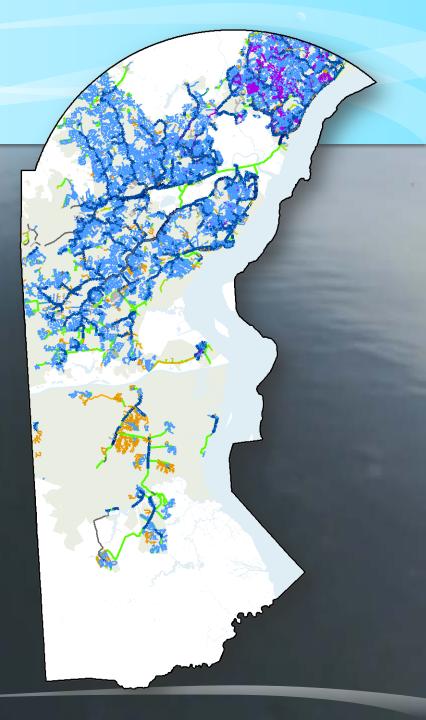


## New Castle County Quick Stats

- New Castle County Sanitary Sewer System
  - Mid-sized system
  - Separate
  - > 50 MGD
  - > 122,000 customer accounts
  - > 550,000 population
  - > 1,760 Miles of sewer > 6" to 84" in diameter
  - > 169 Pump Stations
  - > 44,000 Manholes



## Sewer Maintenance Section

Part of Environmental Operations Division

#### Sewer Operations Charge

- Keep collection system clean to:
  - Prevent SSO's and mainline blockages
  - Prevent basement backups
- Identify causes of SSO's and mainline blockages
- Prevent recurring SSO's and mainline blockages
  - Increased cleaning
  - Modified/enhance methods
  - Structural fixes
- Maximize capacity of trunk lines and interceptors
- Extend life of aging/failing components until engineering programs catch up



## Sewer Maintenance Section

Part of Environmental Operations Division

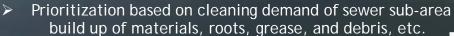


- **Preventative Maintenance Program (PM)**
- **Emergency Response**
- CMOM Enhancement Programs

  Trunk Line Preventative Maintenance Program
  Chemical Root Control Program
  CCTV System Investigation Program
- Operate CCTV (Closed Circuit TV)
- Utility Marking (MISS Utility)
- Dye Testing to verify sewer connections

## Preventative Maintenance Program (PM)

- PM program, as currently defined, cleans
- 500 miles of gravity sewer collection system
- per year.
  - Approach implemented in late 1980's
  - Shift from Reactive Maintenance to focus on Preventive Maintenance
  - Decreased SSO's and mainline blockages dramatically
  - Mapped cleaning schedules with standardized frequencies: 6 month, 1 year, 2 year, 3 year, 4 year, 5 year.

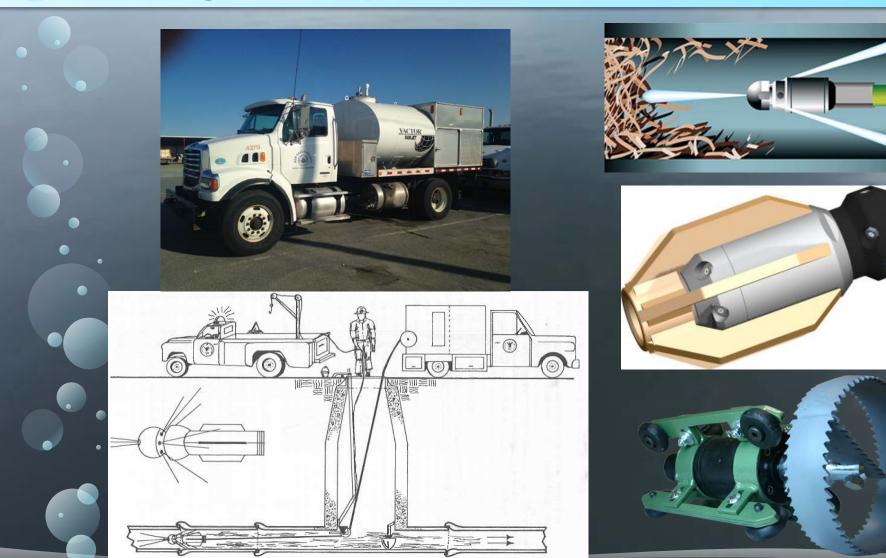


- Work order History
- Visual determination
- CCTV & Zoom
- Quality control and frequency adjustment
- Analysis of sequencing
- Schedule of cleaning projects affected by many factors
  - Weather extreme cold/wet
  - Equipment downtime jet/vac combination units
  - Manpower resources off-road work
- Tracking year-to-date PM numbers

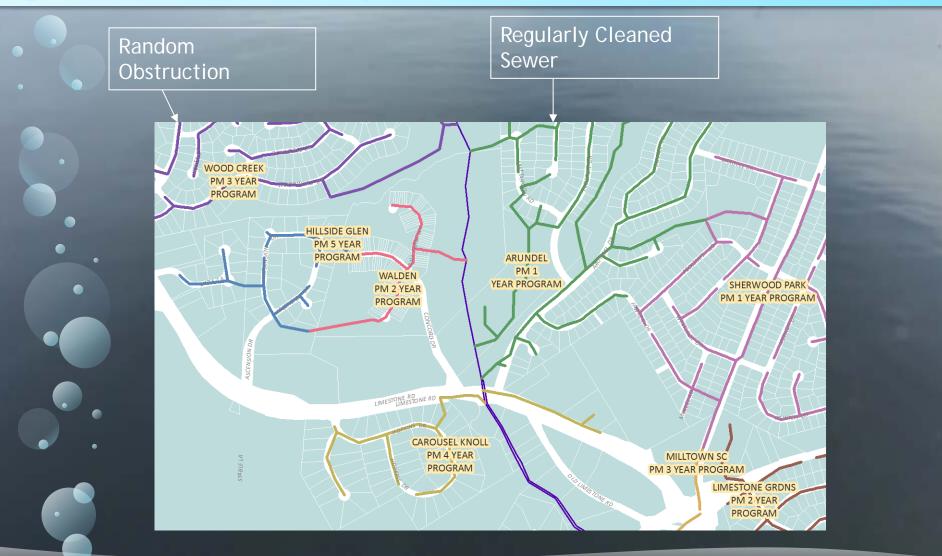




## Preventative Maintenance Program (PM)



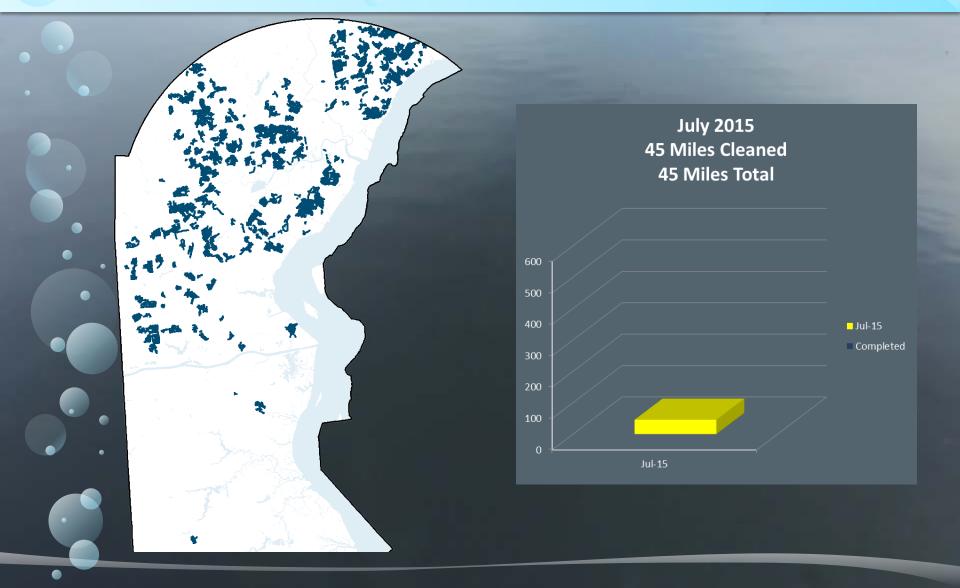
## Preventative Maintenance Program (PM)



## Preventative Maintenance Cleaning Schedules



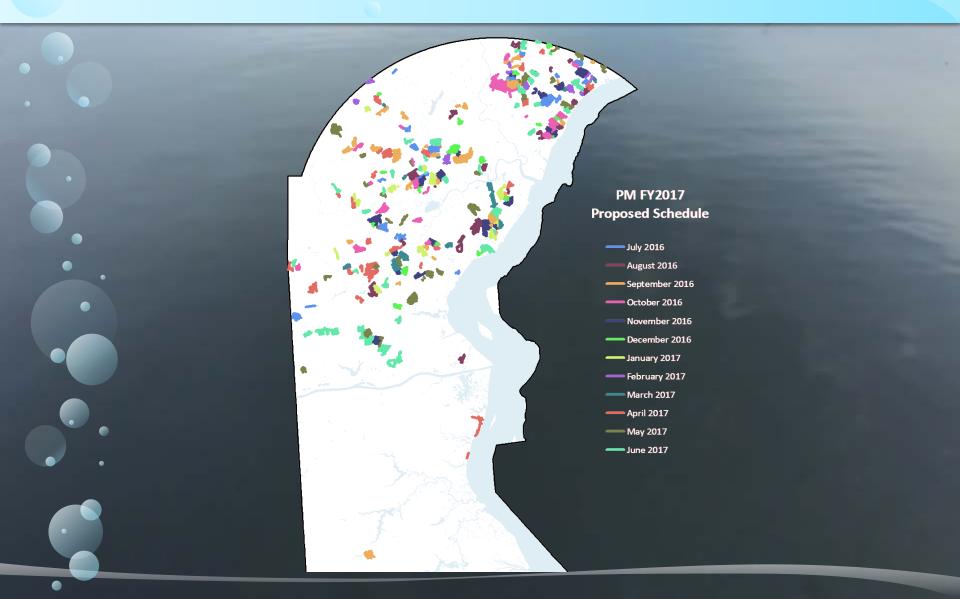
## Tracking Preventative Maintenance



## Preventative Maintenance - Weekly Checks



#### Preventative Maintenance Schedules for FY2017 - Projected



Proj Start Date	Council	Location Details	PM Freque
7/27/16	1	FIRST STATE PLZ.	1YR PN
8/13/16	1	ELSMERE PM	1YR PN
8/20/16	1	HERSHEY RUN PM	1YR PN
9/9/16	1	MANNETTE HEIGHTS PM	3YR PN
9/25/16	1	FIRST STATE PARK PM	1 YR PN
10/10/16	1	CAVALIERS PM	2YR PN
10/16/16	1	BELVEDERE PM	1YR PN
10/17/16	1	ROLLING HILLS PM	2YR PN
10/17/16	1	STANTON HEIGHTS PM	2YR PN
10/21/16	1	OAK GROVE PM	1YR PN
11/4/16	1	CEDAR HEIGHTS PM	3YR PN
11/14/16	1	RAINTREE VILLAGE PM	3YR PN
11/20/16	1	WILLOW RUN PM	1YR PN
11/24/16	1	CLELAND HEIGHTS	2YR PN
12/5/16	1	ARBOR POINTE PM	3YR PN
12/10/16	1	EASTBURN HEIGHTS	2YR PN
12/10/16	1	EAGLE GLEN	2YR PN
12/19/16	1	GLEN BERNE ESTS	2YR PN
1/7/17	1	ROSELLE PM	1YR PN
2/17/17	1	MIDWAY PK APTS PM	1YR PN
4/28/17	1	EXECUTIVE CAMPUS	2YR PN
5/1/17	1	OMEGA/MBNA	2YR PN
5/26/17	1	KIAMENSI MANOR PM	1YR PN
6/13/17	1	WOODCREST PM	2YR PN
6/20/17	1	TANGLEWOOD PM	1YR PN

	Proj Start Date	Council	Location Details	PM Frequency
	8/3/16	2	RESTURANT ROW +	1YR PM
	8/20/16	2	MCDANIEL CREST PM	1YR PM
	8/20/16	2	DEVON PM	1YR PM
	8/21/16	2	MCDANIEL HEIGHTS PM	1YR PM
	8/23/16	2	VALMY LANE PM	5YR PM
	8/28/16	2	BROOKVALLEY PM	1YR PM
	9/2/16	2	GREENVILLE MANOR PM	2YR PM
	9/11/16	2	BRANDYWINE COMMN PM	1YR PM
	9/15/16	2	FAIRFAX SHOPPES PM	1YR PM
	9/21/16	2	BLUE ROCK MANOR PM	1YR PM
	9/26/16	2	GREENVIEW PM	2YR PM
	10/10/16	2	SHARPLEY PM	3YR PM
	10/10/16	2	EDENRIDGE PM	3YR PM
•	10/13/16	2	COLONIAL WOODS PM	1YR PM
	10/23/16	2	GRAYLYN CREST OUTFALL	6 MONTH PM
	11/21/16	2	OLDE COLONIAL VL PM	1YR PM
	11/25/16	2	LONGWOOD PM	1YR PM
	12/5/16	2	WESTOVER HILLS 2 PM	3YR PM
	12/5/16	2	BIRCH KNOLL PM	3YR PM
	1/15/17	2	WINDSOR HILLS	2YR PM
	1/20/17	2	CONCORD PK VILL PM	1YR PM
	4/1/17	2	CRESTFIELD PM	2YR PM
	4/25/17	2	SURREY PARK PM	2YR PM
	5/2/17	2	PENARTH PM	2YR PM
	5/11/17	2	OAK LANE MANOR PM	2YR PM
•	5/16/17	2	PERTH PM	2YR PM
	5/22/17	2	BEAU TREE PM	2YR PM
	5/22/17	2	BROOKMEADE PM	2YR PM
	5/26/17	2	STRATFORD APTS.	1YR PM
	6/22/17	2	CHALFONTE PM	2YR PM
	6/25/17	2	HOLIDAY HILLS PM	2YR PM

•	Proj Start Date	Council	Location Details	PM Frequency
	8/29/16	3	MEADOWDALE PM	3YR PM
	9/6/16	3	PATTERSON FARM PM	3YR PM
	9/13/16	3	BRACKIN ESTATES PM	4YR PM
	9/13/16	3	BRACKENVILLE RD PM	4YR PM
	9/13/16	3	COKESBURY VILL PM	4YR PM
	9/13/16	3	BERKSHIRE PM	4YR PM
	10/17/16	3	THE RIDGE PM	2YR PM
	10/27/16	3	MARRA LANDING PM	5YR PM
	12/19/16	3	CREST DR PM	4YR PM
	12/23/16	3	MANLEY	2YR PM
	2/21/17	3	PIERSONS RIDGE PM	3YR PM
	2/24/17	3	FOXMEADOW FARMS PM	3YR PM
	4/30/17	3	THE PINES PM	2YR PM
	6/21/17	3	HIGHLAND WEST PM	1YR PM
	6/23/17	3	HICKORY HILLS PM	1YR PM
	Proj Start Date	Council	Location Details	PM Frequency
	5/18/17	4	PENNROSE PM	2YR PM
•	8/17/16	5	CHESTNUT CROSSNG PM	1YR PM
	10/7/16	5	BEAULIEU PM	3YR PM
	12/10/16	5	PENCADER*GREASE PM	1YR PM
	9/20/16	6	TOWNSEND VILL II PM	5YR PM

Proj Start Date	Council	Location Details	PM Frequency
7/27/16	7	AIRPORT PLAZA PM	1YR PM
8/11/16	7	NEW CASTLE POINT PM	1YR PM
8/17/16	7	CEDAR POINTE PM	6MON PM
8/27/16	7	NEW CASTLE MANOR PM	1YR PM
8/31/16	7	CASTLE HILLS PM	1YR PM
9/6/16	7	GOVERNORS FIELD PM	5YR PM
9/29/16	7	WOODBURNE PM	5YR PM
10/8/16	7	JEFFERSON FARMS PM	1YR PM
10/14/16	7	STRATFORD PM	1YR PM
10/17/16	7	CARRIAGE RUN PM	2YR PM
10/23/16	7	ROGERS MANOR PM	1YR PM
10/28/16	7	BUCKLEY PM	3YR PM
10/31/16	7	MELANIE WOOD PM	2YR PM
11/2/16	7	PLEASANTVILLE PM	1YR PM
11/4/16	7	WIILLARD MANOR PM	1YR PM
11/11/16	7	OLDE MILL VILL PM	3YR PM
12/4/16	7	BOOTHURST PM	1YR PM
12/5/16	7	CENTENNIAL VILL	3YR PM
1/13/17	7	VAN DYKE VILLAGE PM	3YR PM
2/9/17	7	CHURCHMANS CNTR	2YR PM
2/27/17	7	BUTTONWOOD	2YR PM
3/7/17	7	TAYLORTOWNE PM	3YR PM
3/11/17	7	CHARWOOD ESTATES	2YR PM
3/25/17	7	GREENBRIAR	2YR PM
4/15/17	7	MANOR PARK PM	2YR PM
4/20/17	7	LEEDOM ESTATES PM	2YR PM
5/14/17	7	SWANWYCK ESTATES &	2YR PM
		GARDENS PM	

	Proj Start Date	Council	Location Details	PM Frequency	
	8/25/16	8	RIVERWOODS PM	1YR PM	
	8/26/16	8	WHITES VILLAGE PM	1YR PM	
	8/29/16	8	BEVERLY WOODS PM	3YR PM	
	9/2/16	8	EDGEMOOR GARDENS PM	1YR PM	
	9/10/16	8	DARLEY WOODS PM	1YR PM	
	9/19/16	8	MERIDEN PM	3YR PM	
	9/24/16	8	EDGEMOOR TERRACE PM	1YR PM	
	10/6/16	8	BELLEFONTE PM	2YR PM	
	10/7/16	8	BELLEVUE HILLS PM	3YR PM	
	10/8/16	8	WINDYBUSH PM	1YR PM	
	10/10/16	8	BRANDYWINE FARMS PM	3YR PM	
	10/24/16	8	ASHBOURNE HILLS PM	1YR PM	
	10/29/16	8	GORDON HEIGHTS PM	1YR PM	
	10/31/16	8	LYNNFIELD PM	2YR PM	
	10/31/16	8	KUTZ HOME PM	1YR PM	
	11/17/16	8	SPRING VALLEY APTS PM	1YR PM	
	11/19/16	8	PENNY ACRES PM	1YR PM	
•	12/5/16	8	BELLEVUE HALL PM	3YR PM	
	1/6/17	8	EAST POINTE APTS PM	1YR PM	
	1/28/17	8	NORTHRIDGE	2YR PM	
	2/4/17	8	TOP OF THE HILL PM	1YR PM	
	2/6/17	8	ASHBOURNE HLS EX PM	3YR PM	
	2/18/17	8	CLAYMONT CENTRE PM	1YR PM	
	3/31/17	8	FOREST HILLS PK PM	2YR PM	
	4/17/17	8	VALLEY RUN ETC. PM	2YR PM	
	4/30/17	8	BROOKSTONE PM	2YR PM	
	4/30/17	8	HOLLY OAK TERRACE PM	2YR PM	
•	5/6/17	8	BRANDYW 100 APTS PM	1YR PM	
	5/7/17	8	RADNOR GREEN PM	2YR PM	
	5/7/17	8	HILLTOP MANOR PM	2YR PM	
	5/7/17	8	CLAYMONT ADDITION PM	2YR PM	
	5/18/17	8	DELAIRE PM	2YR PM	
	5/22/17	8	SHELLBURNE	2YR PM	
	5/22/17	8	SHELLBURNE	2YR PM	
•					

	Proj Start Date	Cour
	8/19/16	9
	8/25/16	9
	9/13/16	9
	10/1/16	9
	10/2/16	9
	10/7/16	9
	10/14/16	9
	10/25/16	9
	11/19/16	9
	12/3/16	9
	12/4/16	9
	12/5/16	9
	2/26/17	9
	3/11/17	9
	3/16/17	9
	3/20/17	9
	4/6/17	9
	5/20/17	9
	5/22/17	9
•	6/7/17	9
	6/25/17	9

Location Details	PM Frequency
ALBERTSON PARK PM	1YR PM
ARUNDEL PM	1YR PM
BRAND SPR PK PM	4YR PM
HARMONY HILLS PM	1YR PM
HARMONY CREST PM	1YR PM
TREE TOP PM	3YR PM
KIAMENSI GARDENS PM	1YR PM
BELFORD MANOR PM	3YR PM
SKYLINE CREST PM	1YR PM
MARSHALLTON GREEN	2YR PM
ROSEVILLE PARK	2YR PM
WELLINGTON ARMS PM	3YR PM
DRIFTWOOD PM	1YR PM
DELAPLANE MANOR	2YR PM
SKYLINE RIDGE	2YR PM
WEST MEADOW PM	2YR PM
HENDERSON HGHTS. PM	1YR PM
ABBEY WALK PM	1YR PM
MONTCLARE PM	2YR PM
VOODLAND HEIGHTS PM	1YR PM
MARSHALLTON PM	2YR PM

	Proj Start Date	Council	Location Details	PM Frequency
	7/31/16	10	RIZZO PM	1YR PM
	8/11/16	10	MANSION PARK PM	1YR PM
	8/19/16	10	ALBAN PARK PM	2YR PM
	10/30/16	10	HOLLOWAY TERRACE PM	1YR PM
	11/10/16	10	MAYVIEW MANOR PM	1YR PM
	12/7/16	10	DUNLEITH PM	1YR PM
	2/10/17	10	MINQUADALE	2YR PM
	12/2/16	11	SPARROW RUN	2YR PM
	1/30/17	11	BUCKINGHAM PL PM	4YR PM
•	4/20/17	11	CEDARWOOD APTS. PM	1YR PM
	5/14/17	11	PORTER SQUARE PM	2YR PM
	6/7/17	11	ELMWOOD PM	1YR PM
	6/10/17	11	SHERWOOD FOREST PM	2YR PM
	10/28/16	12	CARAVEL HUNT PM	3YR PM
	11/21/16	12	DOBBINSVILLE PM	1YR PM
	12/5/16	12	COUNTRY WOODS PM	3YR PM
	3/13/17	12	PORT PENN	2YR PM
	4/7/17	12	BEAVERBROOK APTS PM	2YR PM
	5/20/17	12	NEW CASTLE 2 PM	2YR PM
	5/20/17	12	NEW CASTLE 1 PM	2YR PM
•	5/26/17	12	NEW CASTLE 3 PM	2YR PM
	6/4/17	12	NEW CASTLE 4 PM	2YR PM
	6/12/17	12	KINGSCROFT PM	2YR PM

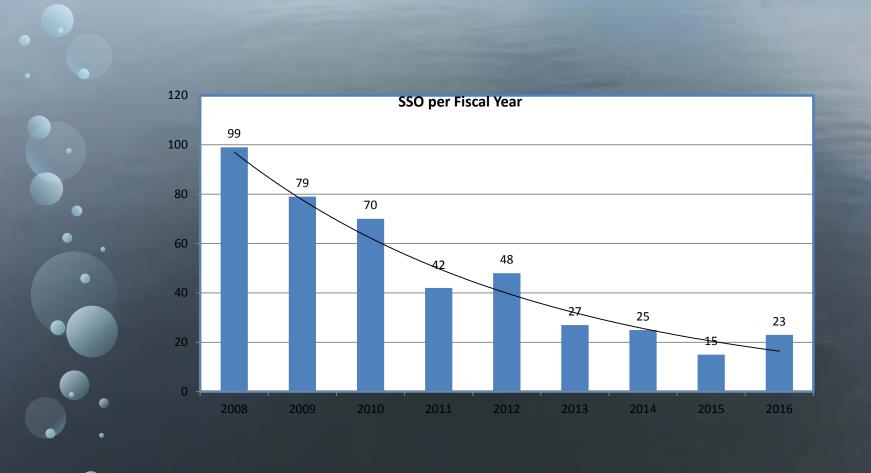
#### Sanitary Sewer Overflow Summary - FY2016

#### New Castle County Sanitary Sewer Overflows

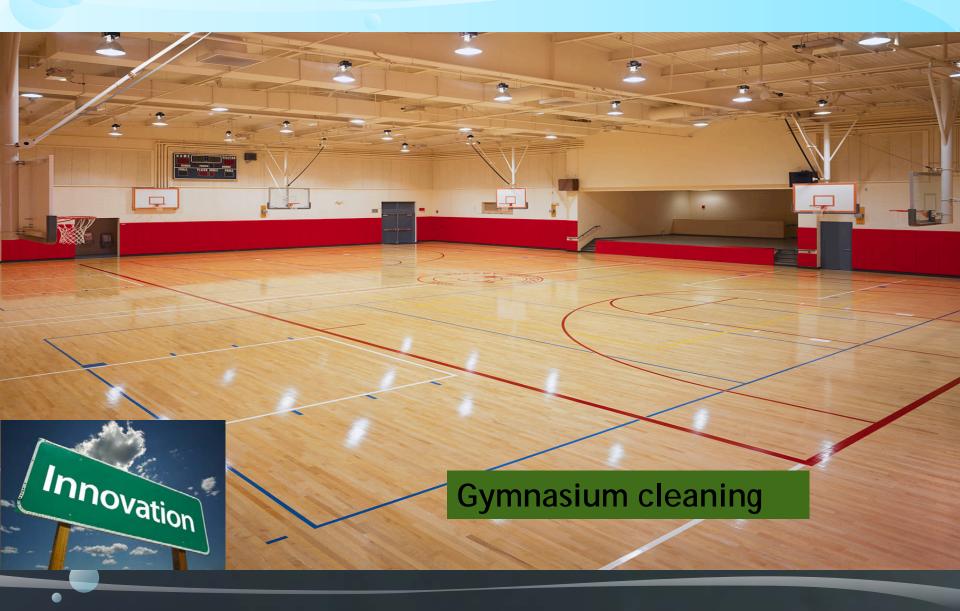
#### Fiscal Year 2016 SSO Summary

Fiscal Year	Debris	Grease	Rain	Root	Structural Failure	Third Party Action	Misc.	TOTAL	Miles of Sewer	SSO/ 100 miles
2016 - 1st Q		3						3		
7/1 - 9/30/2015		13.04%						13.04%	1758	0.171
Gallons		1,075						1,075		
2016 - 2nd Q	1	3						4		
10/1 - 12/31/2015	4.35%	13.04%						17.39%	1758	0.228
Gallons	300	800						1,100		
2016 - 3rd Q	1	2				1		4		
1/1 - 3/31/2016	4.35%	8.70%				4.35%		17.39%	1758	0.228
Gallons	100	600				600		1,300		
2016 - 4th Q	1	6		4	1			12		
4/1 - 6/30/2016	4.35%	26.09%		17.39%	4.35%			52.17%	1758	0.683
Gallons	600	2,005		1,100	300			4,005		
2016 FY Total Count	3	14	0	4	1	1	0	23	1750	1 200
Total Gallons	1,000	4,480	0	1,100	300	600	0	7,480	1758	1.308

#### Sanitary Sewer Summary - Fiscal Years 2008 - 2016



## Key Changes to Current PM Practices



# PM Program Change - Philosophy of Cleaning

- Pipes clog at varying rates
  - Slope/velocity
  - FOG
  - Trees
  - Age/Materials of Construction
- Only some pipes need to be cleaned frequently
- Some pipes may almost never need cleaning

## Hotel Cleaning

- Switch from Gymnasium Cleaning to Hotel Cleaning
- Only clean pipes that need cleaning (~30% -75% need to be cleaned)
  - Prevent mainline blockages and SSO's by cleaning before clog occurs.





#### PM Program Change - Determine cleaning need

- Pre-cleaning inspections: determine extent of pipe blockage (i.e., define cleaning need)
  - Use acoustic tool: Sewer Line Rapid Assessment Tool
  - Inspect over 10,000 ft/day





## Interceptor/Trunkline Evaluation

- Typical Sewer Basin Rehabilitation Process
  - Flow Monitoring and Modelling
  - Conduct Smoke Testing and CCTV as needed in Neighborhoods
  - Rehabilitate Neighborhood Sewers
    - Best/Least expensive to reduce I/I at the source
  - Evaluate Interceptors/Trunklines
  - Rehabilitate or Replace Interceptors/Trunklines
- Sewer Cleaning is first step in Evaluation

## Interceptor/Trunkline Evaluation

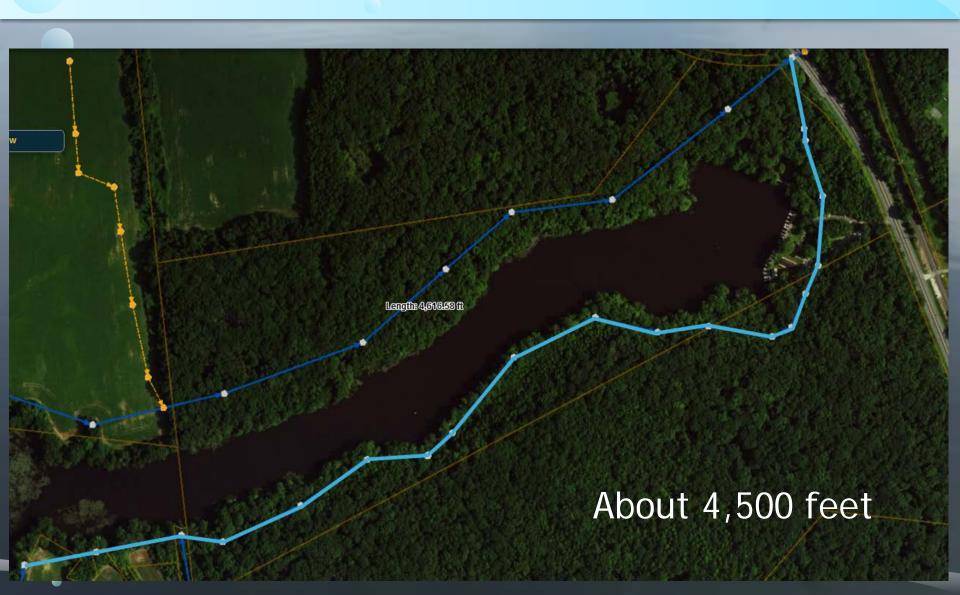
- Interceptor/Trunkline Challenges
  - Large Diameter Pipe
    - Requires a lot of water for cleaning
  - Large Amount of Debris
    - Quantity and size
  - Poor Access
    - Requires detailed planning/coordination



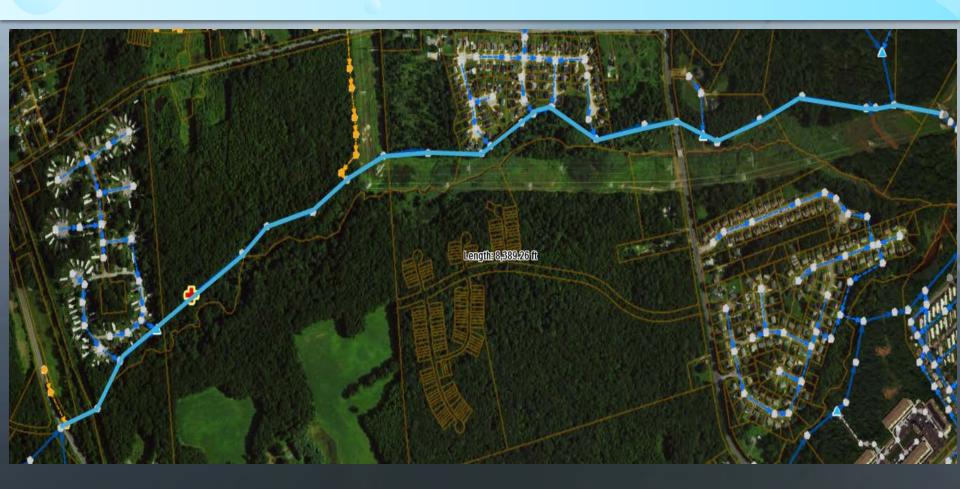
- Recycles wastewater for cleaning
  - Cleans up to 6,000 feet from one location



## South Christiana Evaluation - Part 1A



### South Christiana Evaluation - Part 1B





About 8,500 feet

# Thank you!

#### **Rob Roff**

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