Watershed Master Plan

College Lake Dam Analysis & Proposed Solutions – Carvers Creek

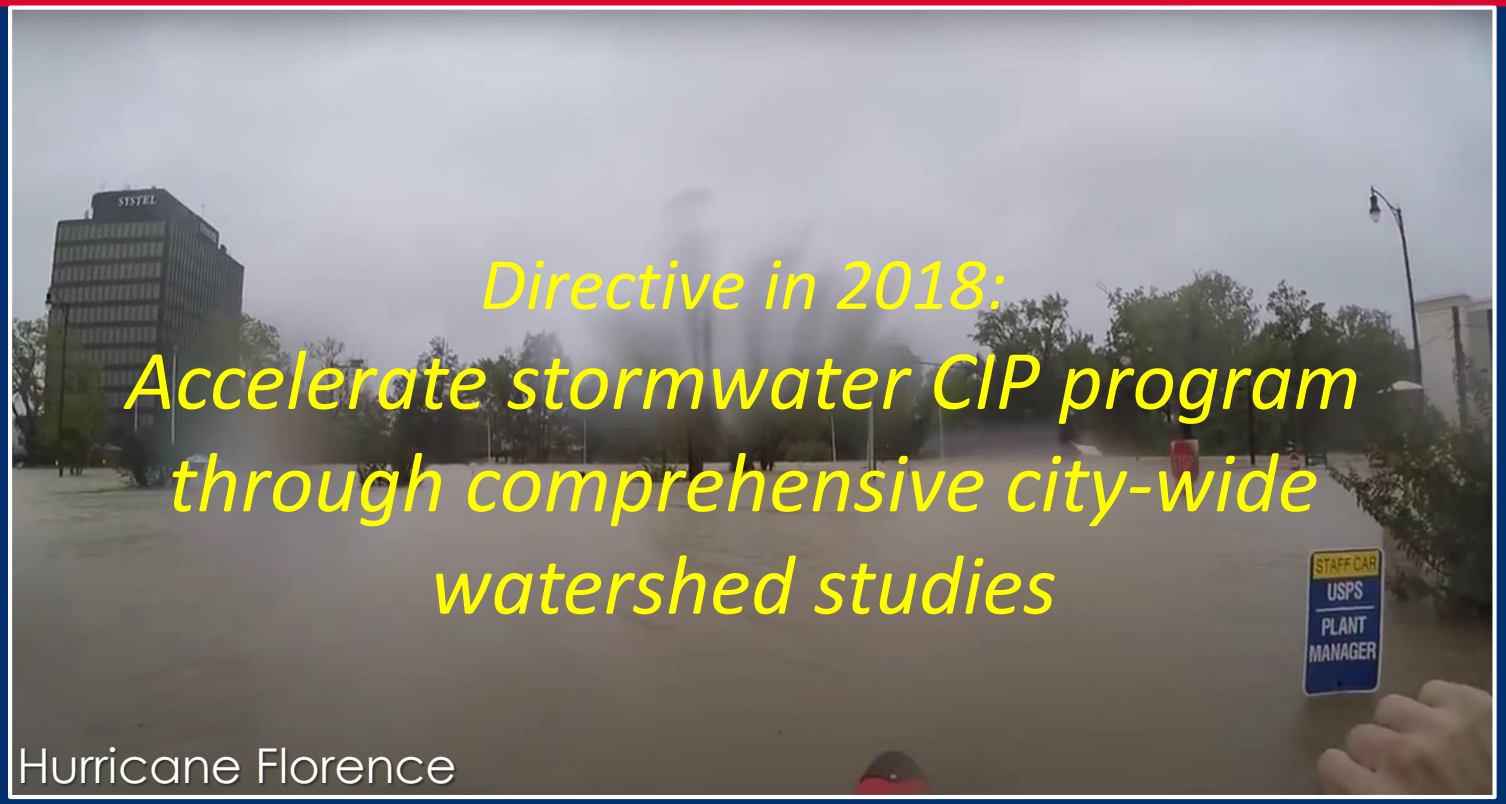
City Council Work Session:
April 7, 2025

FAYETTEVILLE NC

Purpose

- Introduction:
  - Provide an overview of Watershed Studies - *City*
  - Provide a summary of proposed solutions approved to date - *City*
- College Lake Dam:
  - Present analysis and recommended solution - *Kimley Horn*
  - Request consensus to include the solution in the CIP - *City*
- Proposed Solutions for Carvers Creek Watershed:
  - Present proposed solutions - *Kimley Horn*
  - Request consensus to include proposed solutions in the CIP - *City*

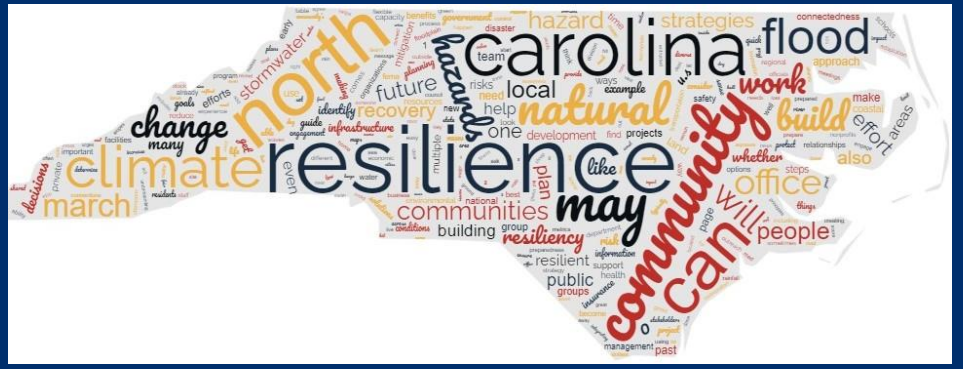
Comprehensive Vision



Directive in 2018:

Accelerate stormwater CIP program through comprehensive city-wide watershed studies

Hurricane Florence



Visualize a Flood Resilient Fayetteville

Winning Grants!

STORMWATER MANAGEMENT

Fayetteville, North Carolina, awarded with $3.5 million for stormwater improvement

Fayetteville, North Carolina, was awarded with a $3.5 million grant for stormwater improvement.

June 4, 2024

ACHIEVERS & ACCOLADES

Fayetteville's commitment to infrastructure leads to FEMA $15.4 million grant finalist

BY STAFF REPORT, POSTED 1 YEAR AGO

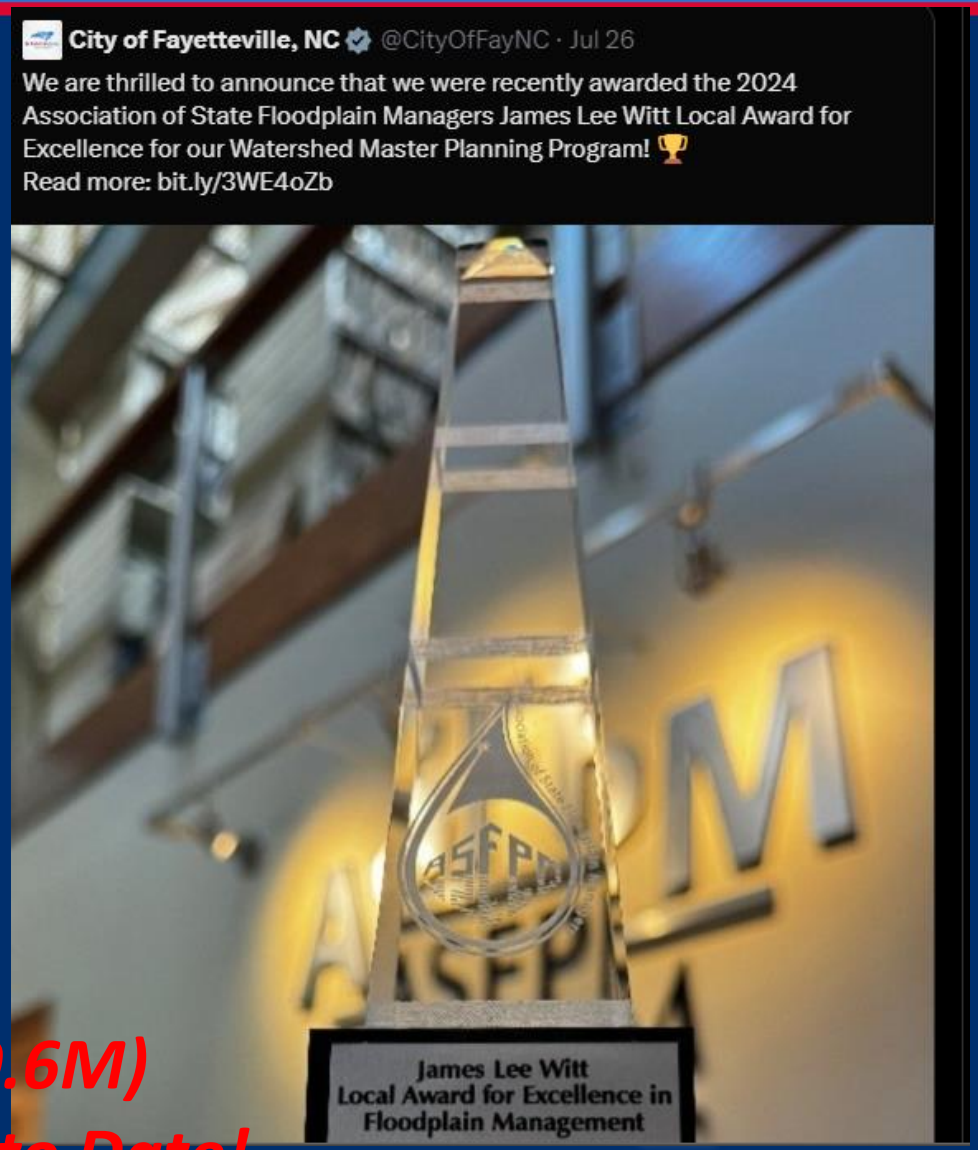
Like 1 Share Share Post

FAYETTEVILLE! Blounts Creek Solution Impact Area

GOVERNMENT

Golden LEAF Foundation awards City of Fayetteville $1M

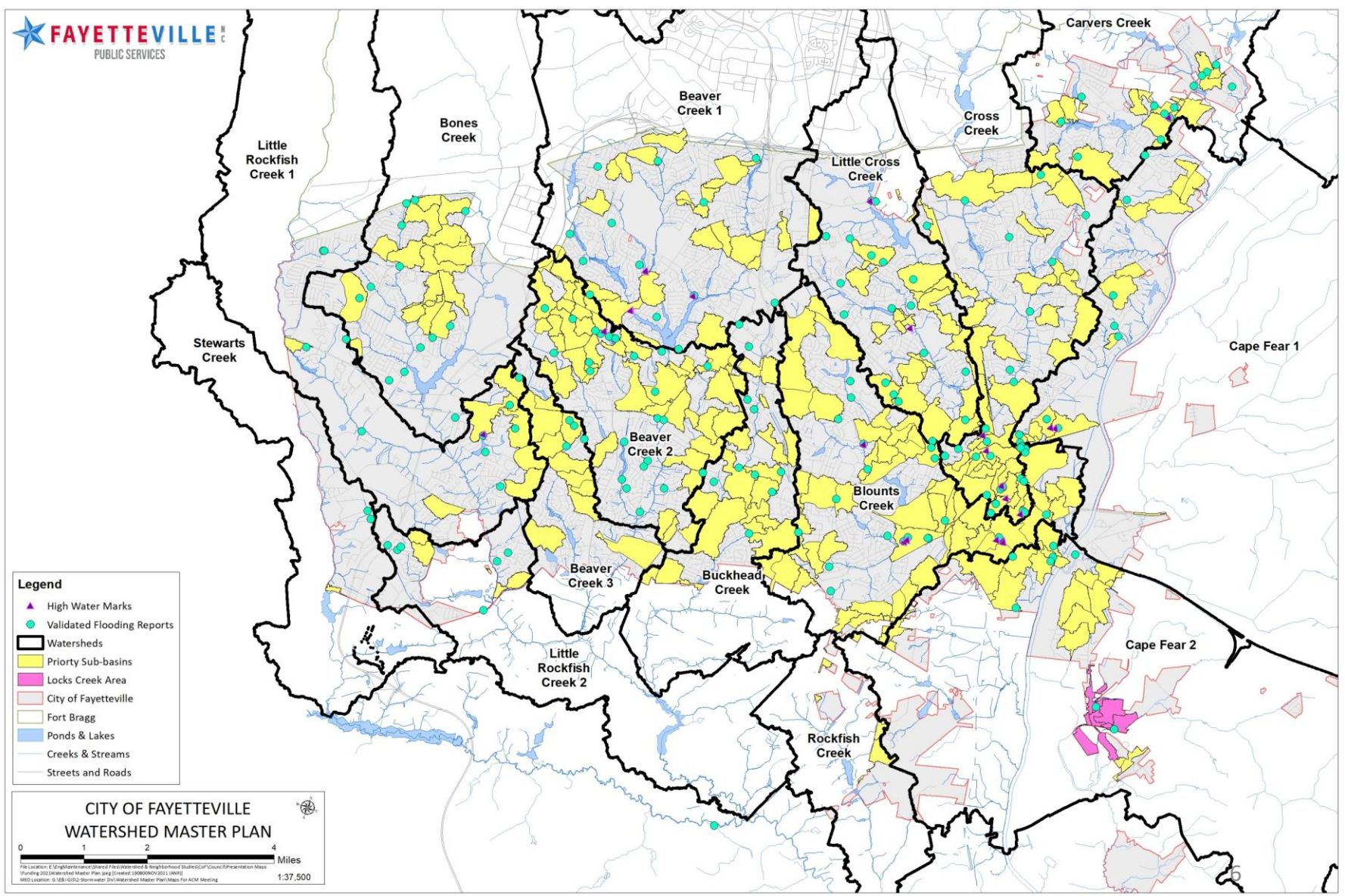
BY STAFF REPORT, POSTED 2 MONTHS AGO



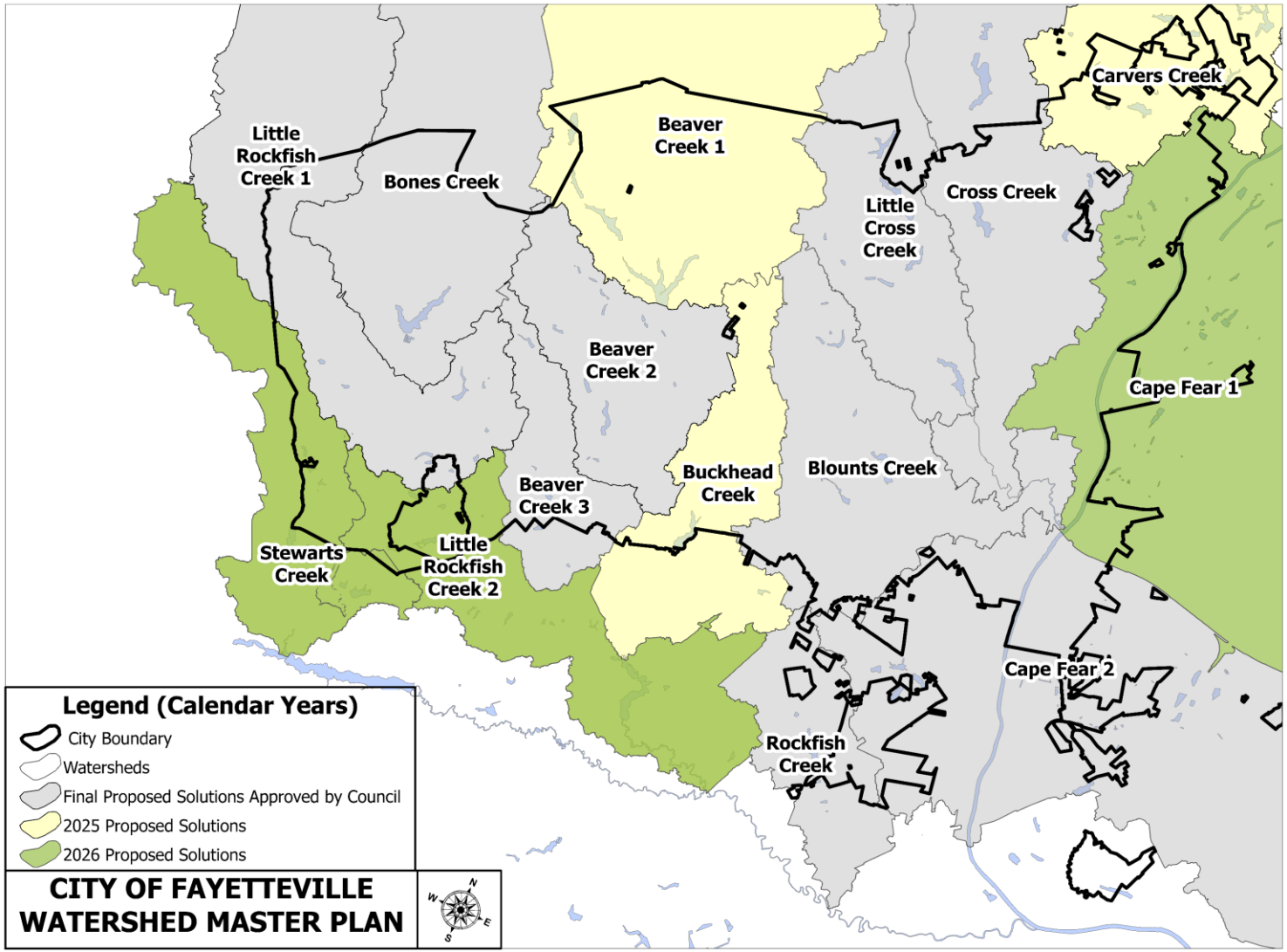
With Wayland Dr BRIC grant ($3.7M), ARPA ($10.6M)
And several other grants = Over $26M Awarded to Date!

Where? High Priority Study Areas

- Flooded Roads
- Emergency Facilities
- Disconnected Structures (Single Access Neighborhoods)
- Structures (>400Ft2)



Proposed Solutions Approved by Council
(To Date)



Study Area

652 – Total Sub-basins

215 – Priority I Sub-basins

35 – Sq. Miles

Study Identified

622 – Concern Areas (CAs)

340 – CAs Selected

346 – Proposed Solutions

Miles of Impacted Lane Length

Identified – 169 | Resolved – 130

Number of Traverse Road Crossings

Identified – 626 | Resolved – 431

Number of Disconnected Structures

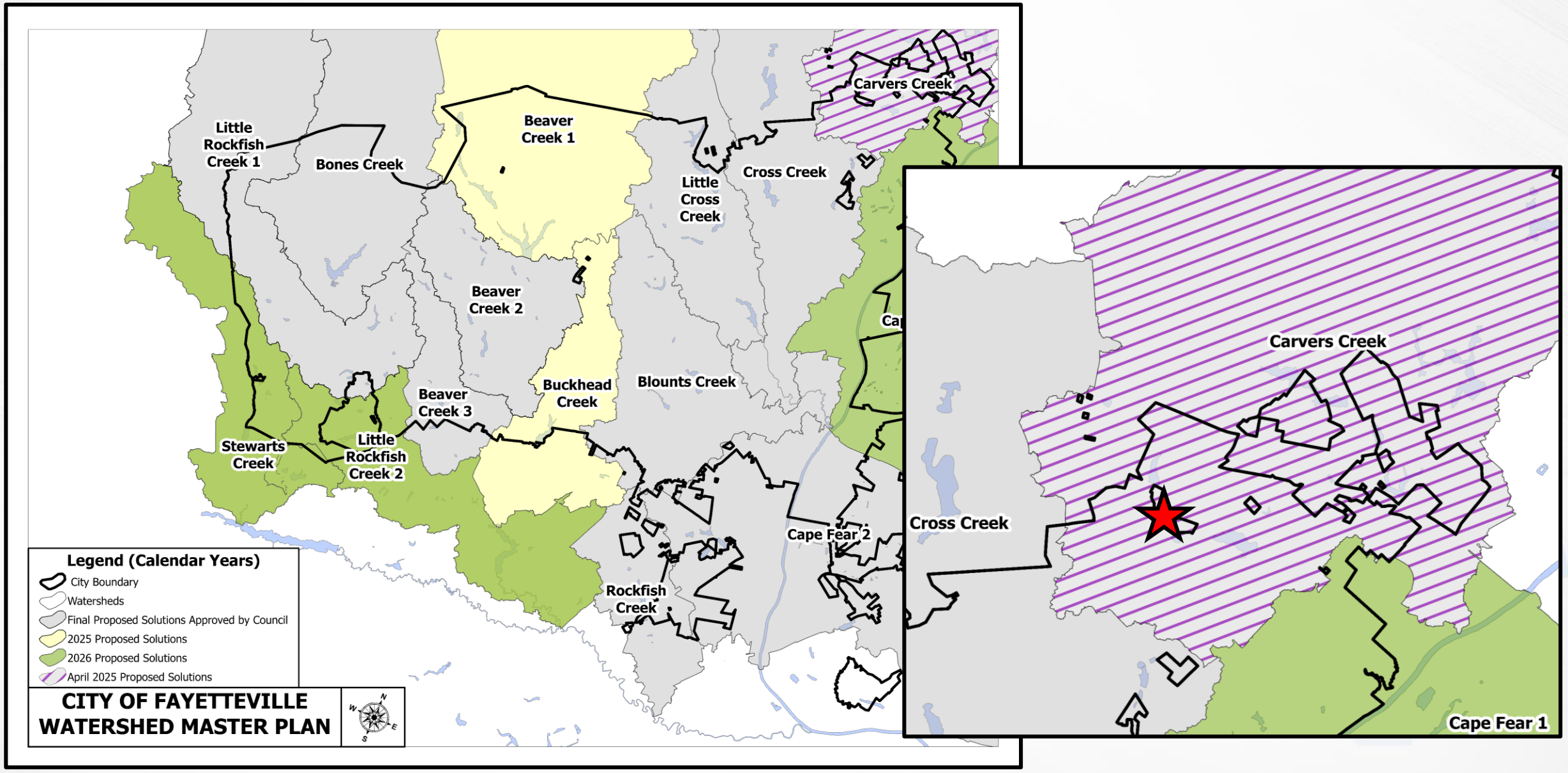
Identified – 1261 | Resolved – 1027

Number of Impacted Structures

	10-yr	25-yr	50-yr
Identified –	596	902	1018
Resolved –	414	610	729

Current Estimated Total Cost $1.1 B

Carvers Creek Watershed
★ College Lake Dam



Purpose

- Introduction:
  - Provide an overview of Watershed Studies - *City*
  - Provide a summary of proposed solutions approved to date - *City*
- College Lake Dam:
  - Present analysis and recommended solution - *Kimley Horn*
  - Request consensus to include the solution in the CIP - *City*
- Proposed Solutions for Carvers Creek Watershed:
  - Present proposed solutions - *Kimley Horn*
  - Request consensus to include proposed solutions in the CIP - *City*

College Lake Dam

City Council Work Session:

April 7, 2025

FAYETTEVILLE NC

Outline

- Existing Condition
- Options for College Lake Dam
- Alternatives
- Metrics
- Summary/Recommendation

Location

Current Conditions

Upstream

City-owned

Downstream

Outfall Conditions

Significant tree growth needs to be removed

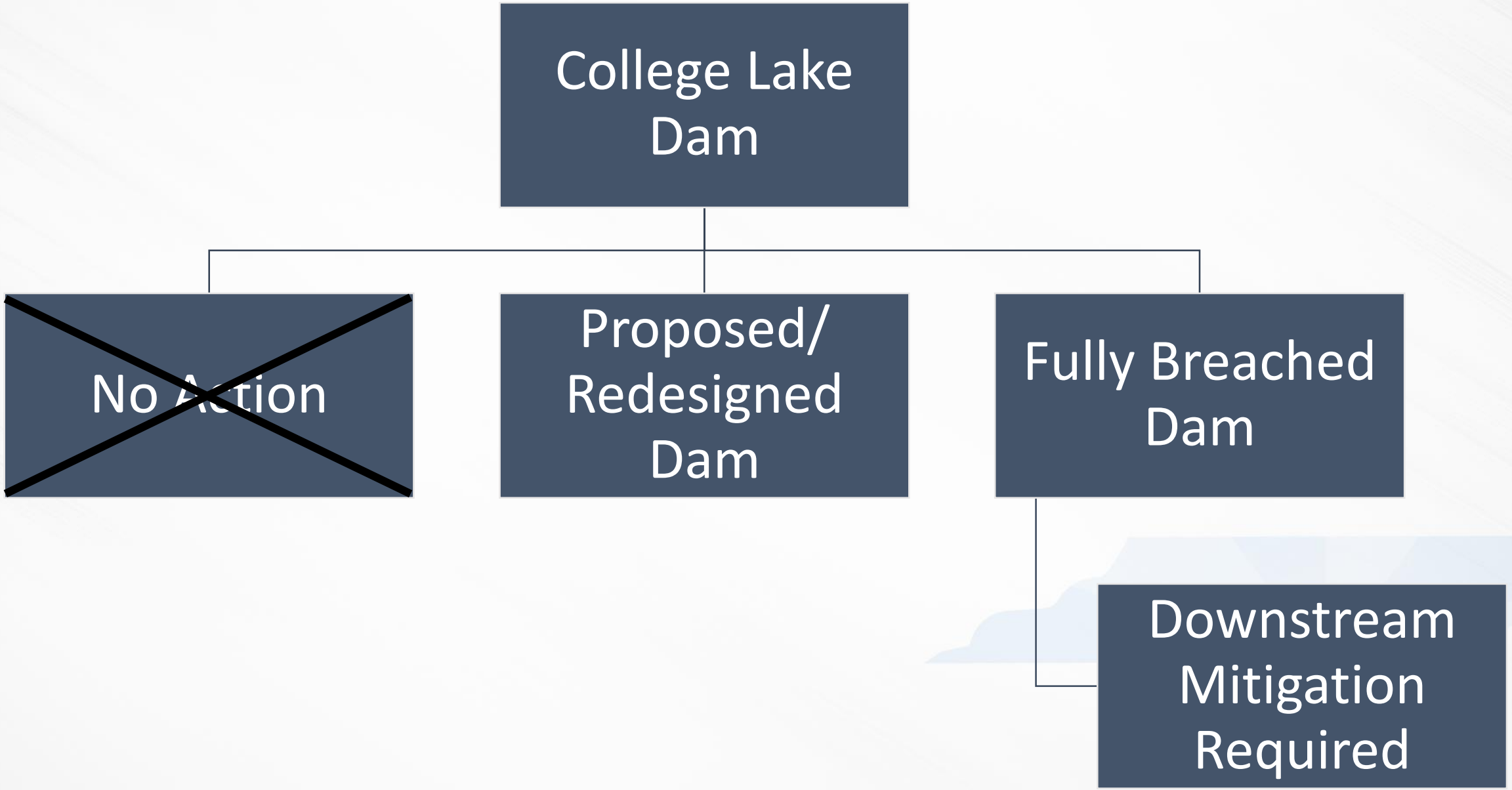
Erosion is creating a shear slope on dam

Remnants of previous riser

Existing Outfall Upstream at College Lake Dam

Feb 2025

College Lake Dam Options

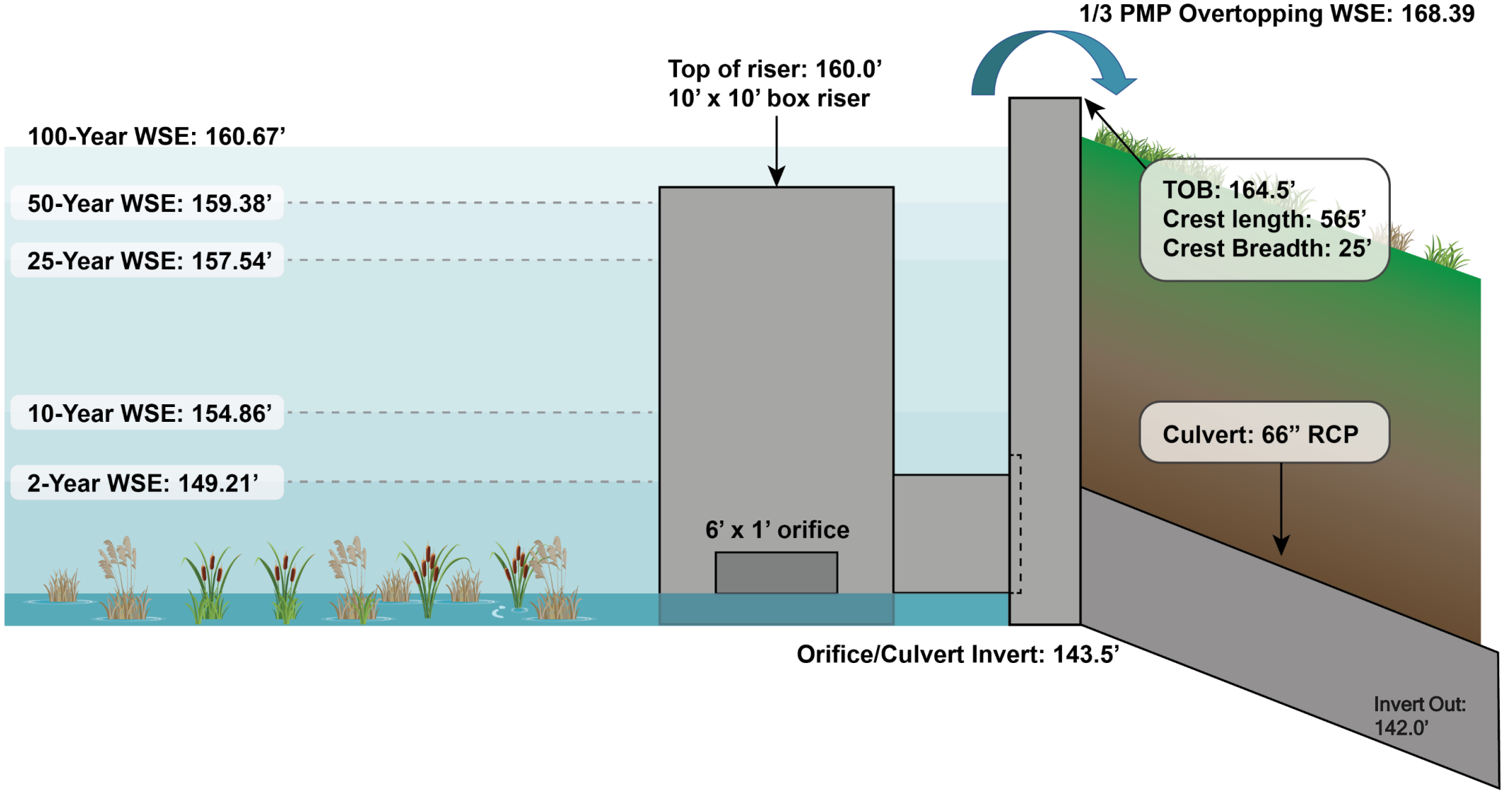


Summary

Metrics	Fully Breached Dam	Fully Breached Dam with Downstream Culvert Upsizing	Fully Breached Dam with Downstream Floodplain Benching	Fully Breached Dam with Combined Downstream Improvements	Proposed/Redesigned Dam
Flooding Impact on Roads					
Economic Impact					
Flooding Impact on Structures					
Cost Impact					

Proposed Concept

Proposed Spillway



Proposed Dam Downstream Impacts

- Removes 1 structure from the 100-year floodplain
- Decreases impact on 21 structures in the 100-year
- Does not increase flooding on downstream road crossings

Fully Breached Dam

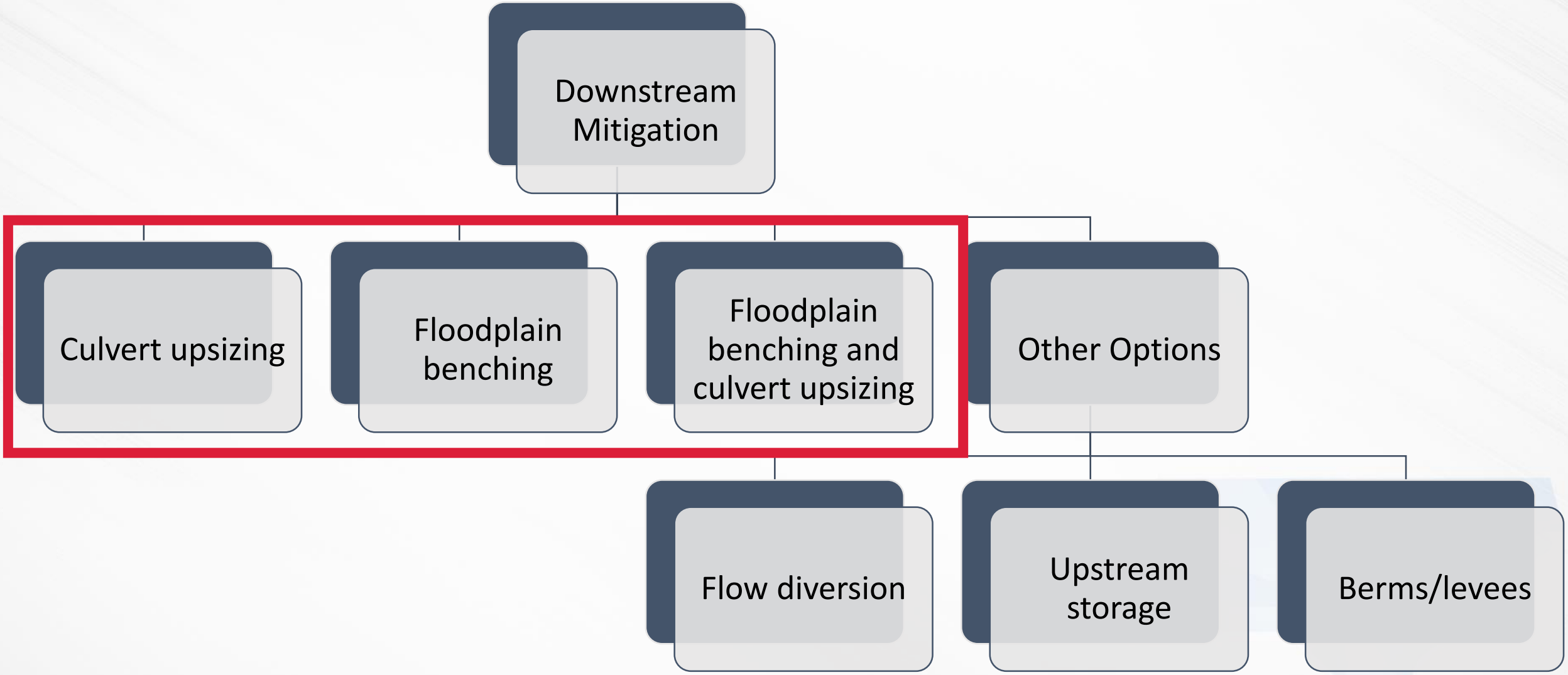
Fully Breached Dam Downstream Impacts

The analysis on this slide is based on the 100YR storm compared to baseline condition

49 buildings experienced an increase in flood elevation*

*within 15 feet of the building

Downstream Options



Downstream Culvert Upsizing

EXCAVATION:
3,400 CY
US/DS channel improvements

Downstream Floodplain Benching

EXCAVATION:
680,000 CY
across ~80 acres

Summary

Metrics	Fully Breached Dam	Fully Breached Dam with Downstream Culvert Upsizing	Fully Breached Dam with Downstream Floodplain Benching	Fully Breached Dam with Combined Downstream Improvements	Proposed/Redesigned Dam
Increased 100-year Flood Depth & Duration on Ramsey Street	Yes	No	Yes	No	No
Increased 100-year Flood Depth & Duration on Shawcroft Road	Yes	Duration Only	Duration Only	No	No
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Yes	Yes	No	No	Duration Only
Increased 100-year Flood Depth & Duration on Rempstone Lane	Yes	Yes	Yes	Yes	No
Economic Cost of Ramsey Street Flooding	$368,000	$0	$387,000	$0	$0
Number of Structures with an Increase in Impact in 100-year	49	25	14	13	0
Value of Impacted Property*	$20,805,000	$14,078,000	$7,626,000	$5,503,000	$0
OPCC including Land Acquisition for Impacted Property**	$31,700,000	$29,600,000	$120,700,000	$123,300,000	$15,000,000 - $20,000,000

**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County*

*** 2024 dollars for construction costs*

Overtopping Depth 100YR

Overtopping Depth in 100-year storm (ft)	*Existing Condition*	Fully Breached Dam (FBD)	FBD with Downstream Culvert Upsizing	FBD with Downstream Floodplain Benching	FBD with Combined Downstream Improvements	Proposed Dam
Rempstone Lane	*0*	0.64	0.64	0.46	0.46	0
Iverleigh Circle	*2.62*	2.87	2.87	0	0	2.61
Shawcroft Road	*1.49*	1.65	1.34	1.23	0.44	1.48
Ramsey Street	*1.43*	1.58	1.31	1.49	1.06	1.43

Overtopping Duration 100YR

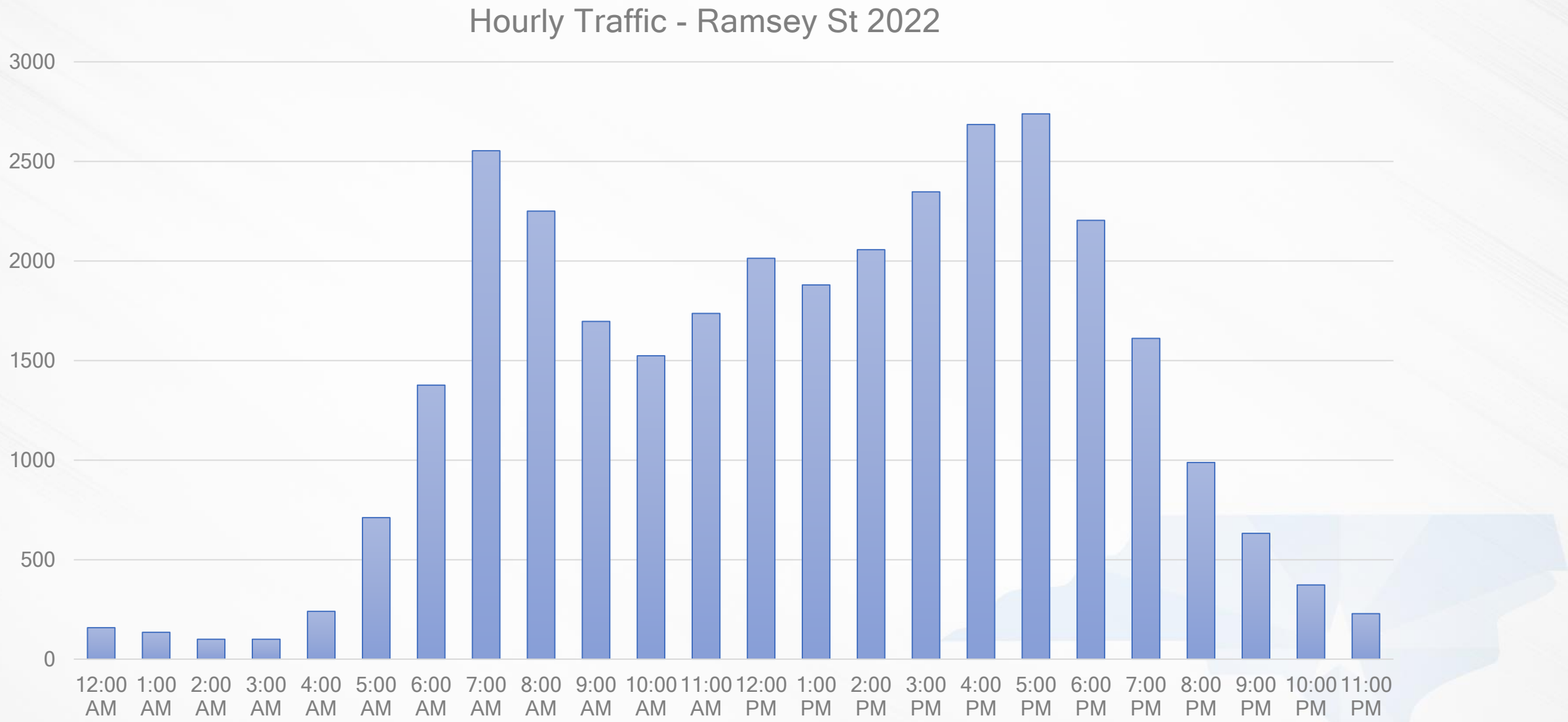
Overtopping Duration in 100-year storm (hr)	*Existing Condition*	Fully Breached Dam (FBD)	FBD with Downstream Culvert Upsizing	FBD with Downstream Floodplain Benching	FBD with Combined Downstream Improvements	Proposed Dam
Rempstone Lane	*0*	2.9	2.9	1.0	1.0	0
Iverleigh Circle	*5.2*	9.4	9.4	0	0	5.6
Shawcroft Road	*1.4*	3.0	2.3	1.5	1.3	1.3
Ramsey Street	*2.4*	4.3	2.3	4.4	2.4	2.3

Summary

Metrics	Fully Breached Dam	Fully Breached Dam with Downstream Culvert Upsizing	Fully Breached Dam with Downstream Floodplain Benching	Fully Breached Dam with Combined Downstream Improvements	Proposed/Redesigned Dam
Increased 100-year Flood Depth & Duration on Ramsey Street	Yes	No	Yes	No	No
Increased 100-year Flood Depth & Duration on Shawcroft Road	Yes	Duration Only	Duration Only	No	No
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Yes	Yes	No	No	Duration Only
Increased 100-year Flood Depth & Duration on Rempstone Lane	Yes	Yes	Yes	Yes	No
Economic Cost of Ramsey Street Flooding	$368,000	$0	$387,000	$0	$0
Number of Structures with an Increase in Impact in 100-year	49	25	14	13	0
Value of Impacted Property*	$20,805,000	$14,078,000	$7,626,000	$5,503,000	$0
OPCC including Land Acquisition for Impacted Property**	$31,700,000	$29,600,000	$120,700,000	$123,300,000	$15,000,000 - $20,000,000

**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County*
***2024 dollars for construction costs*

Economic Analysis – Ramsey Street



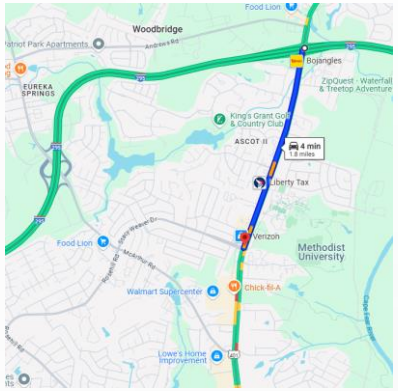
Economic Analysis

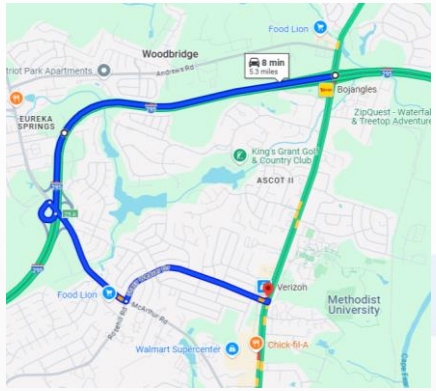
Business Interruption

- Per capita sales
- Total retail space
- Local retail space
- SB/NB traffic w/ business intent

Traffic Rerouting

- Value of time
- O&M cost of detour





Public Safety

- Fayetteville Fire/EMS call statistics
- Apportioning to area
- Additional fatalities
- Value of Statistical Life

Economic Analysis Results

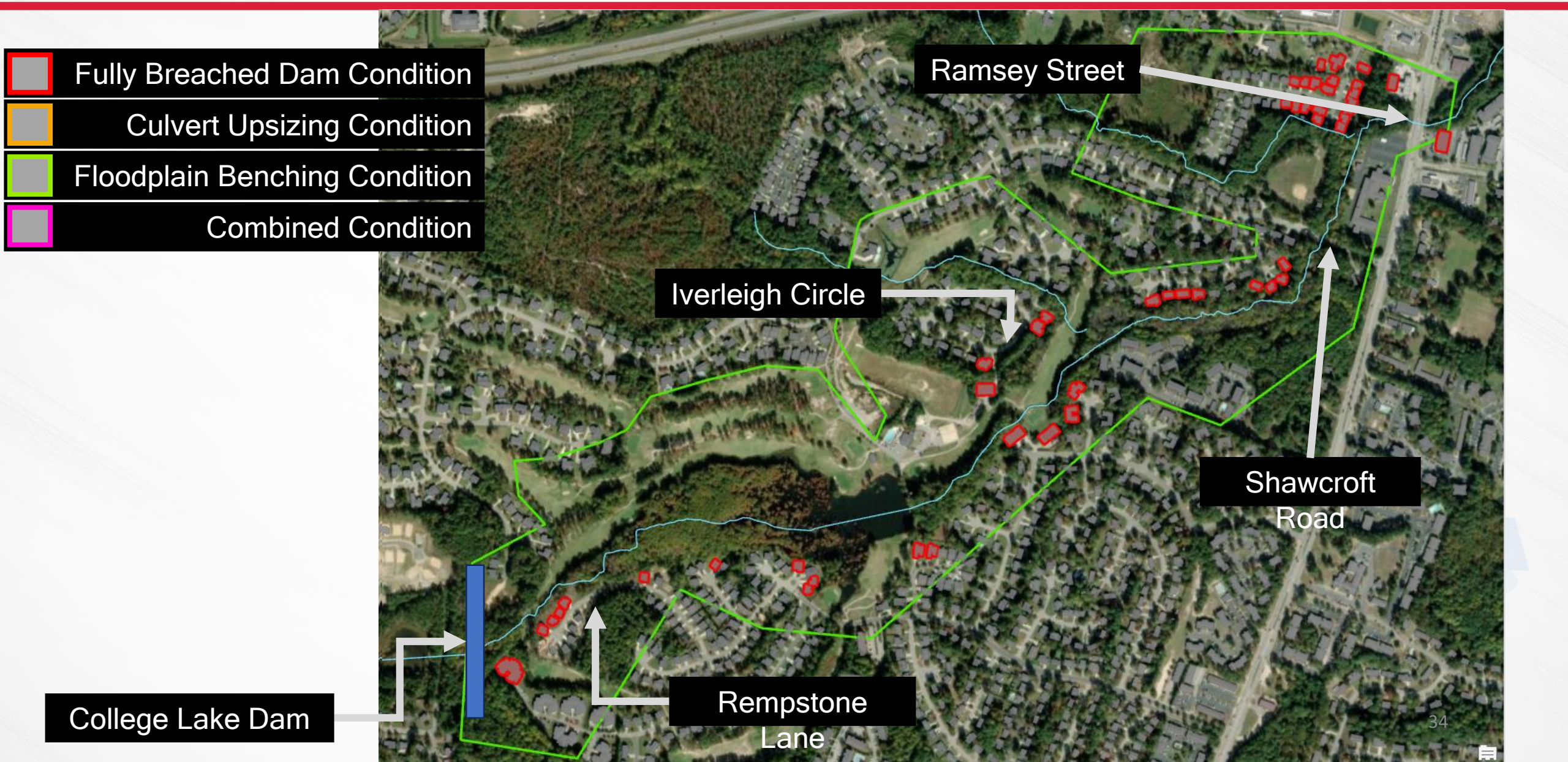
Ramsey Street	Fully Breached Dam (FBD)	FBD with Downstream Culvert Upsizing	FBD with Downstream Floodplain Benching	FBD with Combined Downstream Improvements	Proposed Dam
Existing Condition Time Flooded (hr)	2.4	2.4	2.4	2.4	2.4
Existing Condition (Economic Cost)	$465,200.00	$465,200.00	$465,200.00	$465,200.00	$465,200.00
Proposed Condition Time Flooded (hr)	4.3	2.3	4.4	2.4	2.3
Proposed Condition (Economic Cost)	$833,300.00	$445,900.00	$852,600.00	$465,200.00	$445,900.00
Cost Difference	**$368,000**	**$0**	**$387,000**	**$0**	**$0**

Summary

Metrics	Fully Breached Dam	Fully Breached Dam with Downstream Culvert Upsizing	Fully Breached Dam with Downstream Floodplain Benching	Fully Breached Dam with Combined Downstream Improvements	Proposed/Redesigned Dam
Increased 100-year Flood Depth & Duration on Ramsey Street	Yes	No	Yes	No	No
Increased 100-year Flood Depth & Duration on Shawcroft Road	Yes	Duration Only	Duration Only	No	No
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Yes	Yes	No	No	Duration Only
Increased 100-year Flood Depth & Duration on Rempstone Lane	Yes	Yes	Yes	Yes	No
Economic Cost of Ramsey Street Flooding	$368,000	$0	$387,000	$0	$0
Number of Structures with an Increase in Impact in 100-year	49	25	14	13	0
Value of Impacted Property*	$20,805,000	$14,078,000	$7,626,000	$5,503,000	$0
OPCC including Land Acquisition for Impacted Property**	$31,700,000	$29,600,000	$120,700,000	$123,300,000	$15,000,000 - $20,000,000

**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County*

Impacted Buildings for Alt Conditions



Count and Value of Impacted Buildings

	Existing Condition	Fully Breached Dam (FBD)	FBD with Downstream Culvert Upsizing	FBD with Downstream Floodplain Benching	FBD with Combined Downstream Improvements	Proposed Dam
Number of Structures with an Increase in Impact 100-year storm	-	49	25	14	13	0
Value of Property*	-	$20,805,000	$14,078,000	$7,626,000	$5,503,000	$ -

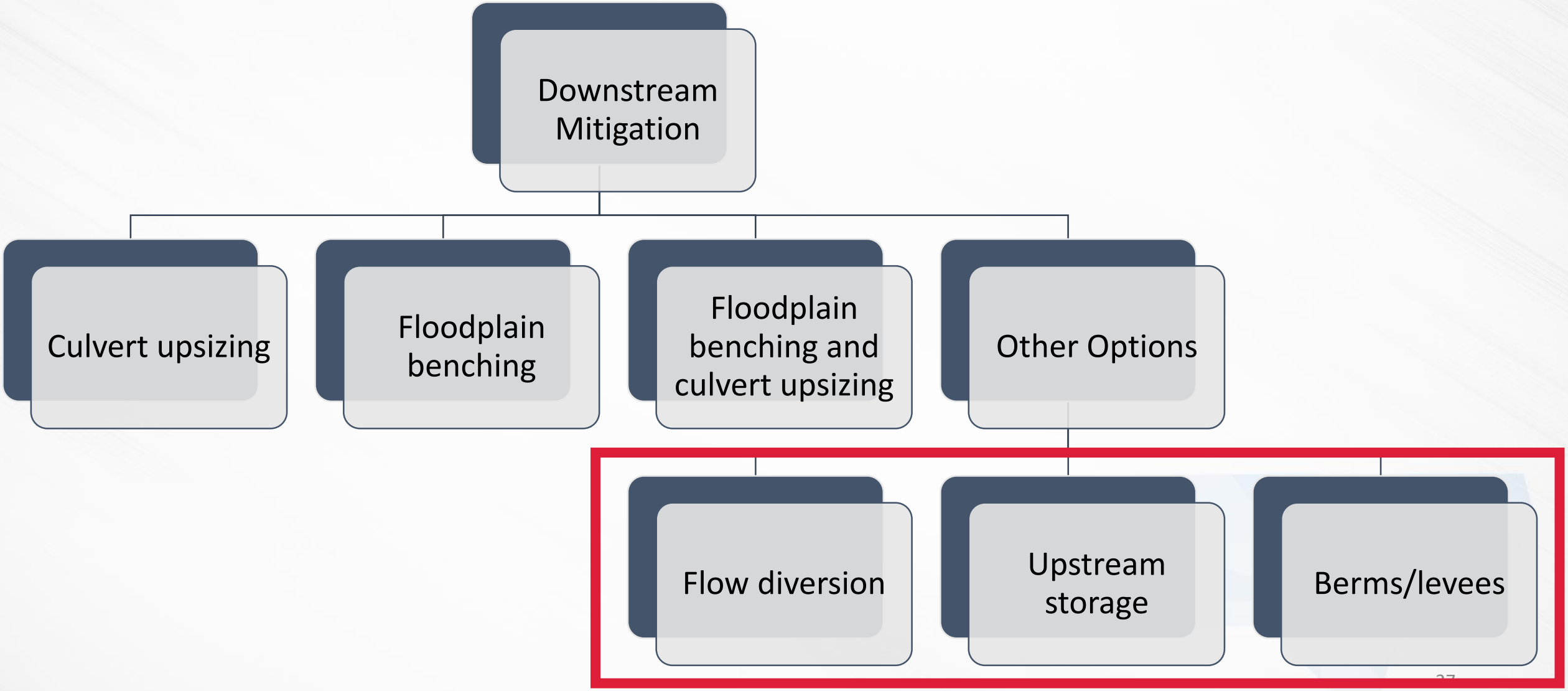
**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County*

OPCC Estimates*

	Fully Breached Dam (Dam Removal)	FBD with Downstream Culvert Upsizing	FBD with Expanded Downstream Floodplain	FBD with Downstream Floodplain Benching	Proposed Dam
OPCC Estimates including Land Acquisition*	$31,700,000	$29,600,000	$120,700,000	$123,300,000	$15,000,000 - $20,000,000

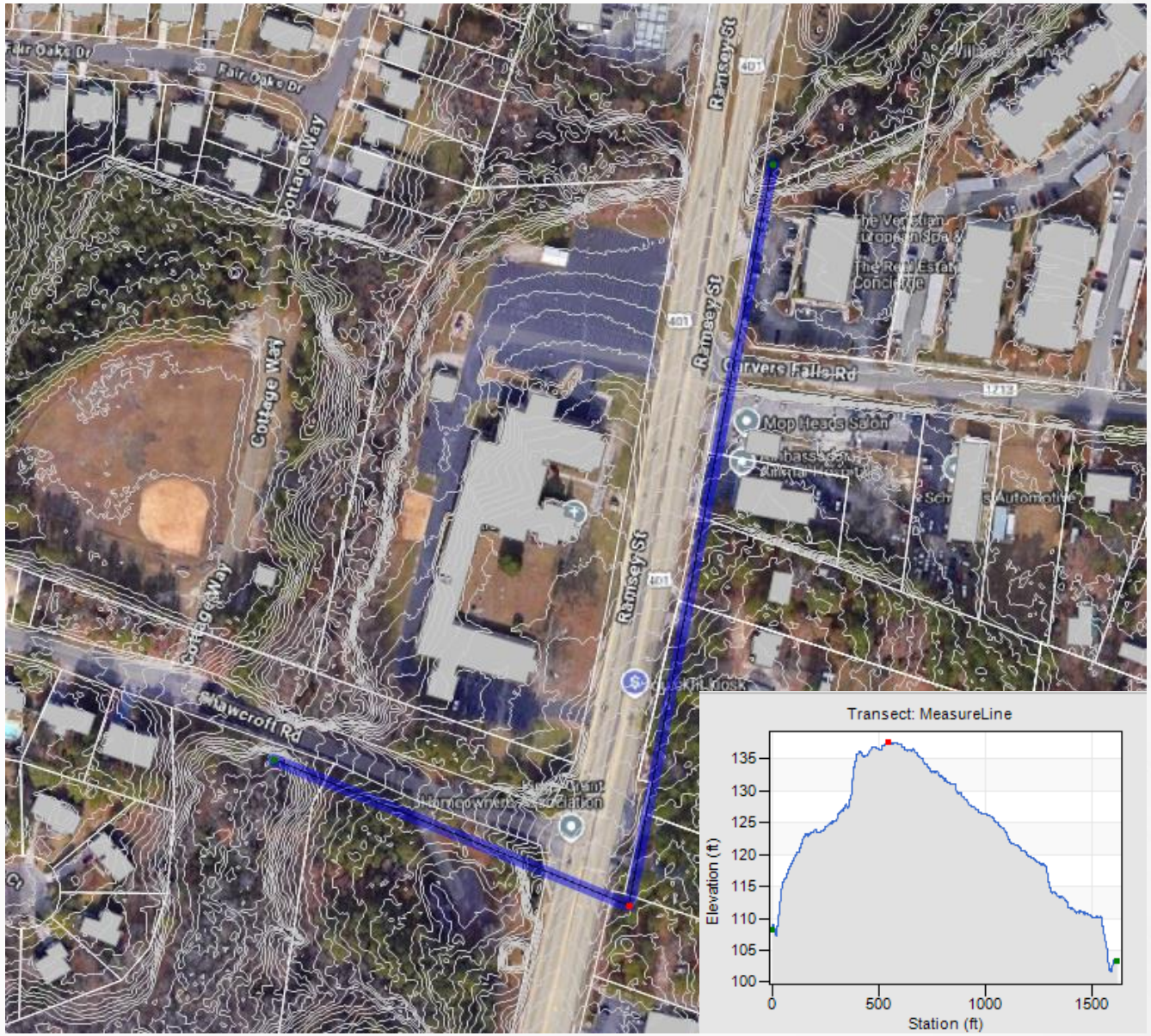
**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County and 2024 dollars for construction costs*

Downstream Options



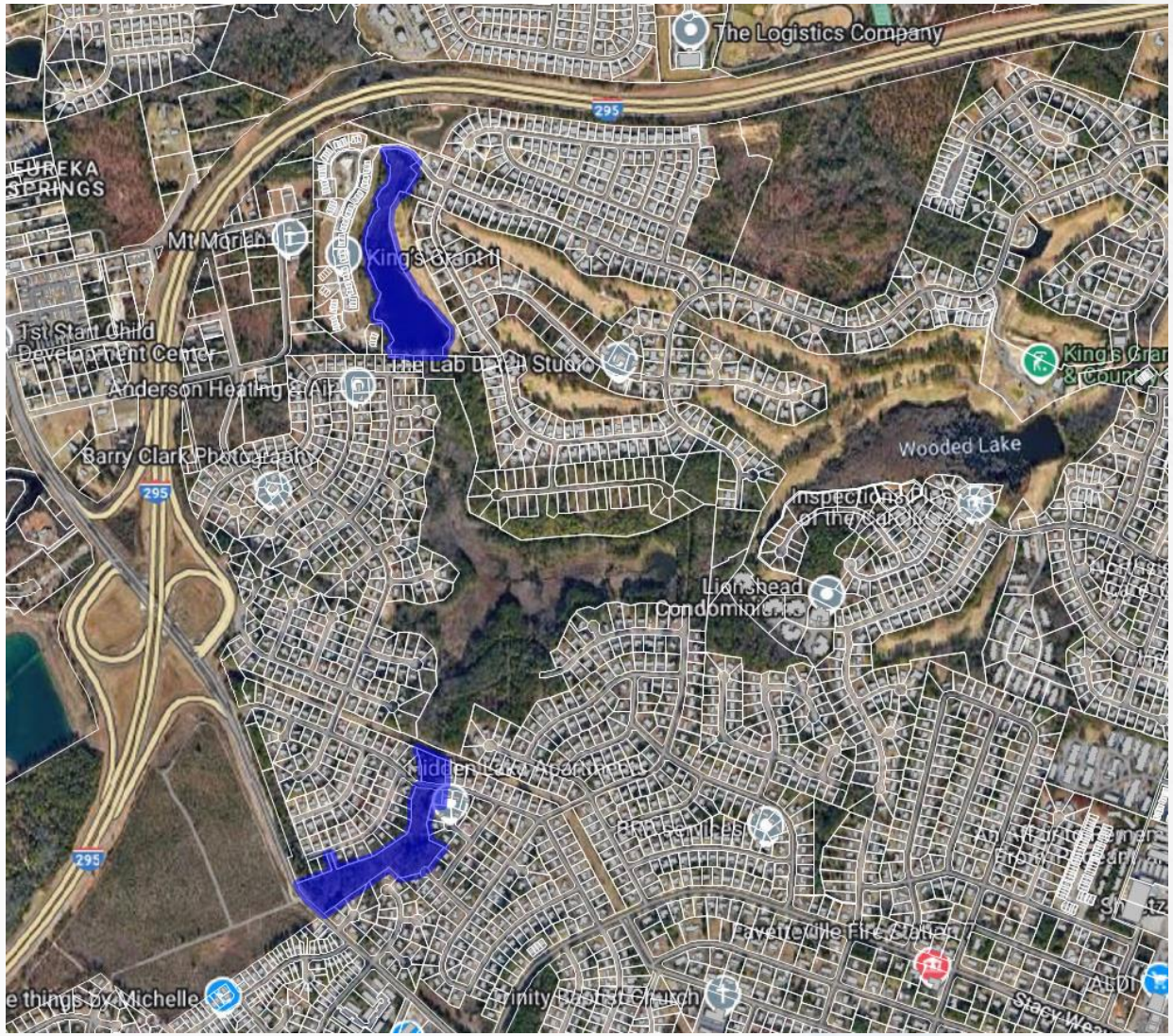
Shawcroft Flow Diversion

	Flood Diversion
Increased 100-year Flood Depth & Duration on Ramsey Street	Not Anticipated
Increased 100-year Flood Depth & Duration on Shawcroft Road	Not Anticipated
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Highly Likely
Increased 100-year Flood Depth & Duration on Rempstone Lane	Highly Likely
Number of Structures with an Increase in Impact in 100-year	Min. 25
Estimated Cost	>$29.6 M (FBD w/culvert upsizing) Improvements would cost more than culvert alternative + more property acquisition
Other Considerations	-Significant utility conflicts/relocations anticipated -Significant environmental permitting effort -Requires new NCDOT crossing -Requires additional easement acquisition from ~10 properties



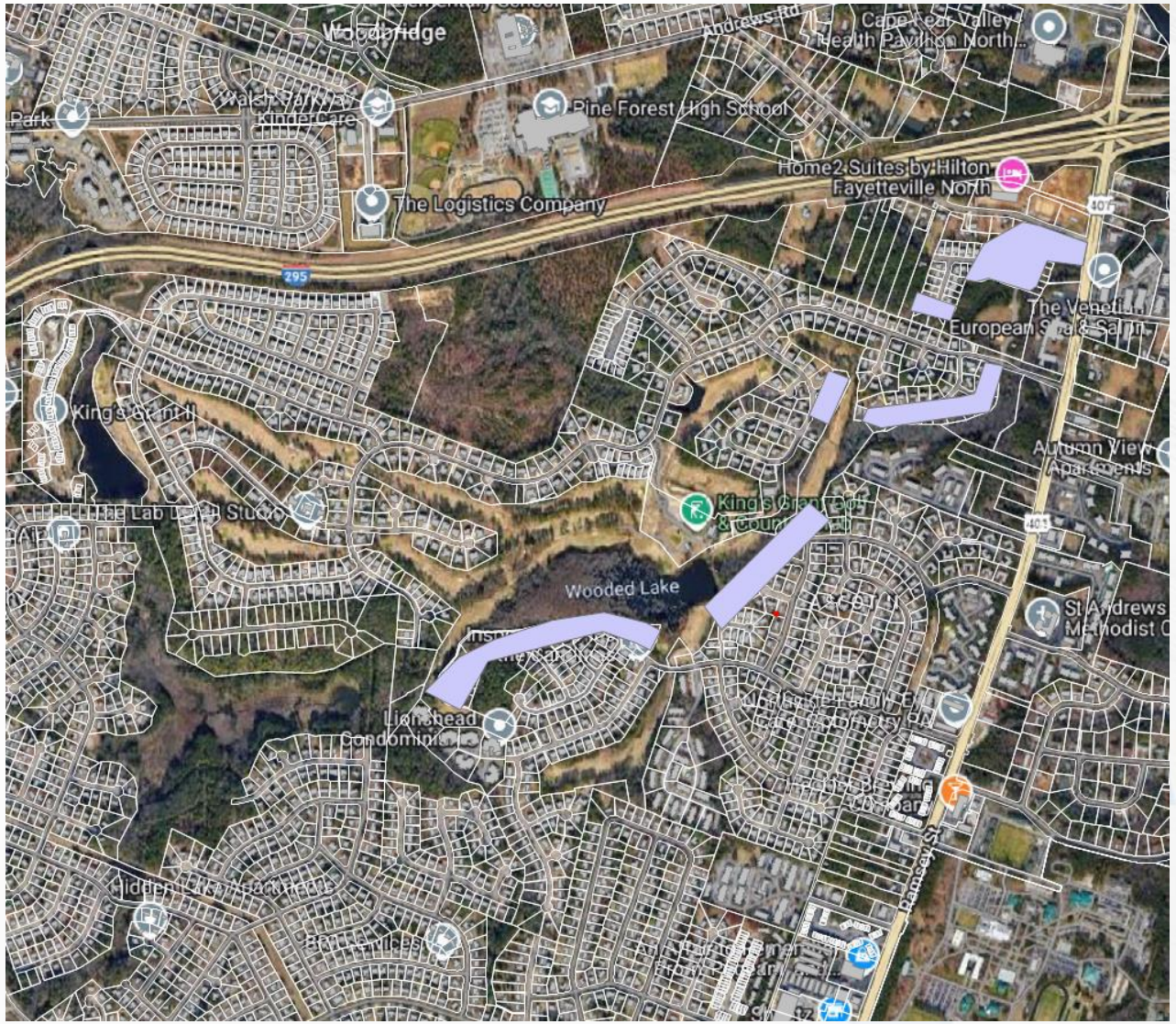
Upstream Storage

	Upstream Storage
Increased 100-year Flood Depth & Duration on Ramsey Street	Highly Likely
Increased 100-year Flood Depth & Duration on Shawcroft Road	Likely
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Likely
Increased 100-year Flood Depth & Duration on Rempstone Lane	Highly Likely
Number of Structures with an Increase in Impact in 100-year	~30-40
Estimated Cost	>$31.7 M (FBD) Property acquisition would be the significant cost and additional improvements from FBD.
Other Considerations	-Available storage is significantly less than storage provided in downstream floodplain benching alternative -Huske Lake is private and City would take ownership of another dam -Will not have a significant effect on timing of flows



Flood Berms / Levees

	Berms/Levees
Increased 100-year Flood Depth & Duration on Ramsey Street	Highly Likely
Increased 100-year Flood Depth & Duration on Shawcroft Road	Highly Likely
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Highly Likely
Increased 100-year Flood Depth & Duration on Rempstone Lane	Highly Likely
Number of Structures with an Increase in Impact in 100-year	>0
Estimated Cost	There would still be a high cost of easements without full property acquisition. Would need to include culvert upsizing in cost.
Other Considerations	-Levees must account for freeboard (avg. 3' from 100-year BFE) -Extensive and difficult FEMA Certification and Accreditation process -City takes on new risks to



Other Alternatives

Metrics	Flood Diversion	Upstream Storage	Berms/Levees
Increased 100-year Flood Depth & Duration on Ramsey Street	Not Anticipated	Highly Likely	Highly Likely
Increased 100-year Flood Depth & Duration on Shawcroft Road	Not Anticipated	Likely	Highly Likely
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Highly Likely	Likely	Highly Likely
Increased 100-year Flood Depth & Duration on Rempstone Lane	Highly Likely	Highly Likely	Highly Likely
Number of Structures with an Increase in Impact in 100-year	Min. 25	~30-40	>0
Estimated Cost	>$29.6M Improvements would cost more than culvert alternative + more property acquisition	>$31.7M Property acquisition would be the significant cost and additional improvements from FBD.	There would still be a high cost of easements without full property acquisition. Would need to include culvert upsizing in cost.
Other Considerations	-Significant utility conflicts/relocations anticipated -Significant environmental permitting effort -Requires new NCDOT crossing -Requires additional easement acquisition from ~10 properties	-Available storage is significantly less than storage provided in downstream floodplain benching alternative -Huske Lake is private and City would take ownership of another dam	-Levees must account for freeboard (avg. 3' from 100-year BFE) -Extensive and difficult FEMA Certification and Accreditation process -City takes on new risks to catastrophic failures -Still requires culvert upgrades to address roadway overtopping

Summary

Metrics	Fully Breached Dam	Fully Breached Dam with Downstream Culvert Upsizing	Fully Breached Dam with Downstream Floodplain Benching	Fully Breached Dam with Combined Downstream Improvements	Proposed/Redesigned Dam
Increased 100-year Flood Depth & Duration on Ramsey Street	Yes	No	Yes	No	No
Increased 100-year Flood Depth & Duration on Shawcroft Road	Yes	Duration Only	Duration Only	No	No
Increased 100-year Flood Depth & Duration on Iverleigh Circle	Yes	Yes	No	No	Duration Only
Increased 100-year Flood Depth & Duration on Rempstone Lane	Yes	Yes	Yes	Yes	No
Economic Cost of Ramsey Street Flooding	$368,000	$0	$387,000	$0	$0
Number of Structures with an Increase in Impact in 100-year	49	25	14	13	0
Value of Impacted Property*	$20,805,000	$14,078,000	$7,626,000	$5,503,000	$0
OPCC including Land Acquisition for Impacted Property**	$31,700,000	$29,600,000	$120,700,000	$123,300,000	$15,000,000 - $20,000,000

**Assumed buyouts and using 2025 Taxable Value from TAXPWA Cumberland County*

*** 2024 dollars for construction costs*

Options and Recommendations

Options:

1. Council provides consensus to approve redesigning College Lake Dam and pursuing applicable funding sources.
2. Council does not provide consensus and remands back to staff with additional guidance.

Recommended Action:

Council provides consensus to approve redesigning College Lake Dam and pursuing applicable funding sources. The proposed dam is programmed in the CIP budget.

Purpose

- Introduction:
  - Provide an overview of Watershed Studies - *City*
  - Provide a summary of proposed solutions approved to date - *City*

- College Lake Dam:
  - Present analysis and recommended solution - *Kimley Horn*
  - Request consensus to include the solution in the CIP - *City*

- Proposed Solutions for Carvers Creek Watershed:
  - Present proposed solutions - *Kimley Horn*
  - Request consensus to include proposed solutions in the CIP - *City*

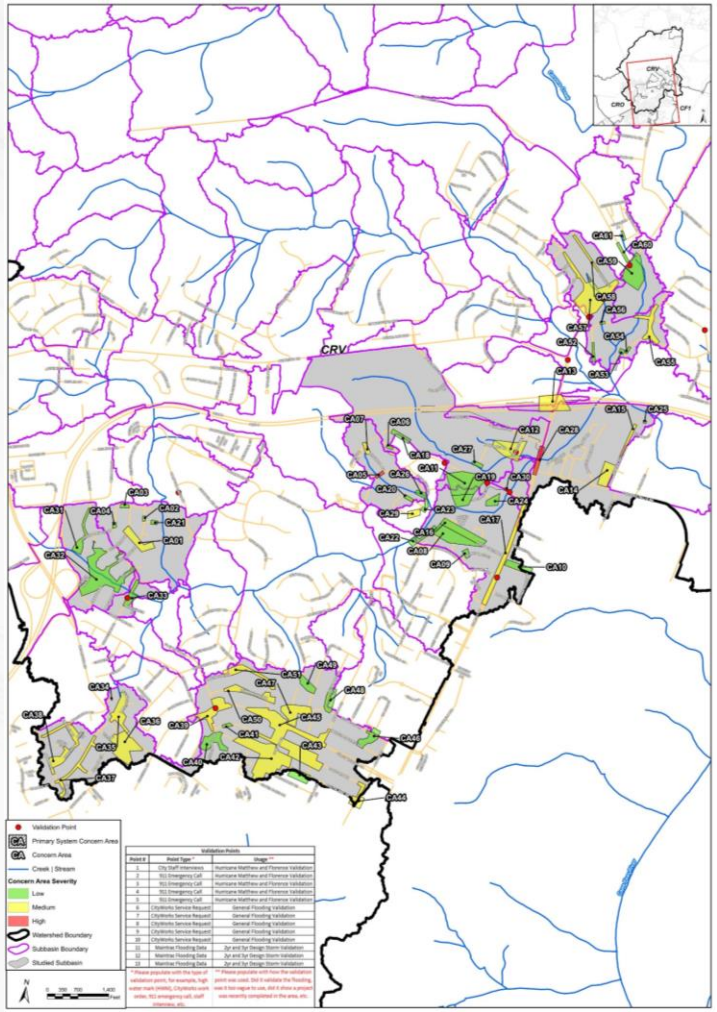
Proposed Solutions for Carvers Creek Watershed

City Council Work Session:

April 7, 2025

FAYETTEVILLE NC

Watershed Priorities and Solutions



Carvers Creek Facts

- Covers 16.57 Sq. miles of City
- Portion of Council District 1

Study Area
103 - Total Sub-basins
12 - Priority I Sub-basins
1.58 - Sq. Miles

Study Identified
61 - Concern Areas (CAs)
27 - CAs Selected
18 - Proposed Solutions

Miles of Impacted Lane Length
Identified - 7.9 | Resolved - 2.5

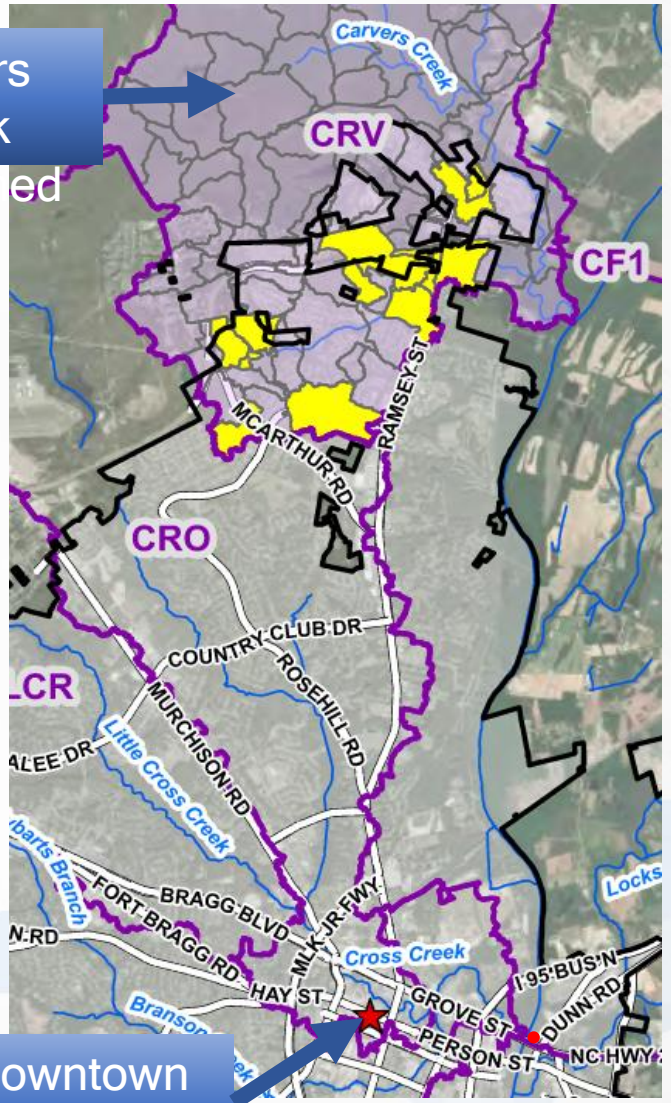
Number of Traverse Road Crossings
Identified - 12 | Resolved - 12

Number of Disconnected Structures
Identified - 772 | Resolved - 772

Number of Impacted Structures
10-yr | 25-yr | 50-yr
Identified - 13 | 26 | 35
Resolved - 6 | 17 | 23

Current Total Cost (2024):
$54,200,000*
**Not including College Lake Dam Improvements*

Carvers Creek

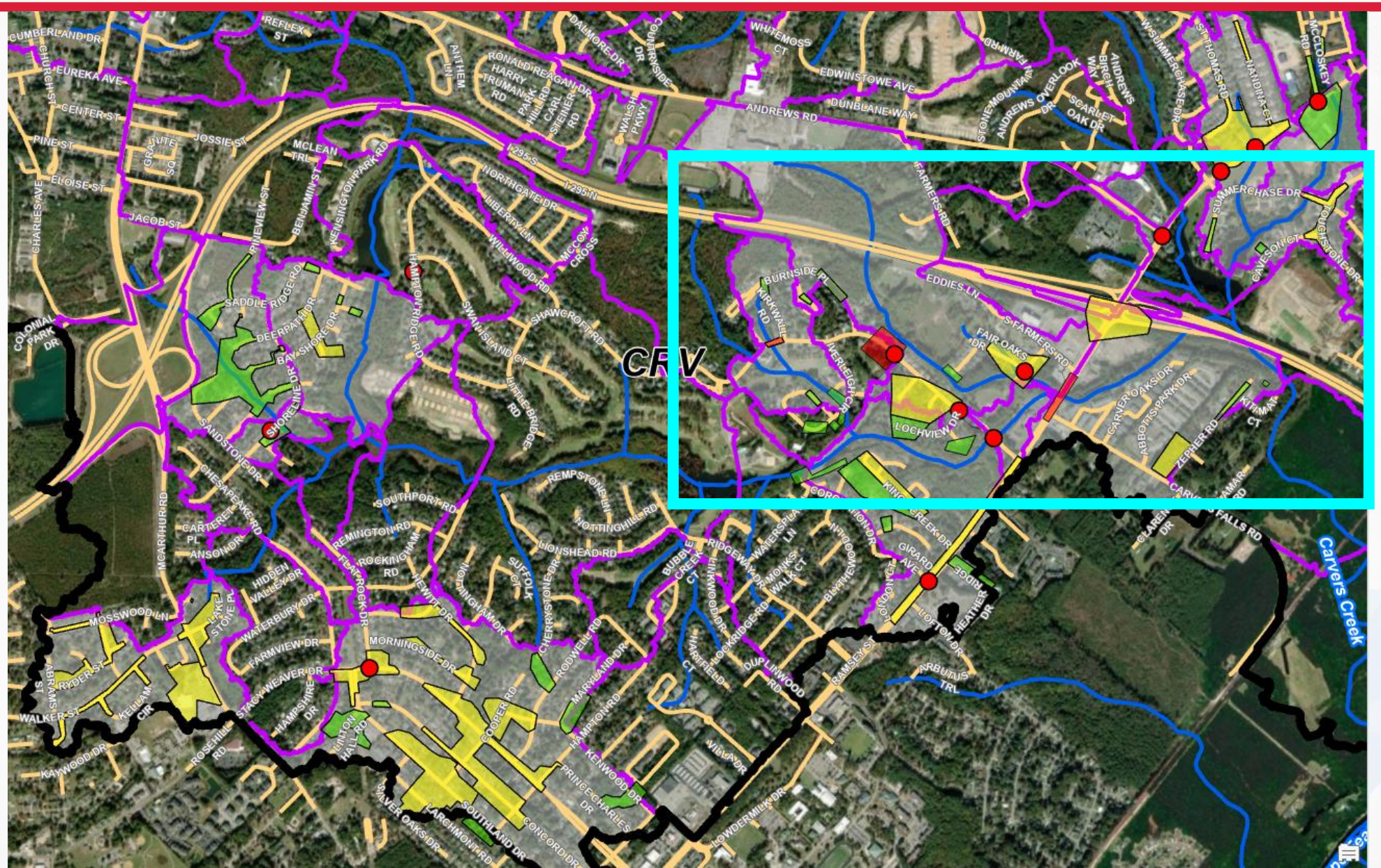


Downtown Fayetteville

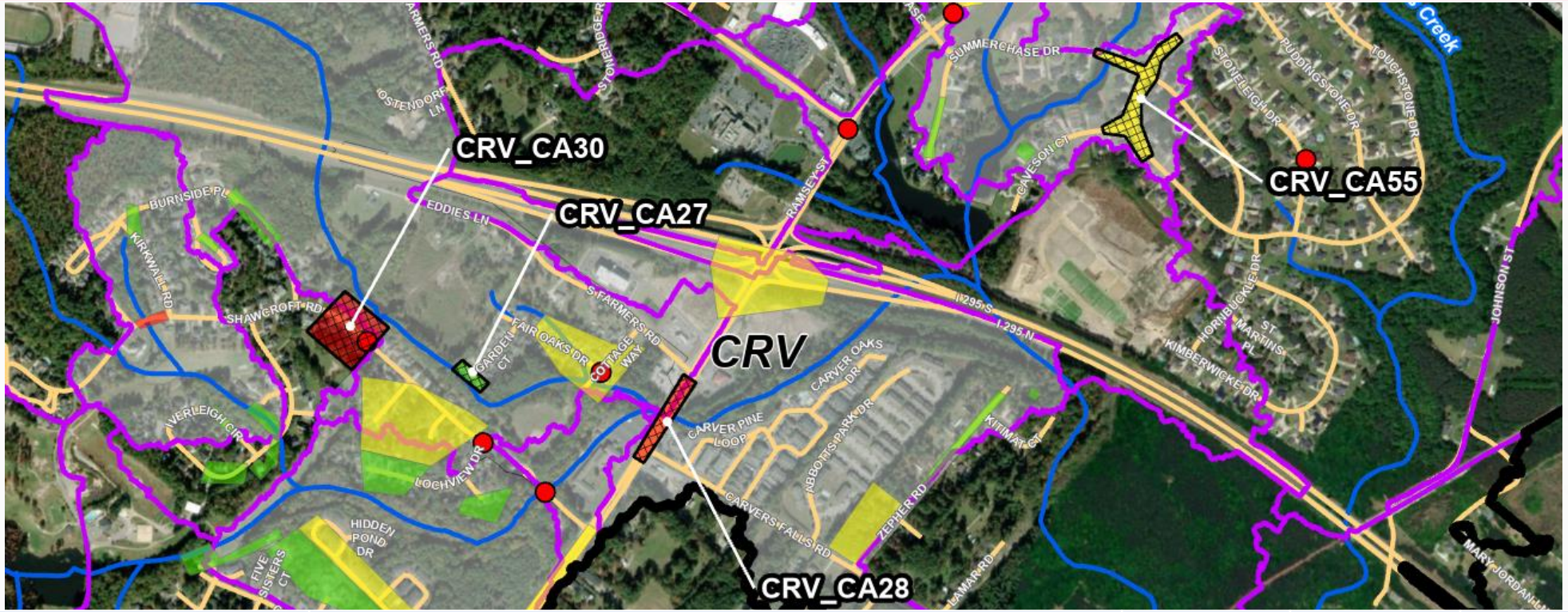
Primary System Proposed Solutions

FAYETTEVILLE NC

Proposed Solution Highlights

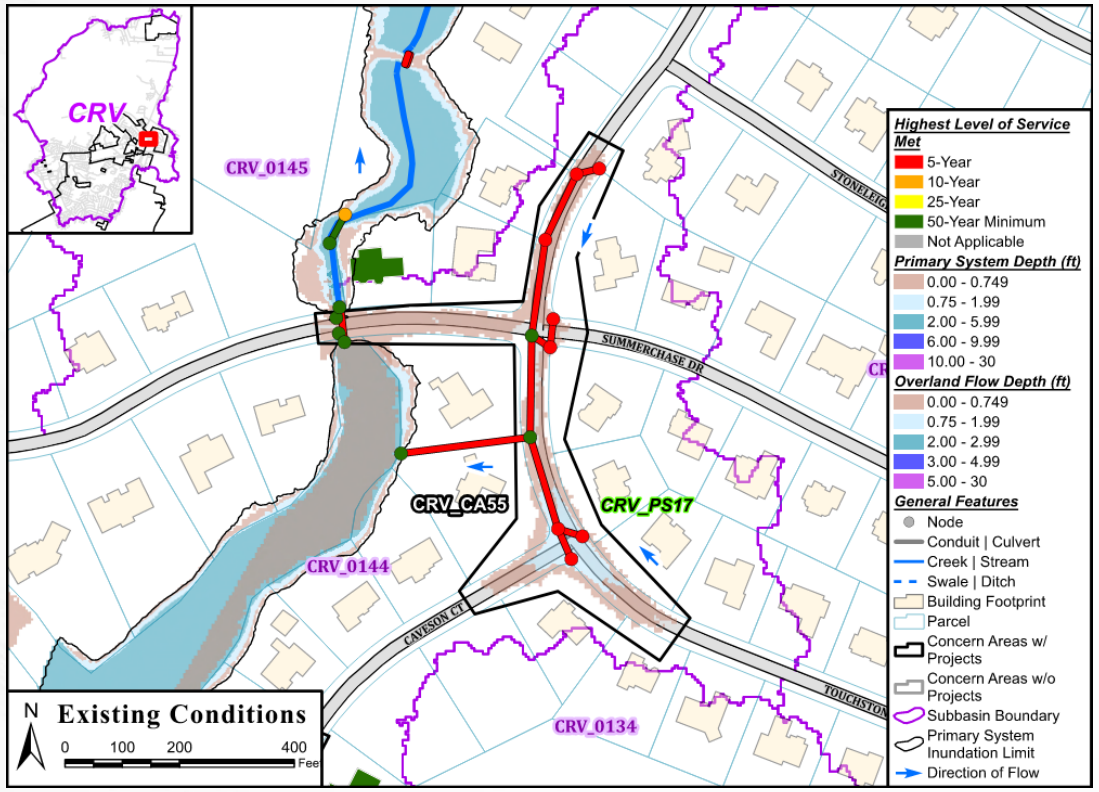


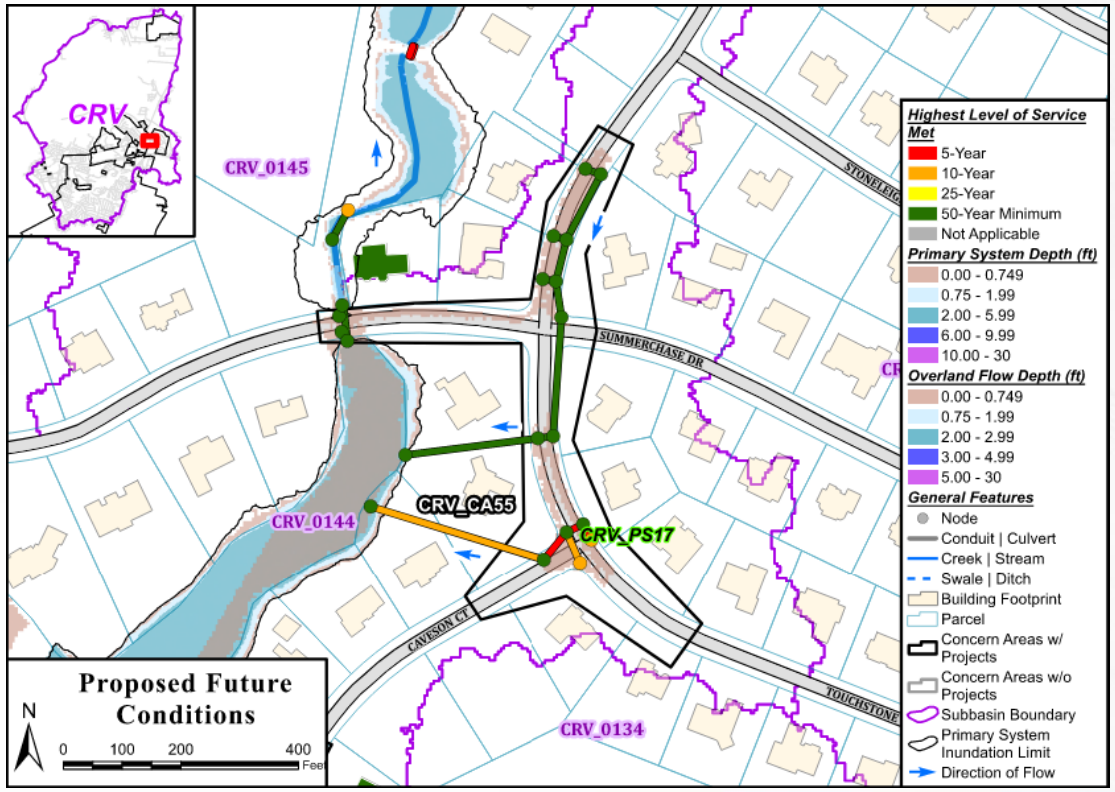
Highest Scoring Proposed Solutions



Solution #	Proposed Solution Description	Score	Efficacy	Cost
PS17 (CA55)	Summerchase Drive Capacity Expansion	22	80%	$2.4M
PS05 (CA27) PS05 (CA30)	Shawcroft Road and Garden Court Improvements	4 5	27% 100%	$2.4M
PS04 (CA28)	Ramsey Street (South of 295) Culvert Crossing Improvements	9	74%	$4.7M

PS17 (CA55)
Summerchase Drive

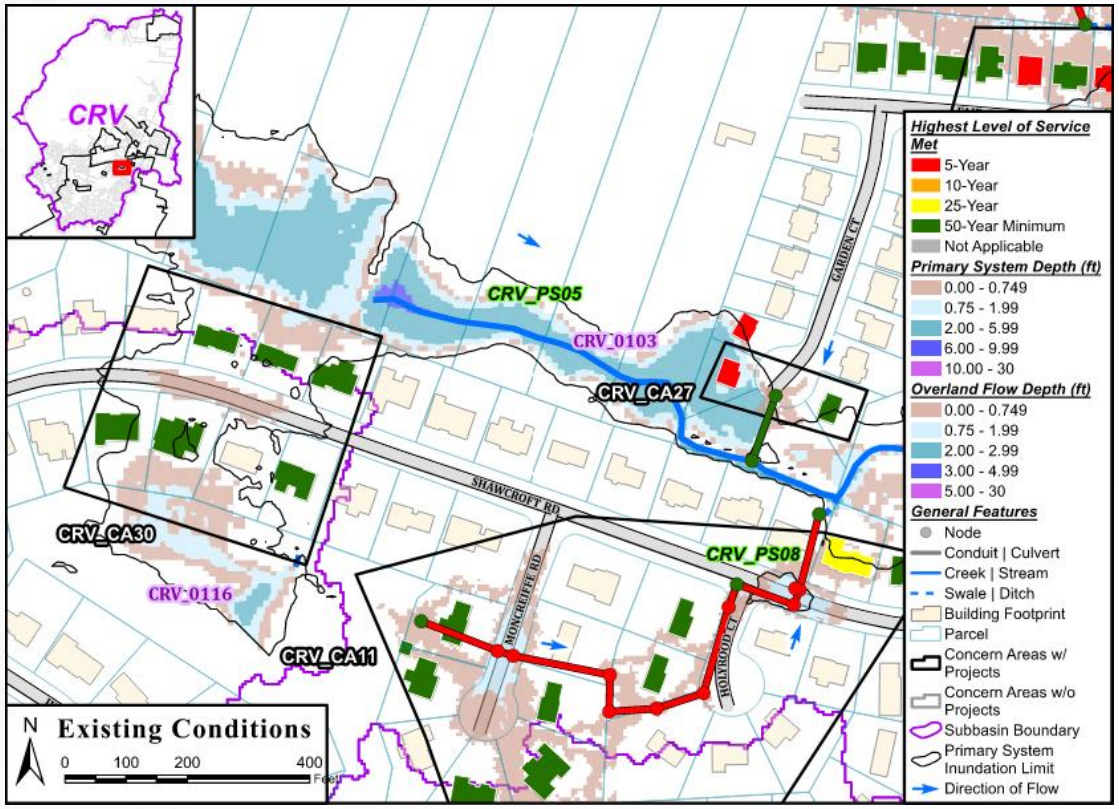




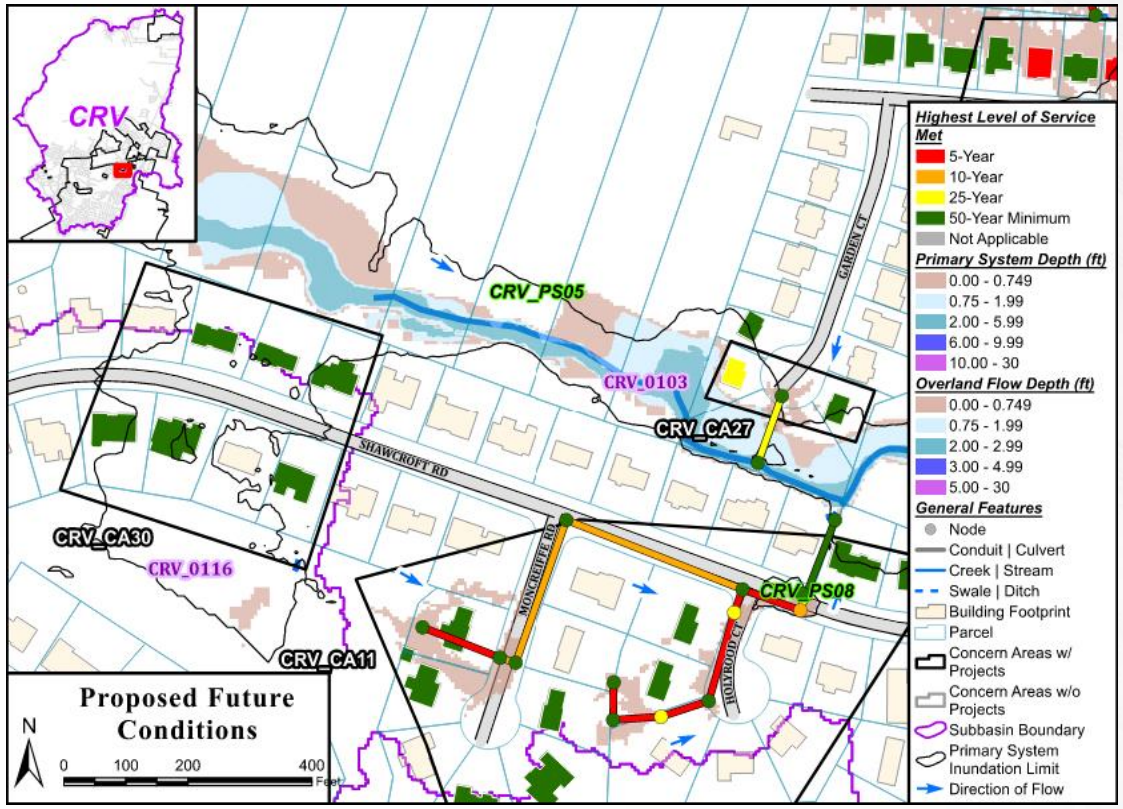
- Council District 1
- PS = Upsizing culverts, pipe upgrades
- CA Score = 22
- Efficacy = 80%

- Estimated Cost = $2.4 M
- Reduces 870 LF of impacted lane length
- Resolves 210 disconnected dwellings

PS05 (CA27, CA30)
Shawcroft Road and Garden Court

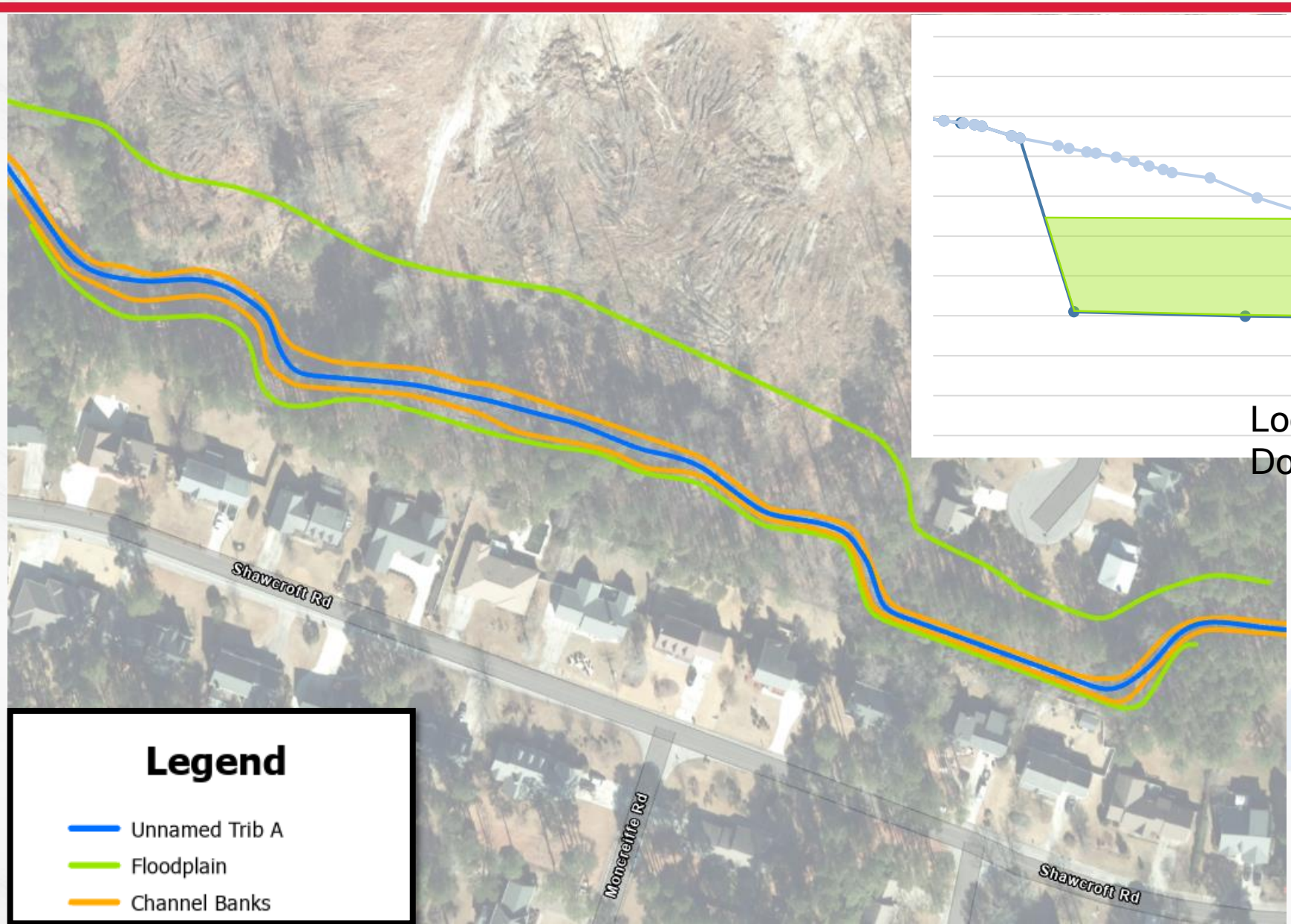


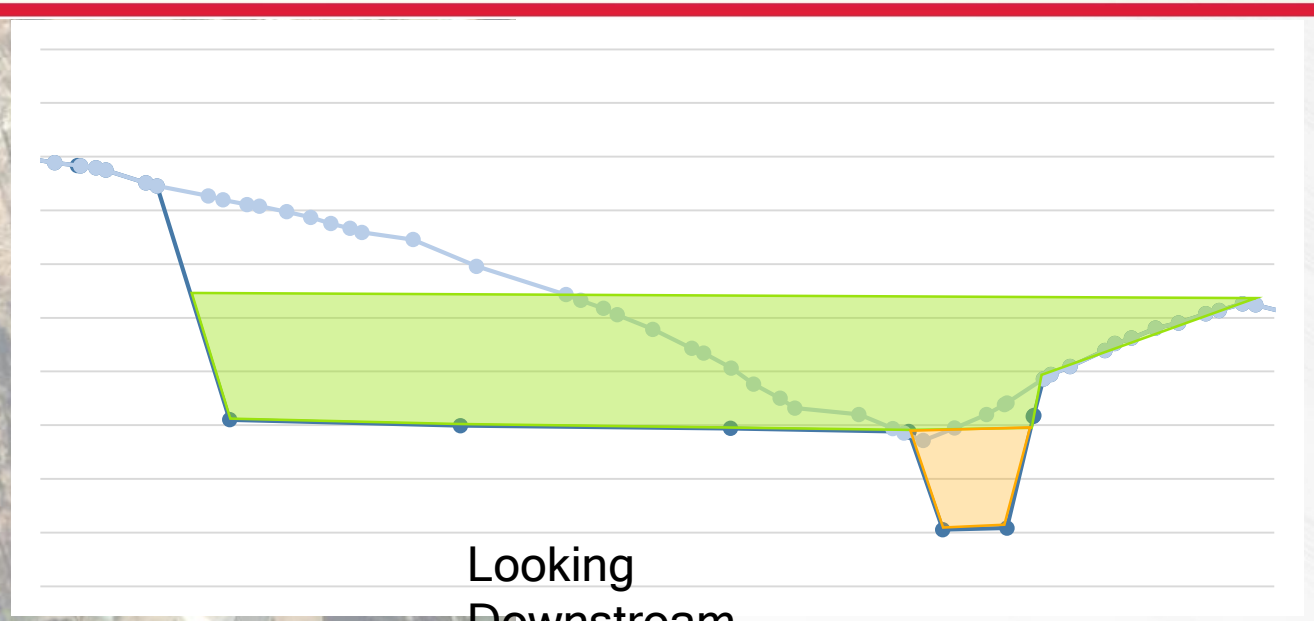
- Council District 1
- PS = Adding floodplain benching
- CA Score = 4(CA27); 5(CA30)
- Efficacy = 27%(CA27); 100%(CA30)
- Estimated Cost = $2.4 M



- Reduces 621 LF of impacted lane length
- Eliminates impact to 2 structures from each 2-, 10-, and 25-year events

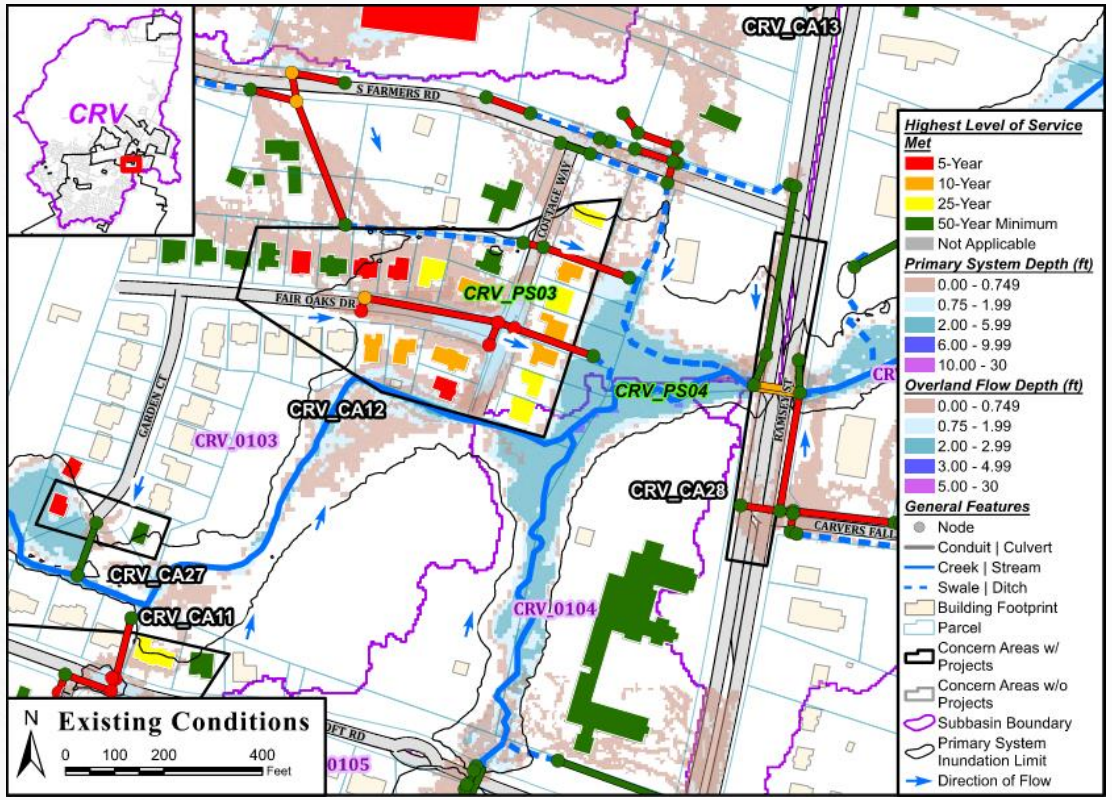
PS05 (CA27, CA30)
Shawcroft Road and Garden Court

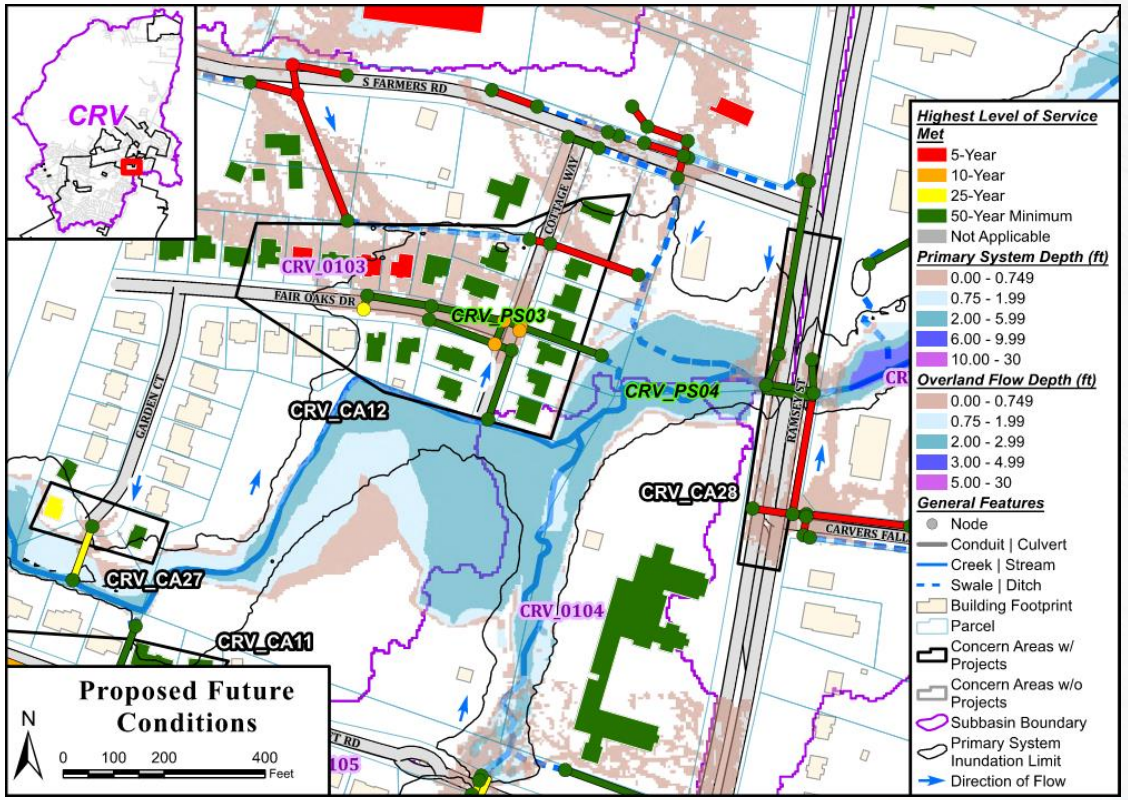




Looking Downstream

PS04 (CA28)
Ramsey Street - South of 295





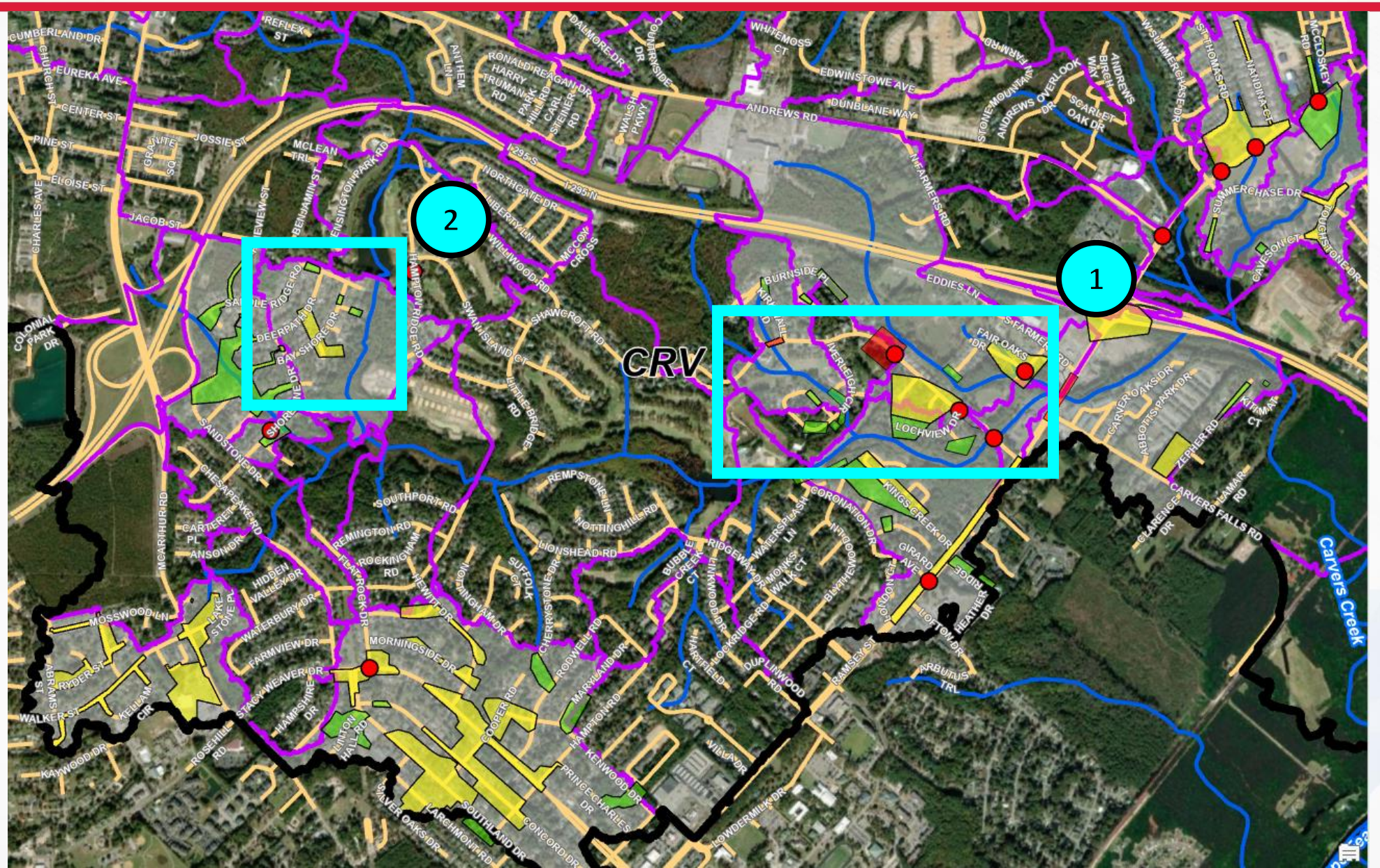
- Council District 1
- PS = Upsizing culverts & adding floodplain benching
- CA Score = 9
- Efficacy = 74%

- Estimated Cost = $4.7 M
- Reduces 120 LF of impacted lane length
- NCDOT Ramsey Street Improvements in preliminary roadway design at this location

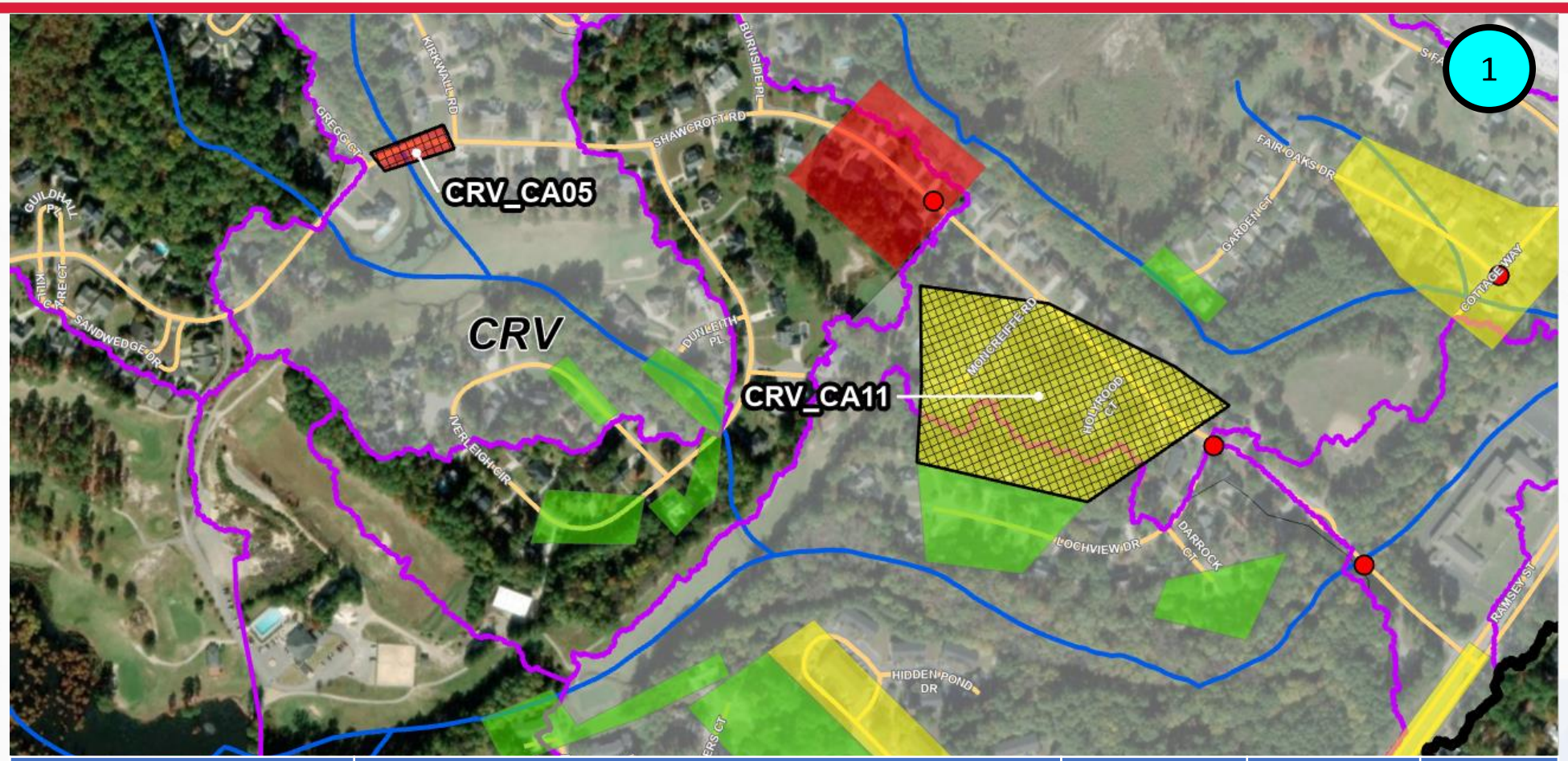
Secondary System Proposed Solutions

FAYETTEVILLE NC

Proposed Solution Highlights

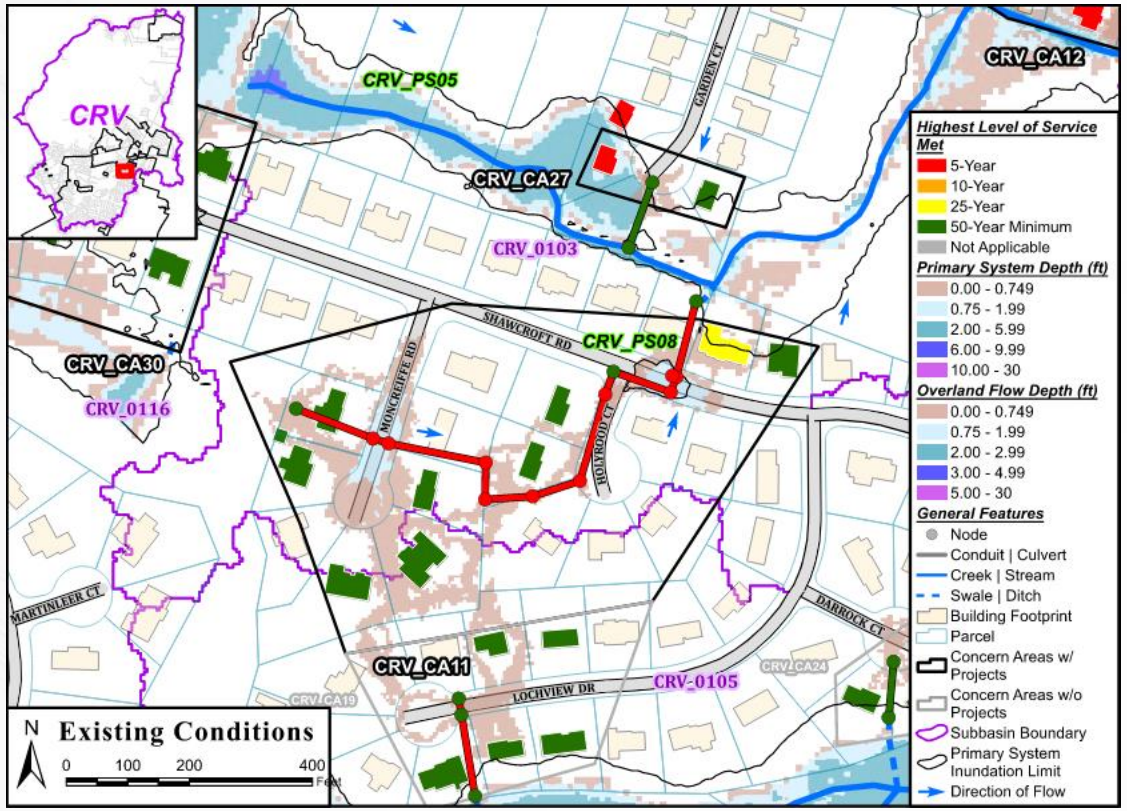


Highest Scoring Proposed Solutions

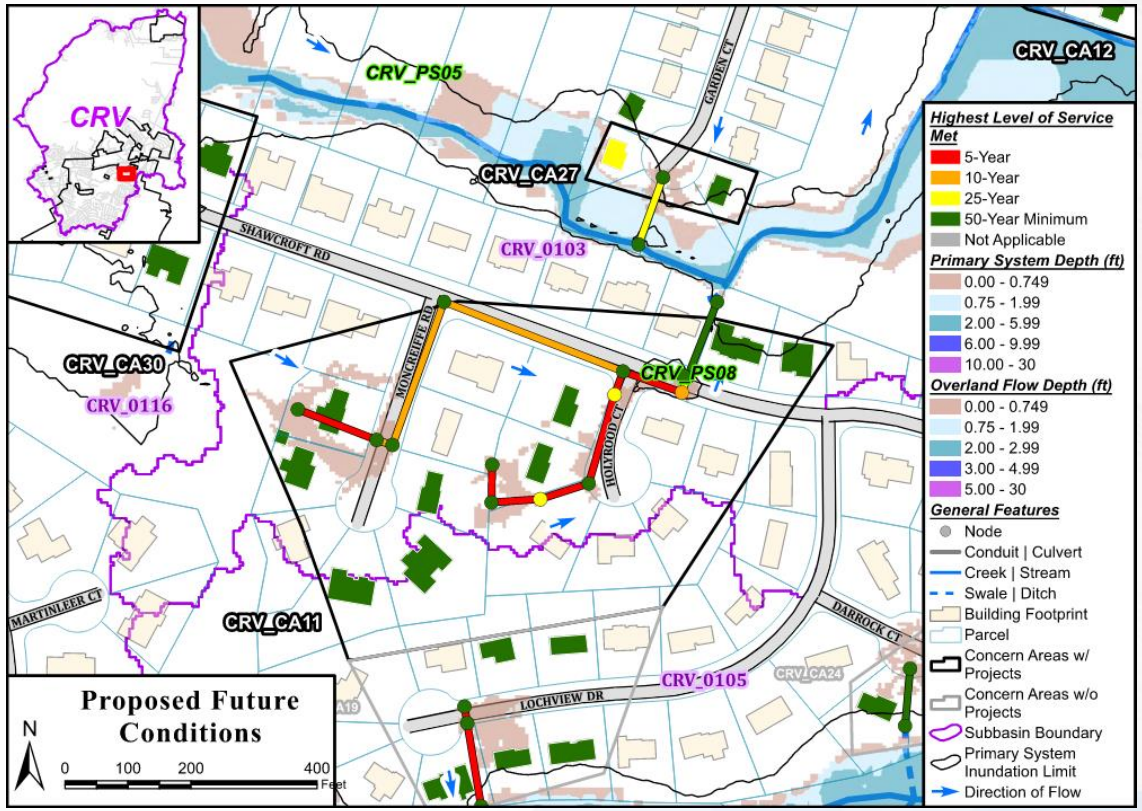


Solution #	Proposed Solution Description	Score	Efficacy	Cost
PS08 (CA11)	Holyrood Court Capacity Expansion	31	85%	$1.1M
	Kirkwall Road Capacity			

PS08 (CA11)
Holyrood Court & Shawcroft Road

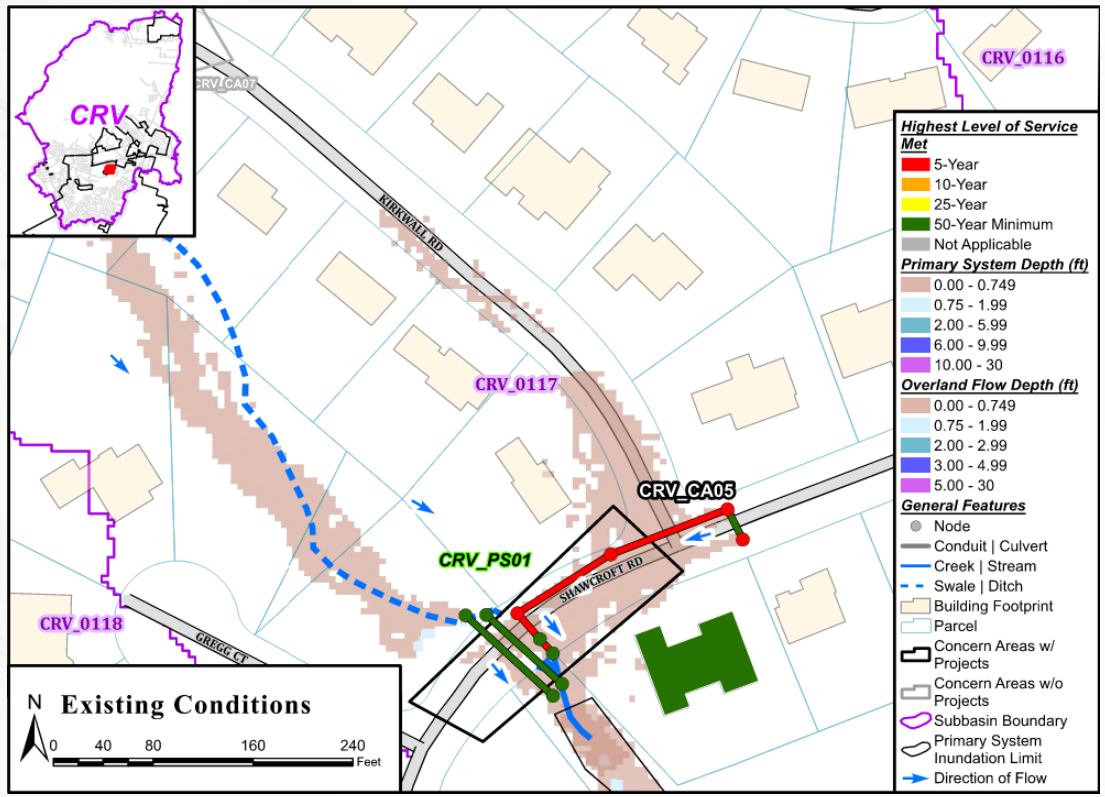


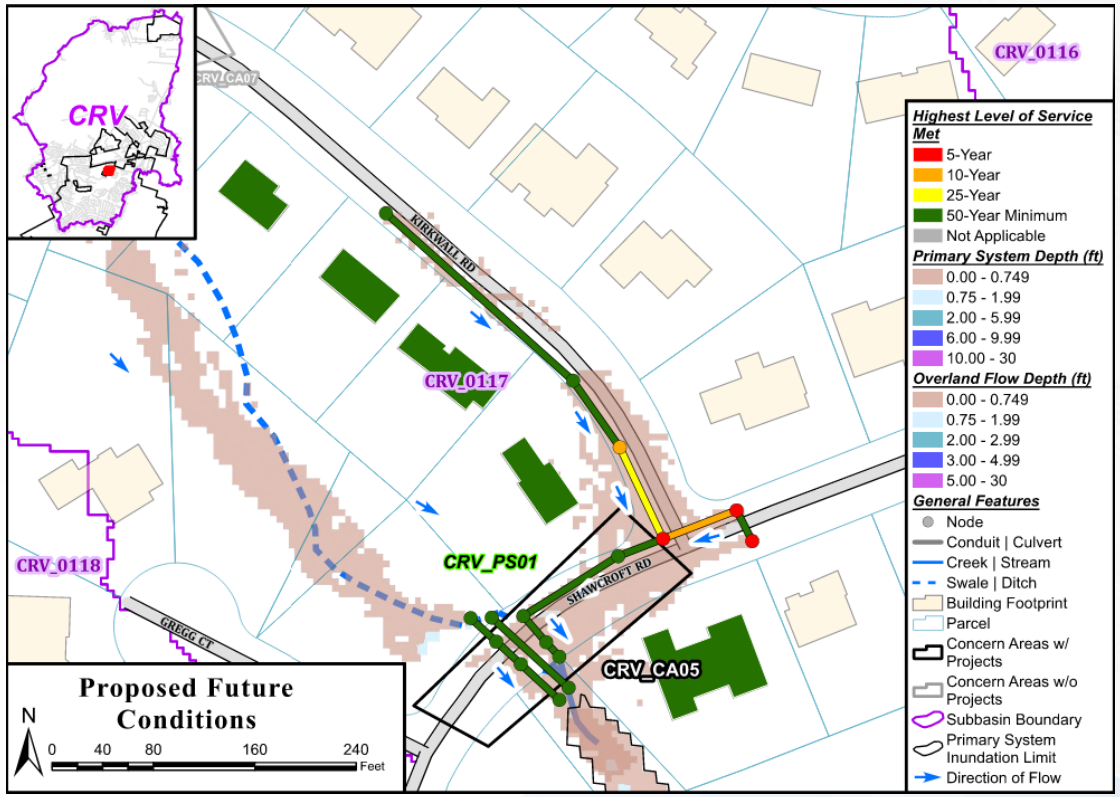
- Council District 1
- PS = Upsizing pipes
- CA Score = 31
- Efficacy = 85%



- Estimated Cost = $1.1 M
- Reduces 760 of impacted lane length
- Addresses 562 disconnected dwellings in the 50-year storm event

PS01 (CA05)
Kirkwall & Shawcroft Road

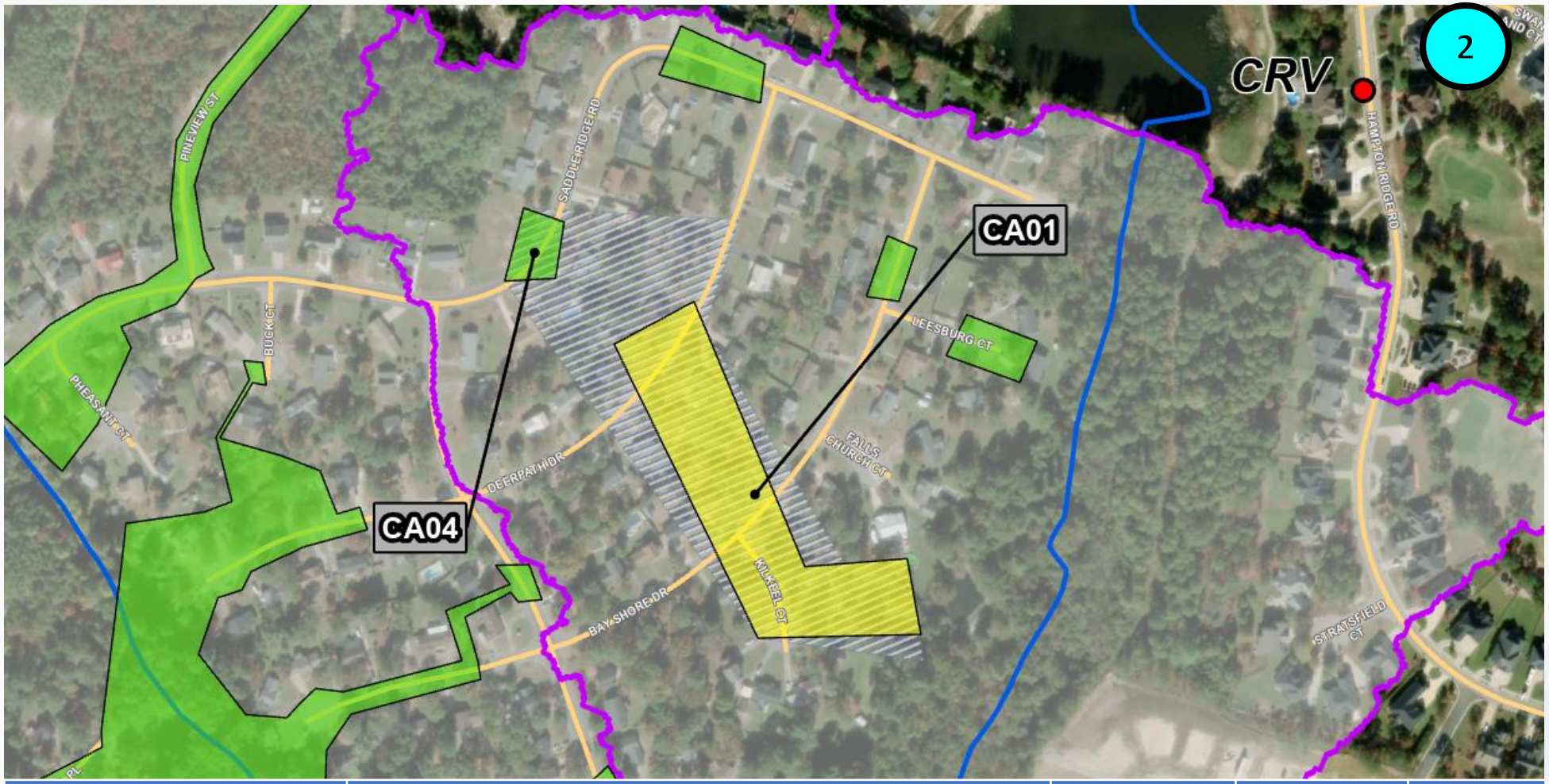




- Council District 1
- PS = Adding inlets and pipes, upsizing pipes
- CA Score = 13
- Efficacy = 79%

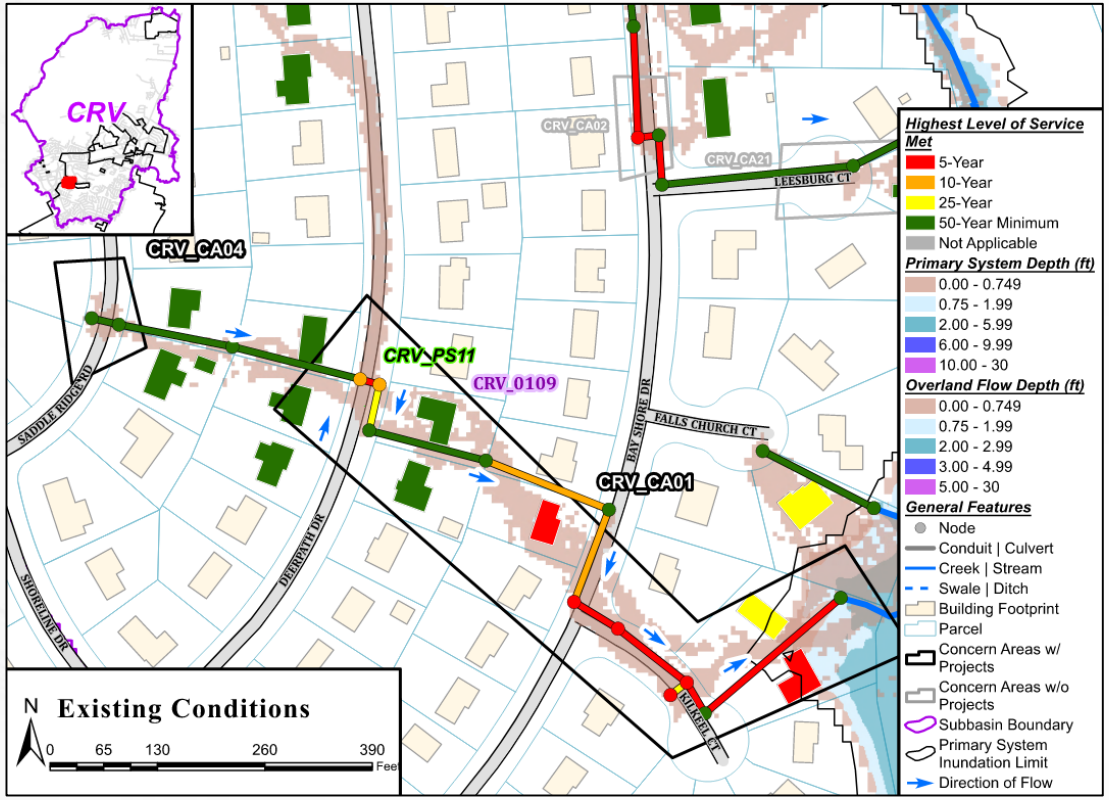
- Estimated Cost = $680,000
- Reduces 200 LF of impacted lane length

Highest Scoring Proposed Solutions

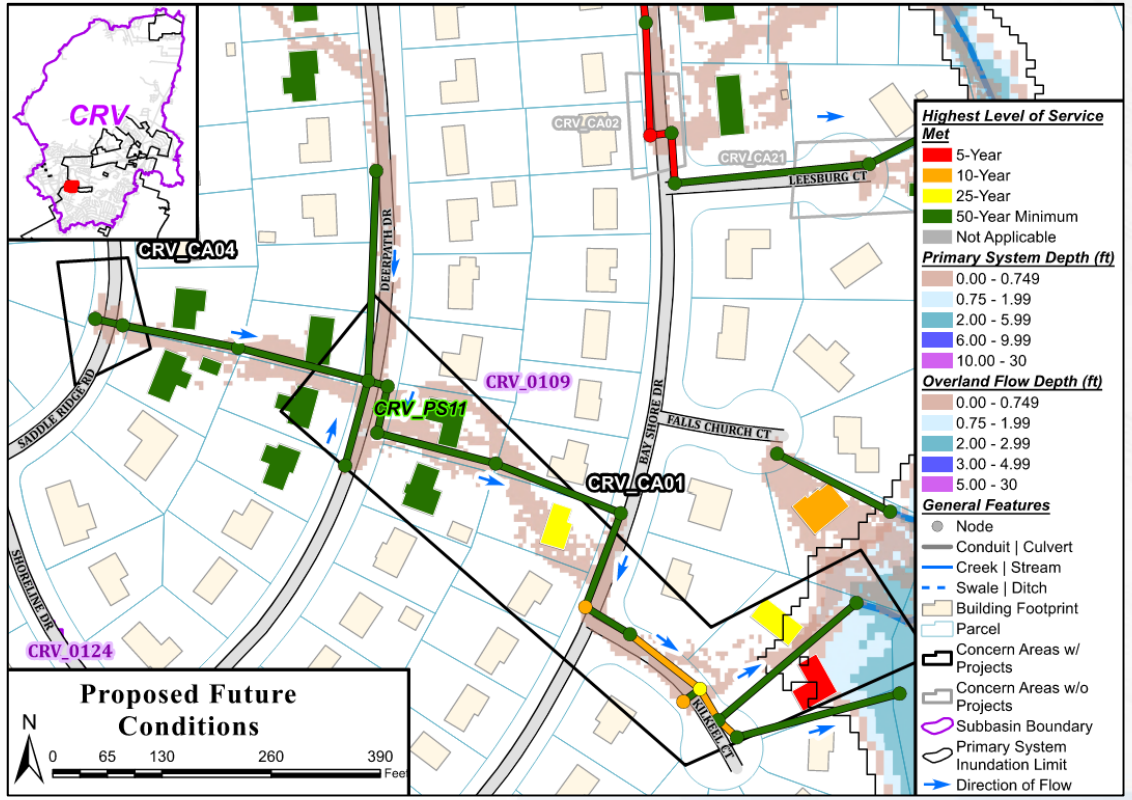


Solution #	Proposed Solution Description	Score	Efficacy	Cost
PS11 (CA01) PS11 (CA04)	Deerpath Road Capacity Expansion	6 3	36% 50%	$2.0M

PS11 (CA01/CA04)
Deerpath Road Capacity Expansion



- Council District 1
- PS = Adding inlets and pipes, upsizing pipes
- CA Score = 6(CA01); 3(CA04)
- Efficacy = 36%(CA01); 50%(CA04)



- Estimated Cost = $2.0 M
- Reduces 300 LF of impacted lane length
- Eliminates impact to 1 structure from 10- and 25-year events

Options and Recommendations

Options:

1. Council provides consensus to approve the 18 proposed solutions to enable staff to program them into the annual CIP prioritization process and pursue grants as applicable.
2. Council does not provide consensus and remands back to staff with additional guidance.

Recommended Action:

Council provides consensus to approve the 18 proposed solutions to enable staff to program them into the annual CIP prioritization process and pursue grants as applicable.

Thank you!

FAYETTEVILLE NC

AMERICA'S CAN DO CITY

FayettevilleNC.gov