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CITY OF CAMBRIDGE • EXECUTIVE DEPARTMENT

Robert W. Healy, City Manager *Richard C. Rossi, Deputy City Manager*

January 13, 2003

To The Honorable, The City Council:

In response to Awaiting Report Item No. 02-105, regarding a report on the condition of Cambridge sewers and ways to clean them more often, Public Works Commissioner Lisa Peterson submits the following report describing:

1. Current condition of Cambridge's sewers and drains;
2. Problems related to the City of Cambridge sanitary sewer and drainage systems;
3. Current maintenance program for the City of Cambridge sanitary sewer and drainage systems;
4. Programs used to improve the City of Cambridge sanitary sewer and drainage systems; and
5. Measures to improve the current maintenance program.

The Department of Public Works receives a number of complaints each year about sewer odors. A majority of the odor-related complaints concern foul smelling catch basins. These catch basin odors can be attributed primarily to the catch basin lateral pipe being directly connected to a combined sewer drainage pipes, i.e. pipes that convey stormwater and sewage. The smell can also be related to rotting vegetation or other matter in the catch basin structures themselves. Occasionally we also receive odor complaints about "smelly manholes." Sewer manholes are necessary in various locations to provide access points for sewer system maintenance. Occasionally these sewer manholes will have holes in them; the reason these holes exist is to allow sewer gases (sulphur dioxide, methane) to vent from the sewer lines.

During the spring of 2003, the DPW will begin an **Odor Control Pilot Project**, to investigate the effectiveness of various odor control methods, particularly odors from catch basins. The methods to be considered are structural such as manhole inserts and chemical such as different types of deodorizers. The study areas will focus on those areas where the problem is most severe, such as Inman Square, Central Square and Harvard Square.

1. Current Condition of Cambridge's Sewer and Drains

The City of Cambridge has provided sewer and drainage service to its property owners for well over one hundred years. There are approximately 265 miles of storm, sewer and combined sewer pipes in the city. The first sewer and drainage pipes constructed were built as combined sewers to handle both sanitary sewage and stormwater within the same pipe. In almost half of the city, combined sewers still serve as the primary conveyance system for sanitary sewage and stormwater. In dry weather, the combined

sewers carry sanitary sewage to MWRA interceptor pipes for treatment at the Deer Island wastewater treatment facility. In wet weather, the combined sewers carry both sanitary sewage and stormwater to the MWRA system, and when the conveyance capacity of the MWRA interceptor system is exceeded combined sewage flows directly to our surrounding rivers at various combined sewer overflow (CSO) locations.

The City has been converting or “separating” its combined sewers to dedicated sanitary sewer and drainage systems for the last thirty years. In separated areas, dedicated pipes convey sanitary sewage to the MWRA interceptors and dedicated pipes convey stormwater to the Charles River or Alewife Brook. This separation work provides better service to the property owners of Cambridge and allows the City to meet state and federal regulatory requirements.

The sewer and drainage systems in Cambridge provide great operational and maintenance challenges for a variety of reasons. This report will discuss some of the major problems that the Department of Public Works deals with, how these problems are resolved and areas where the DPW plans to improve its performance.

2. Problems related to the City of Cambridge Sanitary Sewer and Drainage Systems

Odors- The DPW receives complaints for “sewer” odors at various locations throughout the City. A majority of the odor-related complaints concern foul smelling catch basins. These catch basin odors can be attributed to the catch basin pipe being directly connected to a combined sewer main. This can allow odors from the sanitary waste in the combined sewer to be emitted from the catch basin, particularly in periods of extended dry weather. Decaying organic material within the catch basin can also cause catch basin odor and improper dumping of dog feces, motor oil or other illicit materials including restaurant grease and foodstuff, can exacerbate these odors.

Other odor complaints are associated with manholes. The City has sewer mains that are buried underneath sidewalk areas, especially in the major squares and in locations where there are MBTA tunnels. These sewer manholes allow access to the pipes, but can also allow odors emerge into the open environment near the manhole.

Structural Condition – The City spends in excess of \$1m annually maintaining the structural integrity of the existing sewer and drainage system. Many of the pipes and structures, particularly those in combined sewer areas, are over one hundred years old and are made of a variety of materials, such as vitrified clay, brick, mass concrete and wood. The city spends another \$400,000 -\$500,000 in monitoring and cleaning the existing systems, so as to prevent collapses and blockages occurring in the system. Structural problems when they do occur can lead to service interruptions and when severe, can pose significant problems to public health and safety.

Debris Accumulation – Because the City is topographically flat, our pipe systems are excessively flat and thus significant volumes of debris “settle out” in our pipes. . Debris in the City’s main pipes causes numerous problems, primarily 1) it can inhibit flow, and lead to flooding problems in the storm drain system and 2) it lead to sewer gas accumulation which can lead to concrete corrosion and structural problems in the system. A robust street sweeping program and catch basin cleaning program is required so as to counteract this issue. Excessive debris in catch basins limits the effectiveness of the basin to capture more debris and thus allows more debris into the main conveyance pipes.

Fats, Oils and Grease – The discharge of fats, oils and grease into the City’s sewer system causes blockages within the mains and backup of sewage onto private property. This problem is prevalent in areas with a large concentration of restaurants.

Capacity – Much of the City’s combined sewer system does not have the capacity to handle the volume of rainfall runoff from large rainstorms. Similarly the MWRA system does not have the capacity to convey those flows discharged to it during significant storm events. These capacity problems prohibit the flow of wastewater to the Deer Island treatment plant and can lead to backups into public and private property and combined sewer overflows to the surrounding rivers.

Mechanical Equipment Breakdowns – The City system is primarily a gravity system and does not have a significant dependency on pump systems or other mechanical systems. However, in those low lying areas most subject to flooding where capital improvements have been made over the last 5 years, many of these new systems have pumps, sensors and other devices that present a new challenge for the DPW’s maintenance staff.

This is a very brief summary of some of the maintenance issues associated with our drainage and sewerage systems that are dealt with by DPW staff. Furthermore the DPW works closely with residents and property owners to resolve problems they may have with their own sewer and drain lateral pipes. This involves confirming the nature of their problem, records research to obtain information about their property and assisting them with obtaining a contractor. The DPW also insures that all installation and repair of sewer and drainage piping and structures is permitted, inspected and complies with City standards.

3. Current Maintenance Program for the City of Cambridge Sanitary Sewer and Drainage Systems

The DPW constantly strives to improve its maintenance program for the sanitary sewer and drainage systems. As the City completes capital improvement projects and adds new infrastructure, the maintenance program must include these new and innovative features. The maintenance program needs to be sufficiently flexible to be able to address problems with relatively ancient, though functional systems that are over one hundred years old to breakdowns in state of the art pumping and flushing systems. The DPW staff also need to carry out routine maintenance while always being prepared to react to emergency situations such as pipe breaks, flooding or major interruptions in service.

Routine Checks – Some parts of the sanitary and drainage systems are significantly more prone to blockages and back-ups. This is primarily due to the intensity of use of the systems in these areas. The DPW maintains a history on these locations and checks them on a scheduled basis. These scheduled checks often detect partial blockages that can result in service disruptions and backups. These routine checks are vital to provide uninterrupted service, prevent backups into private property and limit overtime spent on emergency calls.

Catch Basin Cleaning –The DPW cleans catch basins on a routine schedule while also responding to requests from residents and other City staff to clean non-scheduled but nuisance ones. The routine cleaning of catch basins occurs in areas on the same day when street sweeping occurs. This allows the DPW to access catch basins with cleaning equipment without any further posting of parking restrictions. The DPW’s goal is to clean all of the City’s 4,200 catch basins once per year. In addition, the DPW cleans those in problem areas such as the major squares up to four times per year. As part of the catch basin cleaning, a deodorizer is placed in the structure to limit odor.

Mainline Cleaning – The City uses DPW staff and an annual contract to clean sanitary sewer, combined sewer and drainage pipes and manholes. The DPW staff primarily cleans lines in response to service calls

and those locations where cleaning needs are identified during routine checks. The annual contractor performs heavy duty cleaning of lines as a preventative measure. These lines are cleaned to remove large deposits of debris that can cause blockages and reductions in capacity. The City staff completes 900 work orders for mainline cleaning annually. The annual contract cleans 68,000 feet of the City's 265 miles of the City's piping and removes 500 tons of debris.

Television Inspection – The same contract used for cleaning also includes television inspection of pipes. The television inspections are a valuable tool in identifying structural deficiencies before they become a major problem. The television inspections allow the DPW to develop a prioritized list of structural repairs to be completed under the Remedial Reconstruction Contract. The annual contract completes television inspections of 68,000 feet of pipe.

Mechanical Repairs – The DPW also uses an annual contract to repair and maintain the City's six pump stations. This maintenance includes quarterly inspections of all equipment and any necessary repairs. This contract is expected to become much more important as additional equipment is installed through capital improvement contracts.

Structural Repairs – The DPW uses two different contracts to make structural repairs to its sewer and drainage infrastructure. The first contract, the Remedial Reconstruction Contract, is used to repair pipes, catch basins and manholes that need repair or replacement. This work is prioritized based on the impact each defect has on the sewer and drainage systems. This work is ongoing throughout the year and involves simple repairs such as catch basin replacement to more complex work such as complete replacement of sections of pipe up to 300 feet long. This contract will complete \$ 1.1 million of work during fiscal year 2003.

The second contract used to make structural repairs is the Emergency Remedial Repair contract. This contract is used to make unscheduled repairs that must be attended to immediately because of their impact on the performance of the sewer or drainage system or because of an imminent threat to public health and safety. While the nature of this contract makes the amount of work unpredictable, six to ten emergency repairs are typically made annually.

Work Order Management – All work completed by the Sewer Division is tracked in the Hansen work order management system. The Sewer Division implemented the use of the Hansen system during March 1999 and has refined the system since then to make it a valuable tracking and reporting tool. In addition to work orders, all service request calls are entered into the Hansen system and linked to work orders where appropriate. The Sewer Division completes over 5,000 work orders and responds to 400 service requests annually.

4. Programs used to improve the City of Cambridge Sanitary Sewer and Drainage Systems

The following programs are used to improve the City of Cambridge sanitary sewer and storm drainage systems. These programs primarily focus on public education and major capital improvements. While these programs are not part of the City's routine maintenance, they require significant resources of DPW staff and City funds to implement.

Capital Improvement Program – This program is used to complete sewer separation and flood alleviation projects throughout the City. A major focus in the design of these projects is ease and frequency of maintenance of the proposed improvements. At the completion of these projects, DPW staff member responsible for the maintenance is fully trained by the contractor and design engineer on the operation and maintenance of the features installed. The contractor and engineer are also required to

provide detailed operation and maintenance manuals, so that the project are can be included in the City's ongoing maintenance program.

Odor Control Pilot Project – This pilot project will investigate the effectiveness of various odor control methods particularly odors from catch basins. The methods to be considered are structural such as manhole inserts and chemical such as different types of deodorizers. The study areas will focus on areas such as Inman Square, Central Square and Harvard Square. This project will begin during the spring of 2003 and continue through the rest of the year.

Fats, Oils and Grease Program – The "FOG" program utilizes inspection of food preparation facilities along with education of the owners and workers at these establishments. The goal is to reduce the amount of FOG discharged to the City's sewer system in order to reduce blockages and comply with MWRA discharge limits. The DPW proposes to use more sampling of wastewater discharges for FOG from facilities to enforce discharge standards.

Public Education – As part of its stormwater management memorandum of understanding with the EPA, the City has been working on public education materials related to storm water discharges. These materials include pamphlets with information on improper dumping into catch basins, appropriate car washing techniques and erosion control during construction activities. The DPW has also begun installing signs at newly installed catch basins to inform the public not to dump because of discharges to the Alewife Brook and Charles River.

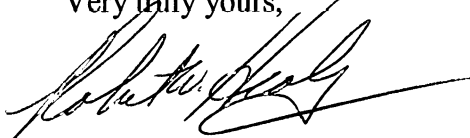
5. Measures to Improve the Current Maintenance Program

When considering how to improve the current maintenance program of the Sewer Division, the DPW looks at ways to be more efficient in its work and how to construct new infrastructure so it requires less maintenance. The use of a work order management system has greatly aided the Sewer Division in tracking work completed and where additional work is necessary. As more data is collected, the Sewer Division will be able to make its approach to maintenance more proactive.

During capital improvement projects the DPW has instituted such technologies as flushing chambers to keep debris out of pipes and move it to grit sumps where it can be cleaned more easily. The standard catch basin now installed by DPW has a six-foot deep sump allowing more effective treatment of stormwater, and therefore, less frequent cleaning. In addition, the DPW installs uniform types of pumps and mechanical equipment that allows repair staff to become familiar with the equipment and deal with problems more efficiently.

I would be pleased to provide additional information, should that be required.

Very truly yours,

A handwritten signature in black ink, appearing to read "Robert W. Healy", written over a horizontal line.

Robert W. Healy
City Manager

RWH/mec

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Consent Agenda #7

Awaiting Report Item
Number 02-105, regarding a
report on the condition of
Cambridge sewers and ways
to clean them more often.

In City Council January 13, 2003

**REFERRED TO HEALTH AND
ENVIRONMENT
COMMITTEE ON MOTION OF
VICE MAYOR DAVIS.**

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1-15-03
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