Weston & Sampson

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REPORT

October 2018

TOWN OF
Dedham
MASSACHUSETTS

2018 Sewer Manhole Investigation
FINAL - Report

Weston & Sampson

5 Centennial Drive, Peabody, MA 01960 (HQ)
Tel: 978.532.1900

Town of Dedham, Massachusetts
Weston & Sampson Project No. 2180144

October 3, 2018

Jason L. Mammone, PE
Director of Engineering
Public Works Facility
55 River Street
Dedham, Massachusetts 02026

Re: Final Report – 2018 Sewer Manhole Investigation

Dear Mr. Mammone:

In accordance with our February 27, 2018 agreement, Weston & Sampson is pleased to submit our final report for the 2018 Sewer Manhole Investigation conducted in spring 2018. This project included topside manhole inspections in subareas KK, OO, QQ, TT, and VV as delineated in the attached Figure 1.

This report presents our analysis of the manhole inspection results, a cost-effectiveness analysis, and recommendations for sewer system improvements. The Department of Environmental Protection (DEP) *Guidelines for Performing I/I Analyses and Sewer System Evaluation Survey* (DEP Guidelines), updated May 2017, were used as a guide for the analysis.

Area Description and Project Objectives

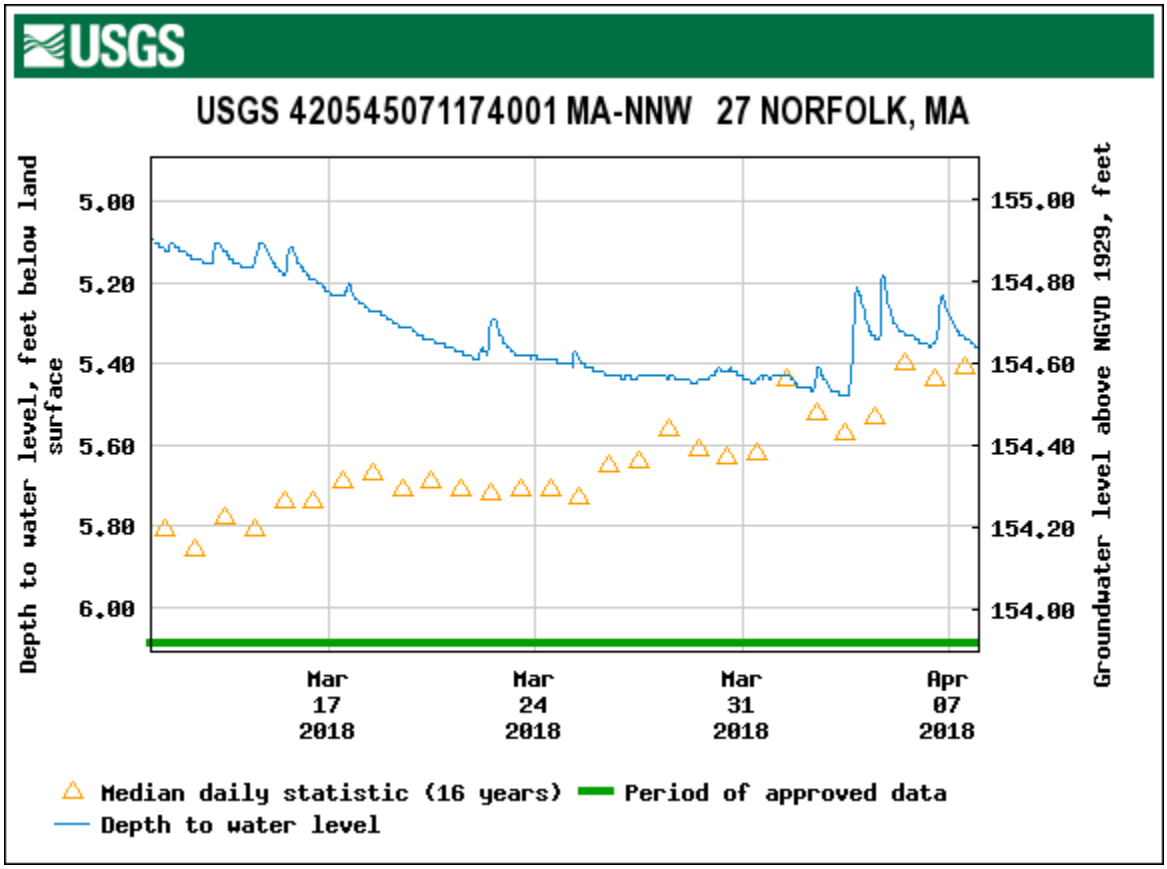
The Town of Dedham, Massachusetts is a residential community located southwest of Boston. Wastewater collected in the town drains east towards Boston where it enters Massachusetts Water Resources Authority (MWRA) interceptors at multiple locations. The flow is ultimately treated at the Deer Island Wastewater Treatment Plant. The town's wastewater collection system consists of approximately 94 miles of gravity sewer. A summary of the gravity sanitary sewer pipes and manholes is shown in Table 1, *Sewer System Summary*.

The 2018 Sewer Manhole Inspections goal was to identify sources of infiltration and inflow (I/I) in the sewer system. This aligns with one of the Town of Dedham's primary goals of reducing wastewater flow to the MWRA to limit user charges. By removing unnecessary and excessive I/I the sewer system flows will be reduced, leading to increased sewer capacities for future development. Additionally, the manhole inspections would identify and record the location and severity of defects. This is a results-driven approach which seeks to maximize the effectiveness of the investigation through total system maintenance along with I/I removal.

Groundwater Levels

According to the USGS groundwater gauge located in Norfolk, Massachusetts, groundwater levels during the 2018 Sewer Manhole Inspections (March 12 to April 6, 2018) were above the average springtime elevations. The springtime groundwater levels provide an optimal period to conduct investigations because during this time, the potential for infiltration is at its highest. Please note that the groundwater gauge site is located outside of Dedham and only serves to indicate regional groundwater elevation trends. This data is not a direct indication of the immediate study area. The following figure shows actual groundwater elevations, measured continuously, over the last year. This includes the time period in which the manholes inspections were performed. The blue line indicates actual measurements

and the orange triangles represent percentile classes of historical averages.



Topside Manhole Inspections

Manhole inspections consist of topside visual inspection of sanitary sewer manholes. Location, diameter, depth, material, casting and cover size, and source of any observed infiltration are recorded for each manhole. The inspections are ideally completed during high groundwater periods in order to identify I/I sources. The inspection also provides data on structural defects in manholes that should be repaired as part of the town's regular maintenance activities.

Weston & Sampson performed the inspection of 455 manholes from March 12 to April 6, 2018. An estimated 38,880 gpd of infiltration was identified in 59 manholes, and an estimated 5,772 gpd of peak design storm inflow was identified in 12 manholes. Manholes identified as sources of inflow are generally subject to ponding or can otherwise collect runoff during wet weather. The results of the manhole inspections are summarized in Table 2, *Manhole Summary.*

Non-infiltration related structural defects were found in 14 manholes such as loose or missing bricks in riser, cone, and bench and invert sections, or defective frames and covers. Recommendations for rehabilitation and estimated costs are listed in Table 3, *Manhole Structural Defects.*

Inspections were not performed at 28 locations where the manholes either could not be opened or located. These manholes are listed in Table 4, *Manhole Inspection Status*. All uninspected manholes should be located, opened, and inspected. Any necessary rehabilitation may then be added to the scope of the next construction phase. An electronic copy of all manhole inspection logs and photos are included on the attached external hard drive.

Database Development

Weston & Sampson created a Microsoft Access database designed specifically for the management of sewer manhole data. The database was developed so that data collected during subsequent investigations can be added and a single, comprehensive sewer manhole database is created over multiple years and phases. The database contains data fields for sewer system information such as manhole location, diameter, depth, material, casting and cover size, condition of manhole components, and source of any observed infiltration. The incoming and outgoing sewer pipe diameter, material, and position within the manhole are also included. An electronic copy of the database is included on the attached external hard drive.

Cost-Effectiveness Analysis

A cost-effectiveness analysis (CEA) was performed for all manhole defects to determine the merit of performing a given rehabilitation. The CEA compares the estimated cost for removing I/I to the estimated savings in transportation and treatment (T&T) costs resulting from I/I removal. T&T costs consist of capital expenditures required to expand and upgrade the wastewater system, plus annual operation and maintenance (O&M) costs. O&M costs are directly related to the quantity of flow being discharged to pump stations and treatment facilities.

The present worth of the T&T cost for the Town of Dedham was calculated using MWRA charges and O&M and capital costs provided by the town. The T&T costs have been extended throughout the projected life-cycle of the rehabilitation of 20 years. Using the DEP FY18 rate of 2.75%, extended over 20 years, the present worth of the Town of Dedham's T&T costs is $20.92. A memorandum detailing the methodology and the calculation of T&T costs may be found in Appendix A, *MWRA T&T Costs*.

T&T costs can change annually. Therefore, if the recommended rehabilitation program included in this report is not conducted within one year, Weston & Sampson recommends a re-calculation of the T&T costs to assure the design continues to be based on a valid CEA. Typically, when T&T costs increase, the scope of recommended rehabilitation will also increase.

The calculation of T&T costs for a particular I/I source considers only the portion of I/I that can be reduced through rehabilitation. The percentage of I/I that can be reduced depends greatly upon both the individual source and the specified repair method. Due to the potential for infiltration to migrate from a repaired defect to a nearby defect that may not have warranted rehabilitation or could not be identified during the inspection, the percentage of removable I/I is typically estimated to be 50 percent. This percentage of I/I reduction is identified in the CEA as "removable" infiltration.

The rehabilitation costs used in the CEA for each rehabilitation method are actual as-bid construction unit costs from the Town of Dedham's 2018 Sewer On-Call Services Contract with Rapid Flow, Inc. The rehabilitation costs listed in this report do not include the cost of additional investigative work or engineering services during design and construction. A list of rehabilitation unit costs used in the CEA is included in Appendix A, *As-Bid Unit Costs for Rehabilitation*.

The CEA table shows the T&T cost associated with the observed infiltration as well as recommended rehabilitation methods and costs. The analysis produces one of four conclusions:

- *Excessive* indicates the cost to rehabilitate the line segment is less than the associated T&T cost and that rehabilitation is recommended.
- *Value-Effective* indicates the rehabilitation cost is more than the T&T cost, but the rehabilitation is still recommended because of the relative value of the repair.

- *Non-Excessive* indicates the cost to rehabilitate the line segment is more than the T&T cost and rehabilitation is not recommended at this time.
- *Non-Excessive Recommended* indicates the rehabilitation cost is more than the T&T cost, but rehabilitation is recommended due to the severity of the defect. Non-Excessive Recommended rehabilitations include defects that are in need of structural repairs and could become sources of infiltration, or result in emergency repairs as the condition of the defect continues to degrade.

The CEA results for manhole infiltration and a summary of the recommended rehabilitation costs are provided in Table 5, *MWRA CEA for Infiltration.* The CEA results for manhole inflow with recommended rehabilitation costs are included in Table 6, *MWRA CEA for Inflow.* A summary of the results of the CEA are as follows:

- 19,440 gpd of excessive removable infiltration and 5,772 gpd of peak design storm inflow at an estimated rehabilitation cost of $63,842. The associated T&T cost is $525,916.
- 0 gpd of non-excessive recommended removable infiltration at an estimated rehabilitation cost of $4,866.

In addition, the following structural manhole repairs are not cost-effective but are recommended and included in the Recommended Rehabilitation Program:

- $9,750 to replace frame and/or cover of seven manholes
- $1,000 to repair the chimney of four manholes
- $2,000 to repair the bench and invert of four manholes

Conclusions & Recommendations

Based on the observations made during the 2018 Sewer Manhole Investigation, Weston & Sampson has developed a Recommended Rehabilitation Program for identified defects and sources of I/I within the inspected manholes. The recommended rehabilitations are provided in Tables 5 and 6, with a summary provided below.

Recommended Rehabilitation Program:

Perform root treatment of 8 manholes:	$	2,000
Cementitious lining of 63 manholes:	$	64,308
Replace six manhole frames and covers:	$	9,000
Replace one manhole cover:	$	750
Repair four manhole chimneys:	$	1,000
Repair four manhole bench and inverts:	$	2,000
Installation of 12 inflow dishes:	$	2,400
Total Construction Cost:	**$**	**81,458**

It is important to note that manhole structures may degrade between the time of inspection and the time of rehabilitation. Generally, the more time that elapses the greater the chance of material and structural degradation.

Future Work

Weston & Sampson recommends that the town continue with its proactive approach towards inspection and rehabilitation of its sewer system. Annual sewer system inspection ensures that necessary rehabilitation work is identified and performed on a regular and timely basis to reduce I/I and prevent serious problems requiring costly emergency repairs. It is recommended that manhole inspections of as many as 725 manholes be conducted in sewer subareas EE, II, NN, SS and WW as part of Year 2 of the Annual I/I Program in Spring 2019. We are available to provide a scope and cost for this work at your request.

We wish to thank you and the members of the Engineering Department staff for their assistance while completing this project. We are available to meet with you at your earliest convenience to discuss this report. Please do not hesitate to contact me at (978) 532-1900 with any questions or comments you may have.

Sincerely,

WESTON & SAMPSON

Donald G. Gallucci, PE
Vice President

cc: Nathan S. Buttermore, PE, Infrastructure Engineer
Ronald I. Lawrence, Project Engineer

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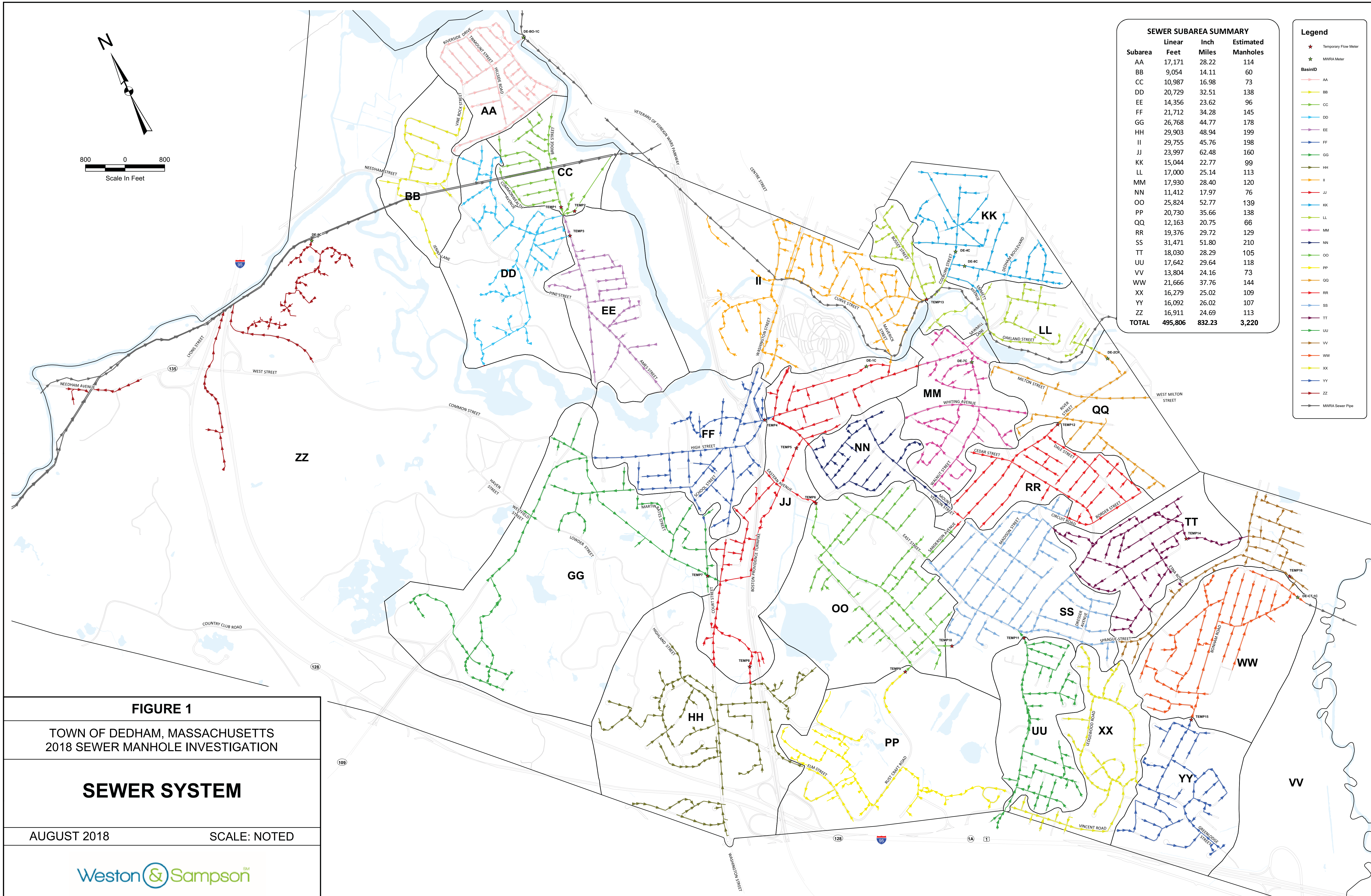
FIGURES

FIGURES 1 – SEWER SYSTEM



SEWER SUBAREA SUMMARY

Subarea	Linear Feet	Inch Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	60
CC	10,987	16.98	73
DD	20,729	32.51	138
EE	14,356	23.62	96
FF	21,712	34.28	145
GG	26,768	44.77	178
HH	29,903	48.94	199
II	29,755	45.76	198
JJ	23,997	62.48	160
KK	15,044	22.77	99
LL	17,000	25.14	113
MM	17,930	28.40	120
NN	11,412	17.97	76
OO	25,824	52.77	139
PP	20,730	35.66	138
QQ	12,163	20.75	66
RR	19,376	29.72	129
SS	31,471	51.80	210
TT	18,030	28.29	105
UU	17,642	29.64	118
VV	13,804	24.16	73
WW	21,666	37.76	144
XX	16,279	25.02	109
YY	16,092	26.02	107
ZZ	16,911	24.69	113
TOTAL	**495,806**	**832.23**	**3,220**

FIGURE 1

TOWN OF DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

SEWER SYSTEM

AUGUST 2018 SCALE: NOTED

Weston & Sampson

TABLES

TABLE 1
SEWER SYSTEM SUMMARY
DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	Estimated Linear Footage (ft)	Inch*Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	60
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XX	16,279	25.02	109
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ZZ	16,911	24.69	113
TOTAL	495,806	832.23	3,220

TABLE 2
MANHOLE SUMMARY
DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
KK	010	COLBURN STREET	LINED	7	0	0
KK	040	COLBURN STREET	LINED	9.9	0	0
KK	060	COLBURN STREET	LINED	11.1	0	0
KK	080	COLBURN STREET	LINED	10.6	864	0
KK	100	COLBURN STREET	BRICK	9	0	0
KK	110	COLBURN STREET	LINED	9.1	0	0
KK	120	COLBURN STREET	LINED	8.7	0	0
KK	130	COLBURN STREET	LINED	7.9	0	0
KK	140	COLBURN STREET	LINED	9.9	0	0
KK	150	COLBURN STREET	BRICK	9.4	0	0
KK	160	EMMETT AVENUE	LINED	8.1	0	0
KK	170	EMMETT AVENUE	BRICK	8.1	0	0
KK	180	HARDING TERRACE	BRICK	8.9	0	0
KK	190	HARDING TERRACE	LINED	10.7	0	0
KK	195	HARDING TERRACE	LINED	10.4	0	0
KK	200	HARDING TERRACE	LINED	10.5	0	0
KK	210	HARDING TERRACE	LINED	9.7	4,320	0
KK	220	HARDING TERRACE	LINED	7.9	0	0
KK	230	HARDING TERRACE	LINED	8.5	0	0
KK	240	HARDING TERRACE	LINED	6.3	0	0
KK	250	HARDING TERRACE	BRICK	6.9	0	0
KK	260	LEONARD STREET	BRICK	7	0	0
KK	270	HARDING TERRACE	BRICK	8.7	0	0
KK	280	HARDING TERRACE	PRECAST	6.3	0	0
KK	282	HARDING TERRACE	PRECAST	10.7	0	0
KK	284	HARDING TERRACE	PRECAST	7	0	0
KK	290	STAFFORD STREET	LINED	7.8	0	0
KK	300	GARFIELD ROAD	PRECAST	10	0	0
KK	310	GARFIELD ROAD	BRICK	11.6	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
KK	320	GARFIELD ROAD	LINED	9	0	0
KK	330	GARFIELD ROAD	LINED	8	0	0
KK	340	GARFIELD ROAD ESMT	PRECAST	8.4	0	0
KK	350	GARFIELD ROAD	PRECAST	5.1	0	0
KK	360	GARFIELD ROAD	PRECAST	3.9	0	0
KK	370	GARFIELD ROAD	PRECAST	4.1	0	0
KK	380	GARFIELD ROAD	PRECAST	3.9	0	0
KK	390	DEDHAM BOULEVARD	PRECAST	5.9	0	0
KK	400	DEDHAM BOULEVARD	PRECAST	5.6	0	0
KK	410	DEDHAM BOULEVARD	PRECAST	4.8	0	0
KK	410 A	DEDHAM BOULEVARD	PRECAST	3.7	0	0
KK	420	DEDHAM BOULEVARD	PRECAST	6.5	0	0
KK	430	CLEVELAND STREET	BRICK	6.9	1,008	0
KK	440	CLEVELAND STREET	BRICK	7.9	0	0
KK	450	CLEVELAND STREET	BRICK	10	0	0
KK	460	LEONARD STREET	LINED	6.7	0	0
KK	470	LEONARD STREET	BRICK	2.2	0	0
KK	490	LEONARD STREET	BRICK	4.9	0	0
KK	491	HIGH ROCK AVENUE	PRECAST	6.4	0	0
KK	492	HIGH ROCK AVENUE	PRECAST	7.7	0	0
KK	500	LEONARD STREET	LINED	7.8	0	0
KK	510	LEONARD STREET	BRICK	6.9	0	0
KK	520	LEONARD STREET	CNL			0
KK	530	GREENHOOD STREET	LINED	8.4	0	0
KK	540	GREENHOOD STREET	BRICK	7.8	0	0
KK	550	BERLIN STREET	BRICK	6.9	0	0
KK	551	BERLIN STREET	CNL			0
KK	560	WHITEHALL STREET	BRICK	6.5	0	0
KK	570	WHITEHALL STREET	BRICK	6.7	0	0
KK	580	GREENHOOD STREET	LINED	7.4	0	0
KK	581	MEADOW STREET	LINED	5.2	0	0
KK	590	GREENHOOD STREET	BRICK	7.2	288	0
KK	600	GREENHOOD STREET	BRICK	7.2	0	0
KK	610	GREENHOOD STREET	BRICK	8.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
KK	620	GREENHOOD STREET	BRICK	7.4	0	0
KK	630	MEADOW STREET	BRICK	4.1	0	0
KK	635	MEADOW STREET	CNL			0
KK	640	MEADOW STREET	BRICK	5.6	0	0
KK	650	MEADOW STREET ESMT	CNL			0
KK	670	MEADOW STREET ESMT	CNL			0
KK	680	COLONIAL DRIVE	LINED	8.6	0	0
KK	690	THOMAS STREET	LINED	11.7	0	0
KK	700	THOMAS STREET	LINED	5.4	0	0
KK	710	THOMAS STREET	PRECAST	8.9	0	0
KK	720	THOMAS STREET	PRECAST	7.8	0	0
KK	730	COLONIAL DRIVE	LINED	5.5	0	0
KK	740	COLONIAL DRIVE	PRECAST	5.5	0	0
KK	750	HYDE PARK STREET	BRICK	8.6	0	0
KK	760	HYDE PARK STREET	PRECAST	8.4	0	0
KK	761	HYDE PARK STREET	BRICK	8.8	144	703
KK	770	HYDE PARK STREET	LINED	7.2	0	0
KK	771	HYDE PARK STREET	BRICK	6.8	0	0
KK	772	HYDE PARK STREET	BRICK	6	288	0
KK	780	FOREST STREET	PRECAST	4.5	0	0
KK	790	FOREST STREET	LINED	4.1	0	0
KK	800	BISMARK STREET	PRECAST	7	0	586
KK	810	BISMARK STREET	PRECAST	5.9	0	0
KK	830	WHITEHALL STREET	BRICK	8.6	0	0
KK	850	WHITEHALL STREET	BRICK	9.3	0	0
KK	860	WHITEHALL STREET	LINED	8.5	0	0
KK	880	WHITEHALL STREET	LINED	8.3	0	0
KK	890	FOREST STREET	BRICK	9.2	0	0
KK	910	WARE STREET	LINED	10	0	0
KK	930	WARE STREET	LINED	5.9	0	0
KK	940	WARE STREET	LINED	6	0	0
KK	950	WARE STREET	PRECAST	5.7	0	0
KK	960	WARE STREET	PRECAST	7.9	0	0
KK	965	WARE STREET	PRECAST	9.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
KK	970	WARE STREET	PRECAST	9.5	0	0
KK	1000	THOMPSON STREET	PRECAST	3.9	0	0
LL	795	PARADISE LANE	BRICK	6.1	144	0
OO	010	EASTERN AVENUE ESMT	PRECAST	12.3	0	293
OO	020	EASTERN AVENUE ESMT	PRECAST	10.7	0	0
OO	030	EASTERN AVENUE ESMT	LINED	10.7	0	0
OO	040	EASTERN AVENUE ESMT	CNO			0
OO	050	EASTERN AVENUE ESMT	PRECAST	10.9	0	0
OO	060	EASTERN AVENUE ESMT	CNL			0
OO	070	JERSEY STREET ESMT	PRECAST	10.7	0	0
OO	080	JERSEY STREET ESMT	CNO			0
OO	090	JERSEY STREET ESMT	PRECAST	8.2	0	0
OO	100	JERSEY STREET ESMT	CNL			0
OO	110	JERSEY STREET ESMT	CNO			0
OO	120	JERSEY STREET ESMT	PRECAST	8.5	0	0
OO	130	JERSEY STREET ESMT	CNO			0
OO	140	WENTWORTH STREET	PRECAST	10.6	0	0
OO	150	FAIRBANKS ROAD	LINED	10.9	0	0
OO	160	FAIRBANKS ROAD	LINED	12.9	0	0
OO	170	FAIRBANKS ROAD	LINED	14.6	0	234
OO	180	FAIRBANKS ROAD	LINED	14.5	0	0
OO	190	FAIRBANKS ROAD	PRECAST	13.4	720	0
OO	195	FAIRBANKS ROAD	PRECAST	11.4	0	0
OO	200	FAIRBANKS ROAD	PRECAST	5.1	0	0
OO	210	FAIRBANKS ROAD	PRECAST	10.7	0	0
OO	220	HARDING TERRACE	PRECAST	9.2	0	0
OO	230	JERSEY STREET ESMT	PRECAST	9.6	144	0
OO	240	CENTRAL AVENUE	LINED	11	144	0
OO	250	CENTRAL AVENUE	BRICK	8.3	288	0
OO	260	CENTRAL AVENUE	BRICK	9.5	0	187
OO	270	CENTRAL AVENUE	LINED	6.7	0	0
OO	290	CENTRAL AVENUE	PRECAST	5.6	0	0
OO	300	CENTRAL AVENUE	LINED	9.2	288	0
OO	310	WEST JERSEY STREET	LINED	7.8	288	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
OO	320	WEST JERSEY STREET	BRICK	7.5	288	0
OO	330	WEST JERSEY STREET	BRICK	7.4	0	0
OO	340	CENTRAL AVENUE	LINED	11.3	0	0
OO	350	PARK STREET	BRICK	9.5	0	0
OO	360	PARK STREET	BRICK	8.6	0	0
OO	370	PARK STREET	BRICK	6.8	0	0
OO	380	MAC'S PLACE	PRECAST	10.3	0	0
OO	400	POWERS STREET	PRECAST	5.6	0	0
OO	410	JERSEY STREET	LINED	6.5	0	0
OO	420	JERSEY STREET	LINED	6.9	0	0
OO	430	JERSEY STREET	BRICK	7.1	0	0
OO	440	JERSEY STREET	BRICK	9.6	432	0
OO	450	JERSEY STREET	LINED	10.7	0	0
OO	460	EAST STREET	BRICK	10.8	1,584	0
OO	470	EAST STREET	BRICK	8.1	288	0
OO	480	EAST STREET	BRICK	9.7	0	0
OO	490	OHIO STREET	BRICK	2.1	0	0
OO	500	AUTUMN LANE	LINED	7.7	0	0
OO	510	AUTUMN LANE	BRICK	10.5	0	0
OO	520	AUTUMN LANE	BRICK	10.1	0	0
OO	530	AUTUMN LANE	BRICK	7.8	0	0
OO	540	EAST STREET	BRICK	7	0	0
OO	550	EAST STREET	BRICK	8.4	0	0
OO	560	EAST STREET	BRICK	9.4	0	0
OO	570	EAST STREET	BRICK	10.1	144	0
OO	580	PURITAN LANE	BRICK	9.2	0	0
OO	590	PURITAN LANE	BRICK	9.6	0	0
OO	595	PURITAN LANE	BRICK	8.1	0	0
OO	600	PARK STREET	BRICK	8.2	144	0
OO	610	PARK STREET	BRICK	8.8	0	0
OO	620	PARK STREET	BRICK	9.8	0	0
OO	630	PARK STREET	BRICK	8	2,880	105
OO	640	WALNUT STREET	BRICK	9.5	1,152	0
OO	650	WALNUT STREET	BRICK	8.4	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
OO	660	JERSEY STREET ESMT	PRECAST	5.4	0	0
OO	670	WENTWORTH STREET	LINED	7.2	0	0
OO	680	WENTWORTH STREET	PRECAST	6.5	432	0
OO	690	WENTWORTH STREET	LINED	7.2	0	0
OO	710	WENTWORTH STREET	LINED	8.3	0	0
OO	713	WENTWORTH STREET	PRECAST	8.1	0	0
OO	715	WENTWORTH STREET	PRECAST	11.7	0	0
OO	717	EAST STREET	PRECAST	9.8	0	0
OO	719	EAST STREET	PRECAST	6.3	0	2,343
OO	721	EAST STREET	PRECAST	8.4	0	0
OO	723	EAST STREET	PRECAST	7.3	0	0
OO	725	SANDERSON AVENUE	LINED	7.7	0	0
OO	727	SANDERSON AVENUE	PRECAST	8.5	0	0
OO	729	SANDERSON AVENUE	LINED	9	0	0
OO	730	ENDICOTT STREET	LINED	3.3	0	0
OO	740	ENDICOTT STREET	LINED	3.8	0	0
OO	750	ENDICOTT STREET	BRICK	3.8	0	0
OO	760	ENDICOTT STREET	BRICK	7.2	0	0
OO	770	ENDICOTT STREET	BRICK	6	0	0
OO	780	ENDICOTT STREET	LINED	2.8	0	0
OO	790	FAIRBANKS ROAD	PRECAST	5.6	0	0
OO	800	WILDWOOD DRIVE	LINED	5.9	0	0
OO	810	WILDWOOD DRIVE	PRECAST	9.2	0	0
OO	820	WILDWOOD DRIVE	PRECAST	6.4	0	0
OO	830	DRAYTON ROAD	CNO			0
OO	840	OTIS AVENUE	LINED	7.5	0	0
OO	850	OTIS AVENUE	LINED	5.4	0	0
OO	860	OTIS AVENUE	LINED	13	864	0
OO	870	OTIS AVENUE	BRICK	9.3	0	0
OO	880	DURANT AVENUE	BRICK	9.7	0	0
OO	882	DRAYTON ROAD	PRECAST	3.4	0	0
OO	890	DURANT AVENUE	BRICK	10.4	0	0
OO	900	TAFT LANE	BLOCK	5.5	0	65
OO	910	WARE STREET	LINED	5.9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
OO	920	MILLS STREET	PRECAST	8	0	0
OO	921	MILLS STREET	PRECAST	6.1	0	0
OO	930	WARE STREET	PRECAST	7.2	0	0
OO	960	MADISON ST	LINED	7.6	0	0
OO	980	MADISON STREET	LINED	5	0	0
OO	990	THOMPSON STREET	BRICK	3.6	288	0
OO	1000	THOMPSON STREET	LINED	6.5	0	0
OO	1010	THOMPSON STREET	BRICK	8.2	0	0
OO	1020	MADISON STREET	LINED	8.6	720	0
OO	1030	MADISON STREET	BRICK	8	144	0
OO	1040	MCKINLEY AVENUE	LINED	11.7	0	0
OO	1041	MCKINLEY AVENUE	BRICK	6.8	0	0
OO	1042	MCKINLEY AVENUE	BRICK	6.1	0	0
OO	1043	MCKINLEY AVENUE	BRICK	6.4	0	0
OO	1045	SNOW LANE	CNL			0
OO	1050	MCKINLEY AVENUE	LINED	18.7	0	0
OO	1062	MCKINLEY AVENUE	LINED	9.3	0	0
OO	1065	RUSTCRAFT ROAD	LINED	12.7	576	0
OO	1075	RUSTCRAFT ROAD	LINED	10.9	0	0
OO	1090	RUSTCRAFT ROAD	BRICK	15.4	288	0
OO	1100	CENTRAL AVENUE	LINED	8.8	0	0
OO	1110	CENTRAL AVENUE	BRICK	9.9	0	0
OO	1120	MATTHEWS STREET	BRICK	9.9	0	0
OO	1130	CENTRAL AVENUE	LINED	10	0	0
OO	1140	CENTRAL AVENUE	BRICK	10	0	0
OO	1150	CENTRAL AVENUE	BRICK	9.8	0	0
OO	1152	GIBSON AVENUE	PRECAST	5.8	0	0
OO	1154	GIBSON AVENUE	PRECAST	5.2	0	0
OO	1160	CENTRAL AVENUE	BRICK	8.9	0	0
OO	1170	WENTWORTH STREET	PRECAST	4.1	0	0
OO	1180	WILDWOOD DRIVE	PRECAST	9.7	0	0
OO	1190	WILDWOOD DRIVE	PRECAST	7.9	0	0
OO	1200	WILDWOOD DRIVE	PRECAST	7	0	176
OO	1210	WILDWOOD DRIVE	PRECAST	5.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
OO	1220	WENTWORTH STREET	LINED	5.7	0	0
OO	1236	MCKINLEY AVENUE	CNL			0
OO	1250	OSCAR'S WAY	LINED	8.4	0	0
OO	1260	PLAIN STREET	PRECAST	6.9	0	0
OO	1270	EAST STREET ESMT	PRECAST	8.1	0	0
OO	1272	EAST STREET ESMT	PRECAST	6.3	0	0
QQ	008	PARADISE LANE	BRICK	9.2	1,008	0
QQ	009	PARADISE LANE	PRECAST	8.1	0	0
QQ	010	PARADISE LANE	PRECAST	6.2	0	0
QQ	020	PARADISE LANE	LINED	9	0	0
QQ	030	PARADISE LANE	LINED	7.4	0	0
QQ	040	RIVER STREET	LINED	7	0	0
QQ	045	RIVER STREET	PRECAST	6.2	0	0
QQ	050	RIVER STREET	LINED	7	288	0
QQ	060	RIVER STREET	LINED	7.5	0	0
QQ	070	RIVER STREET	LINED	8.2	0	0
QQ	080	RIVER STREET	BRICK	8.1	0	0
QQ	090	RIVER STREET	BRICK	9.7	0	0
QQ	100	RIVER STREET	BRICK	7.6	0	0
QQ	110	RIVER STREET	BRICK	6.7	0	0
QQ	120	RIVER STREET	BRICK	11.1	0	0
QQ	130	MILTON STREET	BRICK	11.2	0	0
QQ	140	MILTON STREET	LINED	14.7	0	0
QQ	150	MILTON STREET	BRICK	12.2	0	0
QQ	160	MILTON STREET	BRICK	10	0	0
QQ	170	MILTON STREET	BRICK	7	0	0
QQ	180	MILTON STREET	BRICK	10.6	0	0
QQ	190	MILTON STREET	BRICK	10.9	0	0
QQ	200	MILTON STREET	BRICK	12.2	0	0
QQ	210	MILTON STREET	BRICK	14.1	0	0
QQ	220	MILTON STREET	BRICK	11.2	0	0
QQ	230	MILTON STREET	BRICK	10.2	0	0
QQ	240	MILTON STREET	BRICK	7.3	0	0
QQ	260	CLIFF WAY	BLOCK	2	0	586

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
QQ	270	FLANAGAN PLACE	BRICK	7.8	0	0
QQ	280	FLANAGAN PLACE	PRECAST	7.2	0	0
QQ	300	WHITING AVENUE	BRICK	12	288	0
QQ	306	AZALEA CIRCLE	PRECAST	8.4	0	0
QQ	310	WHITING AVENUE	CNL			0
QQ	320	WHITING AVENUE	CNL			0
QQ	330	WHITING AVENUE	LINED	10.4	0	0
QQ	340	WHITING AVENUE	LINED	8.9	0	0
QQ	350	WHITING AVENUE	BRICK	7.2	0	0
QQ	360	WHITING AVENUE	PRECAST	6.5	0	0
QQ	370	WHITING AVENUE	PRECAST	5.4	0	260
QQ	380	QUINCY AVENUE	BRICK	7.4	0	0
QQ	385	ASHCROFT STREET	CNL			0
QQ	390	QUINCY AVENUE	LINED	11.6	0	0
QQ	400	QUINCY AVENUE	BRICK	9.7	0	0
QQ	410	QUINCY AVENUE	BRICK	9.3	576	0
QQ	420	ASHCROFT STREET	BRICK	10.6	0	0
QQ	430	ASHCROFT STREET	LINED	17.6	0	0
QQ	440	ASHCROFT STREET	LINED	16.2	0	0
QQ	450	ASHCROFT STREET	PRECAST	16.1	0	0
QQ	460	ASHCROFT STREET	PRECAST	16.2	0	0
QQ	470	ASHCROFT STREET	PRECAST	11.6	0	0
QQ	480	ASHCROFT STREET	BRICK	5.6	0	0
QQ	490	ASHCROFT STREET	BRICK	3.5	0	0
QQ	500	ASHCROFT STREET	BLOCK	2.4	0	0
QQ	510	WILLIAMS AVENUE	PRECAST	7.1	0	0
QQ	520	BORDER STREET	PRECAST	8	0	0
QQ	530	BORDER STREET	PRECAST	6.9	0	0
QQ	540	PRATT AVENUE	BRICK	9.1	0	0
QQ	550	BLOSSOM STREET	BRICK	8.4	0	0
QQ	560	BLOSSOM STREET	BRICK	7	0	0
QQ	570	WHITING AVENUE	BRICK	8.3	0	0
QQ	580	WHITING AVENUE	BRICK	7.9	0	0
QQ	590	WHITING AVENUE	BRICK	7.9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
QQ	600	FAIRVIEW STREET	BRICK	7.6	0	0
QQ	610	FAIRVIEW STREET	BRICK	7.2	0	0
QQ	620	FAIRVIEW STREET	BRICK	7	0	0
QQ	630	SINCLAIR COURT	BRICK	7.8	0	0
TT	010	CAPEN LANE ESMT	BRICK	3.1	0	0
TT	020	CAPEN LANE ESMT	LINED	5.5	0	0
TT	025	CAPEN LANE ESMT	CNL			0
TT	030	CAPEN LANE ESMT	CNO			0
TT	035	CAPEN LANE ESMT	CNO			0
TT	040	CAPEN LANE ESMT	CNO			0
TT	045	CAPEN LANE ESMT	BRICK	5.6	0	0
TT	050	CAPEN LANE ESMT	LINED	7.1	0	0
TT	060	CAPEN LANE	BRICK	7.4	3,888	0
TT	070	POPLAR STREET	BRICK	8.9	0	0
TT	080	PAUL STREET	BRICK	6.7	0	0
TT	090	PAUL STREET	BRICK	8	0	0
TT	100	POPLAR STREET	BRICK	6.1	0	0
TT	110	POPLAR STREET ESMT	CNL			0
TT	120	POPLAR STREET ESMT	BRICK	6.6	0	0
TT	130	POPLAR STREET ESMT	BRICK	7.8	0	0
TT	140	ETNA ROAD	BRICK	10	0	0
TT	150	PAUL STREET	BRICK	9.1	0	0
TT	160	ETNA ROAD	BRICK	8	0	0
TT	170	TOWER STREET	BRICK	10.7	0	0
TT	180	ALDEN STREET	PRECAST	12.7	0	0
TT	185	ETNA ROAD	CNL			0
TT	190	ETNA ROAD	PRECAST	10.1	0	0
TT	210	ALDEN STREET	PRECAST	8	720	0
TT	220	ALDEN STREET	PRECAST	8.1	0	0
TT	230	ALDEN STREET	BRICK	7.8	144	0
TT	240	ALDEN STREET	BRICK	6.9	0	0
TT	260	LOCUST STREET	BRICK	2.7	0	0
TT	270	TOWER STREET	PRECAST	10	0	0
TT	280	TOWER STREET	BRICK	11.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
TT	300	TOWER STREET	BRICK	6.9	0	0
TT	310	TOWER STREET	BRICK	6.5	0	0
TT	320	TURNER STREET	BRICK	10.9	0	0
TT	330	TURNER STREET	BRICK	14.2	0	0
TT	340	TURNER STREET	BRICK	7.8	0	0
TT	350	ALDEN STREET	BRICK	8	0	0
TT	370	ALDEN STREET	BRICK	9	0	0
TT	380	ALDEN STREET	BRICK	9.9	0	0
TT	390	TAYLOR AVENUE	BRICK	9	0	0
TT	400	TAYLOR AVENUE	BRICK	7.6	0	0
TT	410	ALDEN STREET	BRICK	7.9	0	0
TT	420	KIMBALL ROAD	BRICK	8.9	0	0
TT	430	KIMBALL ROAD	BRICK	8.8	0	0
TT	440	PAUL STREET	BRICK	6.9	0	0
TT	450	PAUL STREET	BRICK	8.3	144	0
TT	460	PAUL STREET	BRICK	8.5	144	0
TT	470	TURNER STREET	BRICK	10.5	144	0
TT	490	TURNER STREET	BRICK	8.9	0	0
TT	500	TURNER STREET	BRICK	7.3	0	0
TT	510	TURNER STREET	BRICK	9.5	0	0
TT	520	TURNER STREET	BRICK	8.6	2,160	0
TT	530	PAUL STREET	LINED	5.9	0	0
TT	540	CAPEN LANE	BRICK	8.3	1,008	0
TT	550	TARBOX STREET	LINED	6.9	0	0
TT	560	TARBOX STREET	BRICK	8.5	0	0
TT	570	TARBOX STREET	LINED	8.4	0	0
TT	580	TARBOX STREET	BRICK	9.4	0	0
TT	590	ETNA ROAD	BRICK	8.8	0	0
TT	600	TARBOX STREET	LINED	9	0	0
TT	610	TARBOX STREET	LINED	10.7	0	0
TT	620	TARBOX STREET ESMT	CNL			0
TT	630	CRANE STREET	LINED	6.6	720	0
TT	640	CRANE STREET	LINED	7.2	0	0
TT	650	CRANE STREET	LINED	5.8	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
TT	660	CRANE STREET	LINED	8.5	0	0
TT	670	ETNA ROAD	BRICK	9.5	0	0
TT	680	CRANE STREET	LINED	9.2	0	0
TT	690	CRANE STREET	BRICK	10.6	0	0
TT	700	SAVIN STREET	BRICK	7.6	0	0
TT	710	SAVIN STREET	BRICK	8	0	0
TT	720	SAVIN STREET	BRICK	6.9	0	0
TT	730	SAVIN STREET	BRICK	7.3	0	0
TT	740	CRANE STREET	LINED	11.2	0	0
TT	750	CRANE STREET	LINED	9.3	0	0
TT	760	CRANE STREET	BRICK	7.7	0	0
TT	770	CRANE STREET	BRICK	7.5	144	0
TT	780	CRANE STREET	BRICK	7	0	0
TT	790	CRANE STREET	BRICK	3.9	0	0
TT	800	CRANE STREET	LINED	6.9	0	0
TT	810	CRANE STREET ESMT	BRICK	6.3	0	0
TT	820	CRANE STREET ESMT	BRICK	6	0	0
TT	830	CRANE STREET ESMT	BRICK	5	144	0
TT	835	CRANE STREET ESMT	BRICK	7.7	0	0
TT	838	CRANE STREET ESMT	BRICK	6.5	0	0
TT	840	CEDAR STREET	BRICK	20.1	0	0
TT	850	CEDAR STREET	BRICK	12.9	0	0
TT	860	CEDAR STREET	BRICK	8.9	0	0
TT	870	CEDAR STREET	BRICK	10.7	288	0
TT	880	CEDAR STREET	BRICK	11.6	0	0
TT	890	TOWER STREET	BRICK	12.5	0	0
TT	900	TOWER STREET	LINED	12	0	0
TT	910	TOWER STREET	LINED	10.4	0	0
TT	920	TOWER STREET	BRICK	8	0	0
TT	930	TOWER STREET	BRICK	6.5	432	0
TT	940	PAUL STREET	BRICK	9.8	144	0
TT	950	PAUL STREET	BRICK	4.3	0	0
TT	960	TURNER STREET	LINED	9.5	0	0
TT	970	CEDAR STREET ESMT	BRICK	27.8	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
TT	980	CEDAR STREET ESMT	LINED	5.4	0	0
TT	990	CEDAR STREET ESMT	LINED	4.1	0	0
TT	1000	CEDAR STREET ESMT	LINED	6	0	0
TT	1010	SHIRETOWN ROAD	LINED	6.5	576	0
TT	1020	SHIRETOWN ROAD	BRICK	6.6	0	0
TT	1030	SHIRETOWN ROAD	BRICK	7.8	0	0
TT	1040	TOWER STREET	BRICK	3.4	0	0
VV	010	HOOPER ROAD	LINED	9.2	0	0
VV	020	HOOPER ROAD	BRICK	4.2	864	0
VV	030	HOOPER ROAD	LINED	10.7	0	0
VV	040	HOOPER ROAD	LINED	14.2	0	0
VV	050	HOOPER ROAD	LINED	15	0	0
VV	060	HOOPER ROAD	BRICK	8.4	0	0
VV	070	HOOPER ROAD	BRICK	7.9	0	0
VV	080	HOOPER ROAD	BRICK	9.8	0	0
VV	090	SPRAGUE STREET	BRICK	10	0	0
VV	100	SPRAGUE STREET	BRICK	9.6	0	0
VV	110	SPRAGUE STREET	BRICK	9.3	0	0
VV	115	SPRAGUE STREET	PRECAST	9.7	0	0
VV	118	NELSON DRIVE	PRECAST	8.3	0	0
VV	120	SPRAGUE STREET	BRICK	9.3	0	0
VV	130	SPRAGUE STREET	BRICK	14.2	0	0
VV	140	SPRAGUE STREET	BRICK	10.8	0	0
VV	150	SPRAGUE STREET	BRICK	10.4	1,728	0
VV	155	ETNA ROAD	PRECAST	5.9	0	0
VV	160	SPRAGUE STREET	BRICK	9.2	0	0
VV	170	SPRAGUE STREET	PRECAST	9	0	0
VV	180	SPRAGUE STREET	BRICK	8.6	288	0
VV	190	SPRAGUE STREET	BRICK	8.2	144	0
VV	200	SPRAGUE STREET	LINED	9	0	0
VV	210	SPRAGUE STREET	BRICK	8.5	288	0
VV	220	SPRAGUE STREET	BRICK	8.9	0	0
VV	230	SPRAGUE STREET	LINED	8.6	0	0
VV	240	SPRAGUE STREET	BRICK	9.7	288	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
VV	260	SPRAGUE STREET	LINED	8.7	0	0
VV	270	LOUISE ROAD	BRICK	7.8	0	0
VV	280	SAMSON CIRCLE	PRECAST	8.2	0	0
VV	300	TURNER STREET	BRICK	8	0	0
VV	308	AZALEA CIRCLE	PRECAST	9	0	0
VV	310	AZALEA CIRCLE	PRECAST	9	0	0
VV	320	STOUGHTON ROAD	LINED	9	0	0
VV	330	STOUGHTON ROAD	CNL			0
VV	340	DURHAM ROAD	LINED	7.3	0	0
VV	350	DURHAM ROAD	LINED	6.3	1,296	0
VV	360	DURHAM ROAD	BRICK	5	144	0
VV	365	DURHAM ROAD	PRECAST	4	0	234
VV	370	DURHAM ROAD	BRICK	9.1	0	0
VV	380	KENSINGTON ROAD	LINED	5.5	0	0
VV	390	KENSINGTON ROAD	LINED	8.6	0	0
VV	400	MOSELEY ROAD	LINED	11.2	0	0
VV	410	ARGYLE ROAD	BRICK	5	432	0
VV	415	ARGYLE ROAD	BRICK	5.9	0	0
VV	420	SPRAGUE STREET	LINED	8.2	0	0
VV	430	SPRAGUE STREET	BRICK	8.6	0	0
VV	440	SPRAGUE STREET	BRICK	9.2	0	0
VV	450	SPRAGUE STREET	BRICK	8.6	0	0
VV	460	DURHAM ROAD	BRICK	7.9	0	0
VV	470	SPRAGUE STREET	BRICK	8.8	0	0
VV	480	SPRAGUE STREET	BRICK	8.7	0	0
VV	490	SPRAGUE STREET	BRICK	10.3	0	0
VV	500	SPRAGUE STREET	BRICK	9.6	0	0
VV	510	SPRAGUE STREET	PRECAST	8.2	0	0
VV	520	SPRAGUE STREET	BRICK	8.1	0	0
VV	530	KENSINGTON ROAD	BRICK	7.6	576	0
VV	540	LEOMINSTER ROAD	BRICK	4.1	0	0
VV	550	LANCASTER ROAD	BRICK	8.7	432	0
VV	560	LANCASTER ROAD	BRICK	12.9	0	0
VV	570	LANCASTER ROAD	PRECAST	3.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
VV	580	LANCASTER ROAD	LINED	5.6	0	0
VV	590	LANCASTER ROAD ESMT	CNO			0
VV	600	LANCASTER ROAD ESMT	LINED	15.1	0	0
VV	610	LANCASTER ROAD	LINED	9.6	0	0
VV	620	LANCASTER ROAD	BRICK	6.6	0	0
VV	630	MCDONALD STREET	BRICK	7.7	288	0
VV	640	MCDONALD STREET	LINED	9.7	0	0
VV	650	MCDONALD STREET	LINED	8.5	0	0
VV	660	MCDONALD STREET	BRICK	8.4	0	0
VV	670	MCDONALD STREET	BRICK	7.3	0	0
VV	680	LAKESIDE AVENUE	CNL			0
VV	685	KUNKEL PLACE	CNO			0
TOTAL MANHOLE INFILTRATION					38,880	5,772
TOTAL NUMBER OF MANHOLES					483	
TOTAL NUMBER OF MANHOLES INSPECTED					455	

TABLE 3
MANHOLE STRUCTURAL DEFECTS
DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
KK	170	EMMETT AVENUE	REPLACE FRAME AND COVER, REPAIR CHIMNEY	$1,750
KK	270	HARDING TERRACE	REPAIR CHIMNEY	$250
KK	540	GREENHOOD STREET	REPLACE FRAME AND COVER	$1,500
KK	550	BERLIN STREET	REPAIR CHIMNEY	$250
KK	590	GREENHOOD STREET	REPLACE FRAME AND COVER	$1,500
KK	730	COLONIAL DRIVE	REPAIR CHIMNEY	$250
OO	1150	CENTRAL AVENUE	REPLACE FRAME AND COVER	$1,500
QQ	009	PARADISE LANE	REPLACE FRAME AND COVER	$1,500
TT	180	ALDEN STREET	REPAIR BENCH/INVERT	$500
TT	690	CRANE STREET	REPLACE FRAME AND COVER, REPAIR BENCH/INVERT	$2,000

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
TT	920	TOWER STREET	REPAIR CHIMNEY	$250
VV	310	AZALEA CIRCLE	REPLACE FRAME AND COVER	$1,500
VV	415	ARGYLE ROAD	REPAIR BENCH/INVERT	$500
VV	430	SPRAGUE STREET	REPAIR BENCH/INVERT	$500
TOTAL REHABILITATION COST				$13,750
TOTAL NUMBER OF MANHOLES				14

TABLE 4
MANHOLE INSPECTION STATUS

DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inspection Status
KK	520	LEONARD STREET	CNL
KK	551	BERLIN STREET	CNL
KK	635	MEADOW STREET	CNL
KK	650	MEADOW STREET ESMT	CNL
KK	670	MEADOW STREET ESMT	CNL
OO	040	EASTERN AVENUE ESMT	CNO
OO	060	EASTERN AVENUE ESMT	CNL
OO	080	JERSEY STREET ESMT	CNO
OO	100	JERSEY STREET ESMT	CNL
OO	110	JERSEY STREET ESMT	CNO
OO	130	JERSEY STREET ESMT	CNO
OO	830	DRAYTON ROAD	CNO
OO	1045	SNOW LANE	CNL
OO	1236	MCKINLEY AVENUE	CNL
QQ	310	WHITING AVENUE	CNL
QQ	320	WHITING AVENUE	CNL
QQ	385	ASHCROFT STREET	CNL

Subarea	MH #	Street Name	Inspection Status
TT	025	CAPEN LANE ESMT	CNL
TT	030	CAPEN LANE ESMT	CNO
TT	035	CAPEN LANE ESMT	CNO
TT	040	CAPEN LANE ESMT	CNO
TT	110	POPLAR STREET ESMT	CNL
TT	185	ETNA ROAD	CNL
TT	620	TARBOX STREET ESMT	CNL
VV	330	STOUGHTON ROAD	CNL
VV	590	LANCASTER ROAD ESMT	CNO
VV	680	LAKESIDE AVENUE	CNL
VV	685	KUNKEL PLACE	CNO
TOTAL NUMBER OF MANHOLES			28

Notes: CNL = Can Not Locate
CNO = Can Not Open

TABLE 5
MWRA COST EFFECTIVE ANALYSIS FOR INFILTRATION

DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
KK	080	COLBURN STREET	10.6	864	432	$9,037	Cementitious Lining	$1,272	EXCESSIVE RECOMMENDED
KK	210	HARDING TERRACE	9.7	4,320	2,160	$45,187	Cementitious Lining	$1,164	EXCESSIVE RECOMMENDED
KK	360	GARFIELD ROAD	3.9	0	0	$0	Root Treatment, Cementitious Lining	$718	NON-EXCESSIVE
KK	370	GARFIELD ROAD	4.1	0	0	$0	Root Treatment, Cementitious Lining	$742	NON-EXCESSIVE
KK	400	DEDHAM BOULEVARD	5.6	0	0	$0	Root Treatment, Cementitious Lining	$922	NON-EXCESSIVE
KK	420	DEDHAM BOULEVARD	6.5	0	0	$0	Root Treatment, Cementitious Lining	$1,030	NON-EXCESSIVE
KK	430	CLEVELAND STREET	6.9	1,008	504	$10,544	Cementitious Lining	$828	EXCESSIVE RECOMMENDED
KK	540	GREENHOOD STREET	7.8	0	0	$0	Cementitious Lining	$936	NON-EXCESSIVE RECOMMENDED
KK	590	GREENHOOD STREET	7.2	288	144	$3,012	Cementitious Lining	$864	EXCESSIVE RECOMMENDED
KK	761	HYDE PARK STREET	8.8	144	72	$1,506	Cementitious Lining	$1,056	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
KK	772	HYDE PARK STREET	6	288	144	$3,012	Cementitious Lining	$720	EXCESSIVE RECOMMENDED
KK	890	FOREST STREET	9.2	0	0	$0	Root Treatment, Cementitious Lining	$1,354	NON-EXCESSIVE RECOMMENDED
LL	795	PARADISE LANE	6.1	144	72	$1,506	Root Treatment, Cementitious Lining	$982	EXCESSIVE RECOMMENDED
OO	050	EASTERN AVENUE ESMT	10.9	0	0	$0	Root Treatment, Cementitious Lining	$1,558	NON-EXCESSIVE
OO	190	FAIRBANKS ROAD	13.4	720	360	$7,531	Cementitious Lining	$1,608	EXCESSIVE RECOMMENDED
OO	195	FAIRBANKS ROAD	11.4	0	0	$0	Root Treatment, Cementitious Lining	$1,618	NON-EXCESSIVE RECOMMENDED
OO	230	JERSEY STREET ESMT	9.6	144	72	$1,506	Cementitious Lining	$1,152	EXCESSIVE RECOMMENDED
OO	240	CENTRAL AVENUE	11	144	72	$1,506	Cementitious Lining	$1,320	EXCESSIVE RECOMMENDED
OO	250	CENTRAL AVENUE	8.3	288	144	$3,012	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
OO	300	CENTRAL AVENUE	9.2	288	144	$3,012	Cementitious Lining	$1,104	EXCESSIVE RECOMMENDED
OO	310	WEST JERSEY STREET	7.8	288	144	$3,012	Cementitious Lining	$936	EXCESSIVE RECOMMENDED
OO	320	WEST JERSEY STREET	7.5	288	144	$3,012	Cementitious Lining	$900	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
OO	350	PARK STREET	9.5	0	0	$0	Root Treatment, Cementitious Lining	$1,390	NON-EXCESSIVE
OO	440	JERSEY STREET	9.6	432	216	$4,519	Cementitious Lining	$1,152	EXCESSIVE RECOMMENDED
OO	460	EAST STREET	10.8	1,584	792	$16,569	Cementitious Lining	$1,296	EXCESSIVE RECOMMENDED
OO	470	EAST STREET	8.1	288	144	$3,012	Cementitious Lining	$972	EXCESSIVE RECOMMENDED
OO	570	EAST STREET	10.1	144	72	$1,506	Root Treatment, Cementitious Lining	$1,462	EXCESSIVE RECOMMENDED
OO	600	PARK STREET	8.2	144	72	$1,506	Cementitious Lining	$984	EXCESSIVE RECOMMENDED
OO	630	PARK STREET	8	2,880	1,440	$30,125	Cementitious Lining	$960	EXCESSIVE RECOMMENDED
OO	640	WALNUT STREET	9.5	1,152	576	$12,050	Cementitious Lining	$1,140	EXCESSIVE RECOMMENDED
OO	680	WENTWORTH STREET	6.5	432	216	$4,519	Cementitious Lining	$780	EXCESSIVE RECOMMENDED
OO	860	OTIS AVENUE	13	864	432	$9,037	Cementitious Lining	$1,560	EXCESSIVE RECOMMENDED
OO	910	WARE STREET	5.9	0	0	$0	Root Treatment, Cementitious Lining	$958	NON-EXCESSIVE RECOMMENDED
OO	990	THOMPSON STREET	3.6	288	144	$3,012	Cementitious Lining	$432	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
OO	1020	MADISON STREET	8.6	720	360	$7,531	Cementitious Lining	$1,032	EXCESSIVE RECOMMENDED
OO	1030	MADISON STREET	8	144	72	$1,506	Cementitious Lining	$960	EXCESSIVE RECOMMENDED
OO	1043	MCKINLEY AVENUE	6.4	0	0	$0	Root Treatment, Cementitious Lining	$1,018	NON-EXCESSIVE
OO	1065	RUSTCRAFT ROAD	12.7	576	288	$6,025	Cementitious Lining	$1,524	EXCESSIVE RECOMMENDED
OO	1090	RUSTCRAFT ROAD	15.4	288	144	$3,012	Cementitious Lining	$1,848	EXCESSIVE RECOMMENDED
QQ	008	PARADISE LANE	9.2	1,008	504	$10,544	Root Treatment, Cementitious Lining	$1,354	EXCESSIVE RECOMMENDED
QQ	050	RIVER STREET	7	288	144	$3,012	Cementitious Lining	$840	EXCESSIVE RECOMMENDED
QQ	300	WHITING AVENUE	12	288	144	$3,012	Cementitious Lining	$1,440	EXCESSIVE RECOMMENDED
QQ	410	QUINCY AVENUE	9.3	576	288	$6,025	Cementitious Lining	$1,116	EXCESSIVE RECOMMENDED
QQ	490	ASHCROFT STREET	3.5	0	0	$0	Root Treatment, Cementitious Lining	$670	NON-EXCESSIVE
QQ	630	SINCLAIR COURT	7.8	0	0	$0	Root Treatment, Cementitious Lining	$1,186	NON-EXCESSIVE
TT	060	CAPEN LANE	7.4	3,888	1,944	$40,668	Cementitious Lining	$888	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
TT	210	ALDEN STREET	8	720	360	$7,531	Cementitious Lining	$960	EXCESSIVE RECOMMENDED
TT	230	ALDEN STREET	7.8	144	72	$1,506	Cementitious Lining	$936	EXCESSIVE RECOMMENDED
TT	380	ALDEN STREET	9.9	0	0	$0	Root Treatment, Cementitious Lining	$1,438	NON-EXCESSIVE
TT	450	PAUL STREET	8.3	144	72	$1,506	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
TT	460	PAUL STREET	8.5	144	72	$1,506	Cementitious Lining	$1,020	EXCESSIVE RECOMMENDED
TT	470	TURNER STREET	10.5	144	72	$1,506	Cementitious Lining	$1,260	EXCESSIVE RECOMMENDED
TT	520	TURNER STREET	8.6	2,160	1,080	$22,594	Cementitious Lining	$1,032	EXCESSIVE RECOMMENDED
TT	540	CAPEN LANE	8.3	1,008	504	$10,544	Root Treatment, Cementitious Lining	$1,246	EXCESSIVE RECOMMENDED
TT	630	CRANE STREET	6.6	720	360	$7,531	Cementitious Lining	$792	EXCESSIVE RECOMMENDED
TT	770	CRANE STREET	7.5	144	72	$1,506	Cementitious Lining	$900	EXCESSIVE RECOMMENDED
TT	830	CRANE STREET ESMT	5	144	72	$1,506	Root Treatment, Cementitious Lining	$850	EXCESSIVE RECOMMENDED
TT	870	CEDAR STREET	10.7	288	144	$3,012	Cementitious Lining	$1,284	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
TT	930	TOWER STREET	6.5	432	216	$4,519	Cementitious Lining	$780	EXCESSIVE RECOMMENDED
TT	940	PAUL STREET	9.8	144	72	$1,506	Cementitious Lining	$1,176	EXCESSIVE RECOMMENDED
TT	970	CEDAR STREET ESMT	27.8	0	0	$0	Root Treatment, Cementitious Lining	$3,586	NON-EXCESSIVE
TT	1010	SHIRETOWN ROAD	6.5	576	288	$6,025	Cementitious Lining	$780	EXCESSIVE RECOMMENDED
VV	020	HOOPER ROAD	4.2	864	432	$9,037	Cementitious Lining	$504	EXCESSIVE RECOMMENDED
VV	150	SPRAGUE STREET	10.4	1,728	864	$18,075	Cementitious Lining	$1,248	EXCESSIVE RECOMMENDED
VV	180	SPRAGUE STREET	8.6	288	144	$3,012	Cementitious Lining	$1,032	EXCESSIVE RECOMMENDED
VV	190	SPRAGUE STREET	8.2	144	72	$1,506	Cementitious Lining	$984	EXCESSIVE RECOMMENDED
VV	210	SPRAGUE STREET	8.5	288	144	$3,012	Cementitious Lining	$1,020	EXCESSIVE RECOMMENDED
VV	240	SPRAGUE STREET	9.7	288	144	$3,012	Cementitious Lining	$1,164	EXCESSIVE RECOMMENDED
VV	350	DURHAM ROAD	6.3	1,296	648	$13,556	Cementitious Lining	$756	EXCESSIVE RECOMMENDED
VV	360	DURHAM ROAD	5	144	72	$1,506	Cementitious Lining	$600	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
VV	410	ARGYLE ROAD	5	432	216	$4,519	Cementitious Lining	$600	EXCESSIVE RECOMMENDED
VV	530	KENSINGTON ROAD	7.6	576	288	$6,025	Cementitious Lining	$912	EXCESSIVE RECOMMENDED
VV	550	LANCASTER ROAD	8.7	432	216	$4,519	Cementitious Lining	$1,044	EXCESSIVE RECOMMENDED
VV	630	MCDONALD STREET	7.7	288	144	$3,012	Cementitious Lining	$924	EXCESSIVE RECOMMENDED
TOTAL				38,880	19,440	$406,685		$80,566	
TOTAL NON-EXCESSIVE				0	0	$0		$14,258	
TOTAL EXCESSIVE RECOMMENDED				38,880	19,440	$406,685		$61,442	
TOTAL VALUE EFFECTIVE RECOMMENDED				0	0	$0		$0	
TOTAL NON-EXCESSIVE RECOMMENDED				0	0	$0		$4,866	
TOTAL RECOMMENDED				38,880	19,440	$406,685		$66,308	
TOTAL RECOMMENDED MANHOLES								63	

TABLE 6

MWRA COST EFFECTIVE ANALYSIS FOR INFLOW

DEDHAM, MASSACHUSETTS
2018 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inflow (gpd)	MWRA T+T Cost	Rehabilitation
KK	761	HYDE PARK STREET	703	$14,707	Install Inflow Dish
KK	800	BISMARK STREET	586	$12,259	Install Inflow Dish
OO	010	EASTERN AVENUE ESMT	293	$6,130	Install Inflow Dish
OO	170	FAIRBANKS ROAD	234	$4,895	Install Inflow Dish
OO	260	CENTRAL AVENUE	187	$3,912	Install Inflow Dish
OO	630	PARK STREET	105	$2,197	Install Inflow Dish
OO	719	EAST STREET	2,343	$49,016	Install Inflow Dish
OO	900	TAFT LANE	65	$1,360	Install Inflow Dish
OO	1200	WILDWOOD DRIVE	176	$3,682	Install Inflow Dish
QQ	260	CLIFF WAY	586	$12,259	Install Inflow Dish
QQ	370	WHITING AVENUE	260	$5,439	Install Inflow Dish
VV	365	DURHAM ROAD	234	$4,895	Install Inflow Dish
TOTAL			5,772	$120,750	
TOTAL NUMBER OF MANHOLES			12		
TOTAL ESTIMATED COST			$2,400		

APPENDIX A

AS-BID UNIT COSTS

MWRA T&T COST CALCULATION

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

				Engineer's Estimate		Rapid Flow, Inc.		National Water Main		Diverisified Infrastructure Services		Municipal Sales, Inc.	
ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
1			*Hourly Rate for Emergency Cleaning*										
1a	20	wo	Emergency Cleaning of Sewers	$ 800.00	$ 16,000.00	$ 500.00	$ 10,000.00	$ 1,200.00	$ 24,000.00	nb	No Bid	nb	No Bid
1b	20	hr	Emergency Cleaning of Sewers	$ 275.00	$ 5,500.00	$ 100.00	$ 2,000.00	$ 175.00	$ 3,500.00	nb	No Bid	nb	No Bid
1c	30	tn	Storage, Testing, and Disposal of Sewer Debris	$ 1.00	$ 30.00	$ 0.01	$ 0.30	$ 0.01	$ 0.30	nb	No Bid	nb	No Bid
			Total Contract #1		**$ 21,530.00**		**$ 12,000.30**		**$ 27,500.30**		**No Bid**		**No Bid**
2			*Hourly Rate for Cleaning & Inspection*										
2a	30	wo	Cleaning & Inspection of Sewers	$ 3,200.00	$ 96,000.00	$ 2,600.00	$ 78,000.00	$ 2,600.00	$ 78,000.00	nb	No Bid	nb	No Bid
2b	40	hr	Cleaning & Inspection of Sewers	$ 50.00	$ 2,000.00	$ 100.00	$ 4,000.00	$ 0.01	$ 0.40	nb	No Bid	nb	No Bid
2c	30	tn	Storage, Testing, and Disposal of Sewer Debris	$ 1.00	$ 30.00	$ 0.01	$ 0.30	$ 120.00	$ 3,600.00	nb	No Bid	nb	No Bid
			Total Contract #2		**$ 98,030.00**		**$ 82,000.30**		**$ 81,600.40**		**No Bid**		**No Bid**
3			*Heavy Cleaning of Sewers*										
3a	600	lf	Heavy Cleaning of 6-inch sewers	$ 1.50	$ 900.00	$ 0.50	$ 300.00	$ 0.01	$ 6.00	$ 2.50	$ 1,500.00	nb	No Bid
3b	7000	lf	Heavy Cleaning of 8-inch sewers	$ 1.00	$ 7,000.00	$ 0.50	$ 3,500.00	$ 0.75	$ 5,250.00	$ 2.50	$ 17,500.00	nb	No Bid
3c	1000	lf	Heavy Cleaning of 10-inch sewers	$ 1.50	$ 1,500.00	$ 0.50	$ 500.00	$ 0.25	$ 250.00	$ 3.00	$ 3,000.00	nb	No Bid
3d	4000	lf	Heavy Cleaning of 12-inch sewers	$ 1.50	$ 6,000.00	$ 1.00	$ 4,000.00	$ 0.25	$ 1,000.00	$ 3.50	$ 14,000.00	nb	No Bid
3e	1000	lf	Heavy Cleaning of 15-inch sewers	$ 3.00	$ 3,000.00	$ 2.00	$ 2,000.00	$ 5.25	$ 5,250.00	$ 6.00	$ 6,000.00	nb	No Bid
3f	500	lf	Heavy Cleaning of 18-inch sewers	$ 3.00	$ 1,500.00	$ 2.00	$ 1,000.00	$ 0.75	$ 375.00	$ 10.00	$ 5,000.00	nb	No Bid
3g	250	lf	Heavy Cleaning of 20-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 0.75	$ 187.50	$ 15.00	$ 3,750.00	nb	No Bid
3h	250	lf	Heavy Cleaning of 21-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 5.25	$ 1,312.50	$ 15.00	$ 3,750.00	nb	No Bid
3i	250	lf	Heavy Cleaning of 22-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 0.75	$ 187.50	$ 15.00	$ 3,750.00	nb	No Bid
3j	500	lf	Heavy Cleaning of 24-inch sewers	$ 3.00	$ 1,500.00	$ 4.00	$ 2,000.00	$ 5.25	$ 2,625.00	$ 18.50	$ 9,250.00	nb	No Bid
4			*Inspection of Sewers*										
4a	1600	lf	Inspection of 6-inch sewers	$ 1.60	$ 2,560.00	$ 0.75	$ 1,200.00	$ 1.20	$ 1,920.00	$ 1.75	$ 2,800.00	nb	No Bid
4b	80000	lf	Inspection of 8-inch sewers	$ 1.60	$ 128,000.00	$ 0.75	$ 60,000.00	$ 1.00	$ 80,000.00	$ 1.50	$ 120,000.00	nb	No Bid
4c	4000	lf	Inspection of 10-inch sewers	$ 1.60	$ 6,400.00	$ 0.75	$ 3,000.00	$ 1.00	$ 4,000.00	$ 1.50	$ 6,000.00	nb	No Bid
4d	13000	lf	Inspection of 12-inch sewers	$ 1.60	$ 20,800.00	$ 0.75	$ 9,750.00	$ 1.00	$ 13,000.00	$ 1.50	$ 19,500.00	nb	No Bid
4e	7000	lf	Inspection of 15-inch sewers	$ 1.70	$ 11,900.00	$ 0.75	$ 5,250.00	$ 1.00	$ 7,000.00	$ 1.75	$ 12,250.00	nb	No Bid
4f	3000	lf	Inspection of 18-inch sewers	$ 1.70	$ 5,100.00	$ 0.75	$ 2,250.00	$ 1.00	$ 3,000.00	$ 1.75	$ 5,250.00	nb	No Bid
4g	500	lf	Inspection of 20-inch sewers	$ 1.70	$ 850.00	$ 0.75	$ 375.00	$ 1.00	$ 500.00	$ 2.50	$ 1,250.00	nb	No Bid
4h	2200	lf	Inspection of 21-inch sewers	$ 1.70	$ 3,740.00	$ 0.75	$ 1,650.00	$ 1.00	$ 2,200.00	$ 2.50	$ 5,500.00	nb	No Bid
4i	500	lf	Inspection of 22-inch sewers	$ 1.70	$ 850.00	$ 0.75	$ 375.00	$ 1.00	$ 500.00	$ 2.75	$ 1,375.00	nb	No Bid
4j	7000	lf	Inspection of 24-inch sewers	$ 1.70	$ 11,900.00	$ 0.75	$ 5,250.00	$ 1.00	$ 7,000.00	$ 3.00	$ 21,000.00	nb	No Bid
4k	125	ea	Clean & Inspection of 4 to 6-inch laterals			$ 100.00	$ 12,500.00	$ 250.00	$ 31,250.00	$ 460.00	$ 57,500.00		
5			*Mobilization*										
5a	1	ls	Mobilization for Items 3-4, lump sum (not to exceed 5% of total)	$ 10,787.50	$ 10,787.50	$ 2,500.00	$ 2,500.00	$ 1,000.00	$ 1,000.00	$ 12,617.00	$ 12,617.00	nb	No Bid
			Total Contract #3		**$ 226,537.50**		**$ 120,400.00**		**$ 167,813.50**		**$ 332,542.00**		**No Bid**
6			*On-Call Sewer Repair*										
6a	10	lf	Structural short liners of 6-inch sewers	$ 425.00	$ 4,250.00	$ 350.00	$ 3,500.00	$ 300.00	$ 3,000.00	nb	No Bid	nb	No Bid
6b	50	lf	Structural short liners of 8-inch sewers	$ 425.00	$ 21,250.00	$ 350.00	$ 17,500.00	$ 400.00	$ 20,000.00	nb	No Bid	nb	No Bid
6c	10	lf	Structural short liners of 10-inch sewers	$ 475.00	$ 4,750.00	$ 350.00	$ 3,500.00	$ 450.00	$ 4,500.00	nb	No Bid	nb	No Bid
6d	10	lf	Structural short liners of 12-inch sewers	$ 525.00	$ 5,250.00	$ 350.00	$ 3,500.00	$ 500.00	$ 5,000.00	nb	No Bid	nb	No Bid
6e	10	lf	Structural short liners of 15-inch sewers	$ 625.00	$ 6,250.00	$ 400.00	$ 4,000.00	$ 400.00	$ 4,000.00	nb	No Bid	nb	No Bid
6f	10	lf	Structural short liners of 18-inch sewers	$ 725.00	$ 7,250.00	$ 400.00	$ 4,000.00	$ 300.00	$ 3,000.00	nb	No Bid	nb	No Bid

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	Engineer's Estimate		Rapid Flow, Inc.		National Water Main		Diverisified Infrastructure Services		Municipal Sales, Inc.	
				UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
6g	250	lf	Structural line pipe (cured-in-place) of 6-inch sewers	$ 55.00	$ 13,750.00	$ 40.00	$ 10,000.00	$ 35.00	$ 8,750.00	nb	No Bid	nb	No Bid
6h	5500	lf	Structural line pipe (cured-in-place) of 8-inch sewers	$ 45.00	$ 247,500.00	$ 30.00	$ 165,000.00	$ 46.30	$ 254,650.00	nb	No Bid	nb	No Bid
6i	800	lf	Structural line pipe (cured-in-place) of 10-inch sewers	$ 50.00	$ 40,000.00	$ 34.00	$ 27,200.00	$ 49.55	$ 39,640.00	nb	No Bid	nb	No Bid
6j	500	lf	Structural line pipe (cured-in-place) of 12-inch sewers	$ 60.00	$ 30,000.00	$ 44.00	$ 22,000.00	$ 52.75	$ 26,375.00	nb	No Bid	nb	No Bid
6k	250	lf	Structural line pipe (cured-in-place) of 15-inch sewers	$ 70.00	$ 17,500.00	$ 50.00	$ 12,500.00	$ 50.00	$ 12,500.00	nb	No Bid	nb	No Bid
6l	250	lf	Structural line pipe (cured-in-place) of 18-inch sewers	$ 80.00	$ 20,000.00	$ 75.00	$ 18,750.00	$ 80.00	$ 20,000.00	nb	No Bid	nb	No Bid
6m	250	lf	Structural line pipe (cured-in-place) of 20-inch sewers	$ 90.00	$ 22,500.00	$ 85.00	$ 21,250.00	$ 55.00	$ 13,750.00	nb	No Bid	nb	No Bid
6n	300	lf	Structural line pipe (cured-in-place) of 24-inch sewers	$ 200.00	$ 60,000.00	$ 125.00	$ 37,500.00	$ 80.00	$ 24,000.00	nb	No Bid	nb	No Bid
6o	15	ea	Full Wrap Lateral Liner (cured-in-place) of 4 to 6-inch laterals	$ 4,000.00	$ 60,000.00	$ 1,850.00	$ 27,750.00	$ 1,100.00	$ 16,500.00	nb	No Bid	nb	No Bid
6p	15	ea	Clean & Inspection of 4 to 6-inch laterals	$ 1,000.00	$ 15,000.00	$ 500.00	$ 7,500.00	$ 700.00	$ 10,500.00	nb	No Bid	nb	No Bid
7			*Manhole Rehabilitation*										
7a	400	vf	Exterior chemical grouting and interior cementitous	$ 150.00	$ 60,000.00	$ 120.00	$ 48,000.00	$ 130.00	$ 52,000.00	nb	No Bid	nb	No Bid
8			*Mobilization*										
8a	1	ls	Mobilization for Items 6-7, (not to exceed 5% of total)	$ 17,959.37	$ 17,959.37	$ 15,000.00	$ 15,000.00	$ 5,500.00	$ 5,500.00	nb	No Bid	nb	No Bid
9			*Alternate Bid #1*										
9a	1	ls	Structural line pipe (cured-in-place) of 12-inch sewer segment AA10-AA5	$ 25,000.00	$ 25,000.00	$ 75,000.00	$ 75,000.00	$ 44,350.00	$ 44,350.00	nb	No Bid		
10			*Alternate Bid #2*										
10a	1	ls	Structural line pipe (cured-in-place) of 24-inch sewer segment JJ460-JJ370	$ 25,000.00	$ 25,000.00	$ 75,000.00	$ 75,000.00	$ 73,650.00	$ 73,650.00	nb	No Bid		
11			*Alternate Bid #3*										
11a	1	ls	Structural line pipe (cured-in-place) of 8-inch sewer segments HH930-HH920, HH920-HH910 & HH910-HH900	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 44,350.00	$ 44,350.00	nb	No Bid		
			Total Contract #4 BASE BID (Items 6 - 8)		**$ 653,209.37**		**$ 448,450.00**		**$ 523,665.00**		**No Bid**		**No Bid**
			BASE BID plus ALTERNATE BID No. 1 (Items 6 - 9)		**$ 678,209.37**		**$ 523,450.00**		**$ 568,015.00**		**No Bid**		
			BASE BID plus ALTERNATE BID Nos. 1 & 2 (Items 6 - 10)		**$ 703,209.37**		**$ 598,450.00**		**$ 641,665.00**		**No Bid**		
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3 (Items 6 - 11)		**$ 728,209.37**		**$ 623,450.00**		**$ 686,015.00**		**No Bid**		
12			*Chemical Root Treatment*										
12a	500	lf	Chemical root treatment of 6-inch sewers	$ 1.80	$ 900.00	$ 2.00	$ 1,000.00	$ 1.75	$ 875.00	nb	No Bid	$ 1.20	$ 600.00
12b	25000	lf	Chemical root treatment of 8-inch sewers	$ 1.80	$ 45,000.00	$ 2.00	$ 50,000.00	$ 1.75	$ 43,750.00	nb	No Bid	$ 1.25	$ 31,250.00
12c	1000	lf	Chemical root treatment of 10-inch sewers	$ 2.00	$ 2,000.00	$ 2.00	$ 2,000.00	$ 1.75	$ 1,750.00	nb	No Bid	$ 1.30	$ 1,300.00
12d	1000	lf	Chemical root treatment of 12-inch sewers	$ 2.30	$ 2,300.00	$ 2.00	$ 2,000.00	$ 1.75	$ 1,750.00	nb	No Bid	$ 1.40	$ 1,400.00
12e	300	lf	Chemical root treatment of 15-inch sewers	$ 2.95	$ 885.00	$ 3.00	$ 900.00	$ 2.00	$ 600.00	nb	No Bid	$ 1.55	$ 465.00
12f	300	lf	Chemical root treatment of 18-inch sewers	$ 4.20	$ 1,260.00	$ 3.00	$ 900.00	$ 3.00	$ 900.00	nb	No Bid	$ 1.75	$ 525.00
12g	300	lf	Chemical root treatment of 20-inch sewers	$ 4.20	$ 1,260.00	$ 3.00	$ 900.00	$ 3.00	$ 900.00	nb	No Bid	$ 2.00	$ 600.00
12h	10	ea	Chemical root treatment of manholes	$ 250.00	$ 2,500.00	$ 250.00	$ 2,500.00	$ 250.00	$ 2,500.00	nb	No Bid	$ 150.00	$ 1,500.00
12			*Mobilization*										
12a	1	ea	Mobilization for Item 12, (not to exceed 5% of total)	$ 2,805.25	$ 2,805.25	$ 1,500.00	$ 1,500.00	$ 500.00	$ 500.00	nb	No Bid	$ -	$ -
			Total Contract #5		**$ 58,910.25**		**$ 61,700.00**		**$ 53,525.00**		**No Bid**		**$ 37,640.00**

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	Engineer's Estimate UNIT COST	Engineer's Estimate TOTAL	Rapid Flow, Inc. UNIT COST	Rapid Flow, Inc. TOTAL	National Water Main UNIT COST	National Water Main TOTAL	Diverisified Infrastructure Services UNIT COST	Diverisified Infrastructure Services TOTAL	Municipal Sales, Inc. UNIT COST	Municipal Sales, Inc. TOTAL
			Total Contract #1		$ 21,530.00		$ 12,000.30		$ 27,500.30		No Bid		No Bid
			Total Contract #2		$ 98,030.00		$ 82,000.30		$ 81,600.40		No Bid		No Bid
			Total Contract #3		$ 226,537.50		$ 120,400.00		$ 167,813.50		$ 332,542.00		No Bid
			Total Contract #4 BASE BID (Items 6 - 8)		$ 653,209.37		$ 448,450.00		$ 523,665.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID No. 1 (Items 6-9)		$ 678,209.37		$ 523,450.00		$ 568,015.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID Nos. 1 & 2 (Items 6-10		$ 703,209.37		$ 598,450.00		$ 641,665.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3 (Items 6-11)		$ 728,209.37		$ 623,450.00		$ 686,015.00		No Bid		No Bid
			Total Contract #5		$ 58,910.25		$ 61,700.00		$ 53,525.00		No Bid		$ 37,640.00
			Total Contract 1-5 BASE BID		$ 1,058,217.12		$ 724,550.60		$ 854,104.20		NA		NA
			BASE BID plus ALTERNATE BID No. 1		$ 1,083,217.12		$ 799,550.60		$ 898,454.20		NA		NA
			BASE BID plus ALTERNATE BID Nos. 1 & 2		$ 1,108,217.12		$ 874,550.60		$ 972,104.20		NA		NA
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3		$ 1,133,217.12		$ 899,550.60		$ 1,016,454.20		NA		NA

MEMORANDUM

DATE: April 25, 2018

FROM: Patrick Yeo

TO: File

SUBJECT: T&T costs for Dedham, Massachusetts using MWRA methodology

Fiscal year 2018 Transportation & Treatment (T&T) costs for sewerage in the Town of Dedham can be calculated using both the MWRA Operation & Maintenance (O & M) and Capital charges, and the town's O & M and Capital costs. Therefore, MWRA charges are based mainly on sewage flow exiting the Town of Dedham. MWRA's FY18 sewerage charges to the Town of Dedham are shown in Table A, and Table B shows Dedham's FY18 O & M and Capital costs.

TABLE A - MWRA CHARGES TO THE TOWN OF DEDHAM

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	MWRA CHARGE	COST ($/GPD)
Average Strength Flow*				
Annual Wastewater Volume	1,193,699,000	3,270,408	$1,181,796	$0.3614
Total Suspended Solids (O & M and Capital)	1,193,699,000	3,270,408	$404,074	$0.1236
Biochemical Oxygen Demand (O & M and Capital)	1,193,699,000	3,270,408	$317,221	$0.0970
Maximum Monthly Flow	N/A	5,547,000	$963,582	$0.1737
Population **	1,193,699,000	3,270,408	$2,613,735	N/A
TOTAL			**$5,480,408**	**$0.7557**

NOTE:
*MWRA's charges only apply to average strength flow.
**MWRA's population charges are not flow based, so it is not to be included in T & T cost.

TABLE B – TOWN OF DEDHAM SEWERAGE COSTS

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	DEDHAM COST	COST ($/GPD)
Debt Service (Capital Costs)	1,193,699,000	3,270,408	$160,000	$0.0489
O & M	1,193,699,000	3,270,408	$1,860,000	$0.5687
TOTAL			**$1,762,972**	**$0.6176**

Therefore, the total FY15 T&T cost for both the MWRA charges and the Town of Dedham's costs are $1.3733 /GPD ($0.7557 + $0.6176).

According to the Department of Environmental Protection's (DEP) Guidelines for Performing I/I Analyses and SSES this cost of $1.3733GPD needs to be extended throughout the life of a rehabilitative measure. The life cycle for a rehabilitative measure can be set by good engineering judgement as well as backup documentation, depending on the type of rehabilitation. For this study, Weston & Sampson will use a life cycle of twenty years.

To find the present worth of a rehabilitative measure over a twenty-year period, a discount rate, or annual percentage rate, is required. According to the DEP, the discount rate for FY18 is 2.75%. To calculate the T&T cost in order to account for this twenty-year period, a present worth analysis must be done. The following formula will calculate the present worth of the T&T cost for the next twenty years:

PRESENT WORTH ANALYSIS:

Discount Rate = 2.75% (DEP FY18 Information)

Present Worth Factor:

$$\frac{(1+i)^n - 1}{i\,(1+i)^n}$$ where: i = discount rate, or interest rate
n = number of years

$$\frac{(1 + 0.0275)^{20} - 1}{0.0275\,(1 + 0.0275)^{20}} = 15.23$$

Present Worth T&T Cost:

(Present Worth Factor) x (FY18 T & T cost)

15.23 x $1.3733/GPD = $20.92/GPD

Therefore, the T&T cost for the Town of Dedham, utilizing a present worth of the rehabilitation for a twenty-year period, with a discount rate of 2.75%, is $20.92/GPD.

Town of Dedham T&T costs were derived using MWRA sewerage costs.