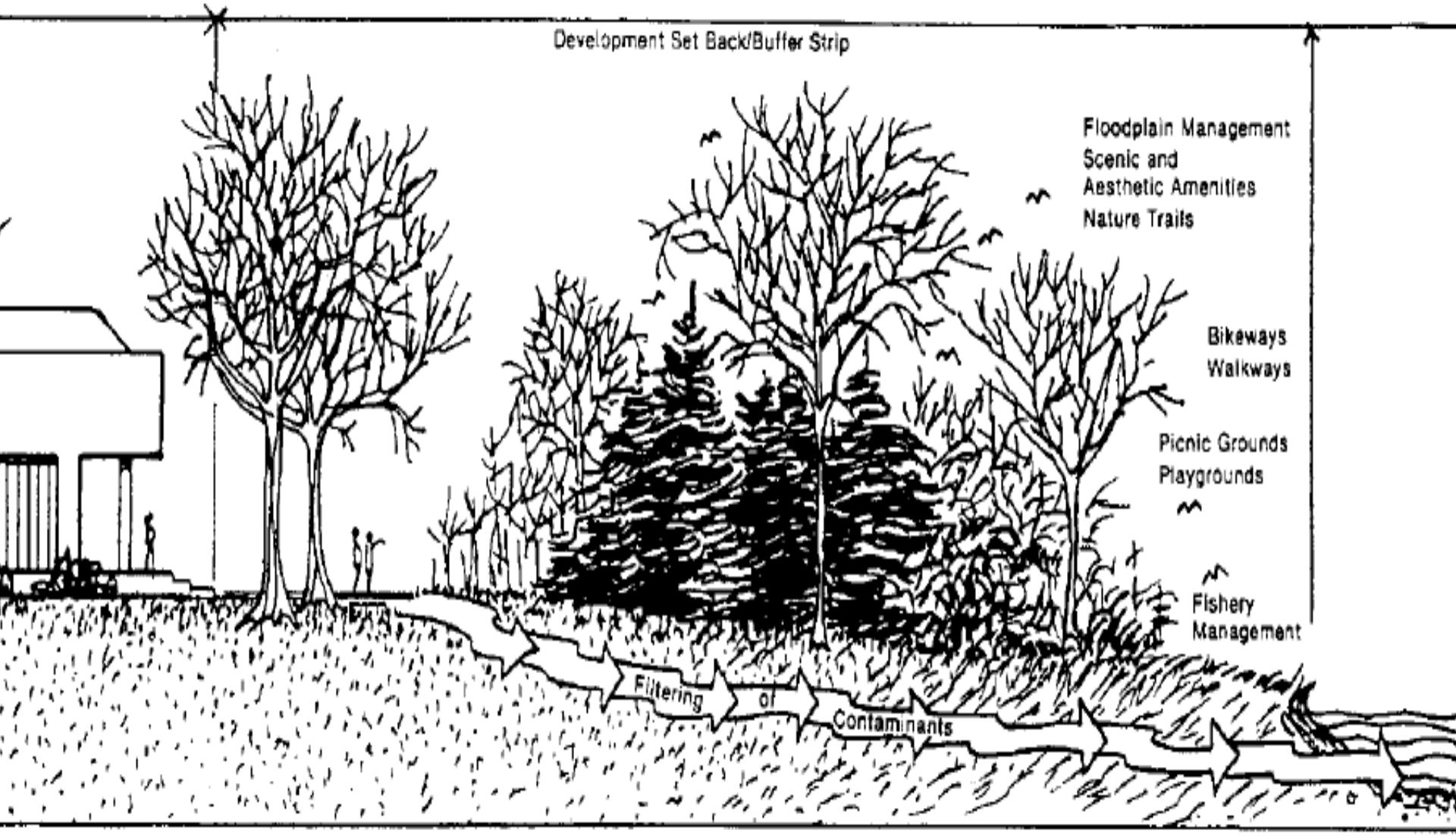
Stream Planning Corridors (Floodplains)



Stream Planning Corridor Cross Section



Stream Corridor Benefits



Suburban Stream Corridor

Stream Planning Corridors

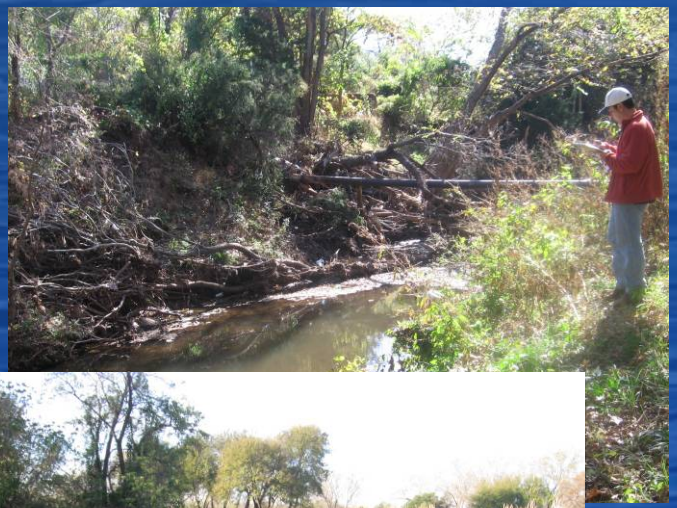
- Recommendations:
  - » Utilize along streams in the Lake Thunderbird watershed draining greater than 40 acres, and
  - » Incorporate an additional 15 ft buffer if streams located in Suburban Residential and Country Residential areas (Norman 2025 Plan)

Structural and Nonstructural Water Quality Controls

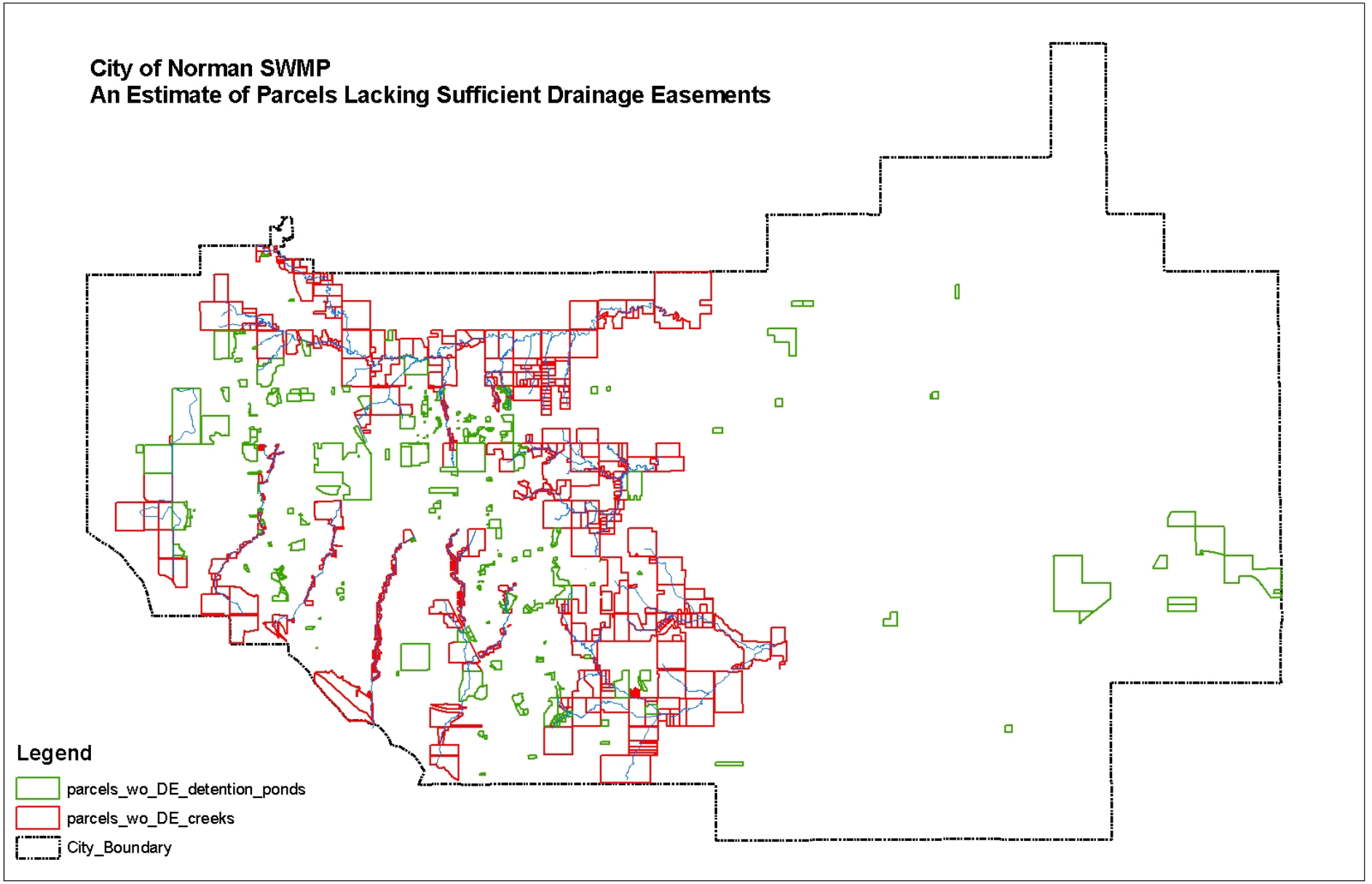
- Structural and Nonstructural water quality controls can help in preventing further water quality degradation in Lake Thunderbird and the Canadian River.
- Recommendation:
  - » Provide structural controls (primarily by developers) and nonstructural controls (developers and City)

Inadequate Drainage Easements, Rights-of-Way, and Rights-of-Entry

- Creeks and Detention Facilities
- 755 creek parcels and 285 detention parcels without available drainage easements
- Needed for:
  - Inspections
  - Initial creek cleanup
  - Ongoing maintenance
  - Capital Improvements
  - Trail considerations



Parcel Identification Lacking Drainage Easements



Creek / Detention Pond Drainage Easements

Inadequate Drainage Easements, Rights-of-Way, and Rights-of-Entry

- Recommendations:
  - To allow for inspection, maintenance, stream stabilization, or flood conveyance, obtain easements and/or ROW on a priority basis especially in areas where structures exist or will be built. In special cases, use rights-of-entry (one time event).
  - As a standard procedure, obtain easement/ROW widths equal to stream bank to bank plus minimum of 10 ft.
  - In special locations, develop a long range plan to obtain a wider area such as the FEMA floodway.

Enhanced Creek/Detention Pond Maintenance

- Initial debris cleanup costs
- 755 parcels along creeks without available drainage easements
- 285 parcels with detention facilities without drainage easments
- Access and trail considerations

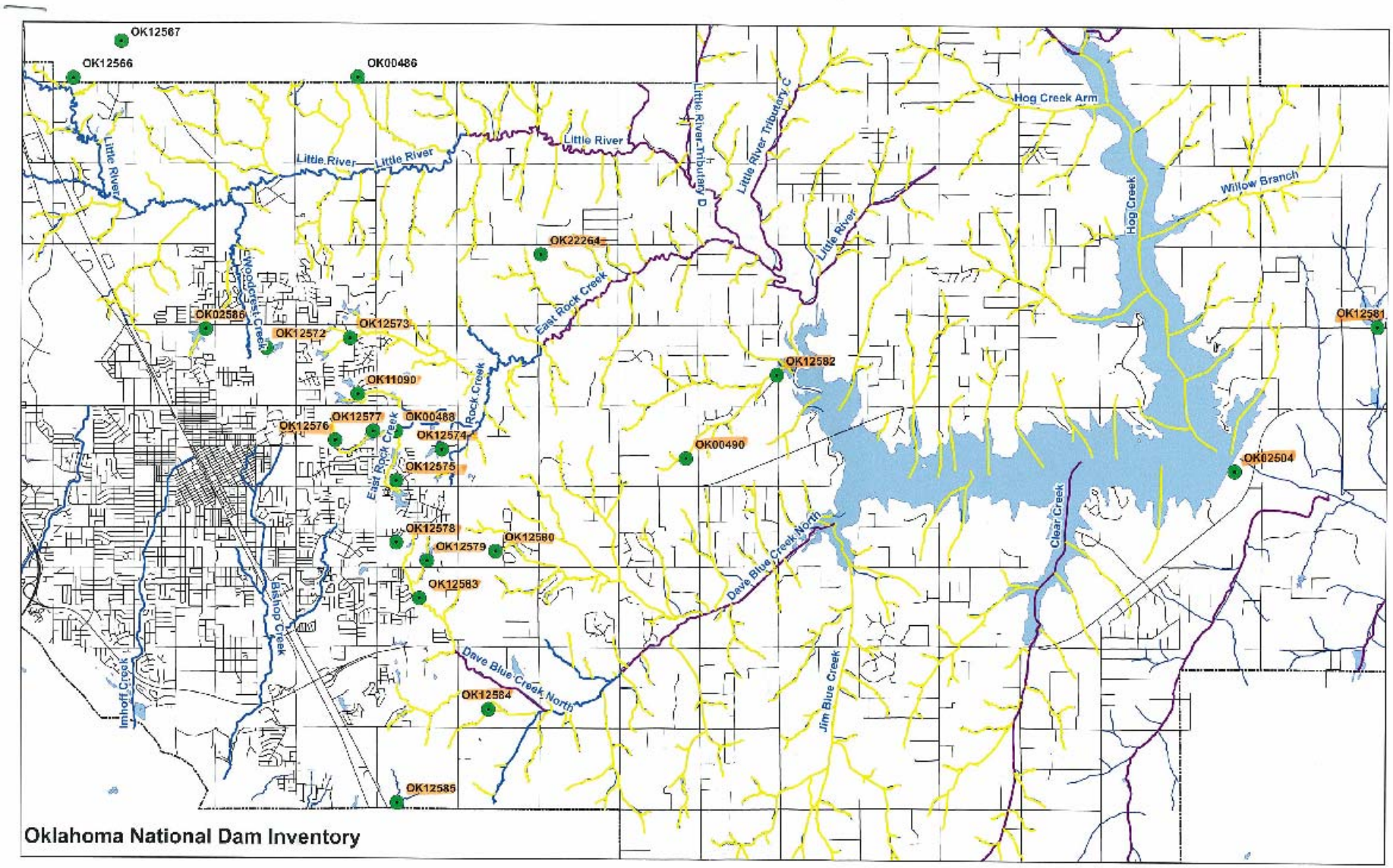
Enhanced Maintenance of Creeks and Storm Water Detention Facilities

- Recommendation:
  - The City should increase maintenance on creeks and detention facilities with a focus on improvement areas and/or areas where maintenance problems persist. The City should share maintenance responsibilities with POAs especially for detention facility areas with the City handling the dams and structural elements and the POAs handling routine mowing and maintenance of the water perimeter areas.

Dam Safety / Liability / Inspection / Maintenance

- Approximately 20 dams identified by the OK National Dam Inventory
- Most all dams in inventory were constructed in the 1960s
- Additional Detention Pond Dams in City

Oklahoma National Dam Inventory



Dam Safety

- Recommendations:
  - The City Should identify responsible parties for the inspection, maintenance, and overall safety for all dams judged to be potentially hazardous beginning with dams judged to have the highest safety risks.
  - After determining prevailing conditions at each dam, the City should split responsibilities with POAs with:
    - the City focusing on the inspection, maintenance, and responsibility of the dam structural elements, and
    - the POAs should continue routine maintenance and mowing.

Storm Water Master Plan

QUESTIONS AND COMMENTS

Lake Thunderbird Sunset