



Northeast Ohio Regional Sewer District
Cuyahoga River North Stormwater Master Plan

Big Creek Stormwater Retrofit

April 15, 2019

David Anderson, Jacobs
Mike Blair, NEORSD



JACOBS



Agenda

- Overview of Northeast Ohio Regional Sewer District (NEORSD) Regional Stormwater Management Program (RSMP)
- Overview of Stormwater Master Plans (SWMP)
- CRN SWMP Problem Area Summary
- Parma Problem Area
- Alternative Evaluation Scorecard and Selecting the Preferred Alternative
- Q&A

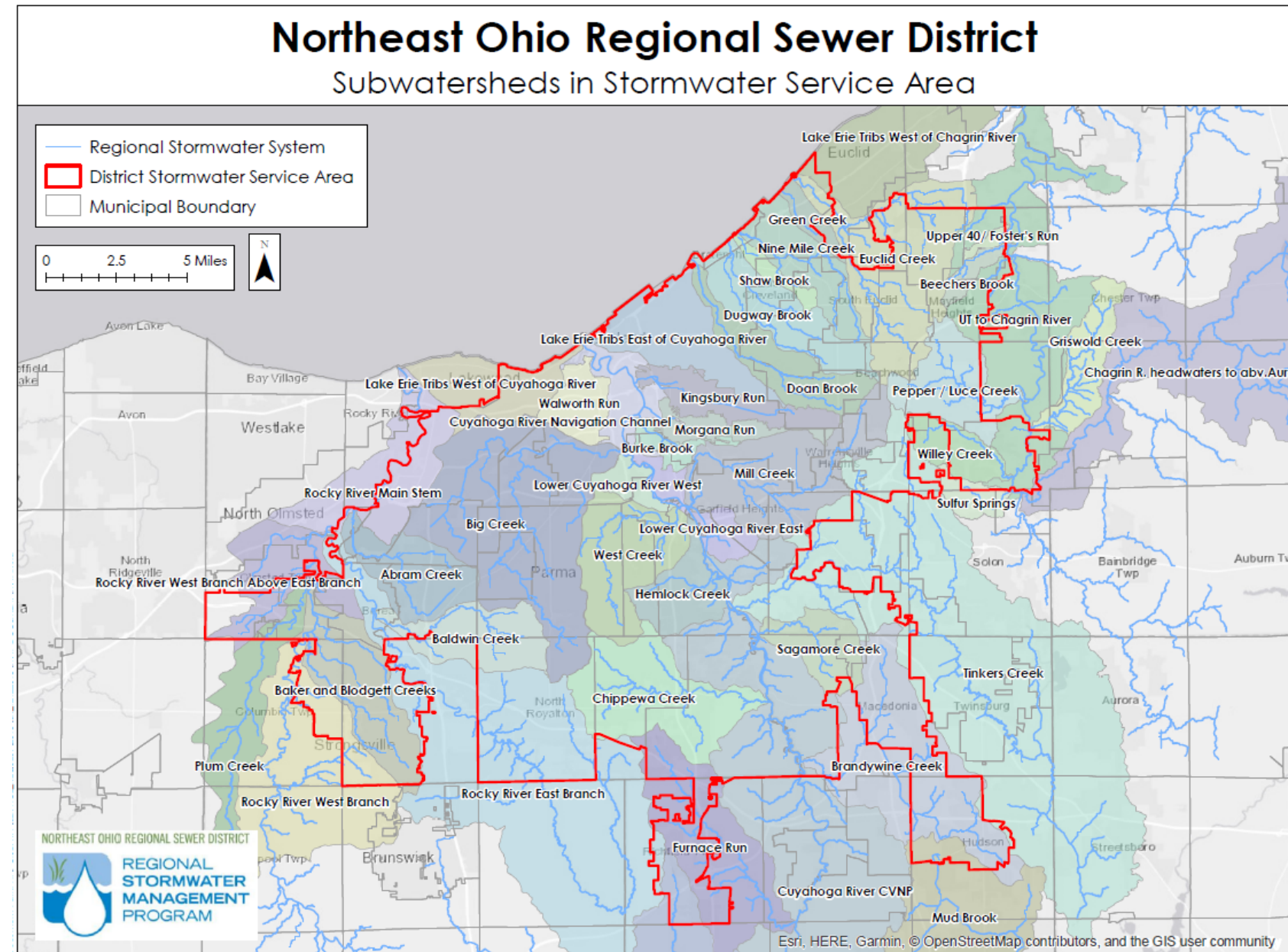


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Overview of NEORSD Regional Stormwater Management Program

- Stormwater Service Area (SWSA) – 368 Square Miles
- 207 square miles of Impervious Surface (~56%) in SWSA.
- 56 communities lie within our SWSA
- Under the RSMP the District is responsible for the conveyance of stormwater within the Regional Stormwater System (RSS)
 - RSS are assets that receive drainage from generally greater than 300 acres of land
- Regional stormwater service area (RSS) currently consists of over 356 miles of streams, 83 miles of culverts and 1,100 crossings



Overview of NEORSD Regional Stormwater Management Program

RSMP Purpose: Address the increase of impervious surfaces which contribute to regional flooding, erosion & water quality issues

Under the Regional Stormwater Management Program the NEORSD provides:

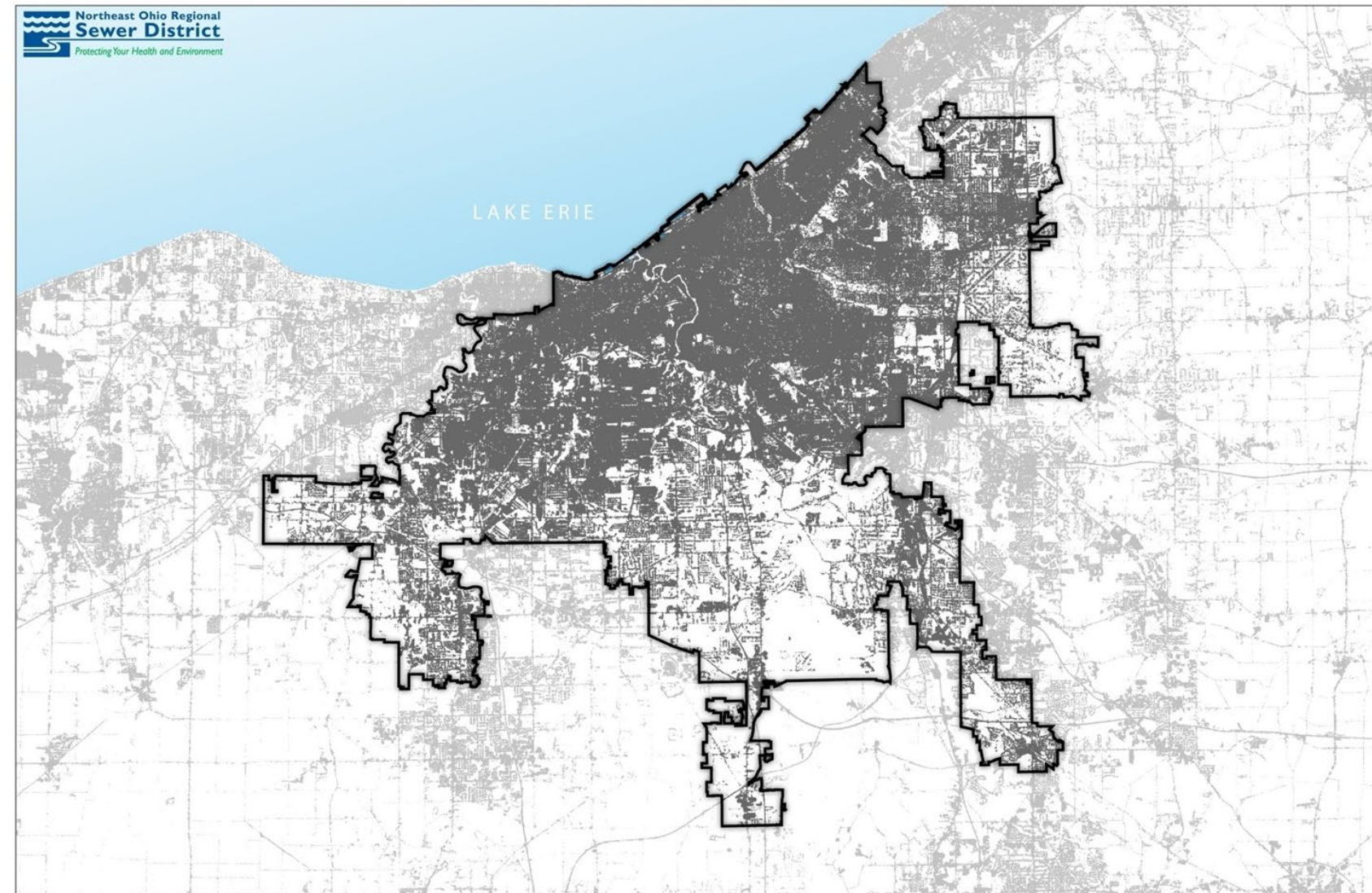
- Maintenance to the Regional Stormwater System (RSS)
- Construction to address flooding and erosion problems
- A community cost-share program to support community-specific stormwater projects
- Educational programs that promote the importance of healthy drainage systems.



Overview of NEORSD Regional Stormwater Management Program

RSMP Supported by A Stormwater Fee

- Estimated revenue of \$43M/Year from impervious surface fee
- 2016 - 2021 Base Rate = \$5.15 per ERU/month
- Impervious Surface Area (IA)
 - Billing Unit = Equivalent Residential Unit (ERU)
 - ERU = 3,000 square feet of IA
- Property Classification
 - SFR: Single Family Residential
 - NSFR: Non-Single Family Residential



Overview of NEORSD Regional Stormwater Management Program

Stormwater Fee Credit Program

Reduction in fees offered to customers who reduce stormwater volume or pollutant load

- Individual Residential Property Credit: 25%
- Stormwater Quality Credit: Up to 25%
- Stormwater Quantity Credit: Up to 75%
- Education Credit: 25%

Stormwater credits require maintenance of control structures



Overview of NEORSD Regional Stormwater Management Program

Community Cost-Share

- 25% of annual Stormwater Fee revenue collected in each Member Community
- Address current, or minimize new stormwater flooding, erosion or water quality problems. CCS Opportunities may include:
 - NPDES Phase II / MS4 Compliance
 - Mitigate Separate Sanitary Sewer Overflow
 - Local Storm Sewer Rehabilitation
 - Stormwater Control Measure Maintenance
 - MS4 IDDE Mapping / Source Tracking
 - Matching Funds for Stormwater Related Grants
- Community Cost Share - 2019
 - 46 projects w/ executed agreement \$8,371,673
 - 22 projects w/ agreements in progress \$2,635,139
- 47 of 55 Member Communities have participated to date



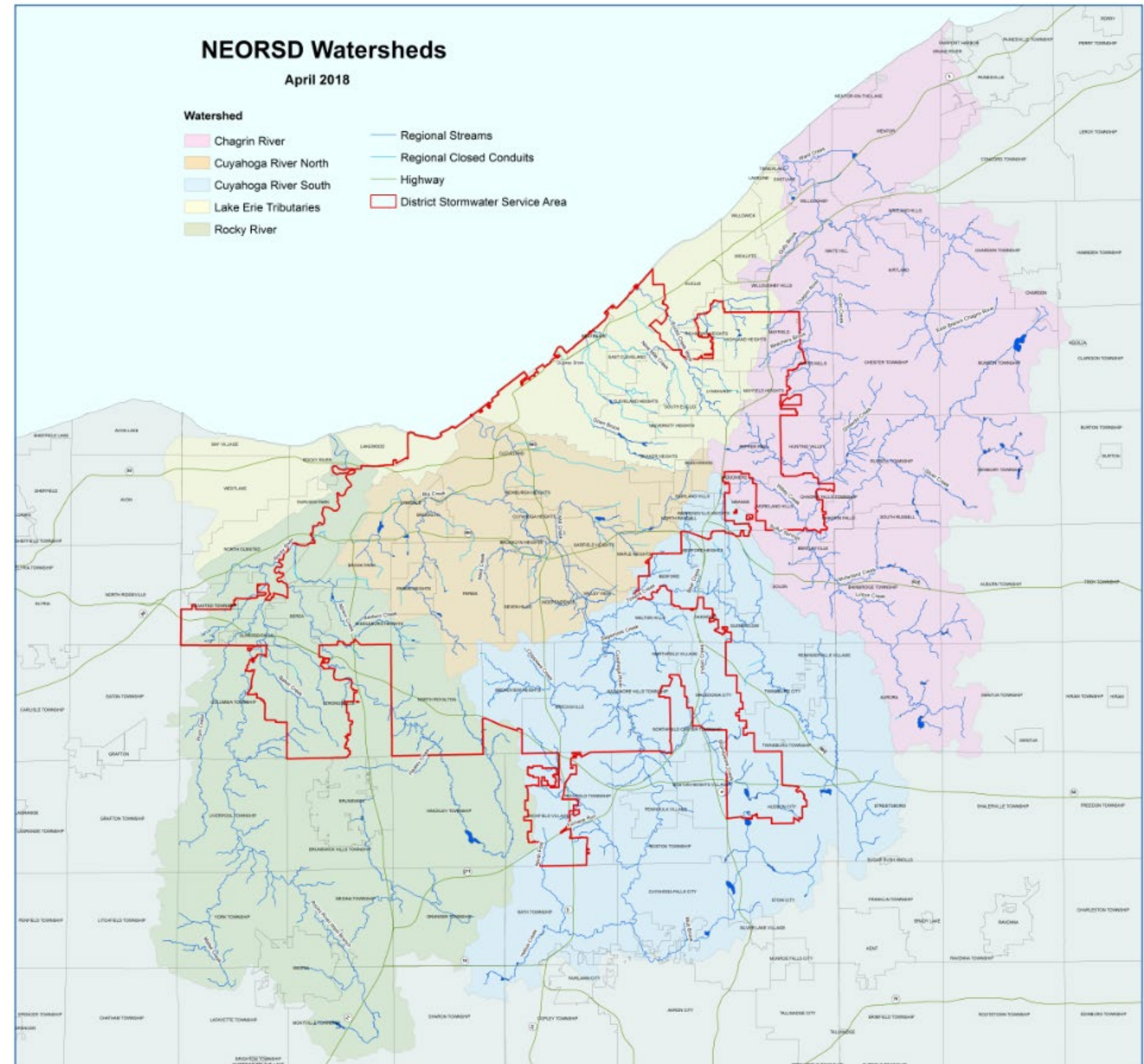


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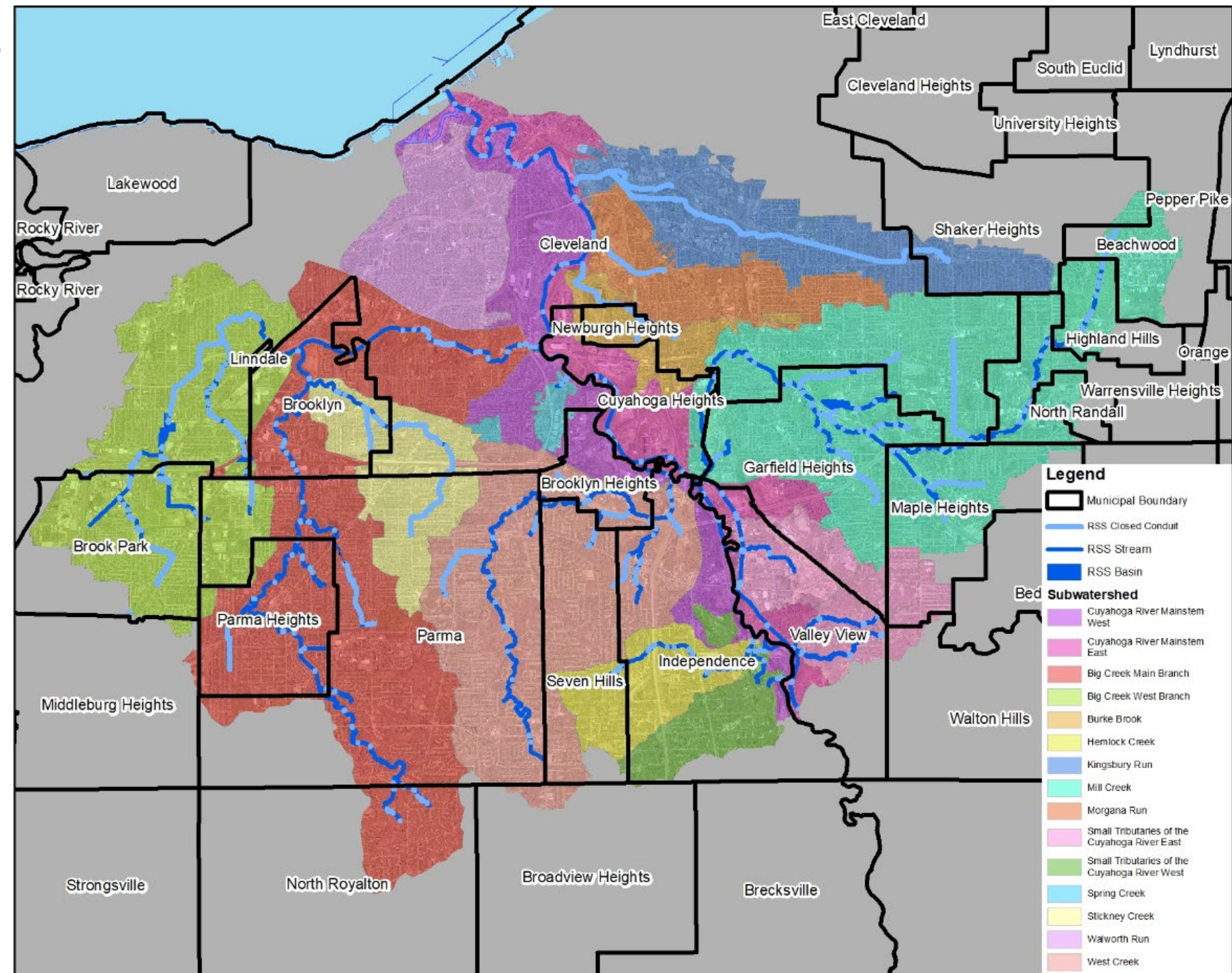
Overview of Stormwater Master Plans

- **Four Separate SWMPs**
 - Cuyahoga River North
 - Cuyahoga River South
 - Rocky River
 - Chagrin River and Lake Erie Direct Tributaries
- **SWMP Study Process Elements**
 - Operational Performance Evaluation
 - Data Collection & Management
 - H/H Modeling
 - Problem Identification
 - Alternative Development and Evaluation
 - Stormwater Master Plan Report
 - District Wide Prioritization Process



Overview of Stormwater Master Plans: Cuyahoga River North

- 8 Subwatersheds: 112 square miles
- Focus on RSS system
- Combined Sewer Inflows
- Field Inspection:
 - Culverted Stream: 35.1 miles
 - Crossings: 170 crossings
 - Streams: 20.2 miles
 - Basins / dams: 12
- Hydrologic and Hydraulic (H&H) model development
 - Inundation
 - Erosion
- Utilize H&H models to design alternatives reduce inundation and erosion potential



Overview of Stormwater Master Plans: Cuyahoga River North

- Asset Management Strategy
 - Buildings, Transportation, and Utility Assets (BTUs)
 - Streams
 - Culverted Streams
 - Crossings
 - Basins
 - Major Structures
- Business Risk Exposure = Criticality of Asset * Condition Rating
- Criticality (3-9) – consequence of failure
 - Employee/ Public Safety & Infrastructure Integrity
 - Regulator Compliance/Public Impact
 - Fiscal Impact
- Condition Rating (1-5) – potential of failure
 - Sediment and Debris
 - Structural
 - Hydraulic Performance
- Assists in prioritization – identifies critical assets in worst condition

Stormwater Asset Class Types	Criticality Rating	BTU Asset Class Types	Criticality Rating	BTU Asset Class Types	Criticality Rating
Basins		Buildings		Transportation	
▪ ODNR Class I	9	▪ Non-Residential:		▪ Railroads	9
▪ ODNR Class II	9	- Hospitals	9	▪ Highways	9
▪ ODNR Class III	6	- School	9	▪ Arterials	8
▪ Unregulated > 25'	6	- Police/Fire Station	9	▪ Local	6
▪ Unregulated < 25':		- City Hall	9	▪ Non-residential roads	6
- Moderate Impacts	5	- WWTP and WTP	9	▪ Parking Lots	5
- Minimal Impacts	4	- Other Insured	8	▪ Trailpath	4
Crossings		- Restroom	6	▪ Residential Drives	4
▪ Driveway	4	- Mausoleum	5	▪ Golf course bridge	4
▪ Parking Lot	5	- Gazebo	4	▪ Sidewalk	4
▪ Local Road	6	▪ Residential:		▪ Footbridge	3
▪ Arterial Road	8	- Insured/Occupied	6	Utility	
▪ Highway	9	- Detached Garage*	5	▪ WW Regional	7
▪ Railroad	9	- All other unoccupied structures *	3	▪ Electric Regional	7
Culverted Streams				▪ Gas Regional	7
▪ Minor INF Impacts	6			▪ Water Regional	6
▪ Major INF Impacts	9			▪ Other Utility Regional	6
Major Structures				▪ Local	4
Streams	3			▪ Towers/Poles	

Condition Rating	Criticality						
	3	4	5	6	7	8	9
1	3	4	5	6	7	8	9
2	6	8	10	12	14	16	18
3	9	12	15	18	21	24	27
4	12	16	20	24	28	32	36
5	15	20	25	30	35	40	45

Source: SWMP Standards – April 2018, NEORSD

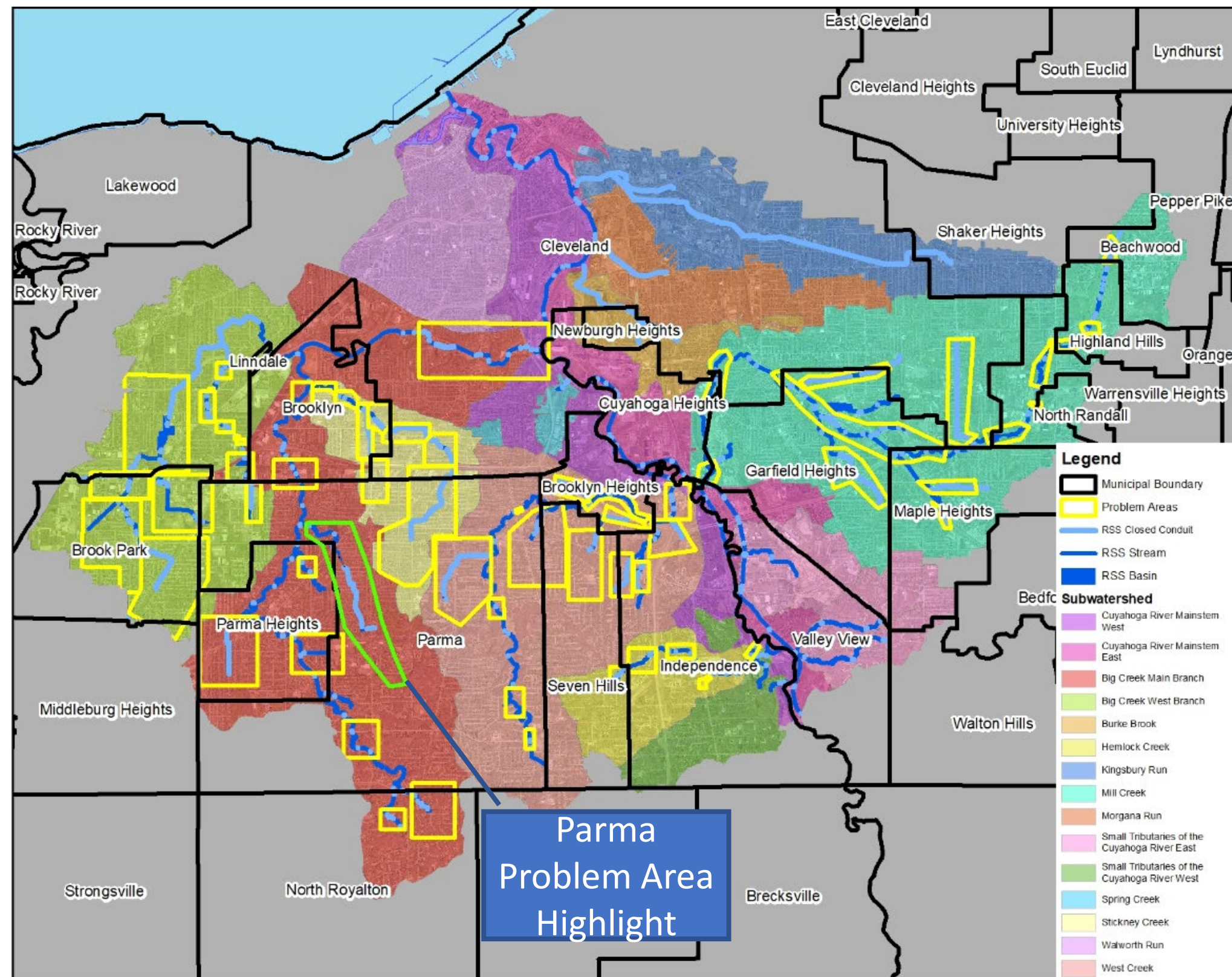


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CRN SWMP Problem Area Summary

- 67 Problem Areas
 - Primarily driven by inundation
 - Potential project area locations
- Parma Problem Area Highlight
 - Problem overview
 - Alternative overview
 - TBL Scoring





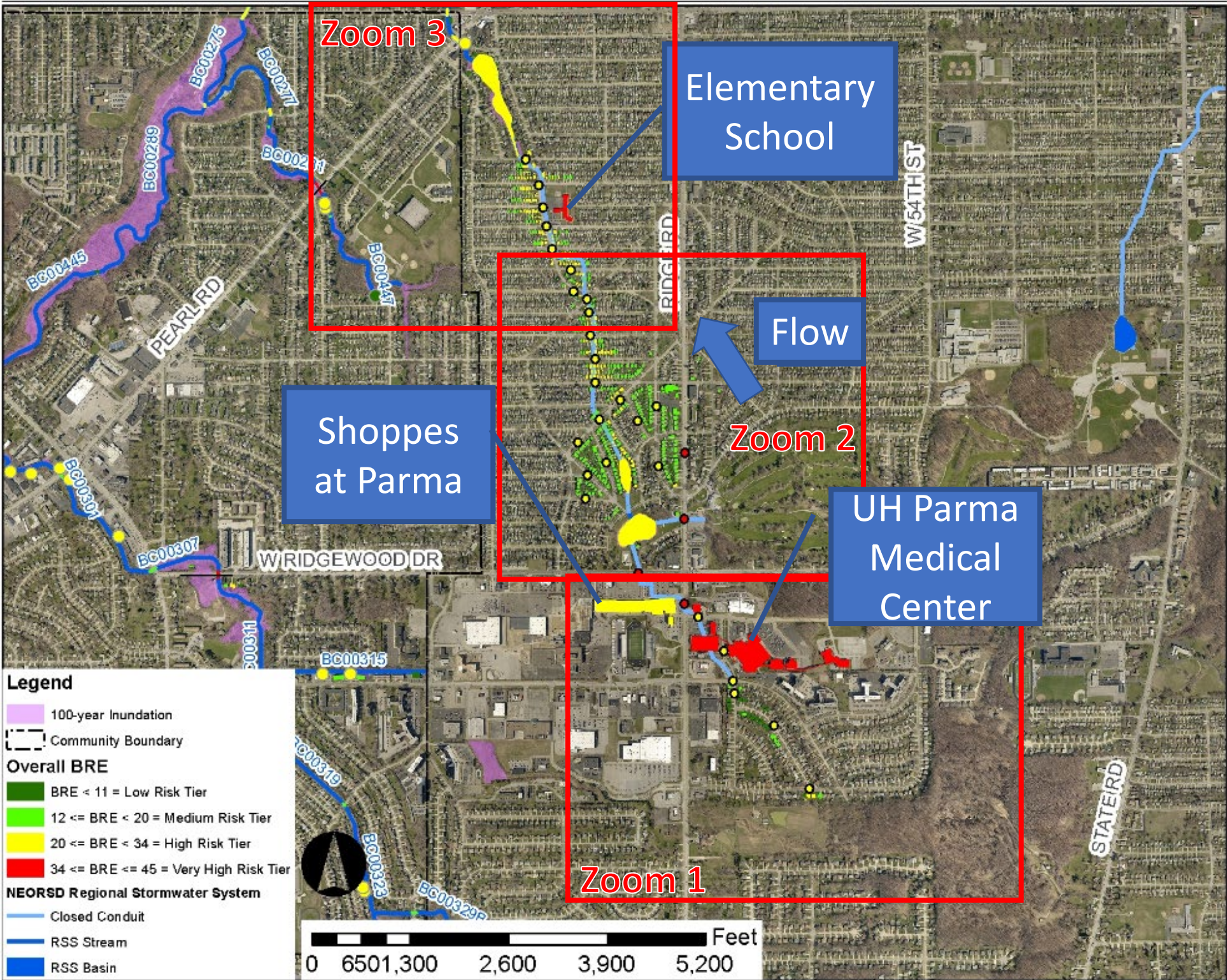
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Parma Problem Area

- 4 stormwater basins
- 2.5 miles of culverted stream
- Flooding and Structural issue in Parma
 - University Hospital Parma Medical Center
 - The Shoppes at Parma
 - Elementary School
- Zoom-ins on proceeding slides

Problem Area: BC-PA-07	
Total Drainage Area	1677 acres
Percent Impervious	694 acres 41.4%
Building Transportation, and Utility Assets (BTUs)	625
TUs with BREs>20 (Alternative Development)	33
Bs with BREs>20 (Alternative Development)	173
Required Volume to Manage to prevent Inundation	115 acre-feet



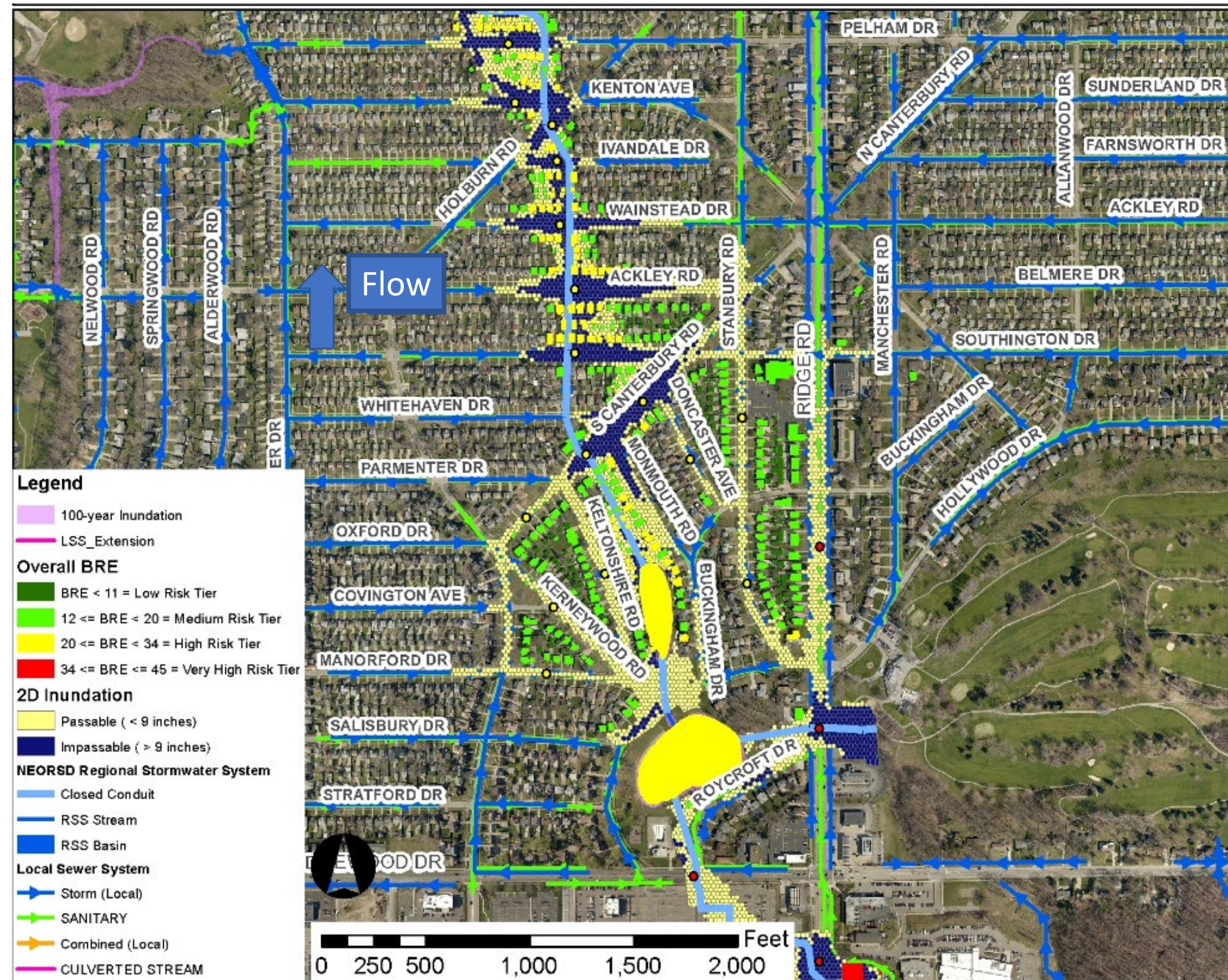
Parma Problem Area

- Local Stormwater System extensions
- 2D modeling above culverted streams
- Upstream end of Problem area
- 100-year inundation: Multiple streets and parking lots are impassable
- Residences, University Hospital Parma Medical Center, and Parma Shopping Center



Parma Problem Area

- 100-year inundation
- Flooding at Ridgewood basins
- Major and local roadways inundated
- Residential inundation



Parma Problem Area

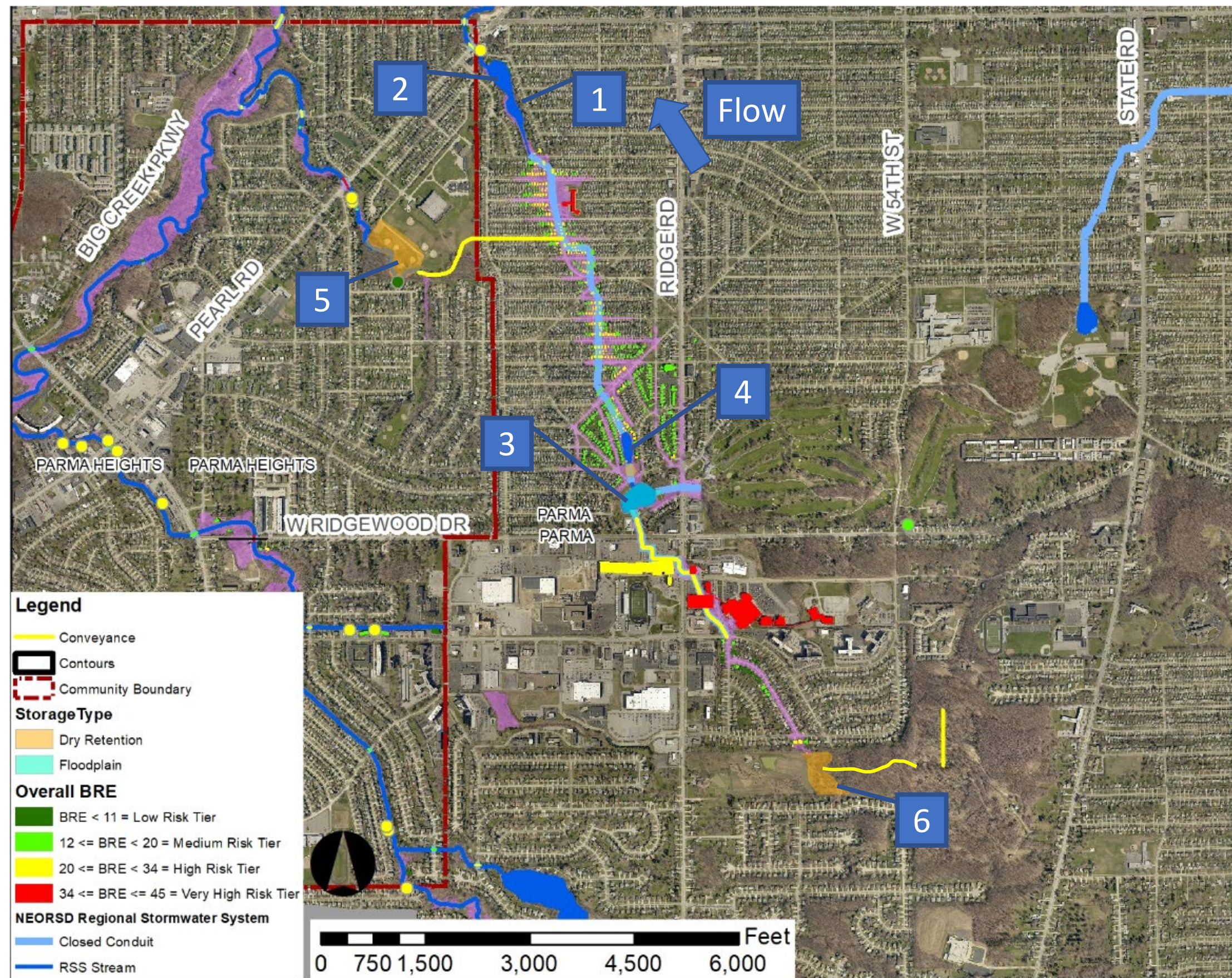
- 100-year Inundation
- Elementary School inundated
- Major and local roadways inundated
- Residential inundation



Parma Problem Area: Alternative 1

1. Upper Twin Lakes basin removal and channel restoration
2. Lower Twin Lakes basin removal and channel restoration
3. Upper Ridgewood dredging and retrofit. Upsize of BC00037/38 to 6 feet
4. Lower Ridgewood dredging and retrofit
5. New SCM adjacent to Parma Pump Station and relief storm sewer
6. New SCM adjacent to Stearns farm and re-route of overland flow

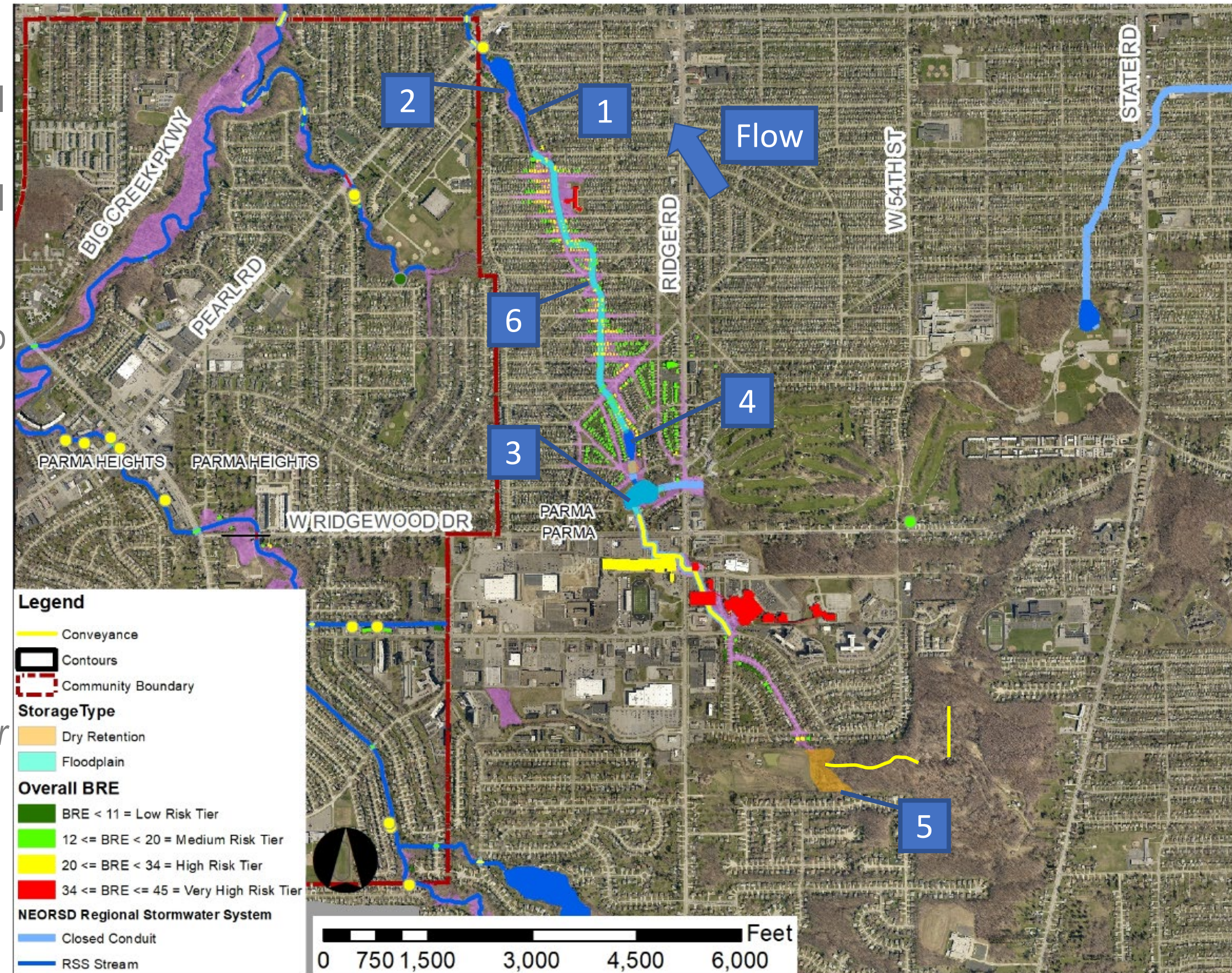
** Components are numbered in order of design and construction prioritization*



Parma Problem Area: Alternative 2

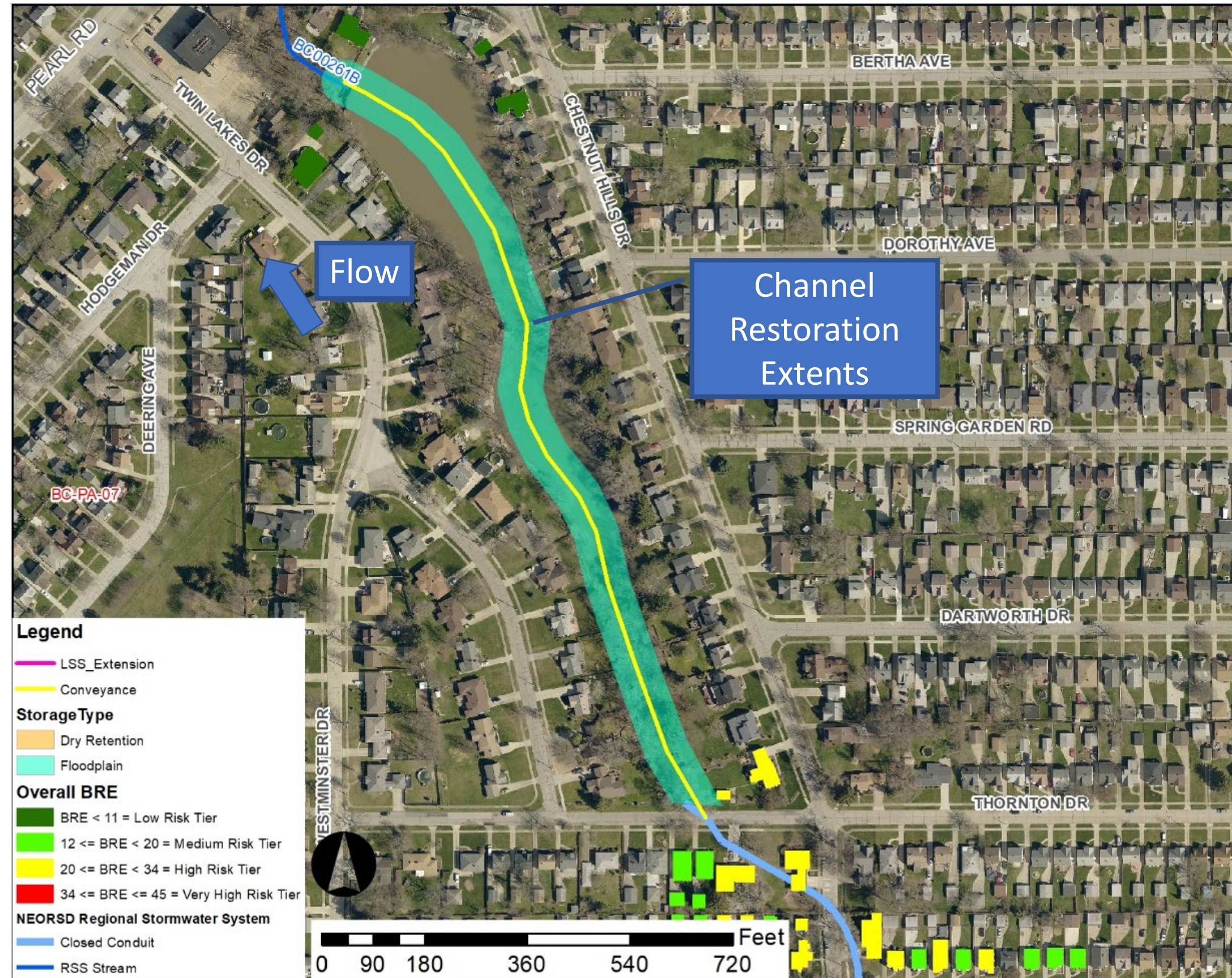
1. Upper Twin Lakes basin removal and channel restoration
2. Lower Twin Lakes basin removal and channel restoration
3. Upper Ridgewood dredging and retrofit. Upsize of BC00037/38 to 6 feet
4. Lower Ridgewood dredging and retrofit
5. New SCM adjacent to Stearns farm and re-route of overland flow
6. Daylight 4,630 feet of culvert

** Components are numbered in order of design and construction prioritization*



Parma Problem Area: Alternative 1/2

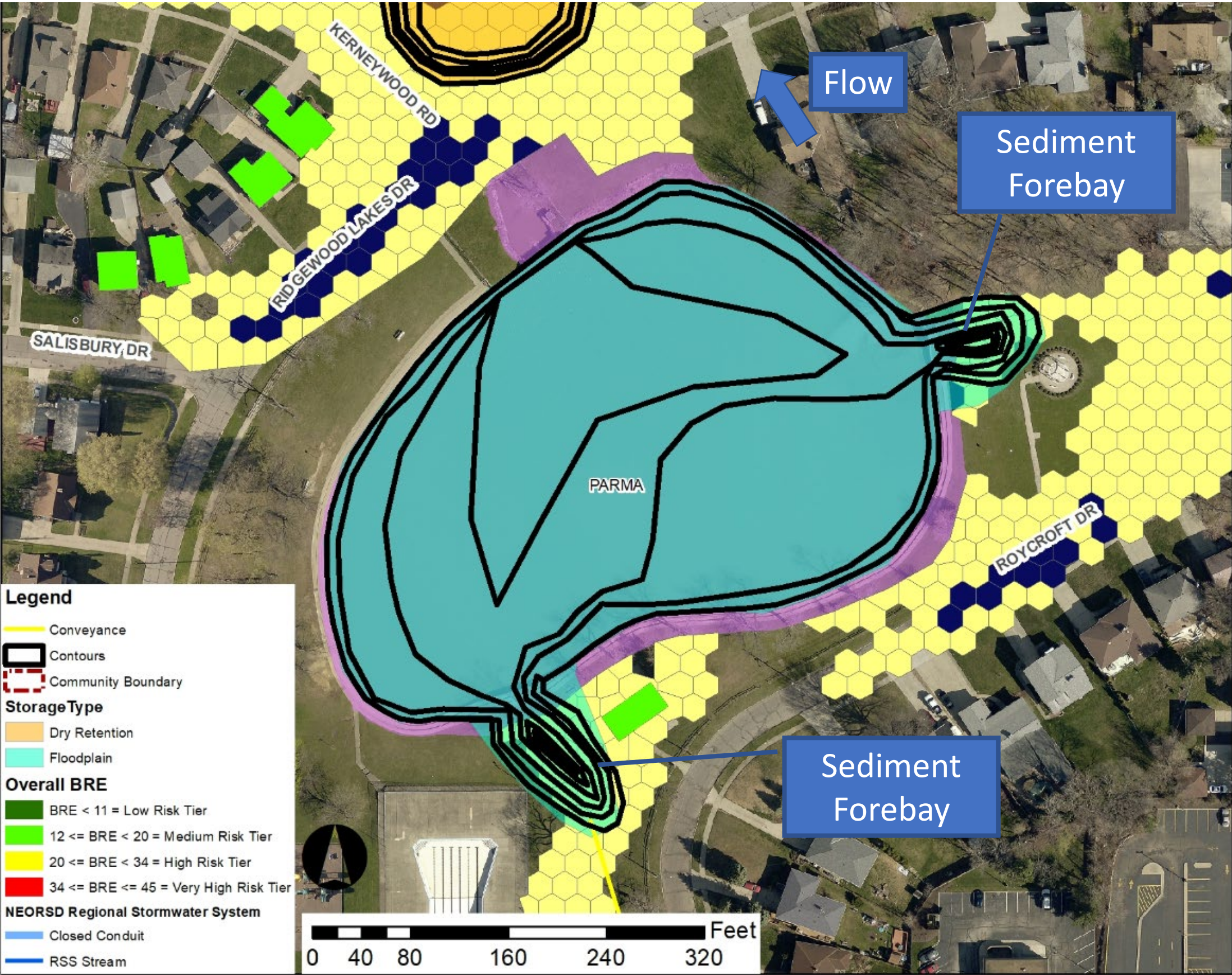
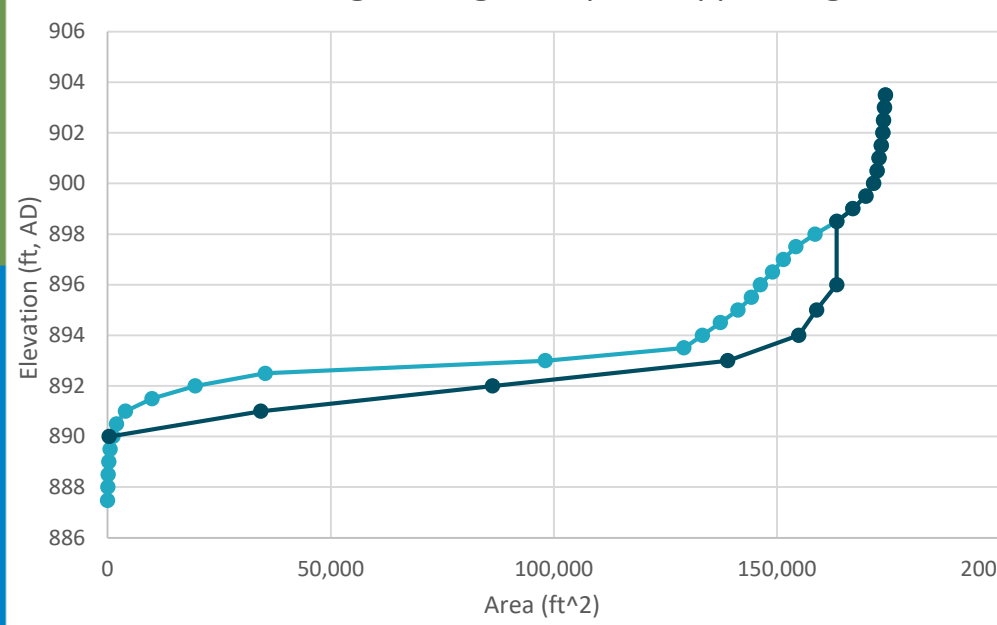
1. Upper Twin Lakes basin removal and channel restoration
 2. Lower Twin Lakes basin removal and channel restoration
- Used existing channel geometry
 - Approximately 1,500 feet of stream restoration
 - Remove fish passage barriers
 - Temperature control
 - Nutrient loadings



Parma Problem Area: Alternative 1/2

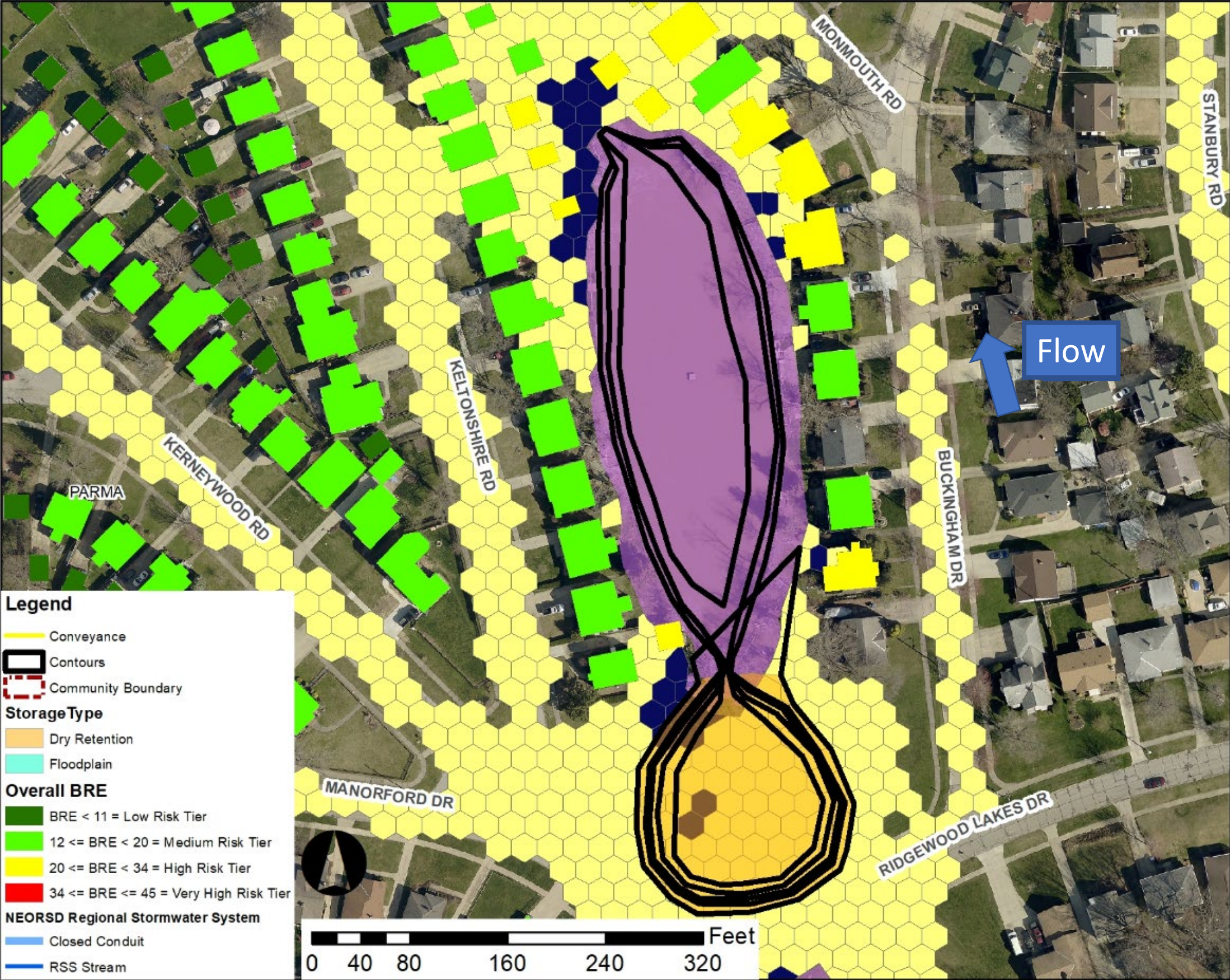
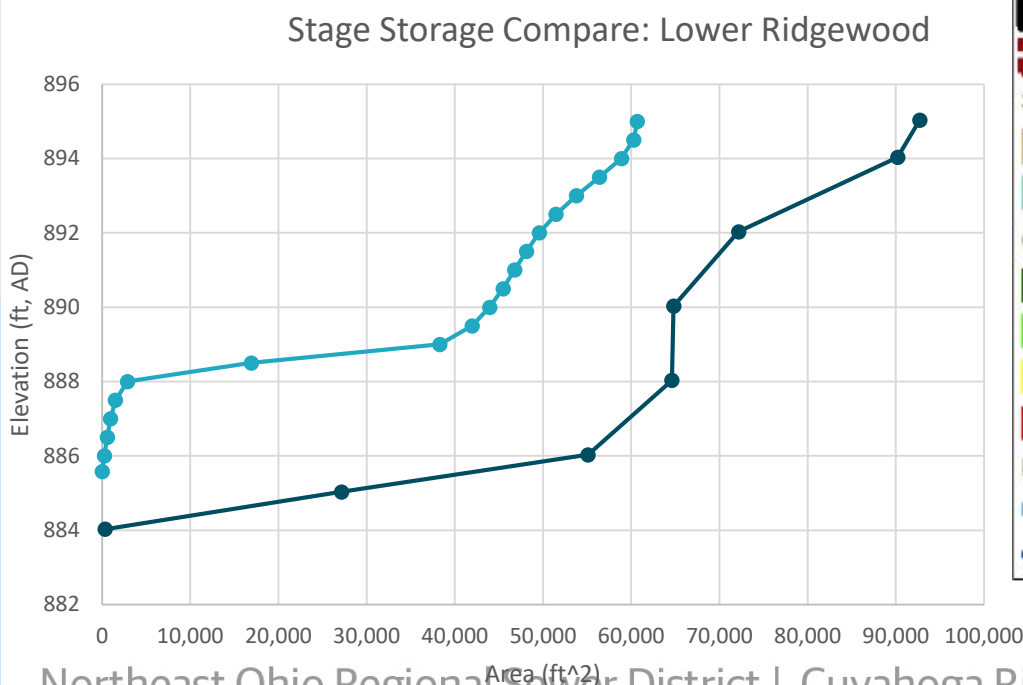
- 3. Upper Ridgewood dredging and retrofit. Upsize of BC00037/38 to 6 feet
 - Convert to dry basin
 - New 3-foot diameter low level outlet
 - Allows baseflow and smaller storms to pass unimpeded
 - Basin graded towards outlet structure
 - Add Sediment forebays
 - Sediment removal ~ 21,500 CY

Stage Storage Compare: Upper Ridgewood



Parma Problem Area: Alternative 1/2

4. Lower Ridgewood dredging and retrofit
- Convert to dry basin
 - New 3-foot diameter low level outlet
 - Allows baseflow and smaller storms to pass unimpeded
 - Basin graded towards outlet structure
 - Add Sediment forebays
 - Sediment removal ~ 27,900 CY



Parma Problem Area: Alternative 1/2

- 3. Upper Ridgewood dredging and retrofit. Upsize of BC00037/38 to 6 feet
- 4. Lower Ridgewood dredging and retrofit

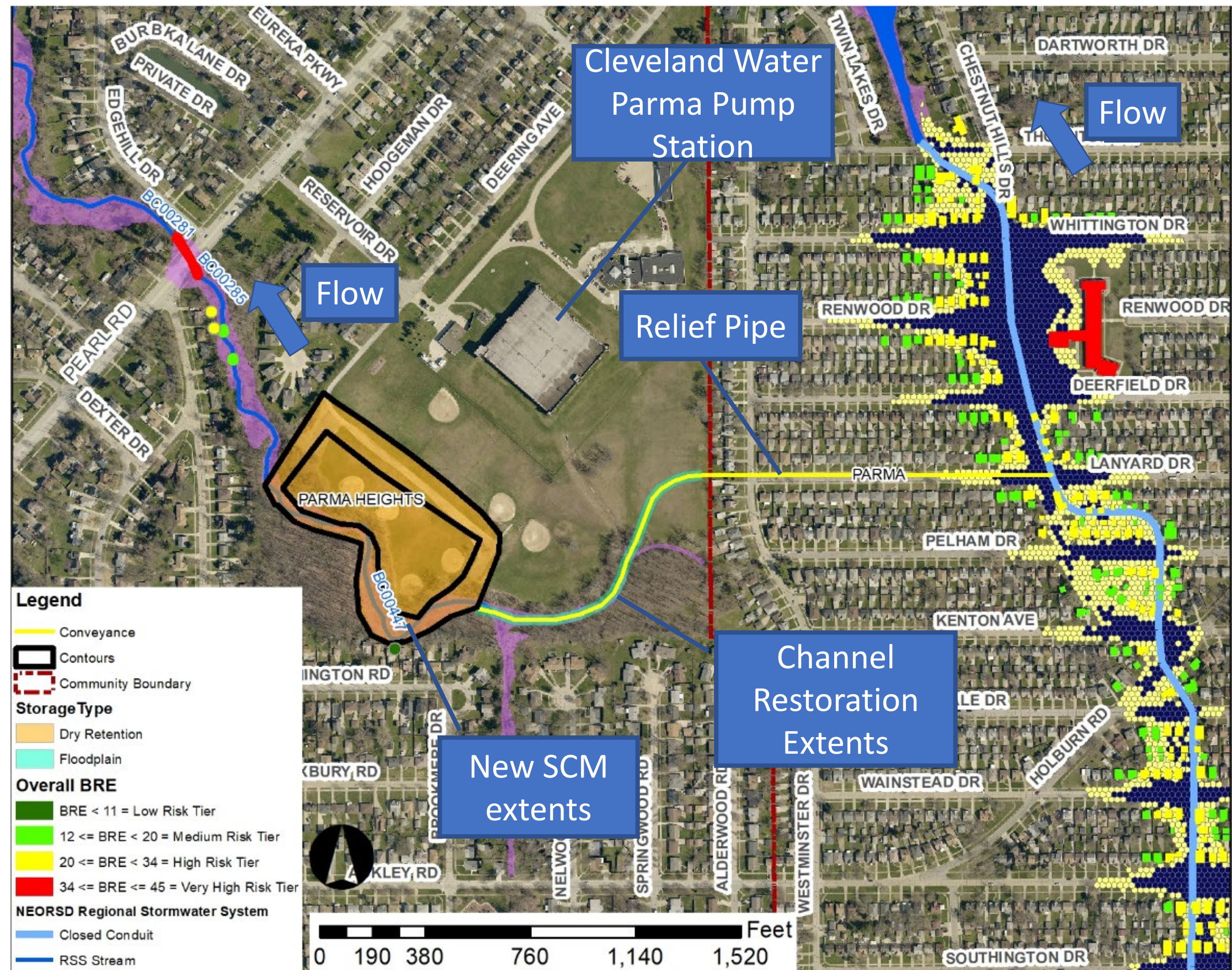


Potentially
Retrofit existing
Lake Drain



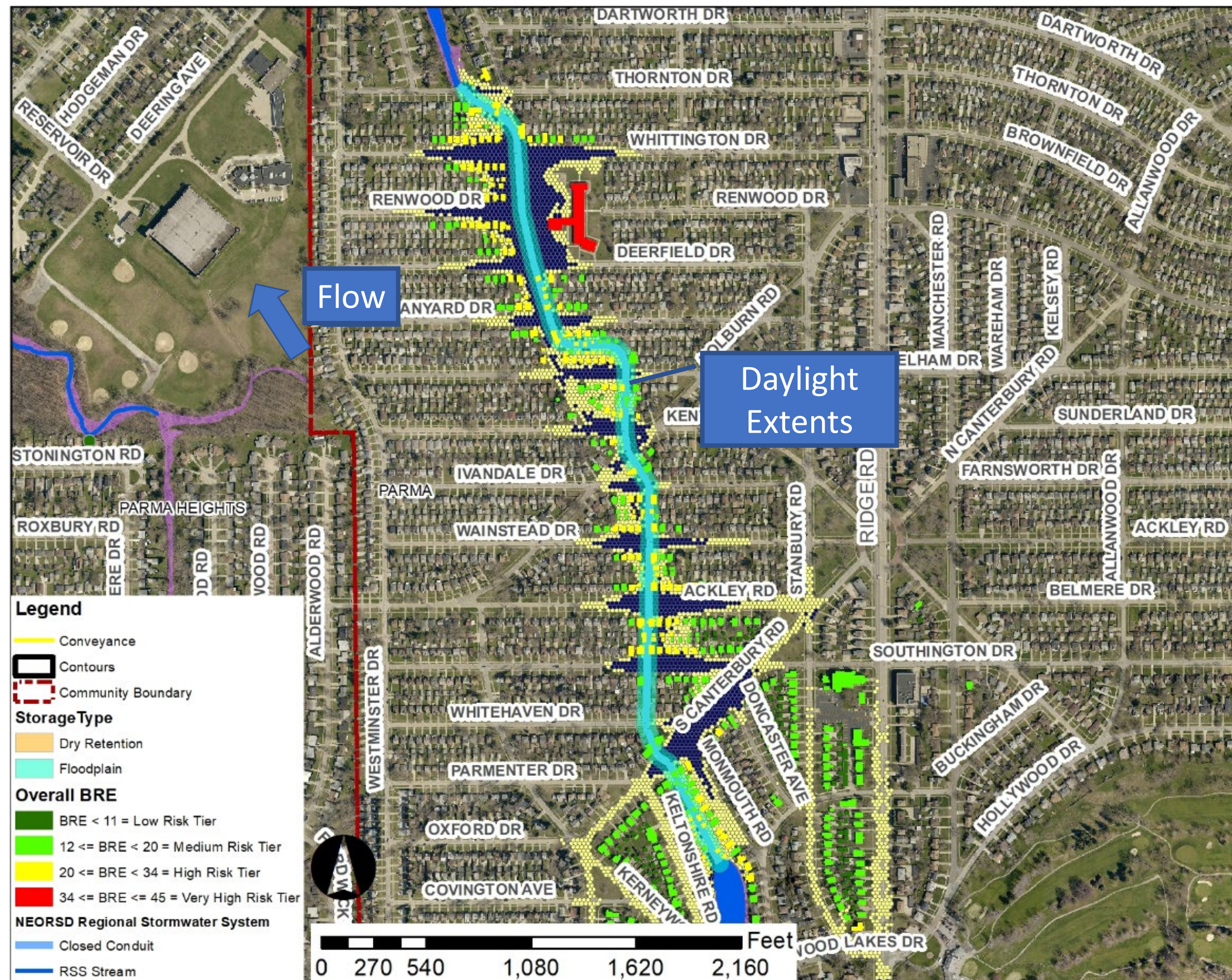
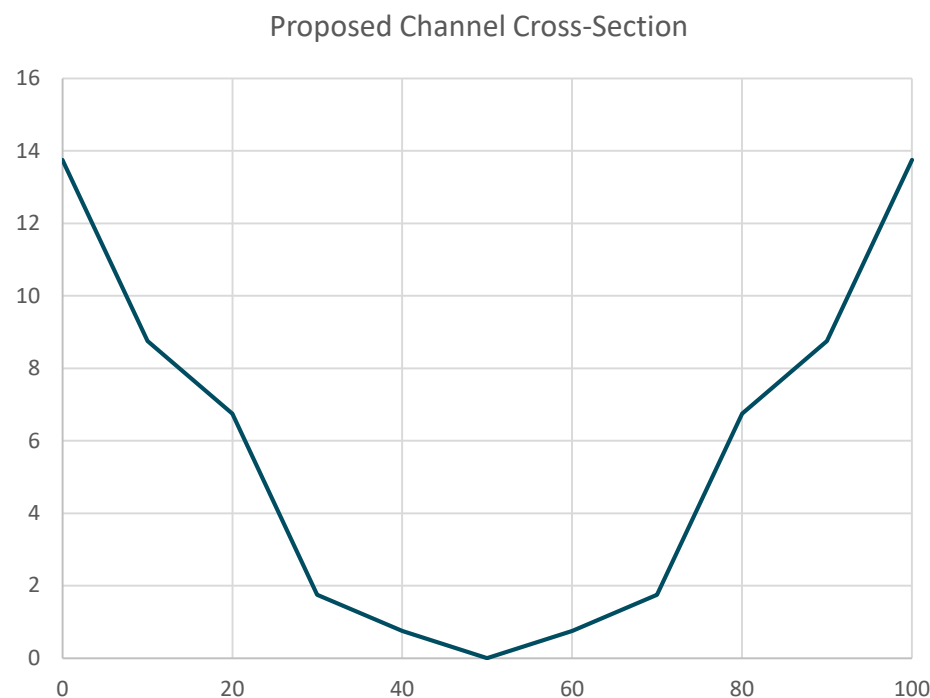
Parma Problem Area: Alternative 1

5. New SCM adjacent to Parma Pump Station and relief storm sewer
 - Public Land
 - Relief pipe – 1,300 feet of 7.667 ft x 11.917 Horizontal Ellipse
 - 1,100 feet of stream channel construction and restoration
 - Depth = 15 feet
 - Storage = 150 acre-feet
 - Potential Class III Dam
 - Downstream flood reduction



Parma Problem Area: Alternative 2

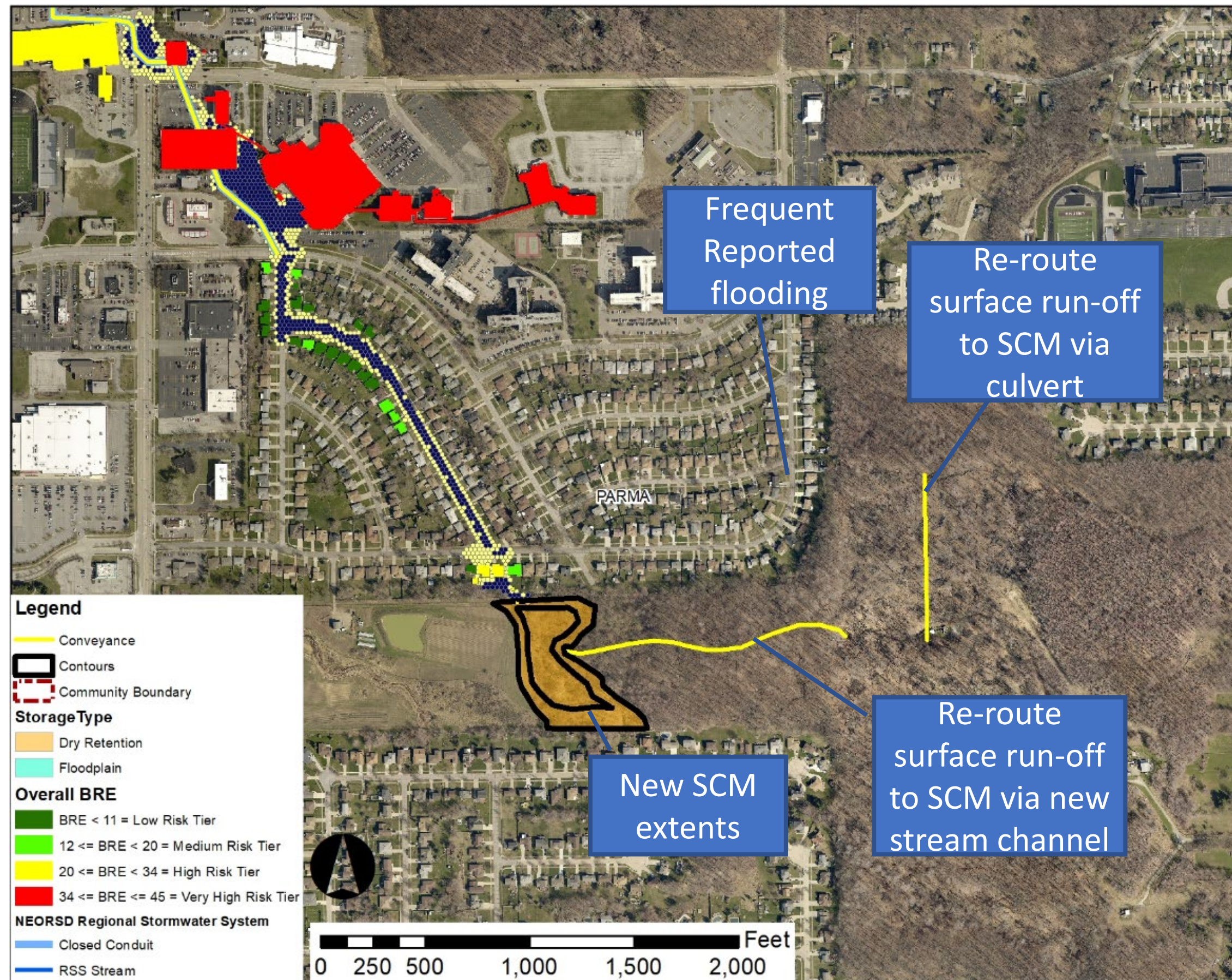
6. Daylight 4,630 feet of culvert
 - 100 foot channel width
 - Minor floodplain benching
 - Assumed same depth to invert of culvert ~14 feet
 - Acquisition of 95 properties
 - Total Tax Assessed value \$7,663,200



Parma Problem Area: Alternative 1/2

5/6. New SCM adjacent to Stearns farm and re-route of overland flow

- Public Land
- Relief pipe – 1,100 feet of 3-ft culvert
- 1,400 feet of stream channel construction and restoration
- Depth = 10 feet
- Storage = 40 acre-feet
- Potential Class IV Dam (Unregulated)
- Downstream flood reduction





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Alternative Evaluation Scorecard

UPDATE ALL TBL REFERENCES

1484 - Cuyahoga River North Stormwater Master Plan
Alternatives Evaluation Scorecard - Big Creek Main Branch Subwatershed

4/9/2019

- Alternative screening mechanism
- Implementation – 50%
 - Economics – 25%
 - Design, Construction, and O&M – 25%
- Environmental/Stream Function and Health Considerations – 50%

Alternative 1 Description	Stearns Farm Basin and conveyance, upscale BC00037/38, Upper Ridgewood floodplain mod, Lower Ridgewood floodplain mod, relief pipe to new basin, convert Twin Lakes to open channel											
Alternative 2 Description	Stearns Farm Basin and conveyance, upscale BC00037/38, Upper Ridgewood floodplain mod, Lower Ridgewood floodplain mod, daylight BC00262, convert Twin Lakes to open channel											
ECONOMICS				ALTERNATIVE 1	SCORE	WEIGHT	WEIGHTED SCORE	ALTERNATIVE 2	SCORE	WEIGHT	WEIGHTED SCORE	
Life Cycle Costs (relative to other alternatives)	Within 25%	0	12.50%	0.0000	Within 25%	0	12.50%	0.0000				
Damage Mitigation	>80%	1	12.50%	0.1250	>80%	1	12.50%	0.1250				
CRITERIA TOTAL				0.1250				0.1250				
DESIGN, CONSTRUCTION, AND O&M												
Ease of Design and Construction	Complex	-1	6.25%	-0.0625	Complex	-1	6.25%	-0.0625				
Property Acquisition Needs	Routine	0	6.25%	0.0000	Significant	-1	6.25%	-0.0625				
Construction Impacts to Public	Routine	0	6.25%	0.0000	Significant	-1	6.25%	-0.0625				
O&M Frequency and Simplicity	Routine	0	6.25%	0.0000	Minimal to none	1	6.25%	0.0625				
CRITERIA TOTAL				-0.0625				-0.1250				
ENVIRONMENTAL/STREAM FUNCTION AND HEALTH CONSIDERATIONS												
Stream Performance (Lateral/Vertical Stability)	Increase in floodplain access; improved hydraulics	1	10.00%	0.1000	Increase in floodplain access; improved hydraulics	1	10.00%	0.1000				
Fish Community	No barriers to fish passage	1	10.00%	0.1000	No barriers to fish passage	1	10.00%	0.1000				
Habitat Preservation and Restoration	Significant improvement	1	10.00%	0.1000	Significant improvement	1	10.00%	0.1000				
Natural Land Preservation	No repurposing of land	0	10.00%	0.0000	Repurposing land for stormwater/habitat	1	10.00%	0.1000				
Regulatory (Water Quality)	Contributes to addressing WQ regs.	1	10.00%	0.1000	Contributes to addressing WQ regs.	1	10.00%	0.1000				
CRITERIA TOTAL				0.4000				0.5000				
TOTAL SCORE				0.4625				0.5000				

Triple Bottom Line

- Life Cycle Costs – cradle to grave costs
- Damage Mitigation – percentage of BTUs removed from floodplain
- Ease of Design and Construction
- Property Acquisition Needs – quantity of properties disturbed
- Construction Impacts to Public – transportation and public and private property disturbances
- O&M Frequency and Simplicity – ongoing cost and manpower commitment

1484 - Cuyahoga River North Stormwater Master Plan
Alternatives Evaluation Scorecard - Big Creek Main Branch Subwatershed

4/9/2019

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	CRITERIA TOTAL			0.4000	CRITERIA TOTAL			0.5000						
TOTAL SCORE				0.4625	TOTAL				0.5000					

Triple Bottom Line

- Stream Performance (Lateral/Vertical stability) – increase access to the floodplain and reduce erosion potential
- Fish Community – impacts to fish passage
- Habitat Preservation and Restoration – supporting biologic life
- Natural Land Preservation – area of land protected from existing/future development
- Regulatory (Water Quality) – impacts to TSS and nutrient loading

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CRITERIA TOTAL				0.4000	CRITERIA TOTAL				0.5000				
TOTAL SCORE				0.4625	TOTAL				0.5000				

Triple Bottom Line

- Alternative 2 selected
- Highlights stream centric approach
- Positive of Natural Land Preservation outweighs negatives of Construction impact and property acquisition

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