



## **Outage of Streaming Video During April 2022 Shooting at 36<sup>th</sup> Street Station, Sunset Park, Brooklyn – FINAL REPORT**

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### **I. EXECUTIVE SUMMARY**

In the past 20 years, New York City Transit (NYC Transit) has made substantial investments to install security cameras in the subway system. Currently, there are over 10,000 security cameras throughout the subway. Those cameras have assisted the NYPD with innumerable criminal investigations. However, on Tuesday, April 12, 2022, in the aftermath of a subway shooting near the 36<sup>th</sup> Street Station in Sunset Park, Brooklyn, NYC Transit reported that the camera network at that station was not functioning. NYPD issued a statement that other MTA cameras provided useful footage that day and praised the great efforts made by personnel across the MTA to assist in their investigation.

To gain a better understanding of what happened with the camera network, the Office of the MTA Inspector General (OIG) initiated an inquiry into the cause of the outage. OIG found no evidence that the outage was intentional. While the exact reason for the network failure remains unknown, OIG's inquiry found that shortfalls in staffing, maintenance, and internal controls – along with a breakdown of communication – significantly delayed both the discovery that the video was not streaming in the days prior to April 12 and then the eventual repair of the network.

#### **A. Methodology**

This Report is based on interviews of over 40 individuals. These individuals include NYC Transit employees responsible for maintaining the streaming cameras and their network, NYC Transit Security personnel, a member of the NYPD, and representatives of the network equipment manufacturer. OIG has reviewed and analyzed the network system logs for the streaming cameras. OIG also has reviewed maintenance records maintained by NYC Transit, reports produced by the network equipment manufacturer, the network equipment manuals, and other materials and information provided by NYC Transit and MTA Construction and Development.

## B. Summary of Findings

- The video stream at the affected stations went down at 5:21 PM on Friday, April 8, four days prior to the shooting.
- This outage was not discovered for 24 hours, until 6:00 PM on Saturday, April 9.
- When the outage was discovered, confusing and inadequate reporting protocols meant that an employee's notification about the outage went unnoticed until OIG's inquiry.
- Limited staffing caused delays in discovery and repair of problems, which did not begin until the morning of Monday, April 11.
- The workforce tasked with maintaining the camera network equipment is insufficiently trained.
- The maintenance protocol for the network equipment is deficient.

## C. Summary of Recommendations

OIG's inquiry focused solely on the outage reported on April 12, which affected only three stations, but OIG identified significant problems that raise concerns about the maintenance of the MTA's streaming camera network in general. There are, however, solutions to these problems, and mitigation of risk is possible to ensure a more reliable system.

- **NYC Transit must ensure adequate staffing to meet repair standards, especially for the highly skilled roles responsible for monitoring the network and overseeing complex repairs to network equipment.**
- **Management must establish clear, formalized communication protocols within and among the different groups with responsibility for the streaming camera network.** The different groups within NYC Transit that maintain the camera network use separate software platforms to report and track problems, and the groups do not have access to each other's systems. There is no uniform, universally understood method of reporting problems and outages between the groups, and thus trouble notifications can be missed entirely.

- **Management must provide formal training for staff charged with monitoring and maintaining the streaming camera network.** There is no structured training for the technicians who do most of the hands-on field work to repair and maintain the network equipment. The more highly skilled professionals who monitor the networks and oversee complex repairs also reported to OIG that they have not received the formal training necessary to do their jobs properly.
- **NYC Transit must develop thorough maintenance procedures for its camera network equipment that are in line with the recommendations of the equipment manufacturer.** OIG has found that NYC Transit has not properly maintained the networking equipment, *i.e.*, neglecting to change key fan filters for approximately six years when the manufacturer recommends changing them every 90 days.
- **NYC Transit must develop and adhere to a regular preventative maintenance schedule for all camera network equipment.** Currently, preventative maintenance is scheduled on an *ad hoc* basis and key performance targets are missed.

There is no question that installing a streaming camera network throughout a system as large and old as the New York City subway is a major undertaking, and NYC Transit has accomplished this task. There is also no question that the loss of video from these cameras in the three stations for five days exposed weaknesses in NYC Transit's response protocol for the camera network. NYC Transit has made enormous investments of money and time implementing security cameras in the subway system. It must be equally dedicated to supporting and maintaining this growing, technologically evolving network.

In response to OIG's draft findings and recommendations, NYC Transit has taken concrete steps to address the concerns raised in this report. The permanent solutions, such as hiring staff and devising a preventative maintenance program, will take time, but these efforts have begun. OIG's 12 recommendations and NYC Transit's actions taken to date appear at the end of this report.

## II. BACKGROUND

In the past 20 years, NYC Transit has made significant investments in security cameras for the subway system. Since 2002, NYC Transit has spent approximately \$658 million on completed camera projects and has allocated another \$437 million to projects that are currently in the planning, design, or construction phases, for a total of \$1.094 billion. Currently, there are over 10,000 security cameras throughout the subway system.

### **A. Live-Streaming Cameras in the NYC Transit Subway System**

The camera system at issue on April 12, 2022 was part of the live-streaming camera network. These cameras feed live video footage to both the NYPD and NYC Transit Security. They are connected through a network that allows the NYPD and NYC Transit personnel to monitor not only the video feed itself but also the connectivity and overall “health” of the network to ensure that all devices are working properly. Video is recorded and stored on remote servers. Approximately 5,100 of these cameras are currently in use, located throughout subway stations.

The camera network, maintained by a specialized group within NYC Transit (“the Network Group”)<sup>1</sup>, directs the data (in this case, the streaming video) from the cameras to hardware in the subway stations. One example of this type of hardware is Network Connectors. These devices serve as the links between the cameras in the stations and the network.

Along this data path are connections to two monitoring systems. One is the Video System, the platform that allows users to view and retrieve video footage from all 5,100 streaming cameras throughout the system. The other is the Network Monitor, which provides information on network operations that assist with troubleshooting and repairs.

On the morning of April 12, 2022, the Video System was not receiving any video from the cameras at the 25<sup>th</sup> Street, the 36<sup>th</sup> Street, and the 45<sup>th</sup> Street stations in Sunset Park, Brooklyn. The data from the failed cameras at these three stations flowed to one Network Connector. As is further described below, this Network Connector is likely the point of failure that caused the outage.

### **B. Streaming Camera Network Responsibility**

NYC Transit’s Electronics Unit is responsible for maintenance of the streaming camera network. Responsibility is further broken down between two groups—the Camera Group and the Network Group. A third group within the Electronics Unit, the Electronics Unit Hub, is meant to serve as a communication liaison between the groups, making sure that the correct groups are notified if and when problems with the cameras and the network occur. NYC Transit Security is not part of the Electronics Unit, but it, along with the NYPD, is a primary user of the camera network.

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<sup>1</sup> For security and ease of understanding, throughout this Report, OIG uses simplified terms to describe the various relevant groups within NYC Transit, its personnel, and its equipment. Additionally, for the same reasons, certain details have been omitted and others generalized.

The Camera Group maintains the cameras themselves and the cables up to the first network point in the subway stations. The Network Group maintains the rest of the network equipment.<sup>2</sup> Both NYC Transit and the NYPD are able to access the streaming video from the camera network.

### **C. Monitoring the Streaming Camera Network**

As with maintenance of the network, the responsibility of monitoring the streaming camera system is divided among several groups within NYC Transit: NYC Transit Security, the Camera Group, and the Network Group. These groups utilize different systems to monitor various functions and components of the camera system and ensure that the system and its cameras are functioning properly.

The Camera Group and NYC Transit Security use the Video System to see if the video stream is working. The Video System plays live video and will indicate if it is not receiving video from a camera. NYC Transit Security performs a “health check” of the Video System every day, Monday through Friday, to identify any camera streams that are down. In March 2022, although not required by the Electronics Unit management, the Camera Group started performing similar “health checks” of the Video System during the evening and overnight shifts, seven days a week, to ensure that there were no major outages.

The Network Group uses the Network Monitor to check on the network hardware, including the Network Connectors and their components, as well as other aspects of the network. Certain employees are deemed to be “experts” on the network and its hardware; they are referred to as “Network Professionals” in this Report. The Network Professionals are skilled technicians responsible for monitoring the network, programming hardware as needed, and performing high-level troubleshooting and repairs on the network hardware. They also provide support to the Network Technicians who perform routine maintenance and repairs on the equipment that falls under the Network Group’s responsibility. Technician Supervisors are responsible for scheduling and tracking routine maintenance and dispatching Network Technicians on trouble calls.

NYC Transit began implementing the Enterprise Asset Management (EAM) System in 2021 as a maintenance management system to track each of its “assets,” or pieces of equipment, which includes logging and tracking equipment problems. Every time a person enters a problem into EAM, EAM creates new “work orders” to log and track the problem. The Network Group

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<sup>2</sup> The Camera Group and the Network Group are responsible for many additional electronic systems beyond the streaming security cameras. This Report focuses on only those responsibilities that are pertinent to understanding the events surrounding the video streaming outage occurring on and around April 12, 2022.

has not yet transitioned to EAM. They are still utilizing the Trouble Ticket System to log and track problems. The Trouble Ticket System is not a complete maintenance management system. Instead of “work orders,” the Trouble Ticket System creates “trouble tickets.” The Camera Group does not have access to the Trouble Ticket System, and the Network Group does not have access to EAM.

When the Camera Group discovers a problem with equipment that is tracked using the Trouble Ticket System, the Camera Group will call into the Electronics Unit Hub switchboard, report the problem to the switchboard operator, and rely upon the switchboard operator to log the problem in the Trouble Ticket System.

### III. TIMELINE OF EVENTS

#### A. Failure of the Live-Streaming Cameras at the 25<sup>th</sup> Street, 36<sup>th</sup> Street, and 45<sup>th</sup> Street Stations in Sunset Park, Brooklyn

Friday, April 8, 2022

*1:03 AM*

Shortly after midnight on Friday, April 8, 2022, two Network Technicians from the Network Group performed routine preventative maintenance on the Network Connector for the 25<sup>th</sup>, 36<sup>th</sup>, and 45<sup>th</sup> Street Stations in Brooklyn. As part of this maintenance, Network Technicians checked the filter in the Network Connector’s internal fan unit. If the fan unit is not removed and replaced properly during this process, the Network Connector will generate an alarm on the Network Monitor.

At 1:03 AM, while the Network Technicians were still at the location, the Network Monitor detected a “fan removed” alarm from the Network Connector. The Network Connector was still functioning despite this alarm. While a Network Professional told OIG that he does not remember the fan alarm, he likely did not address it because the Network Connector was still functioning, and another incident took precedence. The Network Technicians who performed the preventative maintenance finished and left, unaware that there was an active fan alarm on the Network Connector. No other work was attempted on the Network Connector during that shift.

*9:48 AM*

Over 8 hours later, a Network Professional observed the fan alarm for the Network Connector. At 9:48 AM, a different Network Professional entered a trouble ticket for the fan alarm into the Trouble Ticket System and requested that a Technician Supervisor dispatch a team of Network Technicians to attempt to fix the fan.

*Approximately 10:00 AM*

One Network Technician was available to respond to the fan alarm. He arrived at the location around 10:00 AM. This individual was not on the team that performed preventative maintenance the night before. The Network Technician's attempts to resolve the fan alarm were unsuccessful. Once the Network Technician had exhausted the repair options available to him, he left the location and no further attempts to repair the fan were made that day.

*Approximately 12:00 PM*

The Video System history logs indicate that the Video System temporarily lost the video stream from the 25<sup>th</sup>, 36<sup>th</sup>, and 45<sup>th</sup> Street stations at 12:00 PM and regained it at 12:11 PM.

*2:42 PM*

The Network Monitor logs indicate that the Network Monitor stopped receiving messages from the Network Connector at 2:42 PM. The video, however, was still streaming and the fan alarm was still showing in the Network Monitor.

*5:20 to 5:23 PM*

The Network Monitor received "signal fail" alarms from the Network Connector relating to 25<sup>th</sup> Street and 36<sup>th</sup> Street at 5:20 PM and 5:23 PM, respectively.

At 5:21 PM, the Video System history log indicates that streaming video from all three stations stopped. No one within NYC Transit noticed the outage, and therefore no action was taken.

Saturday, April 9, 2022

*Midnight to 8:00 AM shift*

The Camera Group's log for the overnight shift indicates that the health check of all streaming cameras was not conducted during that shift. Thus, the Camera Group did not discover the outages at 25<sup>th</sup> Street, 36<sup>th</sup> Street, and 45<sup>th</sup> Street.

*11:18 AM and 11:33 AM*

A Network Professional monitoring the streaming camera network saw the "signal fail" alarms for 25<sup>th</sup> Street and 36<sup>th</sup> Street in the Network Monitor, and between 11:18 AM and 11:33 AM, attempted to clear the alarms and restore connectivity with those sites remotely. His attempts did not restore the signals to those locations. At the same time, the "signal fail" alarms were "muted,"<sup>3</sup> and subsequent alarm notifications were turned off. OIG has not been able to determine if the Network Professional's attempts to restore connection with those sites caused the system to shut off those alarms. The Network Professional did no further investigation to determine if the camera feed was operational, and thus did not learn that the video was not streaming.

The Camera Group did not perform "health checks" as they only perform such checks during evening and overnight shifts, not during day shifts.

The Network Group still had the open trouble ticket from April 8 for the fan alarm on the Network Connector, but, because no one knew that the video stream was down, the fan alarm was still considered a low-priority event. No further attempts to repair the fan unit were made that day.

*6:10 PM to 6:35 PM*

During his 4:00 PM shift, a Camera Technician from the Camera Group performed a health check of the streaming cameras using the Video System. He noticed that there was no video streaming from 25<sup>th</sup> Street, 36<sup>th</sup> Street, or 45<sup>th</sup> Street and opened work orders in EAM for each of the three stations at 6:10 PM, 6:24 PM, and 6:35 PM, respectively.

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<sup>3</sup> Despite the use of the term "muted," the alarm is a visual notification on a computer screen, not an audible alarm.



*Approximately 7:00 PM*

Around 7:00 PM, due to the open work orders, a Camera Group supervisor dispatched two Camera Technician crews to the three affected stations.

The dispatched crews tested the cameras at each of the three stations. They were able to connect their diagnostic equipment to the network points in each of the subway stations and confirmed at each one that the cameras themselves were streaming data over the cables into the network. The crews notified the supervisor who had dispatched them.

*10:29 PM*

Given the information he received from the dispatched crew, the Camera Group supervisor surmised that the flow of data was working from the cameras to the point of network entry. This meant that the problem was likely with the network and needed to be addressed by the Network Group. The supervisor called the Electronics Unit Hub, which functions as a clearinghouse among the different groups within the Electronics Unit. At 10:29 PM, a switchboard operator at the Electronics Unit Hub opened a trouble ticket in the Network Group Trouble Ticket System. The trouble ticket stated that the camera feed was down for the 25<sup>th</sup>, 36<sup>th</sup>, and 45<sup>th</sup> Street stations.

The Trouble Ticket System automatically assigns a priority level to all work orders; this ticket was assigned a “3” or “medium” priority status. The switchboard operator sent the trouble ticket to the Network Group inbox, or “bucket,” which is supposed to be monitored by Network Group personnel. The trouble ticket alert is not email, but rather it is a message to an inbox within the Trouble Ticket System which personnel must proactively check.

Network Group managers confirmed to OIG that no one was monitoring the Trouble Ticket System inbox because Network Group personnel expected to be notified of network problems either via email or phone.

Sunday, April 10, 2022

No one from the Network Group checked the Trouble Ticket System inbox on Sunday, and so no one saw the trouble ticket indicating that the camera feed was down for the 25<sup>th</sup>, 36<sup>th</sup>, and 45<sup>th</sup> Street stations. Thus, no repair attempts were made that day.

Monday, April 11, 2022

No one from the Network Group checked the Trouble Ticket System inbox on Monday, April 11, and so no one saw the trouble ticket that day.

*6:18 AM*

At approximately 6:00 AM, an outside vendor who was monitoring cameras for fare evasion detection emailed NYC Transit Security, notifying them that the cameras at the 36<sup>th</sup> Street Station were not working. The NYC Transit Security manager who received the email in turn emailed all Camera Group managers at 6:18 AM informing them that the cameras at 36<sup>th</sup> Street were not streaming. The Security Manager included a screenshot from the Video System history logs indicating that streaming had been down since Friday, April 8 at 5:21 PM.

*Approximately 6:30 AM*

At 6:31 AM, a supervisor from the Camera Group responded to the Security Manager's email and told him that a trouble ticket was open in the Trouble Ticket System for the camera streaming outage. The Supervisor did not attempt to contact anyone in Network Group to learn more about the problem or what, if any, attempts had been made to fix it.

*Approximately 8:00 AM*

Upon beginning his shift around 8:00 AM, the same Network Professional who oversaw the attempt to replace the fan unit in the Network Connector on Friday, April 8, resumed his efforts to correct the fan alarm. The Network Professional was unaware that the streaming was down from the three stations connected to that particular Network Connector because the "signal fail" alarms had been "muted."

The Network Professional then prepared a new internal data component for the Network Connector and requested that two Network Technicians be dispatched to install it in the Network Connector. The Network Technicians -- the third team to be dispatched since April 8 -- retrieved the new internal data component, which had been programmed specifically for the camera network at that location and took it to the Network Connector.

*9:45 AM*

Another Network Professional saw that connectivity was down for the network at the 25<sup>th</sup> Street, 36<sup>th</sup> Street, and 45<sup>th</sup> Street stations in Brooklyn, and at 9:45 AM, he emailed certain employees in the Network Group, the Camera Group, and NYC Transit Security, to notify them of a service outage for the streaming cameras at 25<sup>th</sup> Street, 36<sup>th</sup> Street, and 45<sup>th</sup> Street.

*Approximately 10:30 AM to 11:45 AM*

The dispatched Network Technicians arrived at the Network Connector location at approximately 10:30 AM. Their initial attempt to repair the Network Connector failed, and during their second attempt, the Network Connector shut down at approximately 11:45 AM. After their failed attempts to repair the Network Connector, the Network Technicians left the location.

*12:28 PM and 1:11 PM*

A NYC Transit Security employee performing the unit's daily "health check" of the streaming camera system saw that the cameras were not streaming at the 25<sup>th</sup> Street, 36<sup>th</sup> Street, and 45<sup>th</sup> Street stations. At 12:28 PM, he emailed the responsible individuals in the Camera Group to notify them. A Camera Group manager replied at 1:11 PM, stating that there was a network outage and that there was an open trouble ticket for the problem. No further efforts to restore the connection were made that day.

Tuesday, April 12, 2022

*Approximately 8:00 AM*

At the start of his 8:00 AM shift on the morning of April 12, the same Network Professional who saw that the video stream had stopped on April 11 programmed new internal data components for the Network Connector to again attempt to repair the unit. Two new Network Technicians -- the fourth team since April 8 -- were assigned and dispatched to repair the Network Connector.

*Approximately 8:26 AM*

At or around 8:26 AM, an individual fired a gun inside a northbound N train in the vicinity of the 36<sup>th</sup> Street subway station in Brooklyn.

*Approximately 10:00 AM*

Around 10:00 AM, the Network Technicians arrived at the location of the Network Connector, to find it closed to the public and guarded by uniformed NYPD officers. The officers allowed the Network Technicians to enter the location, but within minutes they were approached by other NYPD officers who instructed them to leave.

*Approximately 7:00 PM*

At approximately 7:00 pm, the NYPD permitted NYC Transit employees to resume their attempts to repair the Network Connector. Two new Network Technicians were dispatched -- the fifth team since April 8 -- with entirely new internal data components. The repairs did not work. The Network Technicians left the location around midnight on April 12.

Wednesday, April 13, 2022

*Approximately 8:00 AM*

The Network Professionals who had been working on the Network Connector since Friday, April 8 went to the site of the Network Connector around 8:00 AM on April 13 and attempted a different method of installing the internal data components. The Network Professionals did this as part of a “trial-and-error” approach to fixing the problem, as they were not certain why the previous repair attempts had failed. Subsequently, they learned from the manufacturer of the Network Connector that this different type of installation was a necessary step for this type of repair to the Network Connector.

*12:24 PM*

According to the system logs, at 12:24 PM, video streaming was restored to all three stations.

## **B. The Cause of the Equipment Failure Remains Unknown**

Following the restoration of the video stream on April 13, the Network Group sent the Network Connector to the manufacturer for testing. The manufacturer’s analysis determined that there had not been a hardware malfunction.

## IV. FINDINGS

### A. There Was a Failure to Monitor the Camera Network

The video stream from the three affected stations was down for a total of five (5) days -- from 5:21 PM on April 8, 2022, to 12:24 PM on April 13, 2022. As is outlined above, NYC Transit personnel missed indicators that there were problems with the camera network during that time period.

Critically, the Network Group did not realize the video stream was down until approximately 9:45 AM on April 11. This was 3.5 hours after NYC Transit Security reported the video was down, 39 hours after the Camera Group realized the video was down, and 64 hours after the video streaming actually ceased.

### B. There is an Over-Reliance on Network Professionals Monitoring Multiple Networks Simultaneously

The Electronics Unit relies heavily on the Network Professionals to troubleshoot not just the network operations of the streaming surveillance cameras, but all electronic networks within NYC Transit. This is a very arduous job. One Network Professional told OIG that he must monitor seven different networks simultaneously.

In our opinion, Network Professionals are stretched thin. While Network Professionals monitor all of these networks, they must also provide telephone assistance to Network Technicians in the field when they are performing repairs and preventative maintenance, as well as troubleshoot any network problems that can be addressed remotely. They also program new hardware for Network Technicians to install in the equipment. Expecting the Network Professionals to see and attend to all network alarms as they occur is, at best, unrealistic. NYC Transit needs to determine if this staffing level meets its expectations for how quickly problems are supposed to be addressed.

### C. Staffing Levels Vary from Shift to Shift Within the Groups of the Electronics Unit

Numerous individuals within the Electronics Unit told OIG that repairs are scheduled based on the priority level of the problem, with loss of video streaming receiving the highest priority. Low-priority repairs are often saved for times when the most staff is available. A manager of the Network Group told OIG that a complete outage of video from three stations would be considered a high-priority incident. On April 9 and 10, however, the Network Group

believed that the only problem with the Network Connector was a faulty fan alarm, which is a low-priority incident, and thus, repairs were left for the following Monday, April 11.

Although service outages are high-priority events that are expected to be addressed expeditiously, no repair attempts were made on the Network Connector during the evening shift on April 11 or the overnight shift on April 12. This was well after the Network Group realized that the problems with the Network Connector had shut down the video stream from all of the cameras at the three stations.

Additionally, there is one Network Professional who is considered the expert on the streaming camera network design and another who is the “supertech” for the camera network equipment. When these two individuals are not available, the Network Group operates with a significant knowledge deficit that even the other highly skilled Network Professionals are not trained to fill.

#### **D. There is Poor Communication and Coordination Within and Among the Groups of the Electronics Unit**

OIG’s inquiry revealed that the groups within the Electronics Unit have fundamentally different understandings of protocols for communicating issues and the purposes of the different tracking/notification programs. The most obvious example is the Electronics Unit Hub.

The manager of the Electronics Unit Hub told OIG that he views the Electronics Unit Hub as the primary liaison among the different groups within the Electronics Unit. It is its own entity within the Electronics Unit, staffed and resourced with the purpose of receiving reports of any problems with the electronic equipment in NYC Transit that are tracked in the Trouble Ticket System and ensuring that those problems are reported to the correct group. The Electronics Unit Hub employees’ understanding of the correct way to notify the Network Group is to create a trouble ticket within the Trouble Ticket System and then send it to that group’s “bucket,” or inbox. The Hub employees do not believe that they have any additional notification obligations, such as attempting to call or email anyone within the Network Group of the problem. Nor does the Electronics Unit Hub have any responsibility to follow through with the trouble ticket after it has notified the intended group of the problem. If the Electronics Unit Hub’s trouble ticket is overlooked by the recipient, the problem can go unaddressed, perhaps for days, as it did in the case of the outage of the 25<sup>th</sup>, 36<sup>th</sup>, and 45<sup>th</sup> Street cameras.

Additionally, the use of multiple work order/trouble ticketing systems and monitoring systems within the Electronics Unit creates unnecessary structural impediments to communication. Because the Network Group uses the Trouble Ticket System and the Camera Group does not, the Camera Group had to go through the Electronics Unit Hub to create a trouble ticket for the Network Group on April 9.

The effect is not only that the different groups do not have access to each other's systems, but also that they are unable to interpret information from another group's system. A senior manager of the Electronics Unit told OIG that he (along with everyone in the Network Group) does not use and is unfamiliar with the EAM system and thus does not know how to interpret the system's information. He also acknowledged that no one from the Network Group is tasked with checking the Group's inbox for new trouble tickets, and that Network Group personnel instead expect to be notified of problems by a telephone call or via email. Moreover, he also admitted that he, in fact, did not even learn of the existence of the ticket until May 26, when Camera Group personnel told him that their group had asked the Electronics Unit Hub to create the ticket on April 9.

#### **E. The Notification Process Within the Electronics Unit Did Not Work to Alert Staff to the Camera Outage**

Multiple people within the Network Group told OIG that they view the Trouble Ticket System as a tracking system, not a notification system. Particularly among Network Professionals, the Trouble Ticket System is a place to check for known problems, not to look for reports of new problems. For example, one Network Professional told OIG that he looks in the Trouble Ticket System after he sees an alarm to check if a trouble ticket has already been created and if the problem is being addressed. In a sentiment echoed by multiple people within the Network Group, a senior manager of the Electronics Unit told OIG that his groups rely on an "informal procedure" of the person who reports a problem to call or email the appropriate group, which did not happen in this instance.

The flaw with this informal system is that not everyone in the Electronics Unit seems to know that the informal system even exists. The Camera Group employee who called into the Electronics Unit Hub on April 9, 2022 to report the outage at the three stations told OIG that he did not believe that he needed to further notify anyone beyond what he had done. Moreover, the switchboard operator at the Electronics Unit Hub told the OIG that he does not make any calls or send any emails to Network Group personnel to inform them that he has created a trouble ticket. The manager of the Electronics Unit Hub confirmed that the switchboard operator is not expected to do any follow-up after a trouble ticket is sent to the appropriate inbox. The Camera Group employee who received the email from NYC Transit Security alerting him of the outage

on the morning of April 11, 2022 told OIG that when he confirmed that there was an open trouble ticket, he believed that the already-opened ticket meant that the proper notification had been made and the issue was being addressed. Despite working in the same division, the disparate groups within the Electronics Unit do not have a common understanding of how to alert other groups of network problems, leading to confusion and potentially unseen trouble tickets. The Electronics Unit's failure to create clear protocols for reporting and receiving trouble notifications impedes their efforts to meet their primary goal: to keep the electronic systems in the subway up and running.

OIG asked multiple people within the Network Group at all levels who is actually responsible for checking the Trouble Ticket System "buckets" for new trouble tickets, and the answer almost uniformly was, "we all are." With no one specifically assigned to check, however, OIG found that no one is regularly checking the Trouble Ticket System to look for new trouble tickets. According to a senior manager of the Electronics Unit, the April 9, 2022 trouble ticket meant to alert the Network Group of the streaming outage went unnoticed by the Network Group for over seven weeks. No one checked the Trouble Ticket System to see if there were reports of network problems for the three affected stations prior to April 12.

#### **F. Preventative Maintenance for the Streaming Camera Equipment is Not a Priority**

While researching the cause of the camera outage, OIG became aware of a significant problem with respect to preventative maintenance of streaming camera network equipment. OIG could not identify any formal process for determining what preventative maintenance is required for each piece of equipment, the needed frequency of that maintenance, and what training is required to perform that maintenance properly.

##### *1. Preventative Maintenance Does Not Occur According to a Set Schedule*

There is no established preventative maintenance schedule for the camera streaming equipment. Instead, there is a shared spreadsheet which each Technician Supervisor reviews when deciding where and when to send Network Technicians to perform maintenance work. When preventative maintenance has been completed, the Technician Supervisors are supposed to enter that information in the Trouble Ticket System as well as the shared spreadsheet. One Technician Supervisor told OIG that he keeps his own, more thorough spreadsheet of preventative maintenance in addition to the shared one.



There is confusion amongst Electronics Unit personnel as to the appropriate frequency of when preventative maintenance should be performed. A senior manager of the Electronics Unit told OIG that, ideally, preventative maintenance should be performed on a quarterly basis, but that semi-annual maintenance is a more realistic goal due to a personnel shortage. He further stated that even this reduced goal is not being met for all locations.

Both the Camera Group and the Network Group bear some responsibility for keeping the equipment in the stations clean. Each group also checks the overall condition of the equipment that their group utilizes. The Technician Supervisors in both groups reported to OIG that preventative maintenance is the lowest priority task for their technicians. As should be expected, repairs to malfunctioning equipment take precedence over maintenance for both groups. The result, however, is that preventative maintenance does not occur as often as it should.

OIG reviewed preventative maintenance logs from January 2016 through mid-July 2022 and determined that preventative maintenance is performed haphazardly, with some locations going many months without being touched while others receiving preventative maintenance twice in one month. The preventative maintenance schedule was seriously disrupted in 2021 due to the COVID-19 pandemic. According to the logs, almost no preventative maintenance was performed on any of the camera network equipment at any location throughout the subway system in January and February 2021. As the year progressed, however, preventative maintenance resumed; yet, per the log, over 80 of the 470 locations received no preventative maintenance on their camera network equipment in 2021. OIG has identified one location that, as of July 2022, did not have a preventative maintenance performed on its camera network equipment since January 2021.

Oddly enough, OIG also identified 15 locations for which preventative maintenance on camera network equipment had been done more frequently than was required in 2021, even assuming the standard was quarterly as opposed to semi-annual maintenance. In fact, for three of these locations, preventative maintenance had been performed twice in 11 days.

## *2. The Preventative Maintenance Checklist is Incomplete*

Network Technicians are required to complete a checklist form identifying which tasks they performed during a preventative maintenance and what, if any, problems they identified. The form is paper, not digital, and Network Technicians fill it out by hand. OIG asked a senior manager of the Network Group if the preventative maintenance checklist is updated when new equipment is added to the camera network. He stated that the new equipment is listed on the work form, but that Network Professionals must instruct Network Technicians on any

equipment-specific maintenance that must be performed, such as changing a fan filter. However, the Network Connectors – and their fan filters – are not listed on the work forms at all.

3. *Fan Filters in the Network Connector Devices Were Not Routinely Changed During Preventative Maintenance for the Last Six Years*

NYC Transit contracted with the manufacturer and began installing the Network Connector devices in 2012. The first group of Network Connectors were commissioned into service in 2016, and they were all operational by the end of 2021. According to Electronics Unit records, for some of the Network Connectors, their filters were not changed for up to six years after their installation. Specifically, the Network Connector at issue in this Report was commissioned on December 20, 2019, and its filter was not first inspected until April 8, 2022. According to the equipment manual from the manufacturer, the fan filters of the Network Connectors should be changed every 90 days. Multiple Network Technicians and a manager of the Network Professionals stated that the Network Group did not begin regularly changing fan filters on the Network Connectors until February 2022.

The manager of the Network Professionals told OIG that the Electronics Unit became aware of the need to change the filters in the fan units after an increase in the number of Network Connectors that were overheating. In January 2022, he sent an email to a senior manager of the Network Technicians and two Technician Supervisors with instructions on how to perform maintenance on the Network Connectors' fan units, but he did not specify how often the maintenance should be performed. The email did include an instruction that the person performing the maintenance (almost always a Network Technician) should remove the fan unit, inspect the fan filter, and change it if it is "filthy."

Both representatives from the manufacturer and the manager of the Network Professionals told OIG that Network Connector fan filters can become clogged with dirt over time, blocking the air flow to the Network Connectors' internal cooling fan. If this air flow is blocked, the Network Connector may overheat, potentially damaging the internal components and causing malfunctions or device failure.

4. *Records of Preventative Maintenance are Decentralized and Incomplete*

OIG also reviewed the Trouble Ticket System and scanned copies of the paper forms that Network Technicians complete when performing a preventative maintenance. Technician Supervisors are required to enter all preventative maintenance into the Trouble Ticket System after the maintenance is performed. OIG found several incidences where Network Technicians

completed the paper form after performing a preventative maintenance but there is no corresponding entry in the Trouble Ticket System. This documentation is in addition to the spreadsheets utilized by the Technician Supervisors when scheduling preventative maintenance. The systems are dispersed and difficult to reconcile, contributing to the problems noted above – such as where some stations are serviced too frequently, while others are neglected for over a year.

## **G. Training of the Network Group Staff is Deficient**

### *1. Network Technicians Receive No Formal Training*

The personnel performing preventative maintenance are not adequately trained or supervised. Technician Supervisors assign Network Technicians to perform the preventative maintenance, but they do not oversee the process or monitor the quality of the maintenance. That job is left to the Network Professionals, who are reliant on the Network Technicians -- over whom they have no actual authority -- contacting them during the maintenance.

Certain Network Professionals reported to OIG that some of the Network Technicians are able to perform preventative maintenance adequately and correctly, while others, in the Network Professionals' opinions, do not seem to know how to properly execute the tasks required. In some cases, Network Professionals have found that some Network Technicians cannot even correctly identify all of the equipment utilized in the camera network. Network Professionals attributed this inadequacy to the Network Technicians' lack of structured training.

All of the Network Technicians interviewed by OIG said they received no formal training on how to perform their jobs. They uniformly told OIG that they sometimes receive instructions from the Network Professionals before they go out in the field on specific repair jobs and that they receive informal, on-the-job training from more senior Network Technicians in the field or from a Network Professional who happens to be with them on an assignment.

An Electronics Unit manager told OIG that it is not cost effective to formally train Network Technicians because of the annual "pick." Network Technicians are allowed to "pick" their assignments once per year under their collective bargaining agreement. In management's view, training someone who could leave less than one year after their pick is inefficient. OIG, however, conducted an analysis of employment records of Network Technicians and determined that the average tenure is 3.73 years and that approximately 63% of Network Technicians have three or more continuous years of service in their positions.

Network Professionals reported to OIG that this lack of training means that Network Technicians sometimes cannot differentiate between the different types of equipment -- for example, telling Network Professionals that they changed a fan filter on a Network Connector at a site that does not have one. Most relevant to the current inquiry is that OIG has learned that some Network Technicians do not know how to properly replace the fan filter in a Network Connector. If the fan unit is not replaced properly, the fan unit will not make the proper internal connections to the rest of the device. This will trigger a fan alarm in the Network Monitor, such as the one that occurred immediately after the preventative maintenance performed on April 8, 2022.

## *2. Network Professionals Receive Some Training, but It is Infrequent and Inadequate*

There is also little formal training for Network Professionals. The senior manager of the Network Group also told OIG that he recognizes the need for instituting regular training for Network Professionals.

Regarding the Network Connector networking equipment, the Network Group had one “supertech” Network Professional who had received formal training from the manufacturer at the time the equipment was installed. That employee left NYC Transit over one year ago. The person who replaced the “supertech” received limited informal training from that employee before he left. The new “supertech” and the other Network Professionals have received only limited training from the manufacturer.

Due to this lack of training, no one knew that the Network Connector required a specific installation process for the new internal data components. When the Network Professionals who successfully repaired the Network Connector on April 13 attempted this specific installation process, they were doing so as part of an educated trial-and-error process, not because they had specific training that informed their approach.

Furthermore, the Network Professional who attempted to analyze the failed Network Connector equipment did not know that the manufacturer offered forensic analysis – in-depth testing to determine the cause of equipment malfunction and failure – as part of its ongoing maintenance contract with NYC Transit. On April 13, he took the internal data components and the fan unit to his workstation and wiped them of all software. The manufacturer informed OIG that wiping the software did not impact the manufacturer’s ability to perform a forensic analysis, but the Network Professional agreed that had he known that he could have sent the equipment to the manufacturer, he would not have wiped the components. Formal training from the equipment manufacturer likely would have addressed this.

## V. RECOMMENDATIONS

*OIG shared our findings and recommendations with NYC Transit in preliminary form and then conducted multiple follow-up meetings to document actions NYC Transit has taken. Below is a list of OIG recommendations to address the shortcomings found during this investigation and a summary of agency actions to date.*

- **To better maintain the streaming camera network and respond appropriately to network problems**
  1. NYC Transit management should ensure there are sufficient, skilled employees within the Electronics Unit available to adequately monitor and repair the network systems consistent with agency standards.

***Agency Actions:** NYC Transit has authorized the hiring of approximately 40 additional technicians to meet the increased maintenance needs of the agency's ever-expanding electronic networks, including the streaming cameras. Additionally, NYC Transit is in the process of hiring additional Network Professionals, as well as Training Supervisors, to fill existing vacancies. Filling those vacancies will take time.*

- **Electronics Unit management should create clear, simple communications protocols among groups within the Electronics Unit**
  2. Establish and widely distribute protocols for reporting problems and troubleshooting them.
  3. Implement and utilize one trouble ticketing system across the Electronics Unit.
  4. Determine who is responsible for checking the trouble ticketing system "buckets"/inboxes and ensure they are checked frequently.
  5. Implement protocol for following up on trouble tickets entered into the system and ensure they are properly addressed.
  6. Keep protocols in a centralized and accessible database.

***Agency Actions:** The Electronics Unit has implemented a written policy for reporting and communicating streaming outages within the camera network. This policy includes a more*

*robust reporting and response protocol, which has been communicated to all relevant groups within the Electronics Unit and disseminated to personnel.*

- **Electronics Unit management must make preventative maintenance a priority**
- 7. Determine what maintenance is needed for each device and the frequency of that maintenance based on recommendations from equipment manufacturers.
- 8. Establish a standard, electronic checklist of preventative maintenance for every device.
- 9. Establish a schedule for performance of regular preventative maintenance.
- 10. Maintain electronic logs memorializing performance of preventative maintenance, including dates of maintenance, equipment location, and what maintenance was performed.

**Agency Actions:** *The Electronics Unit is implementing the EAM system for all groups within the Electronics Unit. This action was planned well before the incident of April 12, 2022. In addition to entering the inventory of all Network Groups devices into EAM, the Electronics Unit confirmed that they will assess the preventative maintenance needs and schedule for each piece of equipment, taking into account not only the manufacturer's recommended maintenance schedule but also the realities of the environment that exists within the subway system. The Electronics Unit acknowledged that it needs to collect data on their system needs before being able to implement a structured preventative maintenance program. EAM will also serve to alert users when a preventative maintenance is scheduled to occur and track when one has been performed.*

*The Electronics Unit expects to have EAM fully implemented by the end of 2023. In the interim, the Electronics Unit is still determining which supervisory positions within the Electronics Unit will dispatch the technicians to perform preventative maintenance.*

- **Electronics Unit management should establish frequent, standardized training for Electronics Unit personnel based on job responsibilities**
11. Implement specific training on network equipment and specialized devices for new employees with refresher training for existing personnel provided by management and/or the equipment manufacturer(s), as appropriate for each job title.
  12. Create and maintain centralized records of training taken by Electronics Unit personnel.

***Agency Actions:** The Electronics Unit has hired three training supervisors and is actively seeking a fourth to create a comprehensive training program for technical and maintenance staff within the Electronics Unit. The Electronics Unit plans to utilize both training provided by equipment vendors and in-house experts. MTA Human Resources will work with the Electronics Unit to track employees' technical training courses within the existing Human Resources training management system. The training program is dependent on new hires and will not start until there are adequate numbers of staff to be pulled for training and still have staff available to monitor and maintain the electronic network.*



## New York City Transit

December 14, 2022

### VIA E-MAIL

Elizabeth Keating  
Acting MTA Inspector General  
One Penn Plaza, 11<sup>th</sup> Floor  
Suite 1110  
New York, NY 10119

**Re: Response to MTA/OIG Report #2022-12 – Outage of Streaming Video During April 2022 Attack at 36<sup>th</sup> Street Station, Sunset Park- FINAL REPORT**

Dear Ms. Keating:

This letter is in reply to the Report of the MTA Office of Inspector General (“OIG”), dated December 12, 2022, entitled “Outage of Streaming Video During April 2022 Attack at 36th Street Station, Sunset Park, Brooklyn - Final (MTA/OIG #2022-12)” (the “Report”). In the Report, the OIG highlighted that the New York Police Department (“NYPD”) issued a statement that MTA cameras provided useful footage that day and commended New York City Transit’s (“NYCT”) response and assistance in the investigation. NYPD’s statement was as follows:

*The MTA is a vital partner in the NYPD’s Domain Awareness System and supplies live feeds from 5,100 cameras and an additional 5,000 cameras that record locally throughout the subway system. These are used on average dozens of times on a daily basis to identify specific incidents, crimes and to identify perpetrators. We communicate with the MTA about outages when they occur. If we discover an issue with a feed, we report it to them to make sure they are aware.*

*At the time of the attack on Tuesday in Brooklyn, the cameras were out at three stations due to a technical issue. Statements that the lack of cameras on the station delayed the manhunt by many hours are unfair and misleading. We had witness descriptions of the suspect and the distinctive, bright colored clothing he wore during the attack. As for his face, during the attack and the escape he wore a large black mask obscuring most of his face. As the Bomb Squad cleared the scene for suspected devices both a rental truck key with a serial number and a piece of identification were recovered by 11:00 am. That allowed us to recover video of the suspect from the Pennsylvania rental location as well as a name and a driver’s license photo from motor vehicle records.*



*The MTA cameras in other parts of the system were essential elements in determining his movements before and after the shootings. Their personnel worked with us around the clock to identify and retrieve images in this case. While it has become routine to cast blame in many directions after an incident, we should remember that the gunman is the sole party responsible for this attack.*

NYCT has an extensive and redundant camera network. NYCT has over 10,000 cameras throughout all 472 stations. In fact, NYCT has invested in the expansion of cameras by 66% over the last four years.

On average, 99% of NYCT's cameras within the network are operational at any given time. Of the more than 10,000 cameras, NYCT has 5,000+ live-streaming cameras ("Streaming Cameras").

On April 12, 2022, 99.6% of the Streaming Cameras were operating within the network. Of the over 5,000 Streaming Cameras across the entire system, 22 were out of service (19 of those were the subject of this Report). Even with that outage, because of its robust and redundant camera network, NYCT provided NYPD with four images of the perpetrator who attacked our system that day. Coverage is extensive and redundant enough that an unexpected failure of cameras in one location was offset by other cameras.

As the Report acknowledges, neither the OIG nor the equipment manufacturer could determine the point of failure that caused the camera outage. We are, however, certain that train service was restored along the 4<sup>th</sup> Avenue line by 4pm that day by our greatest asset - our heroic NYCT workforce. NYCT brought full service, including re-opening the 36<sup>th</sup> Street station back in less than 24 hours despite the extreme stress of that day.

Your recommendations regarding staffing levels, training, and relying on manufacturers preventative maintenance protocols are acknowledged, and as the Report indicates are being addressed; however, to be clear these are business decisions. MTA has finite resources, and prioritizing investments in one area requires reducing investment in others. As your investigator acknowledged to MTA executives, your team does not have the expertise to determine what is an acceptable turnaround time for repairing one broken camera out of 10,000+ or how many people should be hired by a public transit agency for this one facet of the operation. Prioritizing the acceleration of the repair of the 1% of our cameras that are out of service at any time comes at the expense of other train and bus service-sensitive activities. Indeed, MTA's purposeful strategy for surveillance cameras has been to deploy redundancy across the system. All indications from our Safety department and NYPD are that the current performance of our camera network has led to the successful identification of dozens of perpetrators including the shooter in April. In October and November, NYCT successfully provided over 1,800 video clips to NYPD to help police solve crimes, most of which were not committed in our system but instead above ground. Our cameras

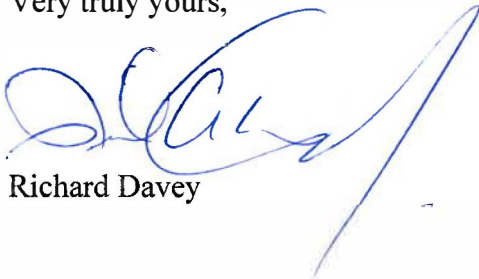
captured images of these perpetrators who fled into our system. These cameras continue to effectively perform their core function – to assist in investigations and help solve crimes.

The other recommendations you make, (Recommendations 2, 3, 4, 5, 6 and 10), regarding providing a common platform and protocols for reporting and tracking maintenance issues will all be implemented as a part of the MTA-wide Enterprise Asset Management (“EAM”) program. EAM is implemented asset class-by-asset class, and the phasing for each asset class is a business decision. Implementation for the security camera and associated networks are currently on going. However, due to the extensive number of associated assets and maintenance requirements for each, the implementation will require a multiphase implementation over an extended period. I am wary of re-prioritizing the EAM timeline and accelerate it for security cameras and their associated networks at the expense of a different asset class that is core to running a reliable safe service.

NYCT has developed and is distributing a more standardized protocol for performing maintenance (encompassed by recommendations 7, 8, and 9). Over the past several months, NYCT has been working closely with user departments to identify the best practices from previously utilized protocols. A single, standard protocol and schedule for preventative maintenance has been finalized and will be applied going forward.

If you need any additional information or have any questions, please feel free to contact me.

Very truly yours,



Richard Davey

cc: Janno Lieber, MTA Chair and CEO