Stormwater Infrastructure Improvement Plan

City of Newton, MA

February 11, 2015

Presenters

David Turocy
Commissioner of Public Works, City of Newton

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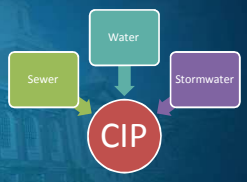
Project Purpose

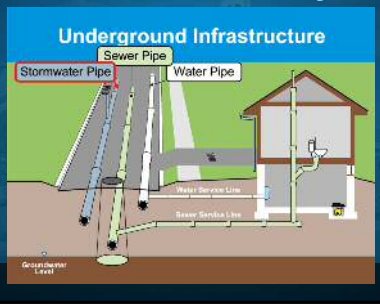
To Develop a Stormwater Infrastructure Improvement Plan to efficiently invest City resources by planning & prioritizing stormwater projects.

Project Background

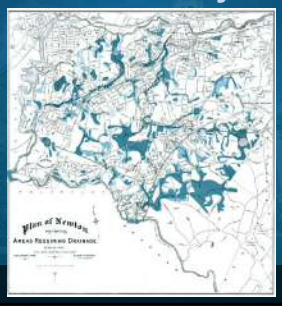
Existing Capital Improvement Plans for Water & Sewer Systems – No Plan for Stormwater



What is a Storm Drain System?



Newton's Stormwater System (1892)



Why Do We Need a Storm Drain System?

Drainage on Oldham Rd

Flooding Near Hammond Brook

Stormwater Pollution

Water Travels Over the Surface Picking Up Pollutants Including:

- Nutrients
- Bacteria
- Oil/Grease
- Sediment
- Debris

Problems We Are Trying to Solve

Capacity

Water Quality

Problems We Are Trying to Solve

Operation & Maintenance

Problems We Are Trying to Solve

Outfall at South Meadow Brook

City's Current Drainage Investments

- Street Sweeping
- Catch Basin Cleaning
- Reactive Inspection/Cleaning of Storm Drains
- Prep for Storm Events
- Limited Illicit Discharge Detection & Elimination Work

What is Missing?

- Inspection/Rehabilitation of Critical Infrastructure
- Stream Improvements
- Localized Flooding
- Federal Permit Compliance

Stormwater System

- 320 miles of drain pipe
- 12,750 catch basins
- 2 Pump stations
- 183 exterior outfalls/interconnections
- 201 interior outfalls
- 14 miles of streams
- Stormwater fee established in 2006 to partially fund stormwater costs
  - $25 residential; $150 commercial

Why Does Newton Need a Stormwater Infrastructure Improvement Plan?

- Comply with Federal Stormwater Permit / Improve Receiving Water Quality
- Reduce Localized Flooding
- Identify & Rehabilitate Failing Drainage Infrastructure
- Predictive Maintenance

Flooding at Library Parking Lot

Plan Development Process

- Water/Sewer/Stormwater Working Group
- Historical Data & GIS Integration
- Field Reconnaissance
- Needs Assessment

Upstream Section of South Meadow Brook

Plan Development Process

- Project Prioritization
- Stormwater Infrastructure Improvement Plan Development

Water/Sewer/Stormwater Working Group

- Alderman Fuller & Alderman Crossley
- David Turocy
- Keith Nastasia
- Lou Taverna
- Maria Rose
- Jennifer Steel
- Maureen Lemieux
- Richard Pishkin
- David Elmer & Jaurice Schwartz (Weston & Sampson)

Step 1: Historical Data & GIS Integration

- Drainage System Inspection and O&M Data
- Illicit Discharge Detection & Elimination Data
- Sampling Data
- Prior Drainage Improvements

Historical Data & GIS Integration

Step 1: Historical Data & GIS Integration

- 2003 Federal Stormwater Reports
- Reoccurring Maintenance Issues, Flooding Areas & Stream Assessment Areas
- GIS Integration

Flooding at Union St/Herrick Ave

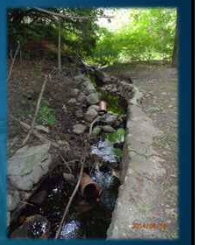
Historical Data & GIS Integration

Step 2: Field Reconnaissance

- **Stream Assessments**
- **Localized Flooding**

Overgrowth at Cold Spring Brook

Dedham Street Flooding



Cheesecake Brook Behind Oldham Rd.

Field Reconnaissance

Stream Assessments

- **Walking Stream Survey (14 miles)**
- **Handheld Computer/GPS**
- **Data Collection Form**
- **Geocoded over 3,200 Photos**

Paul Brook

Field Reconnaissance

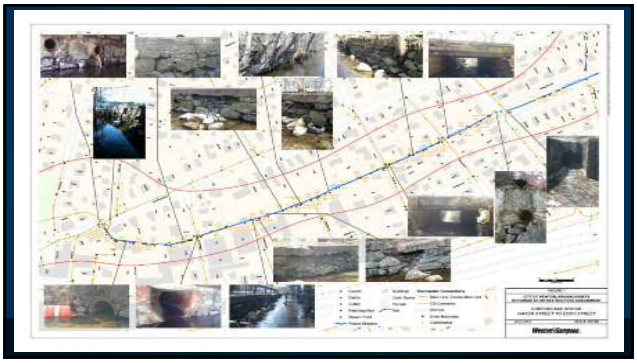
What Did We Find?

- Extensive Cleaning/Maintenance Required
  - Debris on Embankments
  - Severe Overgrowth
  - In-Stream Obstructions
  - Sediment at Culverts & In Stream
- Structural Deficiencies
- Unmapped Outfalls/Dry Weather Flow


Paul Brook at Parker Street


Cheesecake Brook

Field Reconnaissance



Localized Flooding

- Identified Problem Areas
- Performed Site Visits
- Developed Proposed Solutions

Field Reconnaissance

Step 3: Needs Assessment

What We Do Not Know "Data Gaps"

- Structural Condition of Road-Width Culverts
- Condition of Critical Drainage Infrastructure
- Phosphorus Total Maximum Daily Load Compliance / Illicit Discharge Detection & Elimination

Needs Assessment

Stormwater Infrastructure Improvement Plan Components

- Federal Stormwater Permit Compliance
- Localized Flooding Projects
- Stream Cleaning Projects
- Culvert & Critical Infrastructure Projects

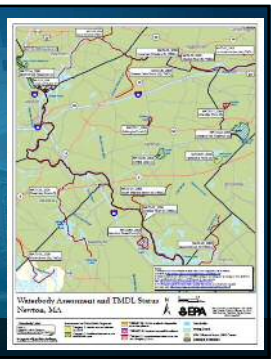
Culvert at Runaway Brook Near Grove Street

Federal Stormwater Permit Compliance

- Evaluated Draft Permit Requirements
- Annual Compliance Costs (Years 1-5)
- Annual Illicit Discharge, Detection & Elimination Compliance Costs (Years 1-10)

Federal Stormwater Permit Compliance

- Compliance with Charles River Phosphorus Total Maximum Daily Load
  - Phosphorus Control Plan Development Costs Years 1-5
  - Phosphorus Control Plan Implementation Costs Years 6-20



Localized Flooding Projects

- Developed Projects to Improve Flooding
- Developed Planning Level Costs
  - Evaluation
  - Design
  - Construction

Drain Manhole Overflowing at Dedham Street

Stream Improvement Projects

- Recommended Improvements
  - Remove debris within stream bed/embankments
  - Remove sediment in stream bed and at culverts
  - Cut back overgrowth
  - Repair retaining walls
- Permitting/Design/Construction Costs

At South Meadow Brook Between Winchester & Needham

What is a Culvert?

South Meadow Brook At Needham Street

Cheesecake Brook

Culvert Projects

- Limited Condition Information
- Culvert Evaluation Projects
  - Structural Evaluation of Road Width Culverts
  - TV Inspection of Critical Drainage Infrastructure

Needs Assessment

Culvert Projects

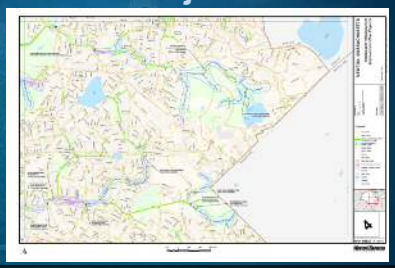
- Known Culvert Rehabilitation & Replacement Projects
- Unknown Culvert Rehabilitation & Replacement Projects

Needs Assessment

Weston&Sampson

Comprehensive Project List

- Identified Projects
- Developed Project Costs
- Documentation & Geo-Referencing



Needs Assessment

Step 4: Project Prioritization

- Risk Based Approach
- Condition Assessment
- Consequence of Failure
- Risk Rating

Project Prioritization

Condition Assessment

- Created Condition Assessment Rating Criteria by Project Type (Flooding, Streams & Culverts)
- Project Based Condition Values

Project Prioritization

Consequence of Failure

- Impact to Health & Safety
- Potential for Property Damage
- Cost of Deferred Maintenance
- Number of People Impacted
- Impacts to Traffic
- Impact on City Development Priorities
- Green Infrastructure Practices/Natural Drainage Enhancement

Category of Consequence	% of Weight
Public Health & Safety	22.2%
Property Damage	22.2%
Cost of Deferred Maintenance	20.0%
People Impacted	13.3%
Traffic Impacts	13.3%
City Development Priorities	8.9%
Total	100.0%

Project Prioritization

Risk Rating

- Risk = Probability of Failure x Consequence of Failure
- Risk Rating Calculated for each Project
- Prioritized Stream Cleaning, Localized Flooding & Culvert Projects numerically based on Risk Rating
- Permit Compliance Work Federally Mandated

Project Prioritization

Risk Rating

Project Prioritization

Risk Rating

Project Prioritization

Step 5: Stormwater Infrastructure Improvement Plan

What is Included?

- Compliance with Draft Federal Stormwater Permit
  - Allowance for Phosphorus Total Maximum Daily Load Compliance Implementation

Stormwater Infrastructure Improvement Plan Development

What is Included?

- Localized Flooding
  - Evaluation, Design, and/or Construction at 10 locations

Backyard Flooding at Beethoven Ave

Stormwater Infrastructure Improvement Plan Development

What is Included?

- **Stream Improvements**
  - 14,000 CY of Sediment Removal
  - Debris Removal for 34,000 LF of Stream
  - Cut Back Overgrowth for 26,000 LF of Stream
  - Repair 70,000 SF of Retaining Wall
  - Rebuild 3,000 CY of Retaining Wall
  - Pond Dredging

Cheesecake Brook Behind Oldham Rd.

Stormwater Infrastructure Improvement Plan Development

What is Included?

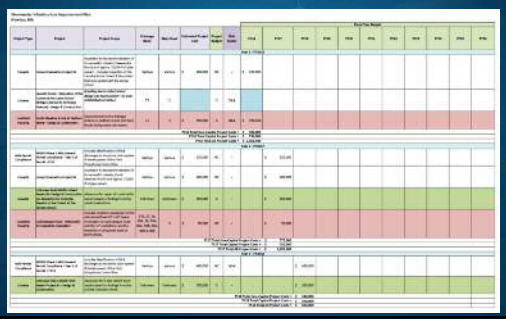
- **Culverts**
  - Structural Evaluation of All Road-Width Culverts
  - TV Inspection of 100,000 lf of critical storm drains
  - 29 Known Culvert Rehabilitation/Replacement Projects
  - 5 Unknown Culvert Rehabilitation Projects
  - 2 Unknown Culvert Replacement Projects
  - Unknown Point Repairs at 32 Locations
  - Allowance for Culvert Cleaning

Culvert at Cheesecake Brook at Parsons Street

Culvert at Runaway Brook at Grove Street

Stormwater Infrastructure Improvement Plan Development

Stormwater Infrastructure



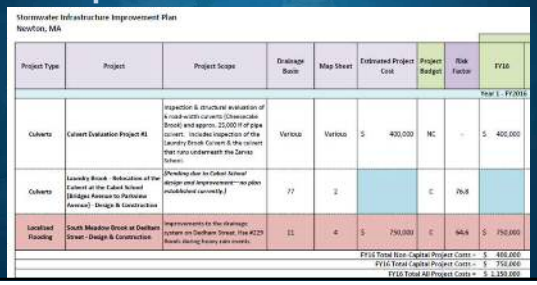
Stormwater Infrastructure Improvement Plan Development

Program Funding

- Years 1 to 5 - $1 million/yr
- Years 6 to 10 - $1.5 million/yr
- Years 11 to 15 - $2.0 million/yr
- Years 16 to 20 - $2.5 million/yr
- Years 21 to 22 - $3.0 million/yr

Stormwater Infrastructure Improvement Plan Development

Stormwater Infrastructure Improvement Plan – Year 1



Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	FY16
								Year 1 - FY2016
Culverts	Culvert Evaluation Project #1	Inspection & structural evaluation of 6 road-width culverts (Cheesecake Brook) and approx. 25,000 lf of pipe culvert. Includes inspection of the Laundry Brook Culvert & the culvert that runs underneath the Zervas School.	Various	Various	$ 400,000	NC	-	$ 400,000
Culverts	Laundry Brook - Relocation of the Culvert at the Eaket School (Bridges Avenue to Parkview Avenue) - Design & Construction	(Pending due to Eaket School design and improvement - no plan established currently.)	77	2		C	76.8	
Localized Flooding	South Meadow Brook at Dedham Street - Design & Construction	Improvements to the drainage system on Dedham Street, Hse #229 floods during heavy rain events.	11	4	$ 750,000	C	64.6	$ 750,000
							FY16 Total Non-Capital Project Costs =	$ 400,000
							FY16 Total Capital Project Costs =	$ 750,000
							FY16 Total All Project Costs =	$ 1,150,000

Key Features

- Culvert Evaluation Projects - Years 1, 2 & 4, 5
- Unknown Culvert Rehabilitation & Replacement Projects
- Localized Flooding Projects Given Special Consideration
- Planned Reprioritization After Year 5 & At Other Intervals

South Meadow Brook at Needham St - Before

South Meadow Brook at Needham St - After

Stormwater Infrastructure Improvement Plan Development

Stormwater Infrastructure Improvement Plan

- 22-Year Plan
- Annual Investment $1 to $3 million
- Total Investment $41 million Over 22 Years
  - Federal Stormwater Permit Compliance - $11.0 million
  - Localized Flooding - $3.0 million
  - Stream Improvements - $12.3 million
  - Culverts - $14.3 million
- Assessment of Annual Operation & Maintenance Needs

Stormwater Infrastructure Improvement Plan Development

Stormwater Infrastructure Improvement Plan Overview
Newton, MA

Like many communities, the City of Newton's stormwater system is old and faces challenges related to stormwater quality and quantity; system maintenance and capital upgrades; localized flooding; and NPDES Phase 2 MS4 General Permit (Federal Stormwater Permit) compliance. Even though the City completes regular maintenance tasks such as grate clearing and catch basin cleaning, as well as a variety of stormwater projects, including water quality sampling, relatively little is known about the condition of the City's 320 miles of drainage infrastructure. A comprehensive plan was required to understand the full range of current and future stormwater needs.

The development of a multi-year Stormwater Infrastructure Improvement Plan will allow the City to efficiently invest in infrastructure improvements to meet the City's stormwater goals over the next 20 years. These include federal permit compliance; protection and improvement of local water quality; and investing in infrastructure improvements to reduce flooding and ensure an adequate level of service. Given these goals, the Stormwater Infrastructure Improvement Plan focuses on four types of projects: federal permit compliance, localized flooding, stream improvements and culverts.

Federal Stormwater Permit Compliance

The City's current stormwater discharges are covered under EPA's 2003 NPDES Phase 2 Small MS4 General Permit. Although this permit technically expired in 2008, the City is covered under the permit until a new permit is issued. A Draft MS4 General Permit was released for public comment on September 29, 2014. Once the permit is final, the City will be required to fulfill a number of requirements to be in compliance. The requirements fall under the following minimum control measures:

- Public Education & Outreach
- Public Participation and Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management
- Good Housekeeping and Pollution Prevention

In addition, there are significant requirements included in the permit related to the Charles River Phosphorus and Charles River Pathogens Total Maximum Daily Loads. There are also separate requirements related to impaired waters without an approved Total Maximum Daily Load, including Saw Mill Brook, which is impaired for chloride.

A summary table was developed outlining the requirements of the draft permit with an estimated compliance cost for the twenty year life of the permit. The City will need to invest an estimated $11.0 million over the next twenty years to comply with the new permit. Complying with the Charles River Phosphorus Total Maximum Daily Load requirements and implementing the Illicit Discharge Detection and Elimination Program will carry the largest financial burden.

Localized Flooding Areas

Public works and engineering staff identified ten areas with reoccurring localized flooding. A site visit was conducted at each location to document existing conditions and identify potential solutions. At some locations the solution will require a phased approach that includes evaluation, design and construction phases. The goal at each location is to eliminate localized flooding while incorporating Best Management Practices for green infrastructure. Planning level costs for evaluation, design and construction are included in the Stormwater Infrastructure Improvement Plan for each flooding location. The total cost of localized flooding projects is estimated at $3.0 million.

Stream Improvements

A condition assessment of the City's streams and brooks was performed to understand the scope of work and cost associated with rehabilitating deficiencies in these assets. Open channel streams and brooks are an integral part of flood protection. A walking stream survey was conducted on more than 14 miles of stream to document stream condition and to develop a list of recommended improvements. Recommended improvements include: removal of debris within the stream channel and embankments, including fallen trees; removal of sediment in the stream bed and at culverts; structural evaluation, rehabilitation and maintenance at selected culverts; and repair of failing retaining walls. The estimated planning level cost to complete the stream improvement work is $12.3 million. The estimate includes an allowance for design, permitting and construction.

Culvert Inspections/Repairs

Since 2000, the City has completed a number of culvert evaluation projects, including the evaluation of 13,000 linear feet of Laundry Brook culvert and a preliminary inspection of various road-width culverts. The stream assessment work completed as part of this project collected additional data regarding the condition of road-width culverts and the headwalls of various pipe culverts. Culverts that were identified for future repair are identified as separate projects within the Stormwater Infrastructure Improvement Plan and have been assigned planning level repair costs. Many culverts will require a complete structural evaluation to fully understand the extent of repairs that will be required.

Most of the City's drainage piping has never been inspected and its condition is unknown. Inspection of all the drain pipes is unlikely to yield a positive return on investment and is not recommended at this time. However, it is important to evaluate the condition of critical drainage infrastructure to identify potential emergencies and schedule future improvements. Approximately 100,000 linear feet of critical drainage infrastructure was identified and was divided into four (4) evaluation projects. Each Culvert Evaluation Project includes a structural evaluation of 6 road-width culverts and cleaning/television inspection of 25,000 linear feet of critical storm drain. The total cost of the culvert evaluation work is estimated at $1.6 million. An allowance is included in the Stormwater Infrastructure Improvement Plan to repair deficiencies that may be identified during the evaluation.

The planning level cost estimate for design, permitting and construction of known culvert deficiencies as well as an allowance for problems that may be identified during the evaluation work is $12.7 million.

Prioritization and Stormwater Infrastructure Improvement Plan Development

Rating criteria and project grouping alternatives were developed for each Stormwater Infrastructure Improvement Plan Project. The rating system was used as a basis to prioritize projects and develop the 22-year Stormwater Infrastructure Improvement Plan. Project prioritization is not always consistent with the rating system. For example, if a stream maintenance project was not highly rated individually, but was critical to the success of a highly rated flooding project, the two (2) projects were grouped and will be completed together. Other adjustments were made to decrease total project cost through economy of scale.

The requirements of the pending Federal Stormwater Permit play a significant role in the scope and prioritization of Projects. Permit work is prescriptive and must be completed in certain years. As such, the Stormwater Infrastructure Improvement Plan was built by scheduling the Federal Permit work first and adding other projects as the budget allowed. Funding has been set at $1 million for the first five (5) years, $1.5 million for the second five (5) years, $2 million for the third five (5) years, $2.5 million for the fourth five (5) years, and $3 million for the last two (2) years. The entire cost of the 22-year Program is estimated at $41 million (in 2015 dollars).

Project prioritization will be re-evaluated in Year #6 of the Plan following collection of the additional condition assessment data.

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
Year 1 - FY2016																		
Culverts	**Culvert Evaluation Project #1**	Inspection & structural evaluation of 6 road-width culverts (Cheesecake Brook) and approx. 25,000 lf of pipe culvert. Includes inspection of the Laundry Brook Culvert & the culvert that runs underneath the Zervas School.	Various	Various	$ 400,000	NC	-	$ 400,000										
Culverts	**Laundry Brook - Relocation of the Culvert at the Cabot School (Bridges Avenue to Parkview Avenue) - Design & Construction**	***(Pending due to Cabot School design and improvement—no plan established currently.)***	77	2		C	**76.8**											
Localized Flooding	**South Meadow Brook at Dedham Street - Design & Construction**	Improvements to the drainage system on Dedham Street. Hse #229 floods during heavy rain events.	11	4	$ 750,000	C	**64.6**	$ 750,000										
								FY16 Total Non-Capital Project Costs =	**$ 400,000**									
								FY16 Total Capital Project Costs =	**$ 750,000**									
								FY16 Total All Project Costs =	**$ 1,150,000**									
Year 2 - FY2017																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 1 of Permit - FY17**	Includes identification of illicit discharges to the storm drain system & development of the City's Phosphorus Control Plan.	Various	Various	$ 325,000	NC	-		$ 325,000									
Culverts	**Culvert Evaluation Project #2**	Inspection & structural evaluation of 6 road-width culverts (South Meadow Brook) and approx. 25,000 lf of pipe culvert.	Various	Various	$ 400,000	NC	-		$ 400,000									
Culverts	**Unknown Road Width Culvert Repair #1- Design & Construction (or Allocation for Potential Repairs to the Culvert at the Zervas School)**	Allowance for repair of 1 road width culvert based on findings from the culvert evaluations.	Unknown	Unknown	$ 250,000	C	-		$ 250,000									
Localized Flooding	**Quinobequin Road - Interceptor & Underdrain Evaluation**	Includes condition assessment of the abandoned lined 20" x 30" sewer interceptor on Quinobequin Road and the 12" underdrain, and the feasibility of using both pipes as storm drains.	27B, 27, 28, 28A, 29, 29A, 30A, 30B, 30C, 30D & 30E	3	$ 50,000	NC	-		$ 50,000									
									FY17 Total Non-Capital Project Costs =	**$ 775,000**								
									FY17 Total Capital Project Costs =	**$ 250,000**								
									FY17 Total All Project Costs =	**$ 1,025,000**								
Year 3 - FY2018																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 2 of Permit = FY18**	Includes identification of illicit discharges to the storm drain system & development of the City's Phosphorus Control Plan.	Various	Various	$ 460,000	NC	-			$ 460,000								
Culverts	**Unknown Pipe Culvert Point Repair Project #1 - Design & Construction**	Allowance for 8 pipe culvert point repairs based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 350,000	C	-			$ 350,000								
										FY18 Total Non-Capital Project Costs =	**$ 460,000**							
										FY18 Total Capital Project Costs =	**$ 350,000**							
										FY18 Total All Project Costs =	**$ 810,000**							

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
Year 4 - FY2019																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 3 of Permit - FY19**	Includes identification of illicit discharges to the storm drain system & development of the City's Phosphorus Control Plan.	Various	Various	$ 445,000	NC	-				$ 445,000							
Culverts	**Culvert Evaluation Project #3**	Inspection & structural evaluation of 6 road-width culverts (Hammond Brook, Paul Brook, Hahn Brook and Saw Mill Brook), and approx. 25,000 lf of pipe culvert.	Various	Various	$ 400,000	NC	-				$ 400,000							
											FY19 Total Non-Capital Project Costs =	**$ 845,000**						
											FY19 Total Capital Project Costs =	**$ -**						
											FY19 Total All Project Costs =	**$ 845,000**						
Year 5 - FY2020																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 4 of Permit - FY20**	Includes identification of illicit discharges to the storm drain system & development of the City's Phosphorus Control Plan.	Various	Various	$ 415,000	NC	-					$ 415,000						
Culverts	**Culvert Evaluation Project #4**	Inspection & structural evaluation of 6 road-width culverts (Strong's Brook, Runaway Brook & South Meadow Brook), and approx. 25,000 lf of pipe culvert.	Various	Various	$ 400,000	NC	-					$ 400,000						
Culverts	**Laundry Brook - Design & Construction of Culvert Improvements (From Parkview Avenue to Bar Screen Before MASS Pike)**	Culvert Improvements Needed / Design & Construct Improvements Based on findings from Culvert Evaluation work.	77	2	$ 550,000	C	**69.7**					$ 550,000						
												FY20 Total Non-Capital Project Costs =	**$ 815,000**					
												FY20 Total Capital Project Costs =	**$ 550,000**					
												FY20 Total All Project Costs =	**$ 1,365,000**					
Year 6 - FY2021																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 5 of Permit - FY21**	Includes identification of illicit discharges to the storm drain system & development of the City's Phosphorus Control Plan.	Various	Various	$ 370,000	NC	-						$ 370,000					
Stream Improvements	**South Meadow Brook/Dickerman Brook - Stream Improvements - Permitting, Design & Construction (Dedham Street to Charles River)**	Sediment Removal/Debris Removal/Retaining Walls / Will help alleviate flooding on Dedham St. , Bound Brook Rd. & Heatherland Rd.	11	3, 4 & 5	$ 1,140,000	NC	**32.9**						$ 1,140,000					
													FY21 Total Non-Capital Project Costs =	**$ 1,510,000**				
													FY21 Total Capital Project Costs =	**$ -**				
													FY21 Total All Project Costs =	**$ 1,510,000**				
Year 7 - FY2022																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 6 of Permit = FY22**	Includes identification & elimination of illicit discharges to the storm drain system & implementation of the City's Phosphorus Control Plan.	Various	Various	$ 790,000	NC	-							$ 790,000				
Stream Improvements	**Laundry Brook - Stream Improvements - Bulloughs Pond to Hull Street, Pulsifer Street to Gay Street - Permitting, Design & Construction**	Debris Removal/Retaining Walls	77	2	$ 260,000	NC	**17.2**							$ 260,000				
Culverts	**Laundry Brook - Design & Construction of Culvert Improvements (From Hull Street to Bridges Avenue)**	Culvert Improvements Needed / Design & Construct Improvements Based on findings from Culvert Evaluation work.	77	2	$ 650,000	C	**68.3**							$ 650,000				
														FY22 Total Non-Capital Project Costs =	**$ 1,050,000**			
														FY22 Total Capital Project Costs =	**$ 650,000**			
														FY22 Total All Project Costs =	**$ 1,700,000**			

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
Year 8 - FY2023																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 7 of Permit = FY23**	Includes identification & elimination of illicit discharges to the storm drain system & implementation of the City's Phosphorus Control Plan.	Various	Various	$ 790,000	NC	-								$ 790,000			
Culverts	**Unknown Road Width Culvert Repair #2 - Design & Construction**	Allowance for repair of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 250,000	C	-								$ 250,000			
Culverts	**Cheesecake Brook - Parson Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	68	1	$ 400,000	C	**66.5**								$ 400,000			
															FY23 Total Non-Capital Project Costs =		**$ 790,000**		
															FY23 Total Capital Project Costs =		**$ 650,000**		
															FY23 Total All Project Costs =		**$ 1,440,000**		
Year 9 - FY2024																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 8 of Permit = FY24**	Includes identification & elimination of illicit discharges to the storm drain system & implementation of the City's Phosphorus Control Plan.	Various	Various	$ 790,000	NC	-									$ 790,000		
Culverts	**Cheesecake Brook - Eddy Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	68	1	$ 250,000	C	**68.6**									$ 250,000		
Culverts	**Cheesecake Brook - Cross Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	68	1	$ 400,000	C	**66.5**									$ 400,000		
																FY24 Total Non-Capital Project Costs =	**$ 790,000**	
																FY24 Total Capital Project Costs =	**$ 650,000**	
																FY24 Total All Project Costs =	**$ 1,440,000**	
Year 10 - FY2025																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 9 of Permit = FY25**	Includes identification & elimination of illicit discharges to the storm drain system & implementation of the City's Phosphorus Control Plan.	Various	Various	$ 790,000	NC	-										$ 790,000	
Culverts	**Unknown Road Width Culvert Replacement #1- Design & Construction**	Allowance for replacement of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 650,000	C	-										$ 650,000	
																	FY25 Total Non-Capital Project Costs =	**$ 790,000**
																	FY25 Total Capital Project Costs =	**$ 650,000**
																	FY25 Total All Project Costs =	**$ 1,440,000**
Year 11 - FY2026																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 10 of Permit = FY26**	Includes identification & elimination of illicit discharges to the storm drain system & implementation of the City's Phosphorus Control Plan.	Various	Various	$ 790,000	NC	-											$ 790,000
Localized Flooding	**Beaconwood Road at Cold Spring Brook - Permitting, Design & Construction**	Work to be completed in conjunction with Stream Improvements at Cold Spring Brook	77	3 & 4	$ 100,000	C	**40.0**											$ 100,000
Stream Improvements	**Cold Spring Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth / Critical to alleviating flooding on Beaconwood Rd.	77	3, 4	$ 930,000	NC	**48.9**											$ 930,000
Culverts	**Cheesecake Brook - Watertown Street – West Culvert - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	68	1	$ 250,000	C	**63.8**											$ 250,000
																		FY26 Total Non-Capital Project Costs = **$ 1,820,000**
																		FY26 Total Capital Project Costs = **$ 250,000**
																		FY26 Total All Project Costs = **$ 2,070,000**

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Year 12 - FY2027																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 11 of Permit = FY27**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-	$ 500,000										
Stream Improvements	**Bullough's Pond - Dredging**	Allowance for Dredging at Bullough's Pond.	77	2	$ 500,000	NC	-	$ 500,000										
Stream Improvements	**Saw Mill Brook - Stream Improvements Permitting, Design & Construction (Downstream of Vine Street)**	Sediment Removal/Debris Removal/Cut Back Overgrowth/Retaining Walls / Will help alleviate flooding on Wayne Rd.	101	5	$ 590,000	NC	**46.2**	$ 590,000										
Culverts	**South Meadow Brook - Oak Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	3	$ 250,000	C	**63.8**	$ 250,000										
Culverts	**Cheesecake Brook - Dunstan Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	68	1	$ 250,000	C	**57.2**	$ 250,000										
							FY27 Total Non-Capital Project Costs =	**$ 1,590,000**										
							FY27 Total Capital Project Costs =	**$ 500,000**										
							FY27 Total All Project Costs =	**$ 2,090,000**										
Year 13 - FY2028																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 12 of Permit = FY28**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-		$ 500,000									
Culverts	**Unknown Road Width Culvert Replacement #2 - Design & Construction**	Allowance for replacement of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 650,000	C	-		$ 650,000									
Stream Improvements	**Saw Mill Brook - Stream Improvements Permitting, Design & Construction (Upstream Sections North & East of Hollywood Drive)**	Sediment Removal/Debris Removal/Cut Back Overgrowth / Will help alleviate flooding on Harwich Rd.	101	5	$ 490,000	NC	**43.6**		$ 490,000									
Localized Flooding	**Harwich Road at Saw Mill Brook - Design & Construction**	Drainage improvements at Harwich Road & Saw Mill Brook to alleviate backyard flooding on Harwich Road.	101	5	$ 100,000	C	**34.8**		$ 100,000									
Localized Flooding	**Wayne Road Near Saw Mill Brook - Design & Construction**	Drainage improvements at Wayne Road & Saw Mill Brook to alleviate street flooding on Wayne Road.	101	5	$ 250,000	C	**30.5**		$ 250,000									
							FY28 Total Non-Capital Project Costs =		**$ 990,000**									
							FY28 Total Capital Project Costs =		**$ 1,000,000**									
							FY28 Total All Project Costs =		**$ 1,990,000**									

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Year 14 - FY2029																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 13 of Permit = FY29**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-			$ 500,000								
Culverts	**South Meadow Brook - Needham Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**54.7**			$ 250,000								
Culverts	**South Meadow Brook - Winchester Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**54.7**			$ 250,000								
Culverts	**Unknown Road Width Culvert Repair #3 - Design & Construction**	Allowance for repair of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 250,000	C	-			$ 250,000								
Culverts	**South Meadow Brook - Dedham Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**54.7**			$ 250,000								
Culverts	**South Meadow Brook - South of Tower Road to Oak Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	3	$ 400,000	C	**51.7**			$ 400,000								
							FY29 Total Non-Capital Project Costs =			**$ 500,000**								
							FY29 Total Capital Project Costs =			**$ 1,400,000**								
							FY29 Total All Project Costs =			**$ 1,900,000**								
Year 15 - FY2030																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 14 of Permit = FY30**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-				$ 500,000							
Stream Improvements	**Cheesecake Brook - Stream Improvements Permitting, Design & Construction (From Cross to Watertown Street)**	Sediment Removal/Debris Removal/Retaining Walls	68	1	$ 950,000	NC	**49.8**				$ 950,000							
Culverts	**Unknown Pipe Culvert Point Repair Project #2 - Design & Construction**	Allowance for 8 pipe culvert point repairs based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 350,000	C	-				$ 350,000							
Culverts	**Hammond Brook - Hammond Pond Parkway North Culvert - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	77	4	$ 250,000	C	**51.2**				$ 250,000							
							FY30 Total Non-Capital Project Costs =				**$ 1,450,000**							
							FY30 Total Capital Project Costs =				**$ 600,000**							
							FY30 Total All Project Costs =				**$ 2,050,000**							

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Year 16 - FY2031																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 15 of Permit = FY31**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-					$ 500,000						
Stream Improvements	**Cheesecake Brook - Stream Improvements Permitting, Design & Construction (From Culverted Section at Watertown to Cross)**	Sediment Removal/Debris Removal/Retaining Walls	68	1	$ 1,500,000	NC	**46.7**					$ 1,500,000						
Culverts	**Paul Brook - Boylston Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 80,000	C	**49.1**					$ 80,000						
Culverts	**South Meadow Brook - Dudley Road - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**47.9**					$ 250,000						
Culverts	**Unknown Road Width Culvert Repair #4 - Design & Construction**	Allowance for repair of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 250,000	C	-					$ 250,000						
												FY31 Total Non-Capital Project Costs =	**$ 2,000,000**					
												FY31 Total Capital Project Costs =	**$ 580,000**					
												FY31 Total All Project Costs =	**$ 2,580,000**					
Year 17 - FY2032																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 16 of Permit = FY32**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-						$ 500,000					
Culverts	**South Meadow Brook - Upland Avenue - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**45.6**						$ 250,000					
Culverts	**Unknown Pipe Culvert Point Repair Project #3 - Design & Construction**	Allowance for 8 pipe culvert point repairs based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 350,000	C	-						$ 350,000					
Culverts	**Major Culvert Cleaning**		Various	Various	$ 500,000	NC							$ 500,000					
Culverts	**Saw Mill Brook - Vine Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	101	5	$ 250,000	C	**44.5**						$ 250,000					
Culverts	**Laundry Brook - Design & Construction of Culvert Improvements (From Mason Rice School to City Hall Ponds)**	Culvert Improvements Needed / Design & Construct Improvements Based on findings from Culvert Evaluation work.	77	4	$ 300,000	C	**44.2**						$ 300,000					
Culverts	**Saw Mill Brook - Lagrange Street - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	101	5	$ 250,000	C	**44.0**						$ 250,000					
													FY32 Total Non-Capital Project Costs =	**$ 1,000,000**				
													FY32 Total Capital Project Costs =	**$ 1,400,000**				
													FY32 Total All Project Costs =	**$ 2,400,000**				

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Year 18 - FY2033																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 17 of Permit = FY33**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-							$ 500,000				
Culverts	**Unknown Road Width Culvert Repair #5 - Design & Construction**	Allowance for repair of 1 road width culvert based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 250,000	C	-							$ 250,000				
Stream Improvements	**Cheesecake Brook - Stream Improvements Permitting, Design & Construction (From Watertown Street to Charles River)**	Sediment Removal/Retaining Walls	68	1	$ 1,200,000	NC	**39.1**							$ 1,200,000				
Stream Improvements	**South Meadow Brook - Stream Improvements Permitting, Design & Construction (Section upstream of Dudley Road to Brandeis Road)**	Sediment Removal/Debris Removal/Cut Back Overgrowth	11	4	$ 170,000	NC	**31.9**							$ 170,000				
Culverts	**Hahn Brook - Dudley Road - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**32.6**							$ 250,000				
Localized Flooding	**Hammond Brook - Design & Construction**	Establish underdrain discharge at Hammond Brook.	77	4	$ 200,000	C	**25.8**							$ 200,000				
														FY33 Total Non-Capital Project Costs =	**$ 1,870,000**			
														FY33 Total Capital Project Costs =	**$ 700,000**			
														FY33 Total All Project Costs =	**$ 2,570,000**			
Year 19 - FY2034																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 18 of Permit = FY34**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-								$ 500,000			
Culverts	**Unknown Pipe Culvert Point Repair Project #4 - Design & Construction**	Allowance for 8 pipe culvert point repairs based on findings from the Culvert Evaluation Work.	Unknown	Unknown	$ 350,000	C	-								$ 350,000			
Stream Improvements	**Hammond Brook - Stream Improvements Permitting, Design & Construction (From Homer Street & Centre Street to Pleasant Street, Chelsey Road to Sumner Street)**	Sediment Removal/Debris Removal/Cut Back Overgrowth/Retaining Walls	77	4	$ 1,240,000	NC	**38.1**								$ 1,240,000			
Localized Flooding	**Oldham Road at Cheesecake Brook - Design & Construction**	Improvements to the drainage system on Oldham Rd. to alleviate flooding to the property at #60 Oldham Rd.	68	1	$ 450,000	C	**22.3**								$ 450,000			
														FY34 Total Non-Capital Project Costs =	**$ 1,740,000**			
														FY34 Total Capital Project Costs =	**$ 800,000**			
														FY34 Total All Project Costs =	**$ 2,540,000**			

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget										
								FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Year 20 - FY2035																		
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 19 of Permit = FY35**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-									$ 500,000		
Stream Improvements	**Hammond Brook - Stream Improvements Permitting, Design & Construction (Upstream of Glen Avenue near the MBTA Green Line Tracks)**	Sediment Removal/Debris Removal/Cut Back Overgrowth	77	4	$ 700,000	NC	**32.4**									$ 700,000		
Culverts	**Laundry Brook - Design & Construction of Culvert Improvements (From Bar Screen Near MASS Pike to Jackson & Canseco)**	Culvert Improvements Needed / Design & Construct Improvements Based on findings from Culvert Evaluation work.	77	2	$ 400,000	C	**27.3**									$ 400,000		
Culverts	**Runaway Brook - First Culvert Upstream Near Washington Street - West End of Culvert - Outlet Only Visible (on Woodland Country Club Golf Course) - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	47	3	$ 250,000	C	**24.8**									$ 250,000		
Stream Improvements	**Cheesecake Brook - Stream Improvements (From Braeburn Pond to Culvert Behind Oldham Road)**	Sediment Removal/Debris Removal/Cut Back Overgrowth/Retaining Walls	68	1	$ 370,000	NC	**30.0**									$ 370,000		
Stream Improvements	**Hahn Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth	11	4	$ 250,000	NC	**29.0**									$ 250,000		
															FY35 Total Non-Capital Project Costs =		**$ 1,820,000**		
															FY35 Total Capital Project Costs =		**$ 650,000**		
															FY35 Total All Project Costs =		**$ 2,470,000**		

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
								Year 21 - FY2036										
MS4 Permit Compliance	**NPDES Phase 2 MS4 General Permit Compliance - Year 20 of Permit = FY36**	Implementation of the City's Phosphorus Control Plan.	Various	Various	$ 500,000	NC	-										$ 500,000	
Culverts	**South Meadow Brook - East End Near Brandeis Road and West End Near Parker Street**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	11	4	$ 250,000	C	**24.9**										$ 250,000	
Culverts	**Strong's Brook - On Newton Commonwealth Golf Course east of Philmore Road - Design & Construction of Culvert Improvements**	Culvert Needs Replacement. / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	93	2	$ 500,000	C	**23.1**										$ 500,000	
Stream Improvements	**Brunnen Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth	62	1	$ 220,000	NC	**28.8**										$ 220,000	
Stream Improvements	**Cranberry Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth	66	1	$ 160,000	NC	**23.5**										$ 160,000	
Stream Improvements	**Runaway Brook - Stream Improvements - Permitting, Design & Construction**	Retaining Walls	47	3	$ 240,000	NC	**25.0**										$ 240,000	
Culverts	**Runaway Brook - On Woodland Country Golf Course - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	47	3	$ 250,000	C	**20.5**										$ 250,000	
Culverts	**Strong's Brook - On Newton Commonwealth Golf Course near Strong's Pond - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	93	2	$ 250,000	C	**19.1**										$ 250,000	
Stream Improvements	**South Meadow Brook - Stream Improvements Permitting, Design & Construction - (Parker Street to Dedham Street)**	Debris Removal/Cut Back Overgrowth	11	4	$ 30,000	NC	**20.3**										$ 30,000	
Stream Improvements	**Strongs Brook - Stream Improvements - Permitting, Design & Construction**	Retaining Walls	93	2	$ 150,000	NC	**20.3**										$ 150,000	
Stream Improvements	**Edmands Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth/Retaining Walls	77	2	$ 310,000	NC	**19.5**										$ 310,000	
Localized Flooding	**Quinobequin Road Between Irwin & Carleton Roads - Design & Construction**	Drainage Improvements on Carlton Rd and Rokeby Rd. Flooding occurs to properties on Rokeby Rd. and Quinobequin Rd.	28, 28A & 29	3	$ 200,000	C	**17.7**										$ 200,000	
																FY35 Total Non-Capital Project Costs =		**$ 1,610,000**
																FY35 Total Capital Project Costs =		**$ 1,450,000**
																FY35 Total All Project Costs =		**$ 3,060,000**

Stormwater Infrastructure Improvement Plan
Newton, MA

Project Type	Project	Project Scope	Drainage Basin	Map Sheet	Estimated Project Cost	Project Budget	Risk Factor	Fiscal Year Budget FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
								Year 22 - FY2037										
Stream Improvements	**Hyde Brook - Stream Improvements - Permitting, Design & Construction**	Debris Removal/Cut Back Overgrowth/Retaining Walls	81	2	$ 510,000	NC	**19.9**											$ 510,000
Stream Improvements	**King Brook - Stream Improvements - Permitting, Design & Construction**	Debris Removal/Cut Back Overgrowth	93	5	$ 20,000	NC	**19.4**											$ 20,000
Culverts	**Hammond Brook - South of Suffolk Road - Located Under Walking Path - Design & Construction of Culvert Improvements**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	77	4	$ 80,000	C	**17.6**											$ 80,000
Culverts	**Strong's Brook - On Newton Commonwealth Golf Course Near Montrose Street**	Culvert Needs Repair / Design & Construct Culvert Improvements Based on findings from Culvert Evaluation work.	93	2	$ 250,000	C	**16.6**											$ 250,000
Localized Flooding	**Judkins Street Near Pellegrini Park - Design & Construction**	Improvement to the drainage system at Pellegrini Park/Judkins Path to alleviate flooding on Jenison Street & Judkins Street.	77	2	$ 500,000	C	**16.0**											$ 500,000
Stream Improvements	**Thompsonville Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal/Cut Back Overgrowth	77	4	$ 250,000	NC	**16.0**											$ 250,000
Localized Flooding	**Harvard Street Between Madison Avenue & Newtonville Avenue - Design & Construction**	Improvements to the drainage system on Harvard Street to prevent street flooding.	77	2	$ 350,000	C	**15.7**											$ 350,000
Stream Improvements	**Paul Brook - Stream Improvements - Permitting, Design & Construction**	Debris Removal/Cut Back Overgrowth	11	4	$ 30,000	NC	**14.2**											$ 30,000
Stream Improvements	**Stearns Brook - Stream Improvements - Permitting, Design & Construction**	Sediment Removal/Debris Removal	11	4	$ 50,000	NC	**10.8**											$ 50,000
Stream Improvements	**Lacy Brook - Stream Improvements - Permitting, Design & Construction**	Cut Back Overgrowth	3	5	$ 20,000	NC	**7.9**											$ 20,000
																	FY35 Total Non-Capital Project Costs =	**$ 880,000**	
																	FY35 Total Capital Project Costs =	**$ 1,180,000**	
																	FY35 Total All Project Costs =	**$ 2,060,000**	

	Cost to be Incorporated As Additional Information Becomes Available
	Localized Flooding Projects
	Culvert Project Place Holders Based on Findings from Culvert Evaluation Projects Completed in Years 1, 2 and 4,5
C	Capital Project
NC	Non-Capital Project
-	Not Applicable

Total Non-Capital Projects Cost:	**$ 25,495,000**
Total Capital Projects Cost:	**$ 15,010,000**
Total Program Cost for All Projects:	**$ 40,505,000**
Total Cost of MS4 Permit Compliance Projects:	**$ 10,965,000**
Total Cost of Culvert Projects:	**$ 14,310,000**
Total Cost of Localized Flooding Projects:	**$ 2,950,000**
Total Cost of Stream Improvement Projects:	**$ 12,280,000**

Federal Stormwater Permit Compliance
Breakdown of Permit Requirements - Newton, MA

Based on the 2014 Draft Massachusetts MS4 General Permit, the City of Newton must comply with the following permit conditions.

Notice of Intent/Stormwater Management Program Document

- Complete Notice of Intent and submit within 90 days of the permit effective date.
- Determine whether stormwater discharges will adversely impact endangered species and historic properties.
- Select Best Management Practices to reduce the discharge of pollutants to the Maximum Extent Practicable.
- Develop a written Stormwater Management Program (SWMP) to outline activities and measures to meet the conditions of the permit.

Discharges to Impaired Waters

- Develop and implement a Phosphorous Control Plan to reduce the amount of phosphorus in discharges to the Charles River and its tributaries. The Waste Load Allocation identified in the Total Maximum Daily Load for the Charles River (52% reduction in total phosphorus) must be met.
- Comply with permit requirements related to the Charles River Pathogens Total Maximum Daily Load, including dissemination of public education materials and ranking of catchments tributary to bacteria/pathogen impaired waters.
- Comply with permit requirements for chloride impaired waters (Saw Mill Brook) including development of a salt reduction plan.

Public Education & Outreach

- Distribute at least two educational messages to each of four (4) target audiences: (1) residents, (2) businesses, institutions, and commercial facilities, (3) developers (construction), and (4) industrial facilities.

Public Involvement & Participation

- Provide opportunities for the public to participate in the review and implementation of the SWMP.

Illicit Discharge Detection & Elimination (IDDE)

- Eliminate illicit discharges within 60 days of detection or establish a schedule to eliminate the discharge for those discharges that cannot be removed within 60 days.
- Identify all known locations where Sanitary Sewer Overflows (SSOs) have discharged within the previous five years.
- Identify all outfalls and interconnections, record their location and condition, and provide a framework for tracking inspections, screenings and other activities. Field label all outfalls with a unique identifier.
- Update the City's drainage system mapping to include the following: additional catchment delineations; municipally owned stormwater treatment structures; use impairments for water bodies on the 303(d) list; septic system information (including inspections, upgrades & repairs); locations of past IDDE work; locations of suspected, confirmed and corrected illicit discharges; and drainage from new developments and re-developments.
- Develop a written IDDE Program to identify the responsibility and process for IDDE, and to detail procedures for locating and removing illicit discharges.
- Adopt a regulatory mechanism to provide legal authority to prohibit/investigate/eliminate illicit discharges.
- Assess and rank all outfall drainage areas ("catchments") for illicit discharges and/or SSOs potential.
- Complete dry-weather screening of all outfalls/interconnections (except Excluded/Problem catchments) within three (3) years of the permit effective date.

- Complete IDDE investigations (including wet weather sampling) in 80% of Problem Areas within three years, and 100% within five years.
- Complete IDDE investigations (including wet weather sampling) in 100% of High Priority Areas where screening indicates sewer input w/in five years.
- Complete IDDE investigations (including wet weather sampling) in 40% of all catchments within five years, and 100% of all catchments within ten years.
- Train municipal employees annually about the IDDE program.

Construction Site Stormwater Runoff Control (CSSRC)

- Develop written procedures for site inspections and enforcement of sediment and erosion control measures.
- Require developers to implement a sediment and erosion control program that includes BMPs appropriate for the conditions at the construction site.
- Include requirements for waste control, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes, in the CSSRC Program.
- Develop written site plan review procedures that meet the conditions of the permit.

Post Construction Stormwater Management

- Modify City stormwater ordinances to require the incorporation of specific targets for retention/infiltration/treatment.
- Develop a report assessing current street design and parking lot guidelines that impact the creation of impervious cover. Determine whether design standards can be modified to support low impact design.
- Develop a report assessing existing local regulations to determine the feasibility of allowing green infrastructure practices when appropriate site conditions exist.
- Develop a method to track changes in impervious area as development/redevelopment occurs.
- Complete an inventory and priority ranking of City property and infrastructure that could be retrofitted with BMPs to reduce frequency, volume and pollutant loads associated with stormwater discharges.

Good House Keeping & Pollution Prevention for Permittee Owned Operations

- Develop written operation & maintenance procedures for municipal operations, including: parks and open space; buildings and facilities; and vehicles and equipment.
- Develop an inventory of all municipal-owned facilities.
- Provide training on use, storage and disposal of petroleum products to municipal staff.
- Develop written plan/schedule for activities such as street sweeping, catch basin cleaning, maintenance of structural BMPs, cleaning of storm drains, and assessment/upgrade of drainage system infrastructure.
- Develop a written plan to optimize the inspection, cleaning and maintenance of catch basins so that no sump is more than 50% full at any given time.
- Sweep streets once per year in spring.
- Look at storage and usage of salt and sand; evaluate alternative deicing opportunities.
- Establish/implement procedures to inspect/maintain storm drains & structural BMPs.
- Develop and implement Stormwater Pollution Prevention Plans (SWPPPs) for the DPW Yards at Elliot Street and Crafts Street. Perform quarterly inspections and annual employee training at each facility.

Reporting

- Submit annual reports each year.

Stormwater Infrastructure Improvement Plan
Newton, MA

Stormwater Infrastructure Improvement Plan Prioritization Methodology and Rating Criteria

The City's risk-based approach, which they utilize to prioritize projects within their city-wide 5-year capital improvement program, will be used to analyze and prioritize stormwater capital projects, including stream improvements, localized flooding and culvert projects. Projects associated with the City's compliance with the pending NPDES Phase 2 Small MS4 General Permit (Federal Stormwater Permit) are not included herein as the timeline for implementation of these projects will be dictated by the permit.

Risk or Probable Magnitude of Future Loss (R) = Probability of Failure (PF) x Magnitude of Consequence of Failure or Expected Loss (Q)

Probability of Failure (PF)

Probability of Failure will be based entirely on the condition of the asset. The rating criteria will vary based on the asset type. Three separate tables were developed for use in classifying the condition of the following assets: streams, drainage infrastructure (as it relates to localized flooding), and culverts. In each table, values assigned to condition range from 0 to 10, with 0 being the worst condition and 10 being the best condition. Each value is then assigned a corresponding probability of failure ranging from 0% to 100%.

The asset's overall probability of failure is equal to the value given to the condition of the asset.

Probability of Failure (PF) = Overall Condition Value

Stream Improvement Projects

For Stream Improvement Projects, stream condition was evaluated based on the following factors: retaining wall condition, extent of overgrowth, extent of debris within the stream channel and the amount of sediment within the stream channel. Table 2 provides a detailed description for each condition value, along with the probability of failure.

Table 2.

Overall Stream Condition		
Rating	**Description**	**Value**
10	Pristine – For Engineered Streams, Retaining Walls Are in Like New Condition; and Sediment Accumulation, Overgrowth and Debris Within the Stream Channel are Minimal, if present at all.	0
9	Excellent– For Engineered Streams, Retaining Walls Are in Like New Condition; Overgrowth and Debris Within the Stream Channel are Minimal; and Sediment Accumulation is < 6”.	0.1
8	Very Good– For Engineered Streams, Retaining Walls Are in Good Condition with Minor Cracks that Require Little, if any, Repointing; Overgrowth and Debris Within the Stream Channel is Minor; and Sediment Accumulation is < 6”.	0.2
7	Good/Minor Deferred Maintenance – For Engineered Streams, Retaining Walls Need Minor Repointing; Overgrowth is Minor; Debris within the Stream Channel is Minor; and Sediment Accumulation within the Stream Channel is > 6”.	0.3
6	Above Average/ Minor Deferred Maintenance – For Engineered Streams, Retaining Walls Need Moderate Repointing; Overgrowth is Minor to Moderate; Debris within the Stream Channel is Minor to Moderate; Sediment Accumulation within the Stream Channel is > 6”.	0.4
5	Average / Functional - For Engineered Streams, Retaining Walls Need Widespread Repointing; Overgrowth is Minor to Moderate; Debris within the Stream Channel is Minor to Moderate; Sediment Accumulation within the Stream Channel is > 6”.	0.5
4	Below Average / Major Deferred Maintenance - For Engineered Streams, Retaining Walls Require a Combination of Rebuilding & Repointing; Overgrowth is Moderate; Debris within the Stream Channel is Moderate; Sediment Accumulation within the Stream Channel is > 12”.	0.6
3	Poor / Serious Condition - For Engineered Streams, Retaining Walls are Failing and Need Rebuilding; Overgrowth is Moderate to Severe; Debris within the Stream Channel is Moderate to Severe; Sediment Accumulation within the Stream Channel is > 18”.	0.7
2	Bad / Critical Condition - For Engineered Streams, Retaining Walls are Failing and Need Rebuilding; Overgrowth is Severe; Substantial Debris is located within the stream Channel; Sediment Accumulation within the Stream Channel is > 18”.	0.8
1	Very Bad / Imminent Failure – For Engineered Streams, Retaining Walls are Failing and Need Rebuilding; Overgrowth is Severe; Substantial Debris, including large fallen trees, are located within the stream Channel; Sediment Accumulation within the Stream Channel is > 24”.	0.9
0	Not Functioning/Failed – Stream Channel Can No Longer Convey Flow due to Large Obstructions or Significant Blockages; Water is Overflowing the Banks of the Stream Channel	1.0

Localized Flooding Projects

For Localized Flooding Projects, the condition of the drainage system, as it relates to the severity of flooding, was evaluated based on the following factors: the adequacy of the existing drainage system, the frequency of maintenance, the number of flooding complaints/frequency of flooding, the magnitude of the total amount of existing flood insurance claims, and the extent of flooding (street vs. private property). Table 3 provides a detailed description for each condition value, along with the probability of failure.

Table 3.

Overall Condition of Drainage Infrastructure		
Rating	**Description**	**Value**
10	New / Pristine - Drainage System is New and is Functioning As Designed; Flooding Complaints & Occurrences Are Rare; Flooding is Confined to the Street; Flood Insurance Claims are $0	0
9	Excellent - Drainage System Requires Only Routine Maintenance and is Functioning As Designed; Flooding Complaints & Occurrences Are Rare; Flooding is Confined to the Street; Flood Insurance Claims are $0	0.1
8	Very Good - Drainage System Requires More Frequent Maintenance, but is Functioning As Designed; Flooding Complaints & Occurrences Are Rare; Flooding is Confined to the Street; Flood Insurance Claims are $0	0.2
7	Good/Minor Deferred Maintenance – Drainage Structures/Pipes Require more than Routine Cleaning and/or Require Minor Repairs; Flooding Complaints & Occurrences Happen Occasionally; Flooding is Mostly Confined to the Street, but does Impact Private Property Periodically; Flood Insurance Claims are between $0 < X < $5,000	0.3
6	Above Average/ Minor Deferred Maintenance - Drainage Structures/Pipes Require Moderate Repair/Maintenance and/or Expansion (Additional Drainage Structures); Flooding Complaints & Occurrences Happen Occasionally; Flooding is Mostly Confined to the Street, but does Impact Private Property Periodically; Flood Insurance Claims are between $0 < X < $5,000	0.4
5	Average / Functional - Drainage Structures/Pipes Require Moderate Repair/Maintenance and/or Expansion (Additional Drainage Structures); Flooding Complaints & Occurrences Happen Occasionally; Flooding has a Greater Impact on Private Property; Flood Insurance Claims are between $5,000 ≤ X < $25,000	0.5
4	Below Average / Major Deferred Maintenance - Drainage Structures/Pipes Require More Substantial Repairs/Maintenance; Flooding Complaints & Occurrences Happen Regularly; Flooding has a Greater Impact on Private Property; Flood Insurance Claims are between $5,000 ≤ X < $25,000	0.6
3	Poor / Serious Condition – Drainage System is in Poor Condition; Existing Drainage System Appears to be Inadequate/Undersized; Flooding Complaints & Occurrences Happen Regularly; Flooding has a Substantial Impact on Private Property; Flood Insurance Claims are between $25,000 ≤ X ≤ $200,000	0.7
2	Bad / Critical Condition - Drainage System Defects are Significant and Require Urgent Attention; Flooding Complaints & Occurrences Are Numerous; Flooding has a Substantial Impact on Private Property; Flood Insurance Claims are between $25,000 ≤ X ≤ $200,000	0.8
1	Very Bad / Imminent Failure – Drainage System is Failing and in Need of Immediate Attention; Flooding Complaints & Occurrences Are Numerous; Flood Insurance Claims and Impacts to Private Property are Significant (>$200,000)	0.9

0	Not Functioning	1.0

Culvert Projects

For Culvert Projects, culvert condition was evaluated based on the following factors, where applicable: headwall and wingwall condition, including extent of cracks and spalls; condition of steel beams; presence of exposed rebar; pipe barrel condition; condition of stone masonry walls; depth of sediment within the culvert, and other maintenance issues as noted below. Table 4 provides a detailed description for each condition value, along with the probability of failure.

Table 4.

Overall Culvert Condition		
Rating	**Description**	**Value**
10	New / Pristine – Culvert is New	0
9	Excellent – Culvert Has No Visible Defects	0.1
8	Very Good – Culvert Has Minor Cracks, but Appears to be Structurally Sound and No Maintenance is Needed At This Time	0.2
7	Good/Minor Deferred Maintenance – Minor Debris or Vegetation is Blocking the Inlet or Outlet of the Culvert and Requires Cleaning or Removal; Trash Rack or Grate Needs Cleaning; Visible Cracks Visible Requiring Minor Masonry Repair; Tree Removal Needed at Culvert	0.3
6	Above Average/ Minor Deferred Maintenance - Sediment Removal Needed (<12”); Minor Concrete Spalling Visible at Headwalls and/or Wingwalls	0.4
5	Average / Functional – Map Cracks w/Efflorescence Visible at Wing Walls; Missing Bricks, Stone & Mortar Requiring Moderate Masonry Repair	0.5
4	Below Average / Major Deferred Maintenance – Moderate Surface Spalls and/or Cracks Visible at Wingwalls and/or Headwalls; Stone Masonry Walls have Large Areas of Missing Mortar & Loose Stones; Wingwall Needs Repair; Sediment Removal Needed (>12”); Extensive Concrete Deterioration with Exposed Rebar	0.6
3	Poor / Serious Condition – Large Deep Spalls Visible & Large Cracks Visible at Concrete Headwalls and/or Wingwalls; Extensive Exposed Steel Rebar; Walls have Stones or Blocks Bulging/Missing/Displaced; Concrete Deterioration Along Flow Line	0.7
2	Bad / Critical Condition – Steel Beams Supporting Stone Caps Have Considerable Rust & Section Loss; Wingwalls are Failing	0.8
1	Very Bad / Imminent Failure – Culvert is At Risk of Imminent Failure – Significant Pipe Deformation and Cracking; Large Sections of Exposed Steel Rebar, Significant Concrete Loss; Undermining of Culvert Walls	0.9
0	0 – Not Functioning / Failed – Culvert Has Failed & Needs Replacement	1.0

Consequence of Failure (Q) Categories:

Consequence of Failure looks at the potential impact if the asset fails. The following impacts were prioritized, examined and weighted.

- **Impact to Health & Safety (weight = 10)** – Will the project reduce the potential for human injury or illness? Is the project critical to the protection of public safety & public health?
- **Potential for Property Damage (weight = 10)** – Will the project mitigate impacts related to flooding? Will the project address damages to public or private property?
- **Cost of Deferred Maintenance (weight = 9)** – What is the cost of deferred maintenance? If the project is not completed now, will the project's scope and cost increase substantially in the future?
- **Number of People Impacted (weight = 6)** – How many people does the project affect? How many people will be positively impacted by the project's implementation?
- **Impacts to Traffic (weight = 6)** – Will any major arterial streets be impacted? If the work is not done soon, will the magnitude of the impact to these streets be worse in the future if the work has to be done under emergency conditions?
- **Impact on City Development Priorities (weight = 4)** – How does the project impact economic development within the City and the City's development priorities?

Table 5 summarizes each impact, or category of consequence, and its weighted value.

Table 5.

Category of Consequence	Weight Value (W_i)	% of Weight
Public Health & Safety	10.0	22.2%
Property Damage	10.0	22.2%
Cost of Deferred Maintenance	9.0	20.0%
People Impacted	6.0	13.3%
Traffic Impacts	6.0	13.3%
City Development Priorities	4.0	8.9%
Totals	**45.0**	**100.0%**

The extent of the impact of each consequence is assigned a value ranging from 0 to 10, which correlates to a rating between 0 and 10 as shown in Table 6. Each asset is rated under each category of consequence based on the potential magnitude of impact associated with that particular category on the asset.

Table 6.

Consequence	
Value	**Rating** (Q_i)
0 – No Impact	0
1	1
2 – Very Little Impact	2
3	3
4	4
5 – Moderate Impact	5
6	6
7	7
8 – High Impact	8
9	9
10 – Very High Impact	10

For each asset, the Magnitude of Consequence of Failure (or Expected Loss) (Q) is calculated by summing the product of the consequence rating and its percent weight for all 7 categories of consequence for each asset.

$$Q = \sum_{i=1}^{i=6} \left(Q_i \frac{Wi}{Wt} \right)$$

Where:
i = consequence of failure category counter (There are 6 consequences so "i" ranges from 1 to 6.)
Q_i = i-th consequence rating (as identified in Table 6)
W_i = Weight of i-th consequence (as identified in Table 5)
W_T = Total Weight (46 as identified in Table 5)

Risk for each asset or project is then calculated as follows:

Risk or Probable Magnitude of Future Loss (R) = Probability of Failure (PF) x Magnitude of Consequence of Failure or Expected Loss (Q)

Green Infrastructure Practices/Natural Drainage Enhancement

The opportunity to incorporate green infrastructure practices will be considered in the development and implementation of each project identified in the Stormwater Capital Improvement Plan. In addition, for those projects where opportunities for natural drainage enhancement are readily apparent, a separate field in the prioritization matrix has been added to highlight these projects. In the event that two

projects are closely ranked, the project that has known potential for natural drainage enhancement will be given priority in the implementation of the overall plan.

United States Environmental Protection Agency
Office of Water (4203)
EPA 833-F-00-002
January 2000 (revised December 2005)
Fact Sheet 2.0

Stormwater Phase II Final Rule

Small MS4 Stormwater Program Overview

Stormwater Phase II Final Rule Fact Sheet Series

Overview

1.0 – Stormwater Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Stormwater Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/ Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a stormwater management program as a means to control polluted discharges from these MS4s. The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to certain "small" MS4s but takes a slightly different approach to how the stormwater management program is developed and implemented.

What Is a Phase II Small MS4?

A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority), and on a case-by-case basis those small MS4s located outside of UAs that the NPDES permitting authority designates. For more information on Phase II small MS4 coverage, see Fact Sheets 2.1 and 2.2.

What Are the Phase II Small MS4 Program Requirements?

Operators of regulated small MS4s are required to design their programs to:

- ❑ Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);
- ❑ Protect water quality; and
- ❑ Satisfy the appropriate water quality requirements of the Clean Water Act.

Implementation of the MEP standard will typically require the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures.

The Phase II Rule defines a small MS4 stormwater management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

The six MS4 program elements, termed "minimum control measures," are outlined below. For more information on each of these required control measures, see Fact Sheets 2.3 – 2.8.

❶ ***Public Education and Outreach***
Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.

❷ ***Public Participation/Involvement***
Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.

❸ ***Illicit Discharge Detection and Elimination***
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).

❹ ***Construction Site Runoff Control***
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).

❺ ***Post-Construction Runoff Control***
Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.

❻ ***Pollution Prevention/Good Housekeeping***
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

What Information Must the NPDES Permit Application Include?

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA issued a Menu of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own list. For more information on application requirements, see Fact Sheet 2.9.

What Are the Implementation Options?

The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's stormwater program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

What Kind of Program Evaluation/Assessment Is Required?

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the "maximum extent practicable" and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program's measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program. For more information on program evaluation/assessment, see Fact Sheet 2.9.

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #1

Location: South Meadow Brook at Dedham Street

Problem: The drain manhole at the intersection of Dedham Street and Cannon Street overflows during heavy rain events. The 12-inch storm drain on Dedham Street empties into the culvert at South Meadow Brook/Dedham Street. There are homes on Bound Brook Road and Heatherland Road that abut the section of South Meadow Brook downstream of this culvert that are considered repetitive loss properties. The property at #229 Dedham Street also floods.

Information Available: The 12-inch storm drain on Dedham Street was previously televised by the City.

Information Needed: The City plans to re-televise the 12-inch storm drain to confirm whether there is a possible restriction where the Dedham Street storm drain empties into the culvert. It looks like the pipe diameter may reduce to less than 12-inches before it discharges at the culvert. The outfall to the culvert is PVC pipe. However, the drain manhole directly upstream of the culvert did not show any evidence of PVC pipe.

Anticipated Tasks:

1) Confirm which properties on Bound Brook Rd and Heatherland Rd are impacted during heavy rain events.
2) Review television inspection videos of the 12-inch storm drain on Dedham Street.
3) Identify the catchment area tributary to the 12-inch storm drain on Dedham Street. Confirm whether the 12-inch storm drain has adequate hydraulic capacity to handle flow from the contributing drainage area by modeling the catchment area.
4) Examine potential culvert restriction at Upland Avenue, and potential channel restrictions between Dedham Street and Upland Avenue.
5) Evaluate the portion of South Meadow Brook downstream of Upland Avenue. Additional stream maintenance and dredging may be needed to ensure that the section of South Meadow Brook downstream of Upland Avenue can adequately handle flows once improvements are made to the sections of South Meadow Brook further upstream.
6) Perform survey to confirm the invert of the culverts at South Meadow Brook (upstream) and Upland Avenue (downstream).
7) Design and construct potential piping repairs/upgrades of the Dedham Street storm drain.
8) Perform stream maintenance of South Meadow Brook between Dedham Street and Upland Avenue. As much as 18" of sediment was found in selected locations along the brook. Complete channel improvements including potential dredging.
9) Perform stream maintenance and dredging of the portion of South Meadow Brook downstream of Upland Avenue as needed.

Estimated Cost:

Engineering & Construction: $750,000

FIGURE 1

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 1:
SOUTH MEADOW BROOK AT DEDHAM ST.

Date: 7/15/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #2

Location: Wayne Road near Saw Mill Brook

Problem: There is an outfall on Wayne Road that discharges to Saw Mill Brook. This outfall is silted in. Wayne Road is flat. During intense rains, Wayne Road floods. The outfall discharging to Saw Mill Brook needs to be channelized. The downstream culverts on Saw Mill Brook, which are located in Boston, are also a potential restriction as they are believed to be undersized.

Information Available: N/A

Information Needed: Confirmation is needed regarding the extent of flooding in this area. Television inspection of the drainage system is needed to confirm that drainage can flow properly. Survey needs to be performed to confirm drainage invert elevations and profile along proposed channel route to Saw Mill Brook.

Anticipated Tasks:

1) Observe area during a rain event.
2) Confirm whether any properties on Wayne Road flood during heavy rain events or whether flooding is confined to the street.
3) Clean catch basins on Wayne Road and televise the storm drain on Wayne Road to confirm that drainage can flow properly without obstructions.
4) The outfall at Wayne Road was 75% submerged and filled with sediment. Water was stagnant. This area is heavily overgrown. A channel needs to be established from the outfall towards Saw Mill Brook.
5) Perform survey to confirm invert elevations for drainage on Wayne Road, including the invert of the outfall, and to confirm profile along proposed channel route to Saw Mill Brook.
6) Channelize a pathway from the outfall at Wayne Road to Saw Mill Brook.
7) Make repairs to the headwall for the Wayne Road outfall.

Estimated Cost:

Engineering & Construction: $250,000

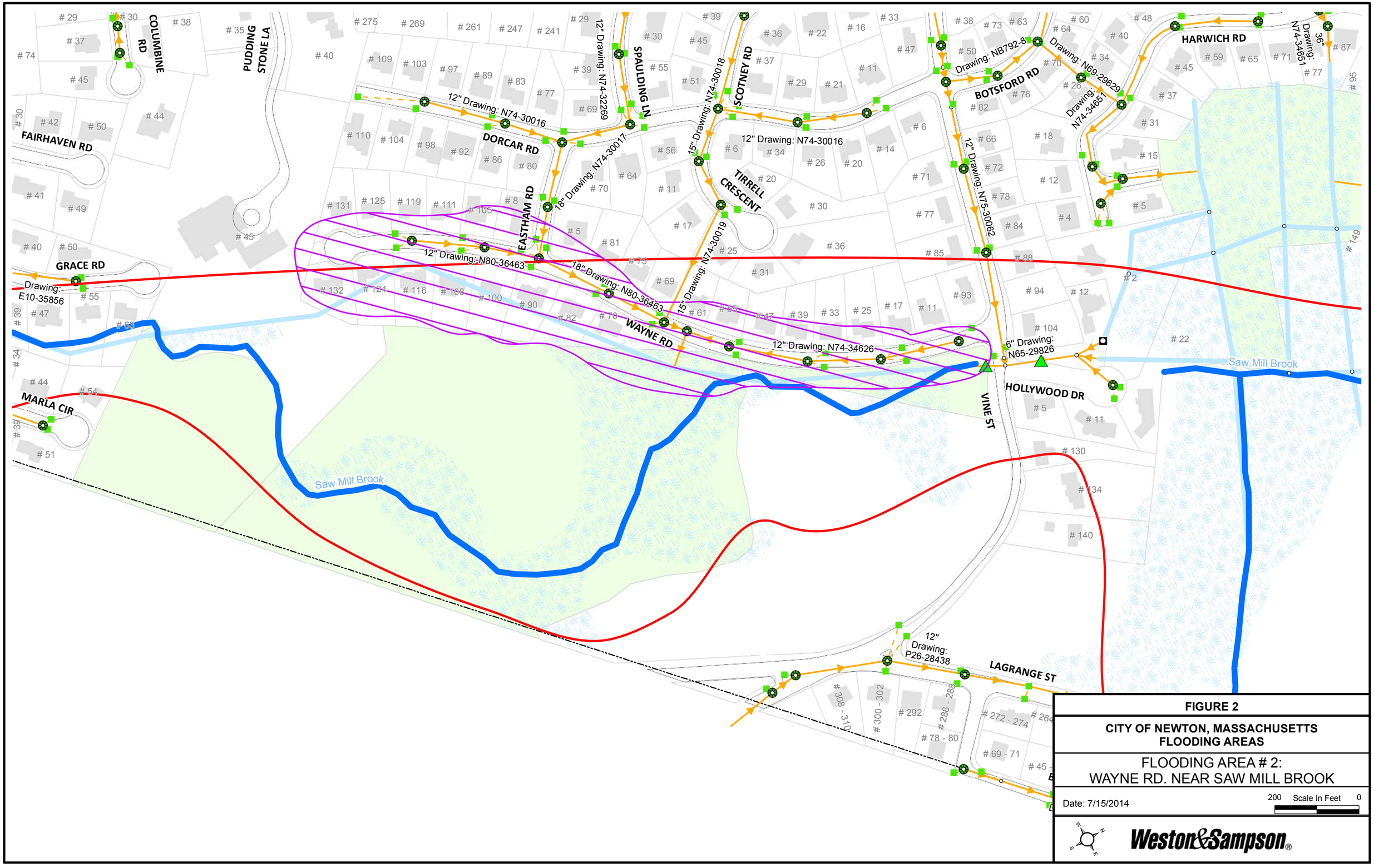


FIGURE 2

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 2:
WAYNE RD. NEAR SAW MILL BROOK

Date: 7/15/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #3

Location: Harvard Street between Madison Avenue & Newtonville Avenue

Problem: There is a low spot on Harvard Street between Madison Avenue & Newtonville Avenue which floods. This low spot is located at the double catch basins, which are situated directly on top of the storm drain.

Information Available: Storm Drain record drawings are available for this area.

Information Needed: Obtain additional information regarding the extent of flooding in this area.

Anticipated Tasks:

1) Observe area during a rain event.
2) Obtain additional information regarding historical flooding in this area.
3) Clean catch basins on Harvard Street. Catch basins are filled with debris and do not appear to have sumps.
4) Televise the storm drain on Harvard Street to confirm pipe condition and ensure that drainage can flow properly.
5) Review record drawings and identify catchment area tributary to the 12-inch storm drain on Harvard Street. Confirm whether the 12-inch storm drain has adequate hydraulic capacity to handle flow from the contributing drainage area by modeling the catchment area.

Estimated Cost:

Engineering & Construction: $350,000

Photos:

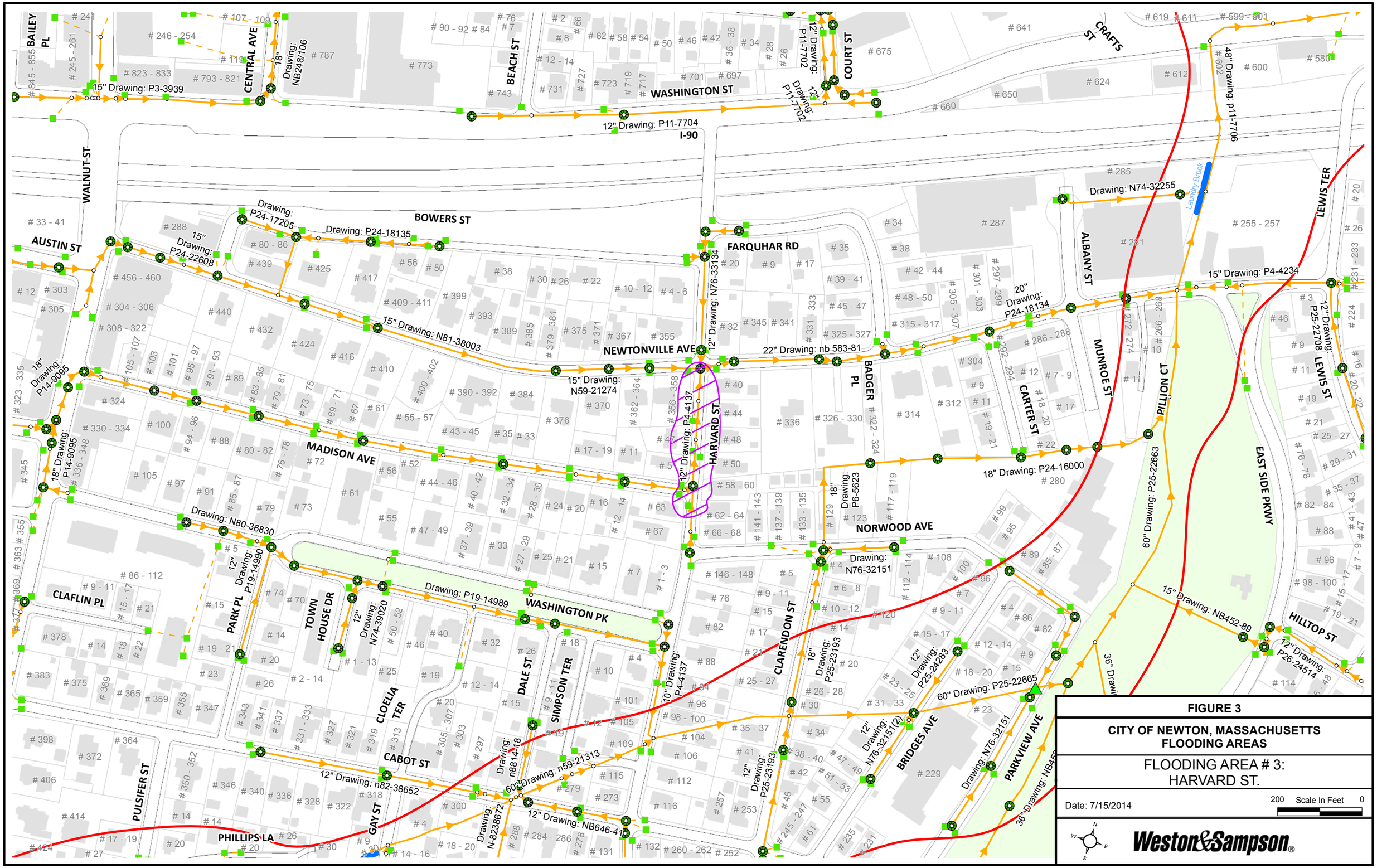


FIGURE 3

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 3:
HARVARD ST.

Date: 7/15/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #4

Location: Flooding on Quinobequin Road between Irwin and Carleton Roads

Problem: Homes along Quinobequin Road between Irwin Road and Carlton Road, and the backyards of homes along Rokeby Road experience flooding. These homes are located within the flood plain.

Information Available: Television inspection was completed on the section of storm drain that collects flow from Rokeby Road and conveys it to an outfall off of Quinobequin Road via an easement.

Information Needed: The television inspection video of the storm drain off of Rokeby Road needs to be obtained from the City.

Anticipated Tasks:

1) Observe area during a rain event.
2) Identify all properties along Quinobequin Road and Rokeby Road that experience flooding.
3) Review television inspection video of the section of storm drain that collects flow from Rokeby Road and conveys it to an outfall off of Quinobequin Road via an easement.
4) Add additional catch basins at the intersection of Carlton Road and Rokeby Road to intercept existing flow that is bypassing existing catch basins in this area and heading down Rokeby Road. Add curbing on Rokeby Road to prevent water from running off the road and flooding adjacent properties.

Estimated Cost:

Engineering & Construction: $200,000

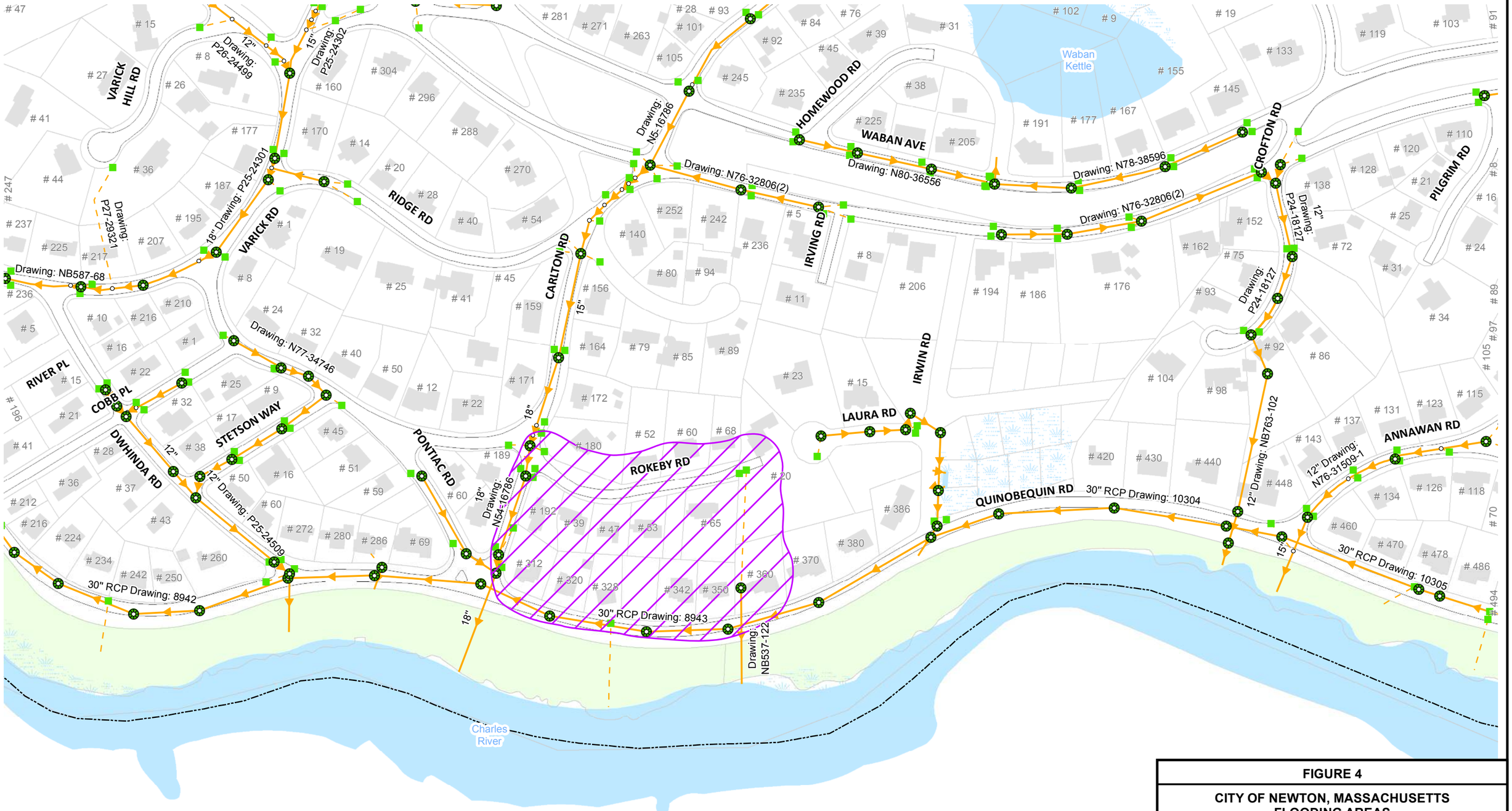


FIGURE 4

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 4:
QUINOBEQUIN RD BETWEEN IRWIN AND CARLTON

Date: 8/18/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #5

Location: Quinobequin Road

Problem: The abandoned 20"x30" sewer interceptor on Quinobequin Road discharges to the "underdrain side" of the vault at Quinobequin Pump Station. The 12" underdrain pipe leaves the vault, and continues past the Quinobequin Pump Station to an underdrain outfall to the Charles River. When the interceptor was abandoned in place, sewer services were extended from the 20"x30" interceptor to homes along Quinobequin Road for potential future use by these properties as a drain connection. There is currently one property with a sump pump connected to the 20" x 30" sewer interceptor. The 12" underdrain is believed to be collapsed somewhere between the Quinobequin Road Pump Station and the outfall. The feasibility of using the 20" x 30" sewer interceptor and the 12" underdrain as a storm drain needs to be evaluated.

Information Needed: Confirmation regarding which properties along Quinobequin Road have sump pumps and/or driveway drains and where they discharge, and how many properties might use a rehabilitated underdrain outfall.

Anticipated Tasks:

1) Identify all properties along Quinobequin Road that have sump pumps and driveway drains that are either connected to the sanitary sewer or whose discharge location is suspect or unknown.
2) Determine the feasibility of connecting sump pumps and driveway drains from properties along Quinobequin Road to the existing 20" x 30" sewer interceptor. Only #386 Quinobequin has connected their sump pump to the interceptor to date. Perform survey to confirm the elevation of the 20"x30" sewer interceptor and the elevation of neighboring properties along Quinobequin Road, and plot all elevation data.
3) Inspect and evaluate the condition of the existing underdrain downstream of the chamber at the Quinobequin Road Pump Station, to which the existing 20"x30" interceptor connects. The inspection should start at the underdrain outfall (the underdrain outfall discharge will first need to be located) to the Charles River, and continue towards the vault at the pump station. If the camera cannot proceed, then a reverse set up should be completed where inspection of the underdrain starts at the vault at the Quinobequin Road Pump Station.
4) Inspect and evaluate the condition of the 20"x30" interceptor.
5) Create an inventory of defects within both the 20" x30" interceptor and the 12" underdrain. Identify all locations where the underdrain has collapsed and where repairs are needed in the 20" x30" interceptor and the 12" underdrain.
6) Evaluate the feasibility of repairing the 12" underdrain and 20"x30" interceptor to create a suitable drain conduit and outfall.

Estimated Cost:

Evaluation: $50,000

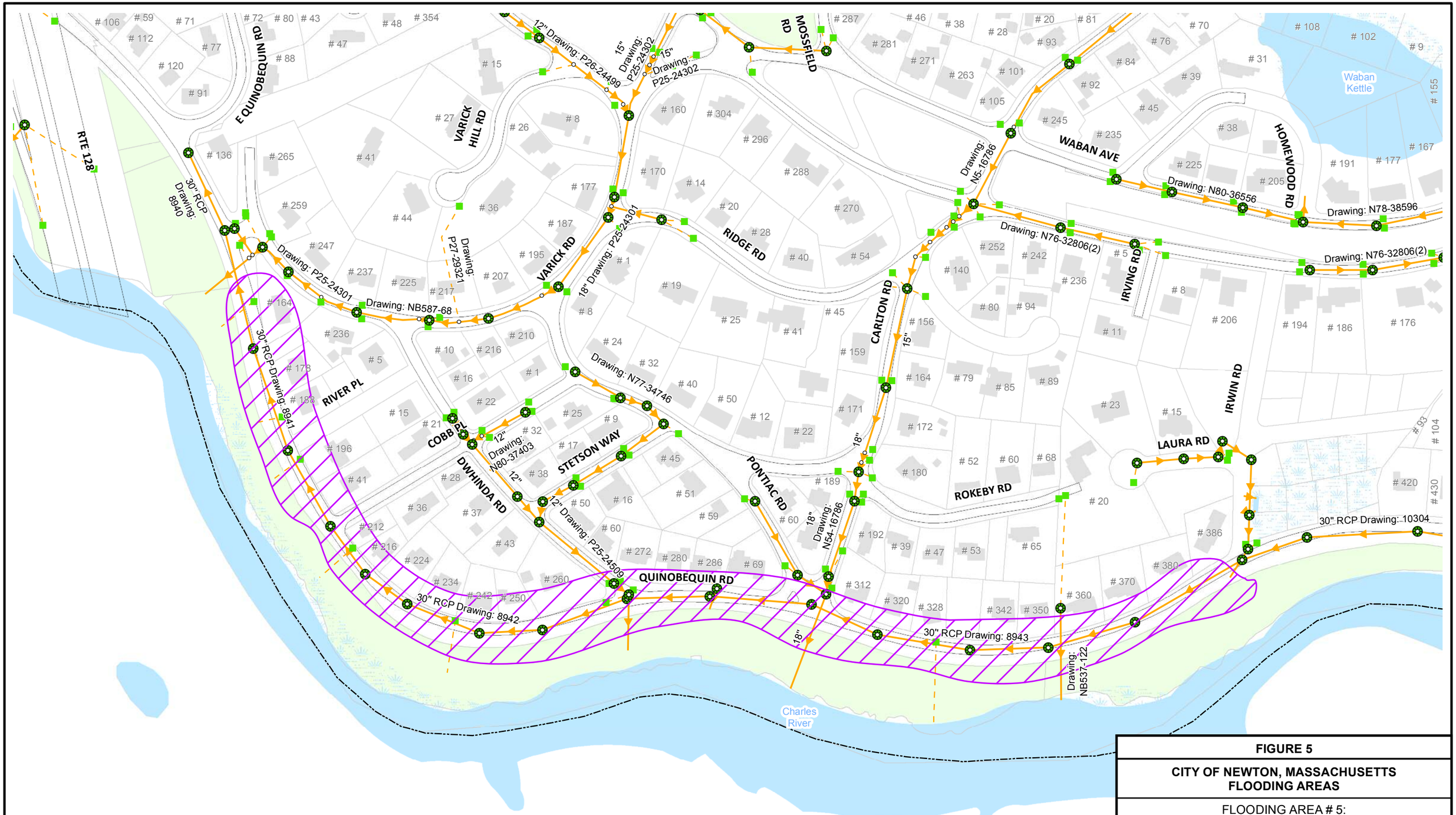


FIGURE 5

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 5:
QUINOBEQUIN RD.

Date: 8/18/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #6

Location: Hammond Brook

Problem: The 12-inch underdrain for the adjacent 20-inch sewer interceptor is leaking through the retaining wall along Hammond Brook. The retaining wall is also failing at various locations. If the underdrain can be day lighted at this location, it presents an opportunity for substantial infiltration reduction upstream.

Information Available: N/A

Anticipated Tasks:

1) The underdrain was observed leaking into Hammond Brook at two locations. The City should sample underdrain flow at these two locations to confirm whether the flow is contaminated.
2) If the underdrain flow is not contaminated, an underdrain outfall discharge point should be established to Hammond Brook.

Estrimated Cost:

Engineering & Construction: $200,000

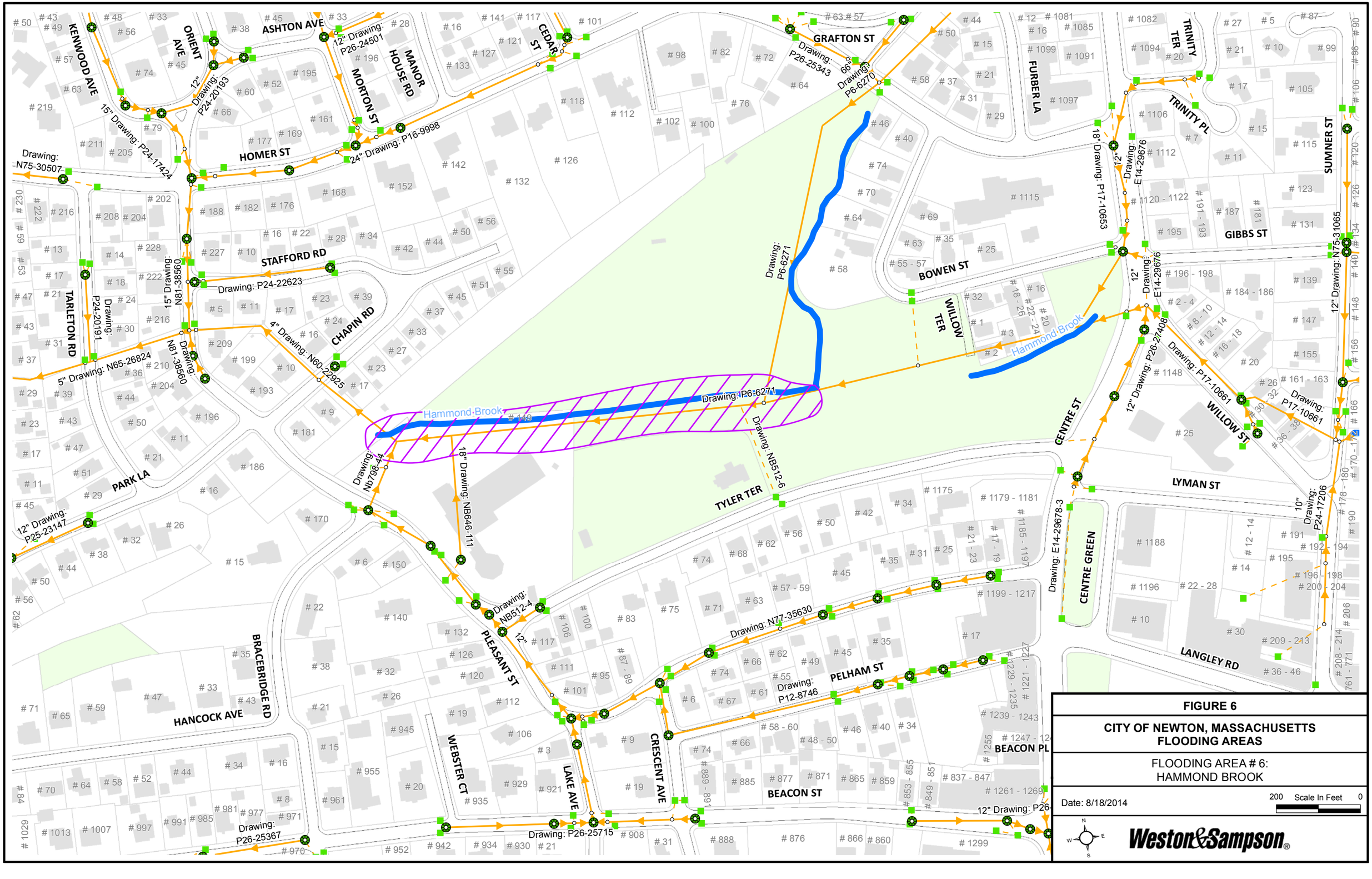


FIGURE 6

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 6:
HAMMOND BROOK

Date: 8/18/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #7

Location: Beaconwood Road at Cold Spring Brook

Problem: The backyards of homes on Beaconwood Road flood, but the area surrounding these homes is a wetlands area. One comment received from an owner on Beaconwood Road states that: "The reason we hold the city responsible for flooding at Beaconwood Rd during intense rainfall events is that the drainage of cold spring is inadequately engineered for several reasons, the most important being that the culvert that goes under the Zervas school is improperly laid, that is the pipe invert is too high so that does not flow readily under most moderate rainfall conditions. Simply stated, the water backs up and floods the area around Beaconwood as it cannot flow away as rapidly as it could if the stream and pipe was better engineered, and the big culvert was properly positioned."

Information Available: N/A

Information Needed: Survey needs to be performed to confirm elevations of the brook and associated storm drainage infrastructure.

Anticipated Tasks:

1) Observe area during a rain event.
2) Prior to any stream cleaning of Cold Spring Brook, a survey should be performed to confirm elevations of the Brook and associated culverts upstream near Beaconwood Road, at the culvert inlet near the Zervas School and downstream at the drain manhole on Beethoven Avenue. There is a small channel that runs near Beaconwood Road conveying flow from the wetlands area surrounding Beaconwood Road to Cold Spring Brook. The channel was flowing during the site visit. This channel starts at a small culvert that runs under the footpath located off of Beaconwood Road. A substantial amount of sediment was also observed at the culvert inlet at the Zervas School.
3) There are a large number of fallen trees along Cold Spring Brook, as well as a build-up of sediment which could be preventing flow near Beaconwood Road from reaching the Zervas School culvert. Stream cleaning of Cold Spring Brook is recommended.

Estimated Cost:

Engineering & Construction: $100,000

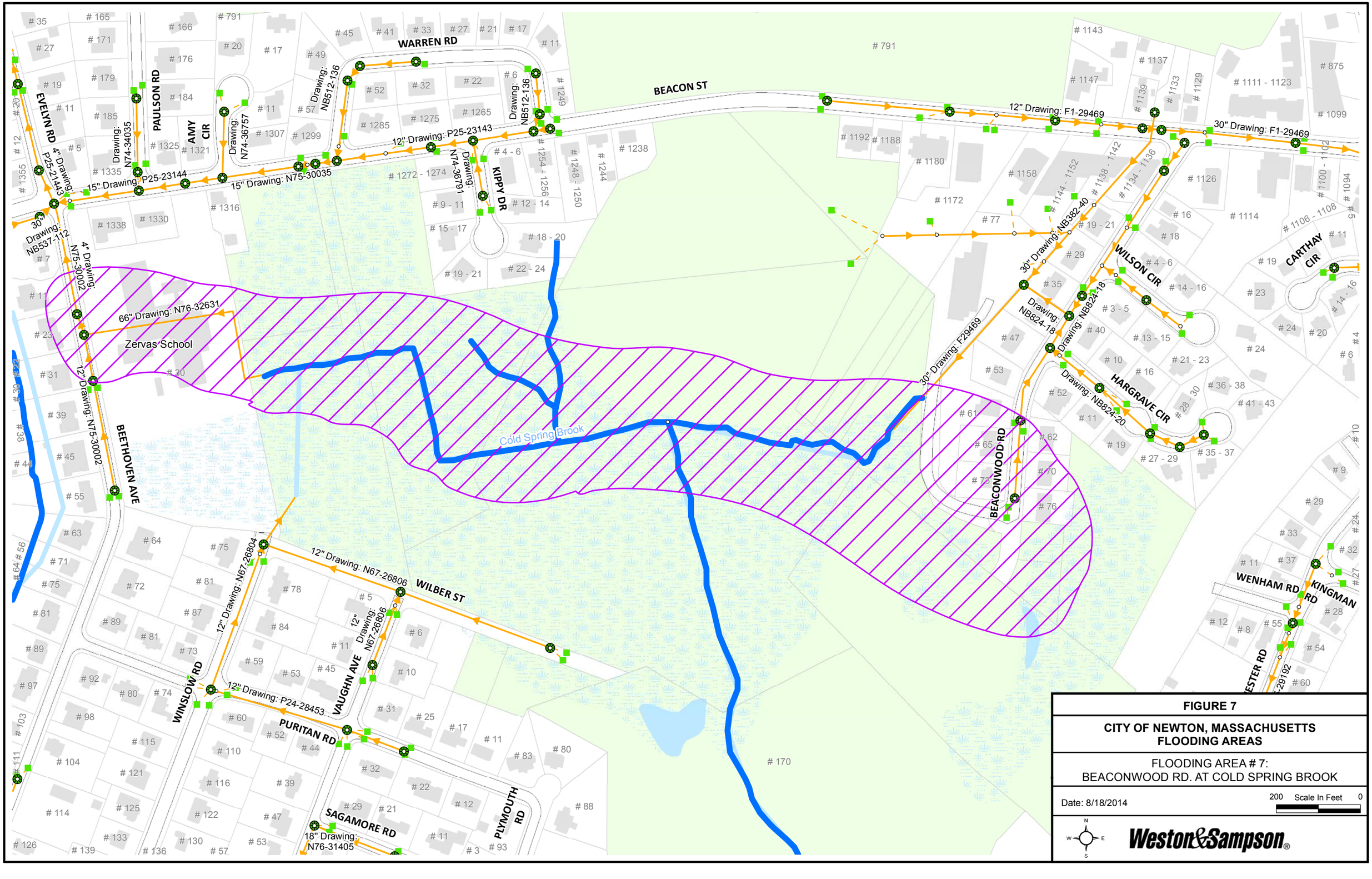


FIGURE 7

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 7:
BEACONWOOD RD. AT COLD SPRING BROOK

Date: 8/18/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #8

Location: Judkins Street near Pellegrini Park

Problem: There is flooding on Jenison Street and Judkins Street. There is one catch basin located at the corner of Judkins Street and Jenison Street. This catch basin collects sheet flow from these two streets and conveys it to a 24-inch storm drain located at Pellegrini Park via a 6-inch drainage pipe located within an easement known as Judkins Path. This 6-inch pipe was television inspected and found to have roots.

Information Available: Television inspection video of the 6-inch drainage pipe going through the Judkins Path easement is available for review.

Information Needed: Television inspection video of the 6-inch drainage pipe going through the Judkins Path easement needs to be obtained from the City. Survey of existing drainage infrastructure is also needed.

Anticipated Tasks:

1) Observe area during a rain event.
2) Complete a survey to document existing conditions.
3) The existing 6-inch drain pipe appears to go underneath the tennis courts at Pellegrini Park. Examine feasibility of pipe bursting to avoid disturbance to the tennis courts.
4) Evaluate the feasibility of rerouting the drainage piping via the street as opposed to going through the easement.

Estimated Cost:

Engineering & Construction: $500,000

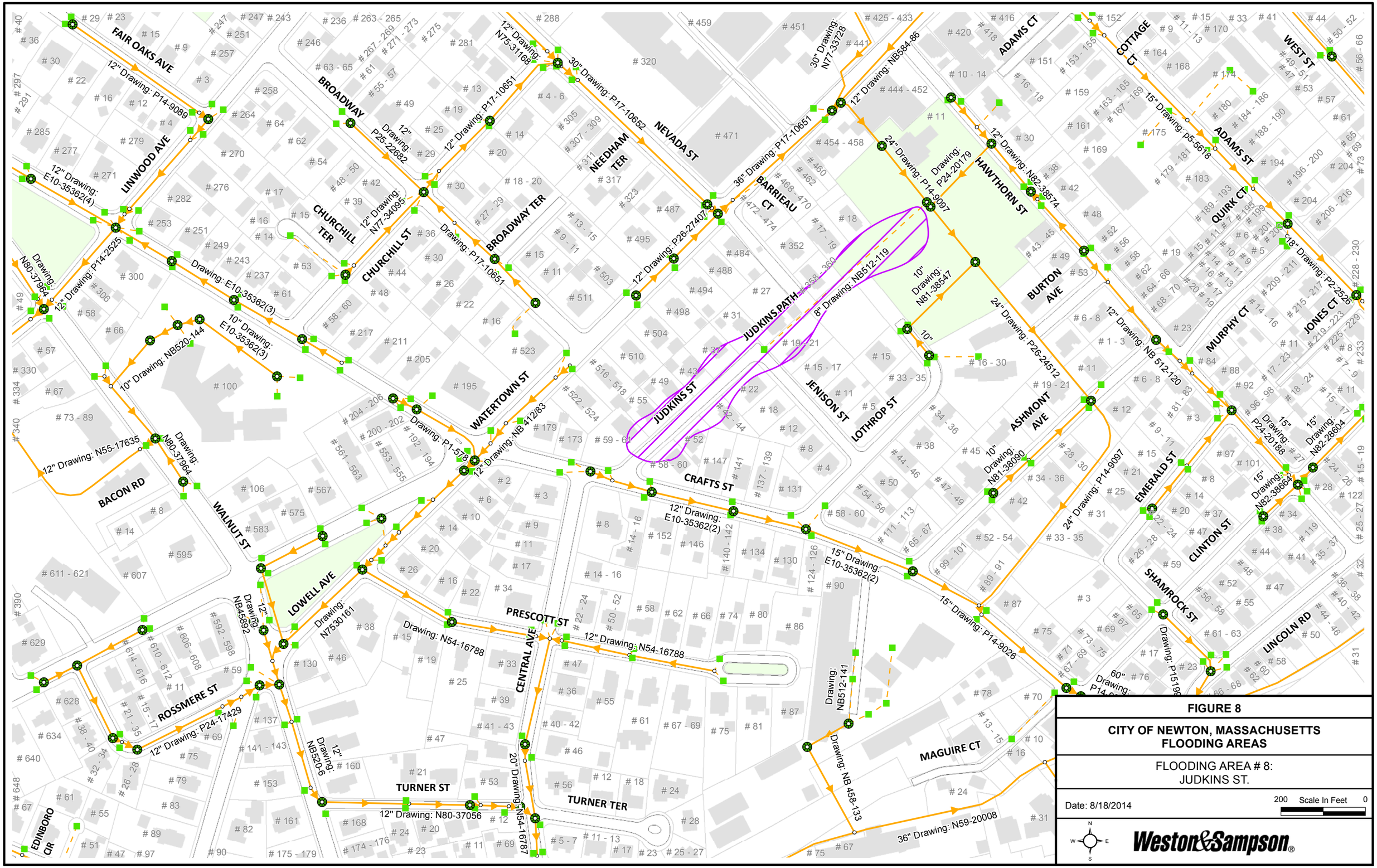


FIGURE 8

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 8:
JUDKINS ST.

Date: 8/18/2014

200 Scale In Feet 0

N W E S

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #9

Location: Harwich Road at Saw Mill Brook

Problem: Homeowners on Harwich Rd have historically complained about backyard flooding. The outfall for a 15" RCP drain at the end of Harwich Rd is silted in. The end of the pipe is not visible. City crews have cleaned out the drain as far as they can. The area may need to be dredged; however it is located next to wetlands and leads to the beginning of Saw Mill Brook.

Information Available: N/A

Information Needed: Confirmation is needed from the City regarding which properties flood. Survey is needed to document existing conditions.

Anticipated Tasks:

1) Observe area during a rain event.
2) Obtain confirmation from the City regarding which homes experience routine flooding.
3) There are three outfalls located off of Harwich Road that discharge to the wetlands area adjacent to Saw Mill Brook. All three of these outfalls need to have an avenue to reach the wetlands for storage and treatment. The outfall that runs between #5 and #15 Harwich Road could not be located in the field. The 12-inch outfall that runs between #139 and #149 Harwich Road was completely submerged, but visible. The 36-inch outfall between #77 and #87 Harwich Road discharges in a depression at a lower elevation than the surrounding ground surface therefore flow pools at the pipe outlet.
4) Clean Saw Mill Brook. Most of Saw Mill Brook was found to be overgrown, with portions of the brook completely inaccessible due to overgrowth and fallen trees.
5) Complete a survey to document existing conditions. As part of the survey, the following data should be collected: inverts at each of the three outfalls and elevation data for Harwich Road street drainage. In addition, enough information should be collected to determine how much sediment needs to be removed adjacent to each of the outfalls in order to ensure proper drainage, and that flows reach Saw Mill Brook.

Estimated Cost:

Engineering & Construction: $100,000

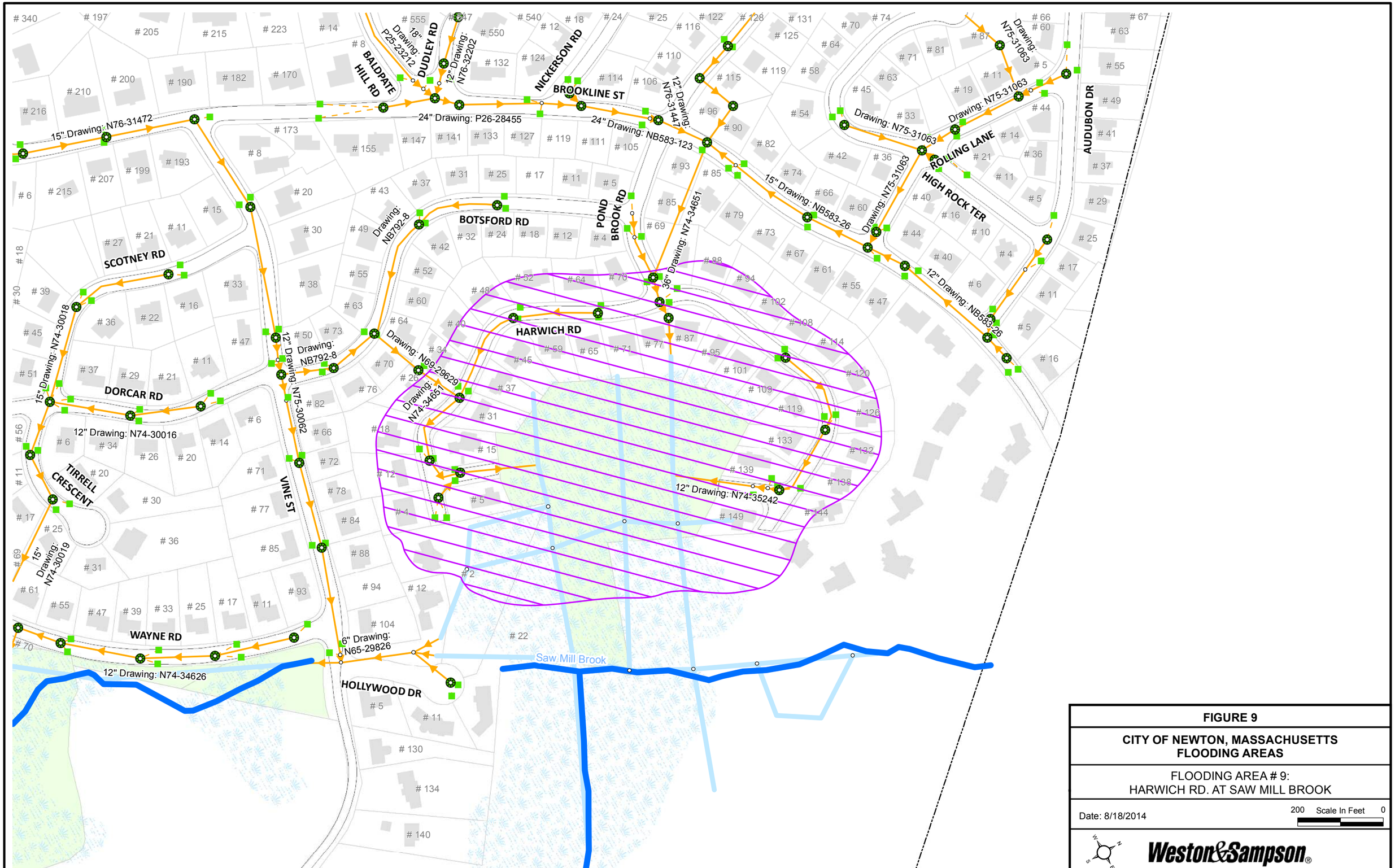


FIGURE 9

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 9:
HARWICH RD. AT SAW MILL BROOK

Date: 8/18/2014

200 Scale In Feet 0

Weston&Sampson®

Newton, MA – Stormwater Infrastructure Improvement Plan
Assessment of Flooding Locations

Flooding Area: #10

Location: Oldham Road at Cheesecake Brook

Problem: There is a double catch basin at the low spot in Oldham Road. A drain from this catch basin runs alongside 60 Oldham Road and outfalls to Cheesecake Brook. The double catch basins surcharge during heavy storms.

Information Available: Memo from Martha Horn dated August 25, 2006.

Information Needed: All drainage on Oldham Road and Chesterfield Road needs to be televised. Survey is needed to document existing conditions.

Anticipated Tasks:

1) Observe area during a rain event.
2) Clean all catch basins along Oldham Road and Chesterfield Road.
3) Televise all drainage on Oldham Road and Chesterfield Road tributary to the outfall near #60 Oldham Road.
4) Survey existing drainage on Oldham Road and points along Cheesecake Brook behind Oldham Road, including the invert at the culvert.
5) Add catch basins at selected locations to intercept flow. It appears that some flow may be bypassing existing catch basins, and the double catch basins near #60 Oldham Road are being overloaded. Runoff appears to be bypassing the catch basin located in front of #16 Chesterfield Road. The catch basin in front of #52 Oldham Road is recessed and needs to be repaired.
6) Dry weather flow was observed coming into the double catch basins at #60 Oldham Road from the north and should be sampled by the City. There was no rain in the 72 hours preceding the observation.
7) Design improvements to the channel and culvert for the portion of Cheesecake Brook located behind #70 Oldham Road where the Oldham Road outfall discharges.

Estimated Cost:

Engineering & Construction: $450,000

WOODLAND RD
BONMAR CIR
ANGIER CIR
HOPE ST
DAY ST
LESLIE RD
OLDHAM RD
CHESTERFIELD RD
COMMONWEALTH AVE
FULLER ST
WIMBLEDON CIR
TEMPLE ST
MIGNON RD
RUANE RD
WASHINGTON ST
MYRTLE ST
ARDMORE RD
ARDMORE TER
PROSPECT ST
WESTVIEW TER
TENNYSON RD
BERKELEY ST
Cheese Cake Brook
Brae Burn Pond
Drawing: N81-38168
24" Drawing: P25-23205
12" Drawing: P26-75366
12" Drawing: P25-24289
12" Drawing: N80-35810
15" Drawing: P16-9979
12" Drawing: N58-20819
12" Drawing: N74-31722
Drawing: N81-38266
12" VCP
12" Drawing: P24-6785
Drawing: NB512/7
16" RCP
12" RCP
Drawing: N81-38266
Drawing: P27-29328
12" Drawing: P2-2634
15" Drawing: P24-16283
15"
24" Drawing: N77-35662
36" Drawing: N77-35662
15" Drawing: P9-7118
15" Drawing: P16-9980
10" Drawing: P16-9980
Drawing: N60-35810
12" Drawing: P26-25722
Drawing: N74-31719
18" Drawing: N74-32137
18" Drawing: P26-28445

FIGURE 10

CITY OF NEWTON, MASSACHUSETTS
FLOODING AREAS

FLOODING AREA # 10:
OLDHAM RD. AT CHEESECAKE BROOK

Date: 8/18/2014

200 Scale In Feet 0

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