The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

PIPELINE ENGINEERING AND SAFETY DIVISION

INCIDENT REPORT

44 Willowdale Road, Groton, Massachusetts
December 11, 2007

PIPELINE ENGINEERING AND SAFETY DIVISION

Accident File

Location: 44 Willowdale Road, Groton, Massachusetts

Date of Accident: December 11, 2007

Gas Company: Boston Gas Company d/b/a National Grid

Estimated Property Damage: Over $260,000 *

Injuries: None

Report Issued – September 1, 2009

* Estimated by Boston Gas Company d/b/a National Grid

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I. INTRODUCTION

A. Scope of the Investigation

The Massachusetts Department of Public Utilities ("Department"), Pipeline Engineering and Safety Division ("Division"), pursuant to G.L. c. 164, § 105A and a Federal Certification Agreement as provided for in 49 U.S.C. § 60105, has investigated a natural gas ("gas") release at 44 Willowdale Road, Groton, on December 11, 2007 ("Incident").[1] The release of gas contributed to an explosion, fire and over $260,000 in property damage to the dwelling, as estimated by the operator of the natural gas facilities, Boston Gas Company d/b/a National Grid ("National Grid" or "Operator") (Exh. 1).[2]

As part of the Department's annual certification process by the United States Department of Transportation ("U.S. DOT"), the Department must report to the U.S. DOT

> each accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss of more than an amount the Secretary establishes... and any other accident the [Department] considers significant, and a summary of the investigation by the [Department] of the cause and circumstances surrounding the accident or incident. 49 U.S.C. § 60105(c).

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[1] Incident means any of the following events:

1. An event that involves a release of gas from a pipeline or liquefied natural gas or gas from an LNG facility and,
   a. A death, or personal injury necessitating in-patient hospitalization; or
   b. Estimated property damage, including cost of gas lost, of the operator or others, or both, of $50,000 or more.
2. An event that results in an emergency shutdown of an LNG facility.
3. An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2). 49 C.F.R. Part 191, § 191.3.

[2] As a result of a merger completed in 2007, Boston Gas is part of the National Grid utility system. Prior to this, the company was Boston Gas Company d/b/a KeySpan Energy, New England.

The purpose of this report is to inform the U.S. DOT as to the cause and circumstances surrounding the Incident.

The Department has established procedures for determining the nature and extent of violations of codes and regulations pertaining to safety of pipeline facilities and the transportation of gas, including but not limited to, 220 C.M.R. §§ 101.00 through 113.00. See 220 C.M.R. § 69.00 et seq. The Division also enforces the U.S. DOT safety standards for gas pipeline systems as set forth in 49 C.F.R. Part 192 ("Part 192"). G.L. c. 164, § 105A.

> [e]ach accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss more than an amount the Secretary establishes, any other accident the [Department] considers significant, and a summary of the investigation by the authority of the cause and circumstances surrounding the accident or incident.

National Grid investigated the Incident, and submitted an Incident Analysis Report (Exh. 1). Part 192, § 192.617

B. Overview of Incident

At approximately 2:28 p.m. on December 11, 2007, the Department received notice from National Grid of a release of gas at 44 Willowdale Road, Groton. The caller reported that a National Grid leak survey technician from Surveys & Analysis Inc. ("Leak Survey Technician") had hit a gas service line[3] while investigating a grade 3[4] leak on Willowdale Road, Groton (Exh. 2).

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[3] *A service line:* A distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is not a meter.49 C.F.R. §192.3.

The Department dispatched two investigators to the scene. The damaged portion of the gas service line was constructed of ¾-inch plastic pipe, operating at high pressure (Exh. 1, at ii).[5] The plastic service line transitioned to one-inch steel piping at the service valve, and continued onto the gas main.

The Leak Survey Technician acquired gas readings in front of the house, and continued the leak investigation by checking at the gas service riser, approximately one foot away from the house (Exh. 3, at 4-5). As he investigated the leak, the Leak Survey Technician utilized a probe bar to create a test hole (id.). When doing so, he punctured the plastic service adjacent to the house (id.). The puncture was located upstream of the service valve. The escaping gas apparently entered the basement of the building through the fieldstone foundation (Exh. 7).

At 12:48 p.m., the Leak Survey Technician knew that he had punctured the gas service, called the National Grid "Call Center" to report the gas leak, and waited for the arrival of a National Grid leak responder (Exh. 2). At 12:57 p.m., a National Grid leak responder was dispatched to investigate the leak ("Leak Responder") (id.). He arrived onsite at 1:14 p.m., and reviewed the situation with the Leak Survey Technician. The Leak Responder attempted to locate the valve box with a shovel. After a couple of shovelfuls, he hit a rock and stopped (Exh. 3, at 1).

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4 National Grid classifies a Grade 3 leak as a non-hazardous leak at the time of detection, and can be reasonably expected to remain non-hazardous.

5 A high pressure system is a system in which the pressure in the main is higher than the pressure provided to the customer. Part 192, §192.3.

The Leak Responder knocked on the door of 44 Willowdale Road, and got no answer. The Leak Responder checked at the front door with his Combustible Gas Indicator ("CGI")[6] machine, and acquired a gas reading of 3.5 percent. He again knocked on the door and "confirmed that it was locked (id.)."

As the Leak Responder walked back to his vehicle to request assistance, he heard an explosion, and was knocked to the ground. He was shaken but uninjured (id.). At 1:30 p.m., he notified National Grid dispatch personnel, and told them that an "explosion" had occurred at the site (Exh. 2).

The house was unoccupied at the time (Exh. 3, at 1). As a result of the explosion, the Leak Responder was taken to the hospital (id.). Personnel present during the Incident were sent for Post Incident Drug and Alcohol Testing (Exh. 4).

II. THE DEPARTMENT'S INVESTIGATION

A. Description of the Site

Willowdale Road is located in a residential area of Groton. The area is comprised of single-family residences. The structure at 44 Willowdale Road was a two-story house, with a basement and a fieldstone foundation. The house had a gas-fired water heater and a central furnace. A two-inch steel gas main[7], sections of which were installed in 1930 and 1955,

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[6] A CGI machine is utilized to detect natural gas concentrations. An air sample is drawn across an element at a controlled rate and a direct reading of combustible gas content of the sample is then obtained.

[7] "*Main*" means a distribution line that serves as a common source of supply for more than one service line

underlies Willowdale Road (Exh. 5). The operating pressure of the gas main at the time of the Incident was between 54 and 57 p.s.i.g (id.). The installation date of the gas service to 44 Willowdale Road is "unknown (Exh. 6)." The outside service riser had a manual shut off valve. The service regulator and gas meter were mounted downstream of this valve.

B. Description of the Scene

On December 11, 2007, at approximately 3:40 p.m., Division investigators arrived at 44 Willowdale Road. Representatives from National Grid, Groton Fire and Police Departments, State Police, and the State Fire Marshal's Office were at the scene.

The house had been completely destroyed by the explosion and ensuing fire. It collapsed into the foundation. Debris had been blown onto the Road, into adjoining properties and across the Road into a wooded area (Exh. 7). The service riser assembly, gas meter and service regulator were intact, and located in close proximity to the original installation location. The service had been bent over by the debris as it was displaced from the house during the explosion. The meter had been burned as a result of the fire (id.).

National Grid could not immediately isolate the gas service to 44 Willowdale Road as the curb valve could not be located (Exh. 3). National Grid shut off the gas main on Willowdale Road at a main valve at the corner of Willowdale Road and Hollis Road. Fourteen accounts, including an elderly complex, had gas service disruption (id.). National Grid eventually located the curb valve and disconnected the service. National Grid re-energized the gas main and restored gas service to the affected accounts (id.).

National Grid conducted a pressure test of the portion of the steel service line that extended from the gas main to the service valve. The service was first pressurized to

56 p.s.i.g. The test held pressure for a period of 16 minutes. The pressure was raised to 91 p.s.i.g. and tested an additional 10 minutes. Both tests were successful (id.).

After completion of the test, National Grid exposed the remaining portion of the service upstream of the service valve. The puncture on the exposed plastic service was clearly visible (Exh. 7).

The service pipe was sectioned and cut into two pieces to help in its transportation. After the investigation was completed at the scene, the State Fire Marshal's Office transferred custody of the pipe to the Division's investigators.

C. National Grid

1. Leak Survey Technician

National Grid contracts with Surveys & Analysis Inc., to perform leak surveys on its facilities. On December 11, 2007, a Surveys & Analysis Inc. Leak Survey Technician was in the process of rechecking an existing grade 3 leak reported at 43 Willowdale Road (Exh. 3, at 4).

The Leak Survey Technician stated that he had been leak surveying on his own for approximately eight months (Exh. 9). In the process of rechecking the leak, he obtained readings with his Flame Ionization Unit ("FIU")[8] at the edge of the road and front lawn of 44 Willowdale Road (Exh. 3, at 4). As he began to perform his leak investigation, another Surveys & Analysis employee arrived onsite to obtain leak survey forms (id.). The Leak

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[8] An FIU detects the presence of a hydrocarbon by drawing an air sample across a flame. The FIU does not provide percent of gas readings and any acquired readings must be verified with a Combustible Gas Indicator.

Survey Technician stopped the investigation and exchanged forms with the other Surveys & Analysis employee who placed the paperwork in his vehicle and stayed onsite (id.).

To further investigate the leak, the Leak Survey Technician acquired a CGI machine and a probe bar from his vehicle (id.). He explained that he "banged a bar hole approximately six feet from the house and got trace gas, less than 1 percent bleed-out not sustained (id.)." He continued his investigation and bar holed approximately one foot away from the house over the gas service, as he removed the bar, he stated that, "he saw blowing dirt and smelled gas and knew that he had damaged the gas service (id.)."

The other Surveys & Analysis employee stated that "he saw the Leak Survey Technician removing the probe bar and CGI machine from his car" and that when he caught up with him, the Leak Survey Technician had begun to bar hole at the house (Exh. 8). It was at this time that he drove the probe bar through the gas service. He further explained that they both knew the gas service had been hit as "they could see it blowing and dirt and dust was flying around (id.)."

At 12:48 p.m., the Leak Survey Technician called the National Grid "leak line" to report that he had probed through the gas service. As he stood in front of the house, he stated that he "didn't knock on the door as he could see that no lights were on and that there were no cars in the driveway, so he assumed that no one was home (Exh. 3)."

The State Fire Marshal's Investigators and Division Inspectors interviewed both of the Surveys & Analysis employees. The Leak Survey Technician, when asked if knew the depth that gas services are installed, replied that "services are usually two (2) feet deep and that he has a mark on his pogo stick so that he knows where two feet is, so that he doesn't go deeper

(Exhs. 7,9)." When he was informed that gas services in private property are installed at a depth of 12" and 18" in sidewalks or public areas, he responded that he did not know those facts (Exh. 9).

The other Surveys & Analysis employee was asked what they had done after the gas service had been damaged. He responded that "they both backed up their cars and that the Leak Survey Technician called dispatch to report the leak (Exh. 8)." He said that he was told to go to his truck by the Leak Survey Technician as he wasn't actually working there (id.). When asked what they did next, he said that "they both sat in their cars and waited for National Grid to arrive" and "that they had not knocked on the door to see if anyone was home (id.)."

2. Operator Qualification and Training

National Grid did not train the Surveys & Analysis employees (Exh. 10). Surveys and Analysis provided no training documents or procedures to the Division with respect to the curriculum covered for the required covered tasks relative to this Incident (Exh. 11). Surveys and Analysis stated that, "training [of Survey's and Analysis employees] is performed via an apprenticeship structure and on the job training (id.)." Surveys and Analysis reported that the only formal documentation for competency from training [of the Leak Survey Technician] is the passing of nationally recognized Operator Qualification ("OQ") testing (id.). Surveys and Analysis verified that the Leak Survey Technician was administered and passed the Industrial Training Services OQ Program and the Northeast Gas Association ("NGA") OQ

Program (Exh. 11).[9]

Surveys and Analysis stated that the Leak Survey Technician was monitored numerous times during his apprenticeship by a National Grid supervisor prior to being authorized to independently perform surveys for National Grid (id.).

NGA qualified the Leak Survey Technician on May 21, 2007, to perform Operator Qualified covered tasks, among these were:

- NGA-018 Conducting Gas Leakage Surveys
- NGA-019 Patrolling and inspecting Pipelines
- NGA-020 Investigating Leak/Odor Complaints
- NGA-070 Abnormal Conditions

(id.).

The Leak Survey Technician stated that he had been leak surveying for approximately 10 months, and received one month of training when he worked in Maine with another surveyor and had received another month's training, so he believed that he had been surveying on his own for eight months (Exh. 9).

When asked what materials had been provided to him during his training, the Leak Survey Technician made available Operator Qualification and Corrosion Training Materials that were specific to Operators from Kentucky, Baltimore and other State utilities (id.).

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[9] NGA is a regional trade association that focuses on education and training, technology research and development, operations, planning, and increasing the public awareness of natural gas in the Northeast U.S. All of the Commonwealth's natural gas utilities are members of NGA.

National Grid provided NGA Operator Qualification records for the National Grid Leak Responder (Exh. 12). NGA qualified him on December 5, 2005 to perform 16 covered tasks, among these were:

- NGA-018 Conducting Gas Leakage Surveys
- NGA-019 Patrolling and inspecting Pipelines
- NGA-020 Investigating Leak/Odor Complaints
- NGA-070 Abnormal Conditions

(id.).

National Grid provided training materials and tests administered to its Leak Responder that covered the following tasks:

- Knowledge Test for Emergency Response - 3/22/2007
- Emergency Response Unit School - Performance Test - 3/23/2006
- Review 70 Abnormal Operating Conditions/Properties of Natural Gas
- Review 18, 19 Leak Investigation
- Review 20B
- LEAK-5010: First Response and Leak Investigation
- LEAK-5030: Leak receipt and Classification
- Module 7 - Emergency Response Unit Guidelines
- Module 3 - Using the Flame Ionization Unit and Other Tools for Investigation of Road Leaks
- Module 14 - Leak Investigation and Repair

(Exh. 13)

III. FINDINGS AND CONCLUSIONS

A. Findings

1. On December 11, 2007, the operating pressure of the National Grid two-inch steel gas main underlying Willowdale Road was between 54 and 57 p.s.i.g.

2. The three-quarter inch plastic service to 44 Willowdale Road operated at high pressure had an outside service riser, and manual shut off valve.

3. The service regulator and gas meter were mounted downstream of this valve.

4. On December 11, 2007, National Grid dispatched a leak survey technician employed by National Grid Contractor, Surveys and Analysis, Inc., to investigate a grade 3 leak on Willowdale Road in Groton.

5. The Leak Survey Technician utilized a Flame Ionization Unit and began to detect gas at the edge of the lawn at 44 Willowdale Road.

6. After detecting gas at 44 Willowdale Road, the Leak Survey Technician retrieved his Combustible Gas Indicator and probe bar.

7. The Leak Survey Technician advanced his first bar hole approximately six feet from the building.

8. The Leak Survey Technician moved approximately one foot away from the building, advanced a second bar hole and punctured the service line to 44 Willowdale Road.

9. At 12:29 p.m., December 11, 2007, the Leak Survey Technician reported to National Grid that he had punctured the service line and waited for National Grid personnel to arrive.

10. After puncturing the service line, there is no evidence to demonstrate that the Leak Survey Technician fully performed an outside leak investigation, performed building checks, and attempted to evacuate and ventilate buildings as necessary.

11. A National Grid Leak Responder arrived on the scene at 1:14 p.m.

12. National Grid could not immediately isolate the gas service to 44 Willowdale Road as the curb valve could not be located.

13. The Leak Responder detected 3.5 percent gas at the door of 44 Willowdale Road.

14. As the Leak Responder walked back to his vehicle to request assistance, the house exploded.

15. National Grid shut off the gas main on Willowdale Road at a main valve at the corner of Willowdale Road and Hollis Road.

16. National Grid eventually located the curb valve and disconnected the service.

17. The gas released from the service line most likely moved into the house through the voids in the fieldstone foundation.

18. The possible sources of ignition of the gas are the gas-fired water heater and central furnace.

19. The Leak Survey Technician was tested for drugs, but there is no evidence that he was tested for alcohol.

20. The Leak Survey Technician did not have appropriate parts of the National Grid O&M manual of written procedures at the time of the incident.

21. The Leak Survey Technician did not participate in National Grid's training program.

22. On May 21, 2007, the Northeast Gas Association qualified the Leak Survey Technician to perform the covered tasks he was required to perform the day of the Incident.

B. Conclusions

1. The acts of the Leak Survey Technician contributed to the incident.

2. The Leak Survey Technician's training was inconsistent with National Grid's training and qualification of its own employees.

3. National Grid's method of qualification of the Leak Survey Technician may have been deficient.

4. The conclusions in the National Grid Incident Analysis report are reasonable, and supported by substantial and specific evidence.

5. National Grid's proposal to review and periodically audit training performed by National Grid leak survey contractors addresses the apparent differences in training between contractors and Operator employees, and is likely to prevent, or reduce in severity a similar occurrence from occurring in the future.

IV. NATIONAL GRID RESPONSE

On June 18, 2009, pursuant to G.L. c. 164, § 105A and 220 C.M.R. §§ 69.00 et seq., the Department concluded an enforcement action with National Grid. National Grid, D.P.U. 07-PL-13. National Grid agreed to: (1) verify that the recommendations presented in National Grid's Incident Analysis Report have been completed; (2) evaluate the Leak Survey Technician that caused the Incident to determine whether the technician is qualified to continue to perform the covered task; (3) review the effectiveness of National Grid's qualification methods, procedures, processes, and training with respect to those National Grid employees and contractors performing covered tasks NGA 020, Investigating Leak/Odor Complaints, and NGA 070, Abnormal Conditions; and (4) file a report with the Department concerning this review.