



## **SUBWAY DRAIN CLEANING: NYC TRANSIT MUST MAINTAIN EFFORT– FINAL REPORT**

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### **I. EXECUTIVE SUMMARY**

In January 2006, the Office of the MTA Inspector General (OIG) issued a report entitled “Subway Flooding During Heavy Rainstorms: Prevention and Emergency Response.”<sup>1</sup> The report covered myriad issues that affected subway flooding, including the need for proactive subway drain cleaning along with drains and pump room maintenance to prevent flooding conditions. New York City Transit (NYC Transit) agreed with the recommendations; however, 11 years later, the conditions of drains and pump rooms were again dire. In the summer of 2017, Governor Andrew M. Cuomo declared a state of emergency, prompting the MTA to [announce the Subway Action Plan](#) (SAP) to stabilize the deteriorating subway system and improve service. The agency used part of the SAP investment to conduct system-wide cleaning and mapping of the subway drainage system and to create a management plan to match ongoing needs with available resources.

The OIG has been monitoring the effectiveness of the subway drain-cleaning activities performed under the SAP by NYC Transit’s Infrastructure Department (Infrastructure) and the agency’s plans to standardize the cleaning process in the future. We found that NYC Transit has made significant progress in (1) mapping the location of drain boxes, which catch debris and help maintain the flow of water; (2) cleaning the drain system; and (3) tracking the effectiveness of Infrastructure’s work utilizing the mapped locations and computer generated workorders. However, to maintain focus and improve follow-through, we recommend that the agency formalize its plans in writing and monitor Infrastructure’s activity and accomplishments.

Specifically, our review found:

- As part of the SAP, the agency successfully mapped the entire subway drain system, an effort the OIG’s 2006 report had revealed was sorely needed. The location of each drain and drain box is now being entered into the department’s Enterprise Asset Management (EAM) system as inspections proceed.

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<sup>1</sup> See [Subway Flooding During Heavy Rainstorms: Prevention and Emergency Response](#), MTA/OIG #2005-64.

- As inspections are conducted over the next several years, crews will measure the extent of silt buildup and clogging and include this data in EAM. This will allow management to proactively schedule maintenance work when and where it is most needed. As of February 2021, approximately 50% of all drain box locations had been assessed and entered into the EAM system work order module. Since Covid impacts have lessened, NYC Transit has been able to increase the inspection pace and plans to meet their goal of 100% inspections conducted by September 2021.
- Infrastructure’s existing drain-cleaning goal is based on annual linear feet of drains cleaned. This goal is outdated and insufficient to support proper maintenance of the system. Instead, the goal should reflect the department’s new approach to have all drains cleaned based on documented silt buildup, once this information is available.
- Infrastructure has made significant progress in the last few years, but between the release of OIG’s report in 2006 and the beginning of the SAP work in 2017, the agency had done very little to ensure that drains were clear.

## **Recommendations**

Given NYC Transit’s history of inattention to drain cleaning, and in order to maintain the momentum that is now apparent, the maintenance schedule and inspection plans should be committed to writing and departmental management should track the program’s progress.

1. Infrastructure’s SAP group should codify a proactive drain maintenance plan, including goals, assignments, timelines, and expected results. The goals should specify when the data for all locations will be uploaded into EAM, how many locations will be proactively inspected each year, and the expected completion date for the planned cleaning schedule.
2. Infrastructure’s SAP group should report in writing to the Chief Infrastructure Officer twice a year on progress toward meeting their stated goals as outlined in Recommendation 1.

NYC Transit’s interim president responded to the OIG’s preliminary report, stated that the agency accepted both recommendations and provided the status of their implementation. NYC Transit’s actions to date are provided at the end of this report.

## **II. BACKGROUND**

The 2006 OIG review was conducted in response to flooding from heavy rainfall on September 8, 2004, which resulted in stranding thousands of subway riders onboard trains – who eventually required evacuation – and the cancellation of over 1,000 trains. There were no reported failures at the pumping facilities which are overseen by Infrastructure’s Hydraulics group (Hydraulics); instead, drains leading to the pump rooms were found to be blocked by trash and mud.

Then and now, Hydraulics is responsible for inspecting and maintaining the 285 individual pump rooms and the drain boxes within 50 feet of each pump room. Currently, Infrastructure’s Plumbing and SAP groups are responsible for cleaning drains along the track bed throughout the system. The SAP group is primarily responsible for performing proactive drain assessments, initiating the EAM tracking system, and developing the cleaning frequency algorithm. All these groups report to the Chief Infrastructure Officer.

While many of OIG’s recommendations from the 2006 report were specific to the storm response, several addressed general preparedness and preventive maintenance issues. For example, prior to the SAP, Infrastructure had no proactive cleaning schedule for the drains. The 2006 recommendations highlighted the need to map and maintain pump rooms, drains, drain boxes, and direct sewer connections. OIG argued that such measures would mitigate the impact of future flooding. The report also revealed that NYC Transit did not know how many feet of drainage pipe existed in the system and noted that the goal at that time – to clean 90,000 feet annually – fell significantly short of what was needed.

Beginning in 2019, OIG followed up on the implementation of the 2006 recommendations and learned that while many of them had been implemented, those pertaining to cleaning and maintenance of the drains and drain boxes had not been addressed until 2017, when the 2-year emergency maintenance program, the SAP, was put into motion.

## **III. FINDINGS**

### **A. The Drainage System Finally Received Attention Due to the SAP**

The SAP was initiated on July 25, 2017, after the Governor declared a state of emergency. NYC Transit retained multiple outside contractors to clean every drain in the

subway system as well as a consultant to coordinate the effort. The consultant's responsibilities included creating maps of the entire drainage system identifying each drain box location and the date contractors cleaned it under the SAP.

Prior to the SAP, Infrastructure did not have a comprehensive list of all drain box locations. As part of the SAP, contractors identified 9,845 drain boxes: 2,063 in the Brooklyn Manhattan Transit (BMT) line, 4,197 in the Independent Subway System IND line, and 3,585 in the Interborough Rapid Transit (IRT) line. As the system grows, Infrastructure is maintaining the location information as needed, e.g., by adding the 161 drain boxes created on the 7 Line extension and 186 new drain boxes added for the 2<sup>nd</sup> Avenue extension. In total, Infrastructure has identified and inventoried 285 pump rooms and 418 miles of drains and troughs.

After all the drains were cleaned under the SAP, the consultant supplied an Excel spreadsheet of the mapped locations. As discussed below, Infrastructure launched an initiative in August 2019 whereby its personnel use handheld devices to upload drain assessment inspections directly to the new EAM system. Infrastructure divided the population of drain boxes into 12 zones and assigned teams to perform proactive assessments and clean the drains in each zone.

In the past, drain cleaning was primarily reactive, based on trouble calls about specific sites or done in support of track work. The new approach is proactive, and as data is collected on the changing condition of each drain between cleanings, Infrastructure can determine the cleaning frequency each location requires.

## **B. Infrastructure Should Update Its Interim Cleaning Goals and Report on Progress**

NYC Transit's annual goal for track drain cleaning is currently 150,000 linear feet. However, with 418 miles of drains in the system, this figure represents only 7% of the total; at that pace Infrastructure would require approximately 15 years to clean the entire system. Furthermore, the goal does not reflect Infrastructure's new direction of cleaning the drains based solely on need regardless of linear feet involved.

Information from February 2021 shows that Infrastructure had cleaned and inspected approximately 5,000 of the nearly 10,000 drain boxes since November 2019: approximately 50% of the boxes. These initial inspections are administratively labor-intensive because of the need for Infrastructure to establish the work order capability in EAM, develop the checklist of approximately 25 different required data points that must be recorded at each assessment or cleaning, manually assign the inspections in EAM, and create an EAM record for each drain.

After each drain has been assessed once and established in EAM, the work order system is designed to automatically generate work orders going forward. The department is determining when those work orders need to be generated by calculating the optimal drain cleaning frequencies for each line based on that line's measured need, regardless of its length. Understandably, all locations do not require the same attention: some sections of track collect more trash and silt than others. Working to meet cleaning goals based on need, rather than on an arbitrary number of linear feet, would better prevent drains from clogging.

Once EAM contains sufficient data, Infrastructure will develop a maintenance plan describing which areas will be cleaned more frequently than others and when they should be cleaned. Because multiple inspections are necessary to determine how long it takes a given drain box to clog again after being cleaned, Infrastructure will need to gather several years of inspection data before it can develop accurately predictive schedules. Once completed, the drain-cleaning frequency algorithm will be dynamic, adjusting for changing future conditions.

In addition, although data collection began in November 2019, the usefulness of the collected information may be affected by the decrease in subway ridership – and the related decrease in trash on the tracks – due to the Covid-19 pandemic that began in March 2020. Thus, Infrastructure might need more time to develop reliable data on clogging frequencies and reasonable cleaning schedules for drain box locations.

In the next couple of years, it will be important for the department to develop need-based goals for: (1) when it will have assessed every drain box at least once and entered that data into EAM, and (2) how many drain lines and drain boxes need to be assessed each year to give Infrastructure enough data to develop optimal cleaning frequencies.

#### **IV. RECOMMENDATIONS**

Our Findings show that while Infrastructure was responsive to many of the recommendations in OIG's 2006 report, the department did not effectively address the cleaning of subway drains at that time. Fortunately, the SAP enabled the cleaning of drains systemwide and set in motion the collection of data that will allow for proactive management and maintenance of drains, direct connections to the city sewer system, and pump rooms in the future. Infrastructure is making appropriate use of the new information and its new EAM module to achieve this goal.

To ensure continued progress, we make 2 recommendations:

1. Infrastructure’s SAP group should codify a proactive drain maintenance plan, including goals, assignments, timelines, and expected results. The goals should specify when the data for all locations will be uploaded into EAM, how many locations will be proactively inspected each year, and the expected completion date for the planned cleaning schedule.

*NYC Transit Response – “NYCT agrees with and has implemented this recommendation. The Division of Infrastructure has developed a proactive maintenance plan. As of May 2021, we have inspected and uploaded into EAM approximately 80 percent of the 9,845 drains identified, with all drains expected to be cleaned by the end of September. Moving forward, we have set a goal for inspecting and cleaning 2,500 drains a year. Additionally, select locations have been identified to receive biannual cleaning based on environmental conditions and the criticality of the location. All drains will be cleaned on a minimum of a 4-year cycle. In addition, we have created an Internal Control to periodically test that drains are inspected as scheduled.”*

2. Infrastructure’s SAP group should report in writing to the Chief Infrastructure Officer twice a year on progress toward meeting the goals stated in its drain maintenance plan (as outlined in Recommendation 1).

*NYC Transit Response – “NYCT agrees with and has implemented this recommendation. The Chief Infrastructure Officer will receive written reports reflecting drain inspection activity twice per year.”*