

Board of Inquiry Report



Castle Village
Retaining Wall Collapse
April 2007

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A view of pre-collapsed section looking down on Riverside Drive and Henry Hudson Parkway North.



View of bowing wall on May 12, 2005.

On Thursday, May 12, 2005, at approximately 4:00p.m., a portion of a 65 foot high stone retaining wall on the side of a bluff rising above the Hudson River just north of the George Washington Bridge suddenly collapsed. Minutes later a second larger collapse followed. A 150 foot section of the 800 foot long wall now covered portions of the Henry Hudson Parkway and Riverside Drive, a number of parked cars, and the adjacent sidewalk. The wall is owned by Castle Village Owner's Corporation, a five building, 575 unit co-operative housing complex located on the top of the hill behind the wall. The collapse caused massive delays on the Henry Hudson Parkway and surrounding roads. Fortunately, there were no deaths or even injuries.

Because of the magnitude of the collapse and because its cause was not readily apparent, Commissioner Patricia J. Lancaster, FAIA, of the New York City Department of Buildings, convened a Board of Inquiry on May 24, 2005. The Board of Inquiry was charged with conducting an independent investigation into the possible causes of the wall's sudden collapse, with gathering the evidence the Board needed to make its findings, and with making recommendations to the Commissioner to prevent similar occurrences in the future.

The Board interviewed numerous individuals, including the members of Castle Village's Board of Directors; Castle Village's property manager Frank Nadal; engineers employed by Castle Village's consultant, Langan Engineering; and various eyewitnesses. The Board reviewed numerous documents submitted by Castle Village and Langan that set forth the history and maintenance of the wall since 1985, when Castle Village became a co-operative housing corporation. Members of the Board also visited the collapse site. The Board also retained two engineering firms, United Research Services ("URS") and Mueser Rutledge Consulting Engineers ("Mueser"), to assist it in conducting the investigation.

URS found that the most likely cause of the collapse of the retaining wall was structural failure resulting from an increased pressure that developed behind the wall due to the build up of groundwater throughout the years. The Board concurs in this finding. Neither of the two documented repairs that Castle Village undertook at the recommendation of engineering consultants was sufficient to address the destabilization posed

by the increased pressure. First, in 1985 when the wall shifted and a bulge occurred, Mueser Rutledge was hired by Castle Village to recommend and oversee a repair. The Board finds that while this repair (installation of wall anchors and bolts) may have addressed the localized issue, it did not address the groundwater pressure build up. The second construction work occurred in 2004 when Castle Village accepted Langan Engineering's first phase design for installation of a new surface drainage system in the yard at the top of the wall. The Board finds that while this surface drainage system failed, this failure did not have a significant adverse effect on the wall.



Sink hole surrounding drainage catch basin on April 19, 2005.



Cracks in re-pointed mortar on January 26, 2002.



2002 picture shows curvature of wall.

The infiltration and pressure posed by the groundwater were far greater than this surface drainage system would have diverted even had it worked as intended.

Effective repair and maintenance is critical to structural stability of all retaining walls. The wall had been a major matter of concern to Castle Village's Board of Directors since the apartment complex became a co-operative in 1985. Repeated inspections and investigations showed cracking and wall movement, bulging of sections of the wall, stones falling from the wall, tilting of the balusters at the top of the wall, and voids and sinkholes in the park located at the top of the hill being held up by the wall. In 2002, Castle Village hired Langan Engineering to monitor the wall. Langan told Castle Village in a report dated January 6, 2003 that portions of the wall were bulging and were moving toward the west, away from the hill that the wall was holding back.

While Castle Village solicited 15 different reports from various engineering firms during the 20 years before the collapse to evaluate and study the wall's many problems, it did not perform any substantial work after the 1985 repair except for the installation of the failed drainage system in 2004. The Board finds that these efforts do not constitute effective repair and maintenance.

Further, when sinkholes and voids reappeared behind the wall in early 2005 and Castle Village learned the new drainage system installed the previous summer had not arrested the wall's decline, the co-operative failed to take effective action. On April 13, 2005, Langan informed Castle Village that the upper section of the wall had further destabilized by moving up to seven inches westward during the previous eight months and that this section of the wall was "critical." Langan wrote Frank Nadal, Castle Village's property manager:

"Our judgment is that there probably is ongoing deep seated global movement of an approximately 50 ft section of the retaining wall. This 'critical' section (i.e., cracks reopening and large sinkholes within the terrace) requires immediate attention; we recommend installing a restraining system to stabilize this critical section."¹

Nevertheless in the following month, as the wall continued to deteriorate, neither Langan nor Castle Village took effective emergency action. Even on May 4, 2005, eight days before the

collapse, when Langan's monitoring points indicated that parts of the wall had moved an additional nine inches since April, no emergency was declared. While this information and Langan's conclusion set forth in its April 13 letter that the wall needed immediate bracing warranted a sense of urgency, Langan did not notify the Department of Buildings of the existence of an imminent threat to public safety. While it is true that a few days

before the collapse Urban Foundations, a Castle Village contractor, hired an expeditor to approach the Department of Transportation for permission to close a lane of Riverside Drive so that the wall could be braced, Langan and Castle Village appeared to treat the situation as an ordinary problem, one that could be dealt with in the ordinary course of business. When the Department of Transportation asked for an engineering report to justify the lane closure, Langan wrote that “the 70 ft high stone wall is exhibiting distress due to lateral movement.” This language was insufficient to put the Department of Transportation on notice that failure of the wall might be imminent. Neither Langan, Castle Village, nor any of its agents acted with a sense of urgency or gave an indication that public safety was at risk. They simply went through the normal permitting process.

On the morning of the collapse, when Langan visited the site to address Castle Village’s mounting concerns, an engineer from Langan told Castle Village to tie the leaning concrete balustrade columns to some trees to prevent them from toppling off onto the sidewalk and roadway below. This demonstrated that Langan and Castle Village both knew there was an imminent threat to public safety. They again failed to implement adequate safety measures to protect the public from the rapidly deteriorating situation, in this instance evidenced by both the leaning balusters and by the wall’s precipitous westward movement over the previous weeks.

Castle Village had a non-delegable duty under the New York City Building Code to maintain the wall in a safe condition. It failed to do so. Castle Village’s manager Frank Nadal; Nadal’s employer Goodstein Management Inc.; and Langan Engineering all failed to properly address the seriousness of the situation in April and May 2005 when they knew that significant changes had taken place after sinkholes and sidewalk joints re-opened and sections of the wall accelerated their westward movement. The Board finds that Castle Village and its agents Nadal, Goodstein Management and Langan all failed to notify the City of the obvious and imminent threat to public safety posed by the wall’s extremely deteriorated condition.

In early May, when Langan’s monitors showed that a section of the wall had moved almost two feet westward since 2002, Langan still took no effective emergency measures and failed to notify the Buildings Department. Two feet of movement of the upper section of the wall—approximately nine inches between April 11 and May 4—is significant. URS has calculated that the factor of safety for the pre-collapse May 2005 geometry of the wall is approximately 1.0 or less than 1.0. As the factor of safety approaches 1.0 or less, failure occurs. The Board finds that Langan should have known this portion of the wall had dramatically destabilized and that the wall was at risk of imminent failure.

As a result of its investigation, the Board recommends the following actions to the Commissioner of Buildings:

- 1) The New York State Education Department licenses and oversees professional engineers. George Derrick and Gregory Biesiadecki, the engineers from Langan who worked on the Castle Village project who were aware of the wall’s movement and condition in March and April 2005, should be referred to the New York State Education Department’s Office of Professional Discipline for consideration of any appropriate disciplinary action based on their failure to exercise a reasonable standard of care and their failure to alert the Department of Buildings that the movement of the wall in the Spring of 2005 had accelerated and that this presented a danger to the public.
- 2) The Department of Buildings does not license engineers; however it does afford engineers privileges that may be revoked. Title 1, §21-02, of the Rules of the City of New York allows the Department of Buildings to revoke a Professional Engineer’s right to professionally certify that his or her submissions are code and zoning compliant. George Derrick and Gregory Biesiadecki, the engineers from Langan who worked on the Castle Village project, should be referred to the Buildings Special Investigations Unit to determine whether proceedings should be commenced under the provisions of §21-02 based on their involvement in the project.

- 3) Section 26-234 of the Administrative Code states that those engaged in building operations have a duty to report dangerous or unsafe conditions to the Department of Buildings. Castle Village; its managing agent Goodstein Management; Goodstein's employee Frank Nadal, the property manager; Langan Engineering; and Langan engineers George Derrick and Gregory Biesiadecki should each be cited with a New York City Environmental Control Board violation for their failure to comply with section 26-234 by bringing the dangerous condition of the wall to the attention of the Department of Buildings.
- 4) The Department of Buildings should propose legislation to require owners to engage a New York State licensed architect or engineer to perform periodic inspection of retaining walls that front a public way. A model for this type of regulation is Local Law 10 of 1980, as amended by Local Law 11 of 1998, which sets forth a facade inspection/repair regulatory scheme for building facades. The legislation would require a cyclical inspection report and a schedule for any needed repair and maintenance to be filed with the Department of Buildings. Criteria for the inspection and reporting process should include factors such as wall height, wall composition, and proximity to a public way.

Furthermore, related to its investigation, the Board acknowledges the following prior actions on the part of the Department of Buildings:

- 1) Pursuant to Section 26-235 or 26-243 of the Administrative Code, the Department of Buildings issued an Emergency Declaration the day after the collapse stating that repair work on the wall was to commence immediately in order to remedy the dangerous condition and protect public safety.
- 2) Castle Village Owner's Corporation was ordered to permanently repair the collapsed portion of the retaining wall and permanently stabilize the remaining portion of the wall. Furthermore, the Department of Buildings monitored this process to ensure that all work conformed to the NYC Building Code, other applicable laws, rules, and regulations, and that all requisite permits were obtained to perform the necessary work.
- 3) Castle Village Owner's Corporation was ordered to monitor the movement of the retaining wall until it provides the Department of Buildings with a report from a professional engineering firm certifying that the wall is safe.
- 4) Sections 27-127 and 27-128 of the Building Code explicitly require an owner to maintain its buildings in a safe condition, and impose responsibility on the owner to do so. Castle Village failed to discharge this duty and was properly served with a notice of violation and found guilty at the Environmental Control Board for its failure to maintain its property in a safe condition.

The following is a list of the principal companies and individuals involved with the Castle Village retaining wall collapse and the investigation that followed.

Castle Village Owner's Corporation ("Castle Village")

A co-operative ownership association that owns the site and is responsible for the maintenance of the retaining wall.

Goodstein Management, Inc. ("Goodstein")

A property management company that manages the Castle Village complex for the Castle Village Owner's Corporation.

Frank Nadal, P.E.

The property manager for the Castle Village complex and an employee of Goodstein Management.

Langan Engineering & Environmental Services ("Langan")

An engineering firm that was retained by Castle Village to evaluate, inspect, make recommendations about, and repair certain areas of the Castle Village grounds, drainage systems, and the retaining wall.

George Derrick, P.E.

A partner at Langan Engineering who was responsible for the Castle Village project and who self-certified the application with the New York City Department of Buildings to perform drainage modifications at the Castle Village site in 2004.

Gregory Biesiadecki, P.E.

A project manager at Langan Engineering who supervised the work at the Castle Village site.

New York City Department of Buildings ("Buildings" or "the Department")

Agency responsible for enforcing the Building Code and the Zoning Resolution. Buildings has regulatory authority over retaining walls located within the property lines of private owners.

Board of Inquiry ("the Board")

Entity convened by the Department of Buildings Commissioner Patricia J. Lancaster, FAIA. Responsible for investigating the cause of the collapse and for making recommendations regarding how to prevent similar collapses.

Mueser Rutledge Consulting Engineers ("Mueser")

Consultants retained by DOB to:

1. Collect information on the construction of the wall;
2. Collect information on inspections and repairs to the wall made prior to the collapse;
3. Interview eyewitnesses to the collapse;
4. Collect photographs taken by various parties prior to and after the collapse; and
5. Prepare a report summarizing all the collected information

United Research Services ("URS")

Engineering firm retained by Buildings to review Mueser's findings and provide an analysis of the technical reasons for the wall's collapse.



A. Construction of Castle Village and the Retaining Wall

Castle Village is located in the historic Washington Heights section of Manhattan in an area bordered on the west by Riverside Drive and the Henry Hudson Parkway, to the south by West 181st Street, to the east by Cabrini Boulevard, and to the north by Alex Rose Place. Resting atop one of Manhattan's highest points at 200 feet above sea level, Castle Village's seven acres include five apartment towers, a parking garage, and a large park that was supported by the retaining wall that collapsed in 2005. This site is close to the original location of Fort Washington, built in 1776 along with Fort Lee in New Jersey, to prevent British troops from sailing up the Hudson River.

In the 1880's, the Paterno family emigrated from Italy and settled in Washington Heights. John Paterno started a real estate business, and after his death in 1899, his sons Charles and Joseph continued to purchase and develop real estate.² The Paterno brothers were involved in the construction of several apartment houses on the Upper West Side of Manhattan.³ In 1905, Dr. Charles Paterno purchased the property that would eventually become the Castle Village site.⁴ He built a four-story castle on the property between 1905 and 1910.⁵ The castle served as Dr. Paterno's home and offered a panoramic view of the Hudson River from its location high above what would later become the Henry Hudson Parkway.⁶ On the west side of the property, a stone retaining wall that would eventually measure 800 feet long and 65 feet high separated the castle from the street below.⁷

Dr. Paterno purchased the adjacent property and constructed the Hudson View Gardens co-operative housing complex in Washington Heights in 1924.⁸ Based on the success of Hudson View Gardens, Dr. Paterno demolished his castle and built Castle Village, which consisted of five fourteen-story residential towers with nine

apartments on each floor.⁹ The architect was George Fred Pelham, Jr., and the buildings were some of the earliest apartment towers to employ reinforced concrete construction.¹⁰ In 1940, Castle Village received the certification of excellence in design for an apartment building from the New York Chapter of the American Institute of Architects.¹¹

The Castle Village complex was operated at first as rental apartments.¹² It was converted into a co-operative ownership association in the 1980's.¹³ Presently, Goodstein Management manages the property for the Castle Village Owner's Corporation.

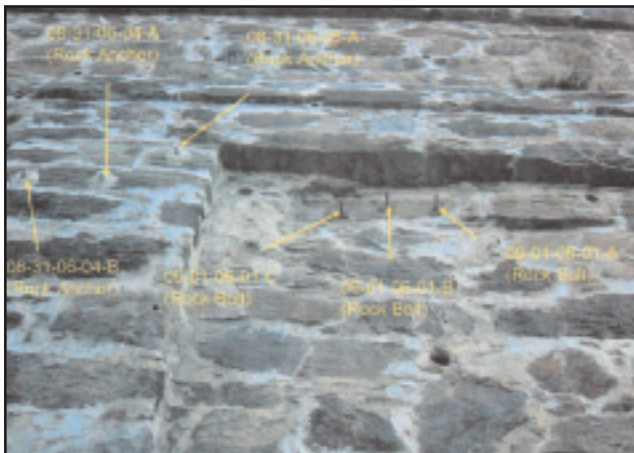
The precise date when construction of the wall began and its original dimensions are unknown. Part of the wall appears to have been built when the original castle was constructed for Dr. Charles Paterno between 1905 and 1910. A 1939 advertisement in the New York Herald Tribune for the Castle Village apartment complex described the wall on the westward side of the new apartment complex as 800 feet long, 65 feet high, and 25 feet thick at the base.¹⁴ Based on available records and research, it is likely that the wall was built in stages between 1905 and the late 1930's. The available research also indicates that a tunnel was created within the wall, and that a stone staircase providing access to the road below was built in the section of the wall that collapsed.¹⁵ This staircase was removed and filled in, most likely when the apartment complex was built in the 1930's.

In 1927, Robert Moses proposed his "West Side Improvement" plan, which involved designing and constructing the Henry Hudson Parkway.¹⁶ Construction of the Parkway began in 1933 and was completed in 1937.¹⁷ It stretched from West 72nd Street in Manhattan to the Bronx-Westchester border and was built along with the Henry Hudson Bridge and Riverside Park.¹⁸

B. Castle Village's Evaluations of the Retaining Wall

Retaining walls are structures that separate lower land areas from higher, retaining soil ("backfill") that would otherwise collapse into a more natural shape. Common materials for retaining walls in New York City are stone, brick, and concrete. They may be reinforced by the use of ties, which are metal bars inserted through the wall that are usually anchored into rock or other material behind the wall. Retaining walls must be designed and built to withstand the lateral pressure exerted by the backfill behind them, or they will eventually fail. Retaining walls made from stone must be maintained so that their strength is not weakened. Common maintenance issues for stone retaining walls are weakening by freeze-thaw cycles, tree roots or other vegetation growing in the wall, and deterioration of any mortar holding stones in the wall together. Retaining walls usually have weepholes inserted through them which are designed to allow rain or ground water accumulating behind the wall to drain through, thereby preventing additional pressure from building up behind the wall. If the lateral pressure behind a wall is greater than the pressure that the wall was built to withstand, or if a retaining wall is weakened by weathering or other forces so that its strength falls below the lateral pressure behind it, the wall is at risk of failing.

The first available inspection records of the Castle Village retaining wall date back to 1985, the year that Castle Village converted to a co-operative. At that time, Mueser Rutledge Consulting Engineers was hired by Castle Village to monitor the wall.¹⁹ Concerns over the wall's structural stability were expressed by Mueser and recommendations for repair were made and implemented.²⁰ On November 4, 1985, Mueser prepared a report recommending rock anchoring and support repairs to the below grade tunnel.²¹ Rock anchors and bolts were installed on certain stones and repairs were made to the tunnels.²²



View of rock anchors and rock bolts installed in 1986.



View of deformation in lower portion of wall on May 9, 2005.

Inspections in the 1990's also cited problems with the wall, including spalling, loose and displaced stones, deteriorating mortar, cracking, and leaks.²³ A physical condition survey conducted by Antonucci and Lawless Architects and Engineers, LLP in 1994 reported twelve to eighteen inches of settlement in the park area behind the wall.²⁴ The settlement was caused either by the filling of voids left in the backfill during the original construction, and/or by new or enlarged voids created by the wall's westward movement.²⁵ Four years later, a 1998 report by Cutsogorge & Tooman Architects, PC, indicated that approximately six cubic feet of stone had spalled from the wall.²⁶ A sidewalk shed was erected to protect the public.²⁷

On July 3, 2002, Castle Village awarded a contract to Langan Engineering & Environmental Services to perform topographic surveying services and inspection services. The scope of the contract was later expanded to include monitoring and evaluation of the retaining wall. Langan began monitoring the wall in November 2002. Langan's inspection records cite wall cracks, water seepage, missing mortar, and fallen wall stones. To monitor the movement, optical laser survey control points were installed along the length of the wall.²⁸

THE CASTLE VILLAGE RETAINING WALL



View of fallen rocks on May 9, 2005.



Measurement of 8 inch lateral displacement of sidewalks on May 12, 2005 prior to the collapse.



View of a sinkhole next to the park sidewalk and fissures in the park soil (both above the wall) created by the wall pulling away westward on May 12, 2005 prior to the collapse.

In 2003 and 2004, the wall was the subject of a series of evaluations by Langan Engineering. During this evaluation period, Langan's monitoring points showed that a portion of the wall was moving westward away from the land it was holding back. Langan expressed concern with this section of the wall (the same section that ultimately collapsed). Langan developed a rating system of I to III, representing a spectrum of no immediate concern to critical level of concern. In a report dated January 6, 2003, Langan gave that portion of the wall an overall condition rating of II, meaning that it showed moderate to heavy deterioration and presented a possible stability or safety concern over the next twelve months.²⁹ Langan gave the portion of the wall that did not collapse an overall condition rating of "I", i.e. little to moderate deterioration and an unlikely stability or safety concern during the following twelve months.³⁰

Frank Nadal of Goodstein Management, in his capacity as property manager for Castle Village, negotiated with Langan Engineering on behalf of Castle Village the scope of any wall repairs.³¹ Langan recommended that Castle Village replace the wall's drainage system.³² Castle Village and Frank Nadal accepted Langan's recommendation and approved the installation of the new drainage system on January 22, 2004.³³ Langan's engineers designed the new system.³⁴ After a bidding process, Morris Park Contracting Corporation was selected by Castle Village to perform the work. The drainage system was installed between September and November of 2004.

On April 5, 2005, Frank Nadal called Langan to request that it restart survey monitoring of the wall after he noticed that sinkholes were again forming above it.³⁵ On April 11, 2005, engineers from Langan inspected the wall. They observed new cracks in its lower portions, new sinkholes at the terrace level, and separation in the newly installed sidewalks. On April 13, 2005, Langan provided Castle Village with a memorandum that recommended further stabilization and stated that a particular section of the wall required immediate attention. Bracing and wall restraining system recommendations and sketches were also provided.³⁶

THE CASTLE VILLAGE RETAINING WALL

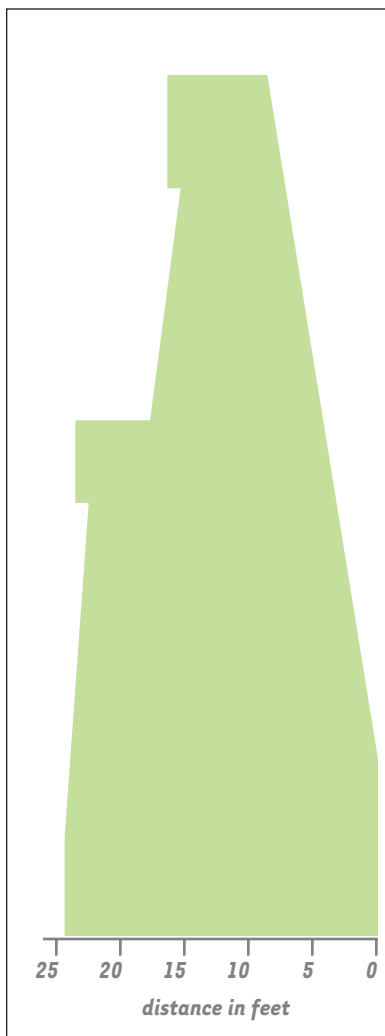


Figure 1
The above drawing represents a cross section of the Castle Village retaining wall after construction.

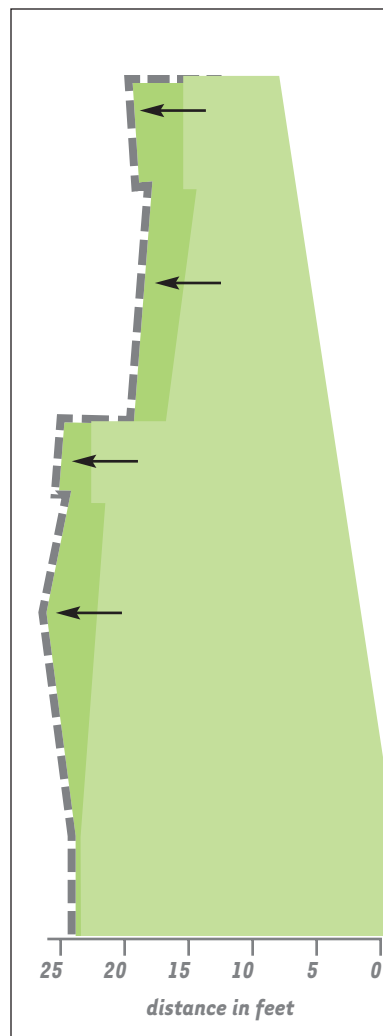


Figure 2
The darker outline in this drawing shows how the Castle Village retaining wall had moved and the deformed shape it had taken in the months prior to its collapse.

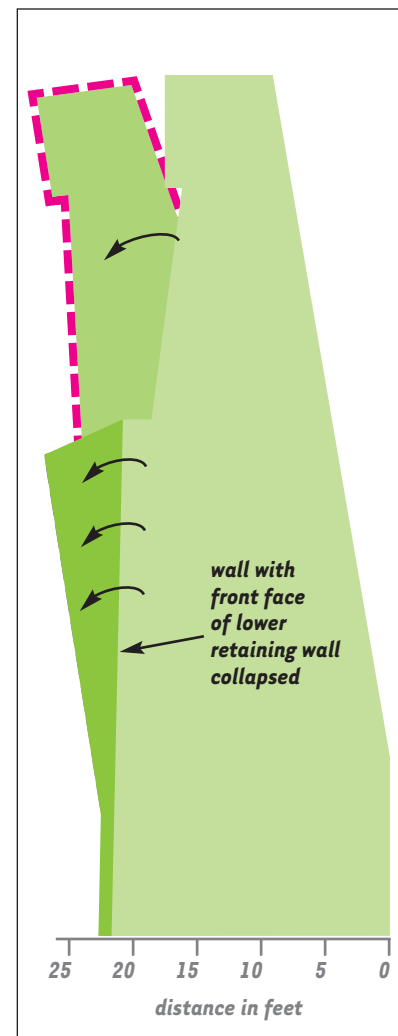


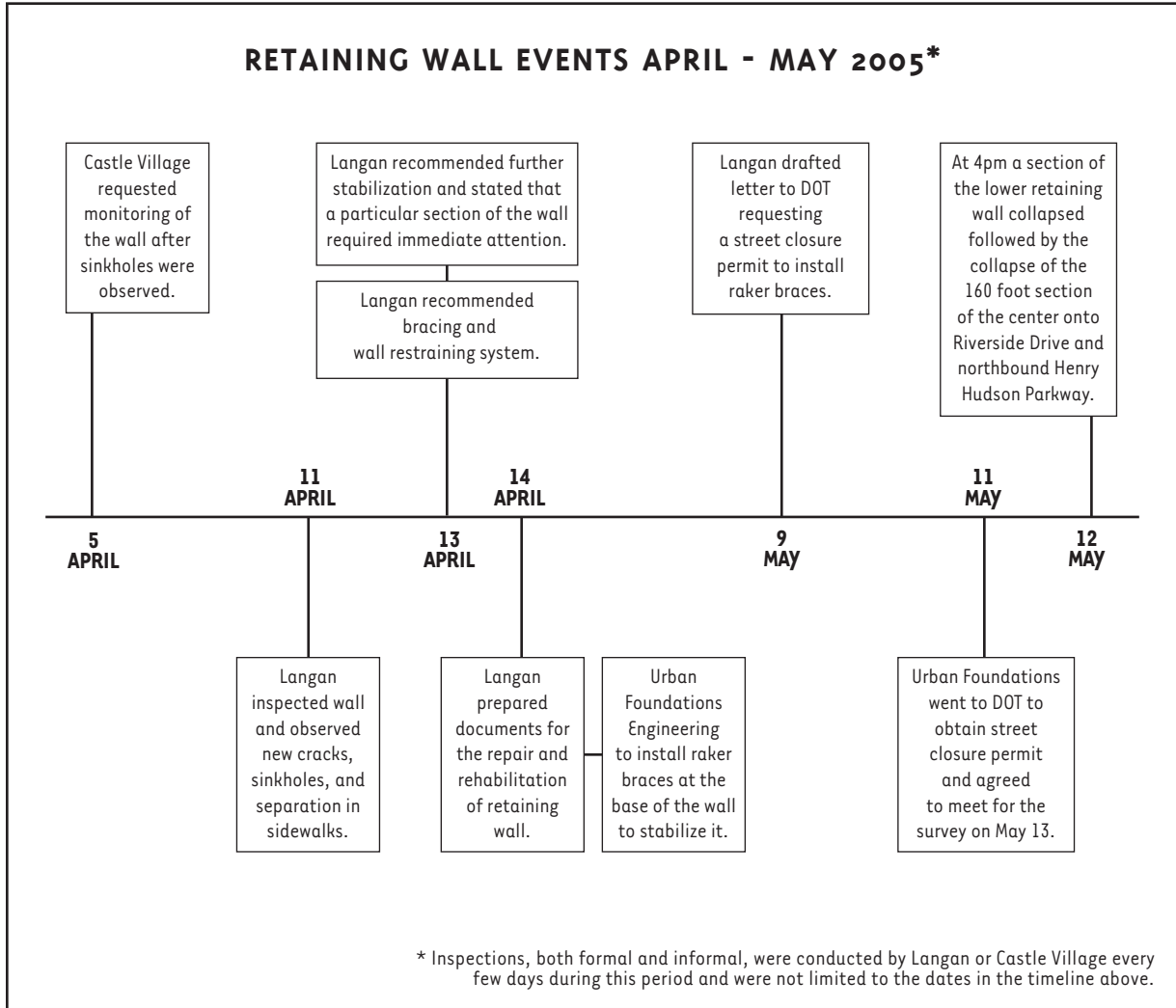
Figure 3
This drawing shows the lower portion of the wall once the bulging front face has been removed and illustrates how the wall was in imminent danger of collapse without that support.

Figures Not Drawn to Scale

On April 14, 2005, Langan received authorization from Frank Nadal to prepare contract documents for the repair and rehabilitation of the retaining wall. Langan selected Urban Foundations Engineering to install raker braces at the base of the wall to stabilize it. Raker braces required a street closure permit from the New York City Department of Transportation ("DOT") because the rakers would have blocked a portion of Riverside Drive. On May 9, 2005, at the request of Urban Foundations, a firm Castle Village hired to assist with obtaining a lane closing permit, Langan drafted a letter dated May 9, 2005 to DOT stating that the 70 foot high wall "is exhibiting distress"³⁷; however, DOT has no record of the receipt of this letter. An expediter hired by Urban Foundations did go to DOT on May 11 to obtain a street closing permit.³⁸ A site survey by DOT was necessary and the DOT representative and Urban Foundations agreed to visit the site on May 13, two days later, to conduct the survey.³⁹

THE CASTLE VILLAGE RETAINING WALL

Between 2002 and May 12, 2005, the day the wall collapsed, Langan had recorded that the wall moved approximately two feet away from the land behind it.⁴⁰ The movement accelerated rapidly during April and May of 2005 and during that time period Langan went to the site to take measurements once every few days instead of once every few months as it had done previously.⁴¹ The portions of the wall that did not collapse showed very little movement.





Retaining wall collapse on May 12, 2005



Contractors on site at collapsed portion of wall working to prevent further collapse.

C. Events of May 12, 2005

On the morning of May 12, 2005, representatives from Langan including Gregory Biesiadecki visited the Castle Village site at the request of Frank Nadal, who was concerned about evidence of further movement and destabilization.⁴² Langan suggested that Castle Village tie the top stone balusters above the wall, which were now leaning over the edge, to the large trees in the garden.⁴³ George Melendez, Castle Village's superintendent, and his staff started performing the tiebacks in the afternoon.⁴⁴ Before they could finish, at about 4 p.m., they heard rumbling.⁴⁵ They looked over the edge of the wall and saw that the lower section of the wall had collapsed.⁴⁶ When police and fire emergency responders arrived, they told Castle Village's employees to immediately get away from the top of the wall, and they complied.

Riverside Drive was now covered with dirt and rocks. Carlos Pellecier, the doorman at an apartment building next to the wall, dialed 911 to report the incident.⁴⁷

About ten minutes later, police officers and firefighters arrived and blocked traffic on the highway.⁴⁸ They surveyed the area and noticed that there were cars buried beneath the fallen debris.⁴⁹ As they peered into the cars to determine if anyone was trapped inside, they heard rumbling.⁵⁰ Another portion of what remained of the retaining wall was starting to collapse. They ran to safety as the remainder of this section of the wall fell behind them.⁵¹

Approximately 150 feet of the wall was now gone.⁵² The collapse caused a large amount of soil and debris (stones from the wall, boulders, dirt, benches, trees, and other objects) to fall down on the sidewalk and roadways below thus blocking a portion of Riverside Drive and the northbound Henry Hudson Parkway.⁵³

The NYPD and FDNY responded by closing the Henry Hudson Parkway in both directions and re-routed traffic. They conducted search and rescue operations using thermal imaging and search dogs to determine if anyone had been trapped beneath the rubble. A safety zone was established to protect first responders; local residents were evacuated while engineers from Buildings checked the stability of the buildings and the remaining portions of the wall.

The New York City Office of Emergency Management ("OEM") directed the Department of Design and Construction ("DDC") to immediately hire contractors and engineers to make the site safe. DDC procured an emergency contract to remove excess soil and debris from the top of the retaining wall; it performed certain structural work to temporarily prevent a further collapse; it monitored the wall using electronic sensor equipment; and it placed barricades on the sidewalk and street. OEM also brought in portable lights

THE CASTLE VILLAGE RETAINING WALL



Contractors dig back top portion of collapse to prevent further sliding of debris.



Safety blocks installed to protect roadway.

for overnight operations. DOT established detours for northbound travelers and NYPD provided escorts for trucks and heavy equipment traveling to and from the collapse site.

DOT, the Department of Sanitation, the Department of Parks and Recreation, and private contractors provided over 70 pieces of heavy equipment to haul rocks and debris from the site to landfills in Queens and Staten Island and to a barge in Manhattan.⁵⁴ The contractors working for DDC secured the area by cutting back the soil in the collapsed area to a safe slope. The slope was reduced to less than 45 degrees to ensure that no further sliding would occur.

The Department of Buildings issued an emergency declaration on May 13 (amended on May 16) to remove debris, to stabilize the wall, to provide a monitoring program for the wall's stabilization, and to protect against rainwater.

By Saturday evening, May 14, engineers from the Buildings Department determined that the evacuated apartments in the adjoining buildings were safe for occupancy during the clean-up. The Department of Environmental Protection briefly shut down a water-main that passed through the collapse zone to prevent further undermining of the wall by water if there were any broken water lines. The Department of Parks removed downed trees and was on hand to mitigate any impacts on the parkway below. Engineers from DDC and Buildings assessed the stability of the wall and ordered the removal of additional portions that were unstable. The exposed slope was covered in tarps while large gravel and sewer drains were cleared to prevent water and mud accumulations and to prevent mudslides in case of rain.

A seven-foot safety wall, comprised of two rows of 4500 lb. concrete blocks, was erected to prevent additional sliding of dirt or rocks onto the roadway. On Sunday evening, May 15, the New York State Department of Transportation, City DOT, and NYPD determined that two northbound lanes of the Henry Hudson Parkway were safe. Vehicles were permitted in the area after 10:00 pm.

A. Mueser Rutledge Engineering Study Prepared for the Board of Inquiry

Buildings retained Mueser Rutledge Consulting Engineers (“Mueser”) to perform a study of the retaining wall and the factors that led to its collapse. Mueser was selected due to its expertise, availability, and prior knowledge of the wall.

In 1985, Castle Village had hired Mueser to perform an engineering study of the wall and to recommend repairs. On subsequent occasions Mueser submitted bids to Castle Village to supply engineering services; however, Mueser was never again selected by Castle Village to provide services. Buildings retained United Research Services (“URS”) to provide a peer review of Mueser’s report and to reach conclusions as to the various technical and engineering reasons for the wall’s collapse.

Neither pre-construction plans nor “as-built” drawings of the original wall construction were available. The construction of the wall appears to have conformed to the standards used in the early part of the last century.⁵⁵ Using field measurements, photographs, historical data, and information from Langan’s reports and drawings, Mueser developed a model of a probable cross section of the original wall.⁵⁶

In addition to its mathematical analyses, Mueser also collected information pertaining to the construction of the wall, interviewed witnesses and collected information on the inspections and repairs to the wall prior to the collapse.

i. Prior Inspections and Repairs to the Wall

Excluding Langan involvement, inspections and repairs to the retaining wall from 1985 to 2002 are as follows:

A letter written by John Flynn, an engineer, in 1985 where he expressed concerns with the condition of the retaining wall.⁵⁷

A November 4, 1985 report from Mueser recommending rock anchoring and repairs to the below-grade tunnels. Rock anchors and bolts were installed (though URS determined they were not anchored in bedrock) and the tunnels were repaired.⁵⁸

The engineering firm of Antonucci and Lawless, in a report dated April 14, 1994, performed a visual inspection of the wall and noted spalling and loose fascia stones.⁵⁹

Cutsogeorge and Tooman Architects, in a report to Castle Village dated June 24, 1998, noted spalling of wall fascia stones and recommended that sidewalk scaffolding be installed for public safety. Scaffolding was erected and was in place on the day of the collapse.⁶⁰

ii. Summary of Information Collected from Interviews

Mueser conducted multiple eyewitness interviews. The eyewitness accounts indicate that the lower part of the wall collapsed first. The collapse of the lower portion of the wall was described as a delamination, or a peeling away of the wall’s façade. The loss of support after the first collapse triggered a second, much larger collapse of the upper portion of the retaining wall. The eyewitnesses indicated that the trees went down vertically, thereby establishing that the whole mass came down in one solid drop. For further eyewitness accounts, see Mueser’s report on pages 39 through 46.

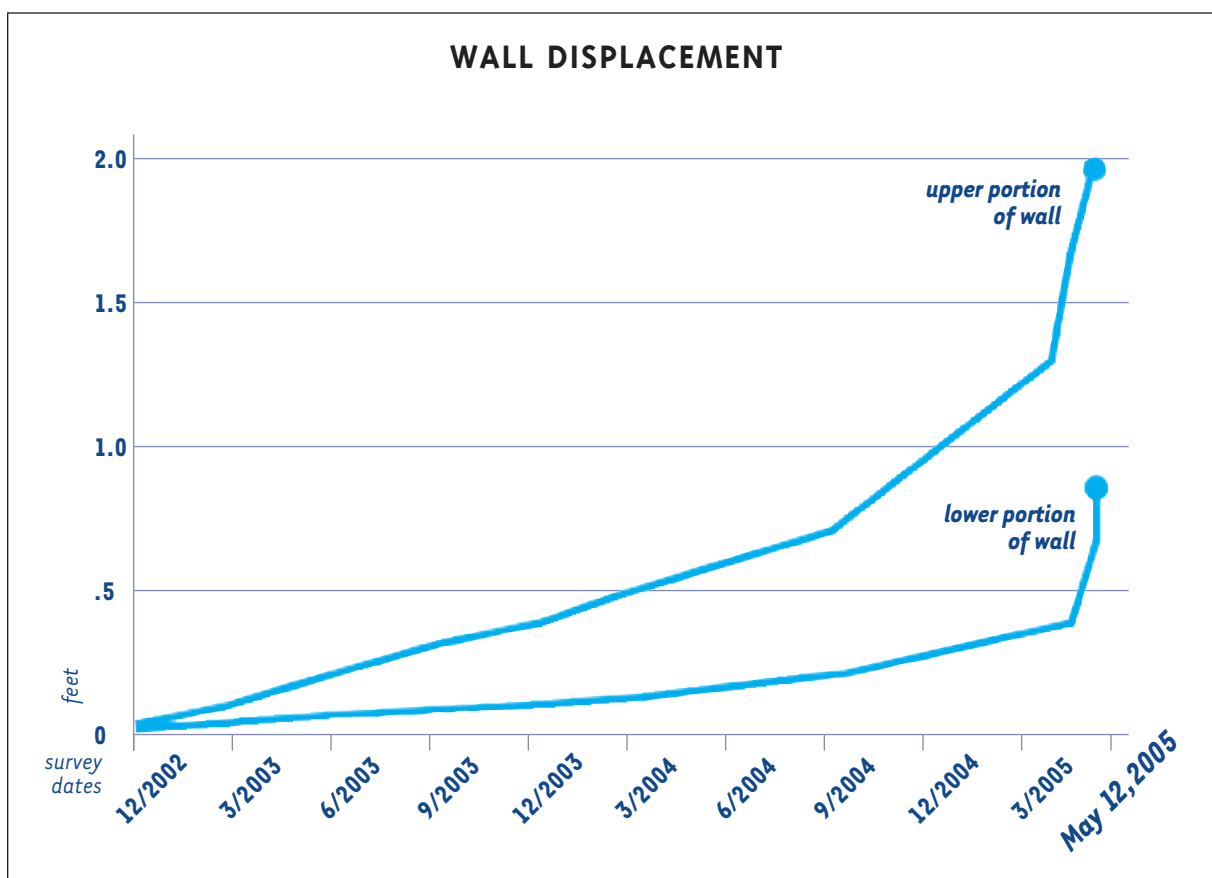
iii. Langan Engineering’s Involvement

In 2002, Castle Village solicited proposals for inspection of the wall, and selected Langan. Langan established location points on the wall for monitoring and monitored the wall from November 2002 through the day of the collapse. Langan performed site topography development and completed a geotechnical subsurface investigation. In addition, Langan designed a new drainage system for the land above the wall and supervised the contractor hired to install it.⁶¹

iv. Langan's Wall Monitoring Program

In 2002, Langan established a rating system for the retaining wall. Areas showing little or no structural distress were given a rating of I; areas showing moderate structural distress were given a rating of II. No area was given a rating of III, i.e. showing heavy structural distress.⁶² The part of the wall that collapsed was given a rating of II.

Langan monitored the wall beginning in November 2002 and ending when the wall collapsed on May 12, 2005. Six survey lines were established in order to monitor the wall. Four of six survey lines showed little or no movement. However, at two locations Langan denominated "pilasters four and five," where the wall ultimately collapsed, did show significant movement of approximately two feet westward during the time that Langan was monitoring it. There was also an acceleration of movement in the wall that coincides with the high rainfall that occurred in March and April of 2005.⁶³



The above diagram shows the westward movement of the section of the wall that collapsed. The movement noticeably accelerated during the months immediately before the collapse. On May 12, 2005, the day of the collapse, the wall had moved two feet westward from its position in 2002 when the wall monitoring began.

B. Summary of the URS Engineering Study prepared for the Board

The Board retained URS to review and analyze the cause of the wall collapse based on the information contained in Mueser's study. URS concluded that the wall developed tension cracks along the lower portion of the wall during and after construction.

URS reviewed the movement of the wall prior to the collapse and concluded that if the balustrade had originally been constructed plumb, portions of the wall had moved two feet westward from its plumb position prior to Castle Village's retaining of Mueser in 1985.⁶⁴ URS further concluded that between 2002 and 2005 at two of Langan's survey points, the top of the wall moved an additional 1.25 to 2 feet and the lower portion moved an additional .7 to 1.2 feet.⁶⁵ These measurements were consistent with the bulging of the lower portions of the wall (which collapsed first) that was observed before the wall collapsed. URS thus concluded that the wall could have displaced a maximum of 4 feet prior to the final survey made before the wall collapsed.⁶⁶

URS also reviewed the drainage system. It concluded that prior to 2004, the wall essentially had no working drainage system.⁶⁷ Small catch basins were present, but they directed the water towards the face of the wall rather than away from it.⁶⁸ Weepholes in the wall were clogged with debris and there was no drainage system behind the wall; therefore water was not able to flow through them.⁶⁹ While some of the groundwater flowed through the wall and weathered the stones and mortar, any groundwater that did not flow through would have been trapped by the impermeable bedrock that sloped downward behind and under the wall. URS concluded that the trapped groundwater had resulted in additional pressure to the wall's lower portion.⁷⁰ URS further concluded that the 2004 drainage modifications did not have a substantial negative impact on the pressure behind the wall from accumulated water.⁷¹



Three anchors in pilaster with large crack in lower portion.

URS also concluded that the pressure from the groundwater resulted in a gradual weakening of the lower portion of the wall.⁷² Installation of rock anchors and bolts in 1986 in some of the stones comprising the wall may have arrested some movement, but even if the anchors and bolts had been inserted into bedrock, which was not the case, they would not have had a significant impact on the wall's stability.⁷³ Groundwater built up over time causing pressure on the wall to increase and eventually caused the cracking and deformation that led to the wall's collapse.⁷⁴ On May 12, 2005, the result of this pressure was a delamination of stones in the vicinity of Langan's survey points denominated pilasters 3, 4 and 5 in the lower wall which fell to the street below. The upper portion of the retaining wall, extending from pilaster 3 to pilaster 7, collapsed shortly afterward due to a loss of support from the lower wall which had previously fallen. URS calculated that the geometry of the wall just prior to collapse suggested a factor of safety of 1.0 or less, indicating failure.⁷⁵

BOARD OF INQUIRY REVIEW OF EVENTS AND ENGINEERING STUDIES

C. Summary of Other Engineering Evaluations

Board members visited the site as a group on July 1, 2005. Several Board members also made subsequent individual visits. In addition to commissioning Mueser's report and the report from URS, the Board examined documents and reports, reviewed the history of the site's engineering evaluation since 1985 and took testimony from parties with an interest in, or knowledge of, the wall (see appendix). The following is a summary of the engineering evaluations conducted on behalf of Castle Village.

ENGINEER	DATE	OBSERVATION	RECOMMENDATION	RESULT
John Flynn	August 28, 1985	Deterioration and cracking of the wall and deterioration of the tunnels	None stated	None documented
Mueser Rutledge Consulting Engineers	November 4, 1985	The wall and the underground tunnels show signs of structural distress	Repair and monitoring of those structures	Sections of wall were pinned and fascia stones repaired
Antonucci and Lawless Architects and Engineers	April 14, 1994	Signs of spalling, deterioration, root infiltration, water leaks, and 12-18 inches of settlement in the land above the wall	Monitoring, cleaning of drains and pipes, replacement of sewer covers, and the addition of more weepholes	None documented
Cutsogeorge and Tooman Architects	June 24, 1998	Severe deterioration of the wall resulted in spalling of six cubic feet of debris to the sidewalk below. Root infiltration severely compromising wall's stability	Sidewalk scaffolding to protect public from spalled stones; necessary removal of all vegetation from face of wall; repoint mortar	Sidewalk scaffolding erected by Castle Village; not known if vegetation was removed; mortar repointed by Phoenix Waterproofing (unconfirmed)
Mueser Rutledge Consulting Engineers	March 17, 1999	Writes proposal for retaining wall inspection services.	None	None
Cutsogeorge and Tooman Architects	1999	Drainage and structural problems still found at the site	A geotechnical engineer needed to conduct investigation	Geotechnical engineer Gregory Pillori hired to study the wall
Gregory Pillori	September 1999	Sinkholes noted in the ground above the wall; drainage system found unable to handle water runoff	Sinkholes should be filled and drainage improved; concerns expressed about wall's stability	No action documented
Langan Engineering	January 7, 2002	Wrote proposal for evaluating wall that was accepted on July 3, 2002	The wall needed to be monitored for possible movement	Langan was hired to perform the monitoring
Mueser Rutledge Consulting Engineers	March 27, 2002	Wrote a proposal for retaining wall inspection services that was not accepted	None	Not accepted
Langan Engineering	January 6, 2003	Wall cracks, water seepage, missing mortar, fallen stones, and settlement of walkways above wall	Further monitoring of parts of the wall showing structural distress was needed	Wall monitoring performed by Langan
Langan Engineering	August 8, 2003	Site drainage was inadequate—existing drains did not discharge to the NYC sewer system	A completely new drainage system was designed	Drainage system installed the following year
Langan Engineering	December 16, 2003	New drainage system proposed along with repairs to walkways above wall	Castle Village approved the work on January 22, 2004	Work performed between August and November 2004
Langan Engineering	September 14, 2004	During installation of drainage system, Langan expresses concern about the stability of the wall's parapet	Concrete deadmen and tieback anchors needed at top of wall to increase the parapet's stability	Work performed as part of drainage system installation
Langan Engineering	April 13, 2005	More sinkholes and depressions appear; Langan finds "deep-seated global movement" of 50' section of the wall	The critical section of the wall needed to be restrained immediately	Langan chooses exterior raker brace. Contractor hired to install brace; wall collapses before work could be done
Langan Engineering	May 12, 2005 (day of collapse)	Frank Nadal called Langan to the site after noticing sinkholes and cracks in soil above the wall	Langan advised Castle Village to tie the top part of the wall to trees directly behind it	Castle Village in process of tying wall to trees when wall collapses

URS found that the most likely cause of the collapse of the retaining wall was structural failure resulting from an increased pressure that developed behind the wall due to the build up of groundwater throughout the years. The Board concurs in this finding. Neither of the two documented repairs that Castle Village undertook at the recommendation of engineering consultants was sufficient to address the destabilization posed by the increased pressure. First, in 1985 when the wall shifted and a bulge occurred, Mueser Rutledge was hired by Castle Village to recommend and oversee a repair. The Board finds that while this repair (installation of wall anchors and bolts) may have addressed the localized issue, it did not address the groundwater pressure build up. The second construction work occurred in 2004 when Castle Village accepted Langan Engineering's first phase design for installation of a new surface drainage system in the yard at the top of the wall. The Board finds that while this surface drainage system failed, this failure did not have a significant adverse affect on the wall. The infiltration and pressure posed by the groundwater were far greater than this surface drainage system would have diverted even had it worked as intended.

Effective repair and maintenance is critical to structural stability of all retaining walls. The wall had been a major matter of concern to Castle Village's Board of Directors since the apartment complex became a co-operative in 1985. Repeated inspections and investigations showed cracking and wall movement, bulging of sections of the wall, stones falling from the wall, tilting of the balusters at the top of the wall, and voids and sinkholes in the park located at the top of the hill being held up by the wall. In 2002, Castle Village hired Langan Engineering to monitor the wall. Langan told Castle Village in a report dated January 6, 2003 that portions of the wall were bulging and were moving toward the west, away from the hill that the wall was holding back.

While Castle Village solicited 15 different reports from various engineering firms during the 20 years before the collapse to evaluate and study the wall's many problems, it did not perform any substantial work after the 1985 repair except for the installation of the failed drainage system in 2004. The Board finds that these efforts do not constitute effective repair and maintenance.

Further, when sinkholes and voids reappeared behind the wall in early 2005 and Castle Village learned the new drainage system installed the previous summer had not arrested the wall's decline, the co-operative failed to take effective action. On April 13, 2005, Langan informed Castle Village that the upper section of the wall had further destabilized by moving up to seven inches westward during the previous eight months and that this section of the wall was "critical." Langan wrote Frank Nadal, Castle Village's property manager:

"Our judgment is that there probably is ongoing deep seated global movement of an approximately 50 ft section of the retaining wall. This 'critical' section (i.e., cracks reopening and large sinkholes within the terrace) requires immediate attention; we recommend installing a restraining system to stabilize this critical section."¹

Nevertheless in the following month, as the wall continued to deteriorate, neither Langan nor Castle Village took effective emergency action. Even on May 4, 2005, eight days before the collapse, when Langan's monitoring points indicated that parts of the wall had moved an additional nine inches since April, no emergency was declared. While this information and Langan's conclusion set forth in its April 13 letter that the wall needed immediate bracing warranted a sense of urgency, Langan did not notify the Department of Buildings of the existence of an imminent threat to public safety. While it is true that a few days before the collapse Urban Foundations, a Castle Village contractor, hired an expediter to approach the Department of Transportation for permission to close a lane of Riverside Drive so that the wall could be braced, Langan and Castle Village appeared to treat the situation as an ordinary problem, one that could be dealt with in the ordinary course of business. When the Department of Transportation asked for an engineering report to justify the lane closure, Langan wrote that "the 70 ft high stone wall is exhibiting distress due to lateral movement." This language was insufficient to put the Department of Transportation on notice that failure of the wall might be imminent. Neither Langan, Castle Village, nor any of its agents acted with a sense of urgency or gave an indication that public safety was at risk. They simply went through the normal permitting process.

On the morning of the collapse, when Langan visited the site to address Castle Village's mounting concerns, an engineer from Langan told Castle Village to tie the leaning concrete balustrade columns to some trees to prevent them from toppling off onto the sidewalk and roadway below. This demonstrated that Langan and Castle Village and both knew there was an imminent threat to public safety. They again failed to implement adequate safety measures to protect the public from the rapidly deteriorating situation, in this instance evidenced by both the leaning balusters and by the wall's precipitous westward movement over the previous weeks.

Castle Village had a non-delegable duty under the New York City Building Code to maintain the wall in a safe condition. It failed to do so. Castle Village's manager Frank Nadal; Nadal's employer Goodstein Management Inc.; and Langan Engineering all failed to properly address the seriousness of the situation in April and May 2005 when they knew that significant changes had taken place after sinkholes and sidewalk joints re-opened and sections of the wall accelerated their westward movement. The Board finds that Castle Village and its agents Nadal, Goodstein Management and Langan all failed to notify the City of the obvious and imminent threat to public safety posed by the wall's impending collapse.

In early May, when Langan's monitors showed that a section of the wall had moved almost two feet westward since 2002, Langan still took no effective emergency measures and failed to notify the Buildings Department. Two feet of movement of the upper section of the wall—approximately nine inches between April 11 and May 4—is significant. URS has calculated that the factor of safety for the pre-collapse May 2005 geometry of the wall is approximately 1.0 or less than 1.0. As the factor of safety approaches 1.0 or less, failure occurs. The Board finds that Langan should have known this portion of the wall had dramatically destabilized and that the wall was at risk of imminent failure.

As a result of its investigation, the Board recommends the following actions to the Commissioner of Buildings:

- 1) The New York State Education Department licenses and oversees professional engineers. George Derrick and Gregory Biesiadecki, the engineers from Langan who worked on the Castle Village project who were aware of the wall's movement and condition in March and April 2005, should be referred to the New York State Education Department's Office of Professional Discipline for consideration of any appropriate disciplinary action based on their failure to exercise a reasonable standard of care and their failure to alert the Department of Buildings that the movement of the wall in the Spring of 2005 had accelerated and that this presented a danger to the public.
- 2) The Department of Buildings does not license engineers; however it does afford engineers privileges that may be revoked. Title 1, §21-02, of the Rules of the City of New York allows the Department of Buildings to revoke a Professional Engineer's right to professionally certify that his or her submissions are code and zoning compliant. George Derrick and Gregory Biesiadecki, the engineers from Langan who worked on the Castle Village project, should be referred to the Buildings Special Investigations Unit to determine whether proceedings should be commenced under the provisions of §21-02 based on their involvement in the project.
- 3) Section 26-234 of the Administrative Code states that those engaged in building operations have a duty to report dangerous or unsafe conditions to the Department of Buildings. Castle Village; its managing agent Goodstein Management; Goodstein's employee Frank Nadal, the property manager; Langan Engineering; and Langan engineers George Derrick and Gregory Biesiadecki should each be cited with a New York City Environmental Control Board violation for their failure to comply with section 26-234 by bringing the dangerous condition of the wall to the attention of the Department of Buildings.
- 4) The Department of Buildings should propose legislation to require owners to engage a New York State licensed architect or engineer to perform periodic inspection of retaining walls that front a public way. A model for this type of regulation is Local Law 10 of 1980, as amended by Local Law 11 of 1998, which sets forth a facade inspection/repair regulatory scheme for building facades. The legislation would require a cyclical inspection report and a schedule for any needed repair and maintenance to be filed with the Department of Buildings. Criteria for the inspection and reporting process should include factors such as wall height, wall composition, and proximity to a public way.

Furthermore, related to its investigation, the Board acknowledges the following prior actions on the part of the Department of Buildings:

- 1) Pursuant to Section 26-235 or 26-243 of the Administrative Code, the Department of Buildings issued an Emergency Declaration the day after the collapse stating that repair work on the wall was to commence immediately in order to remedy the dangerous condition and protect public safety.
- 2) Castle Village Owner's Corporation was ordered to permanently repair the collapsed portion of the retaining wall and permanently stabilize the remaining portion of the wall. Furthermore, the Department of Buildings monitored this process to ensure that all work conformed to the NYC Building Code, other applicable laws, rules, and regulations, and that all requisite permits were obtained to perform the necessary work.

RECOMMENDATIONS

- 3) Castle Village Owner's Corporation was ordered to monitor the movement of the retaining wall until it provides the Department of Buildings with a report from a professional engineering firm certifying that the wall is safe.
- 4) Sections 27-127 and 27-128 of the Building Code explicitly require an owner to maintain its buildings in a safe condition, and impose responsibility on the owner to do so. Castle Village failed to discharge this duty and was properly served with a notice of violation and found guilty at the Environmental Control Board for its failure to maintain its property in a safe condition.

- ¹ Langan Memo to Frank Nadal, p. 1 (April 13, 2005).
- ² Gray, Christopher, "Streetscapes/Castle Village and Hudson View Gardens in Upper Manhattan," *The New York Times*, September 10, 2000, Section 11, p. 7.
- ³ Id.
- ⁴ "Dr. Charles V. Paterno," Washington Heights & Inwood Online, http://www.washington-heights.us/history/archives/dr_charles_v_paterno_48.html. (Accessed March 30, 2007)
- ⁵ Id.
- ⁶ Id.
- ⁷ Id.
- ⁸ Id.
- ⁹ Id.
- ¹⁰ Id.
- ¹¹ Id.
- ¹² Chan, Sewell et al, "Official Hope to Reopen 2 Traffic Lanes at Collapse Site," *The New York Times*, May 15, 2005, Section 1, p. 37.
- ¹³ Id.
- ¹⁴ "Towers and Battlements It Sees, Bosom'd High in Tufted Trees," *The New York Herald Tribune*, May 28, 1939, p. 51.
- ¹⁵ "A Boy in His Rowboat Picked Castle Village Site," *The New York Herald Tribune*, May 28, 1939, p. 51.
- ¹⁶ "9A West Side (Joe DiMaggio) Highway Historic Overview," <http://www.nycroads.com/roads/west-side>. (Accessed March 30, 2007).
- ¹⁷ Id.
- ¹⁸ Id.
- ¹⁹ Mueser, *Investigation Report-Phase I*, p. 5 (April 6, 2007).
- ²⁰ Id.
- ²¹ Id.
- ²² Mueser at 5, 6.
- ²³ Mueser at 6.
- ²⁴ Id.
- ²⁵ Id.
- ²⁶ Mueser at 7.
- ²⁷ Barron et al., "Years before Landslide, Residents Complained of Wall's Instability," *The New York Times*, May 14, 2005, Section A, p. 1.
- ²⁸ Mueser at 9.
- ²⁹ Mueser at 10-11.
- ³⁰ Id.
- ³¹ Id.
- ³² Mueser at 12.
- ³³ Mueser at 13.
- ³⁴ Mueser at 15.
- ³⁵ Mueser at 20.
- ³⁶ Id.
- ³⁷ Langan Letter to DOT, p.1 (May 9, 2005).
- ³⁸ May 11, 2006, Testimony Transcript, p. 46.
- ³⁹ May 11, 2006, Testimony Transcript, p. 24.
- ⁴⁰ Mueser at 21, 56.
- ⁴¹ Mueser at 47.
- ⁴² January 6, 2006, Testimony Transcript, p.54-56.
- ⁴³ November 15, 2005, Testimony Transcript, p. 90-94.
- ⁴⁴ January 6, 2006, Testimony Transcript, p. 55-56, 59-60.
- ⁴⁵ Id.
- ⁴⁶ November 15, 2005, Testimony Transcript, p. 100.
- ⁴⁷ August 2, 2005, Testimony Transcript, p. 9.
- ⁴⁸ Id. at 32, 40 and 46.
- ⁴⁹ Id.
- ⁵⁰ Id. at 32 and 47.
- ⁵¹ Id. at 33, 41 and 47.
- ⁵² Chan et al, at 37.
- ⁵³ Id.
- ⁵⁴ Chan et al, at 37.
- ⁵⁵ Mueser at 56.
- ⁵⁶ Insert note for drawing location.
- ⁵⁷ Mueser at 4.
- ⁵⁸ Mueser at 5.
- ⁵⁹ Mueser at 6.
- ⁶⁰ Mueser at 7.
- ⁶¹ Mueser at 9-21.
- ⁶² Mueser at 10-11.
- ⁶³ Mueser at 12.
- ⁶⁴ URS, *Castle Village Retaining Wall Collapse-Phase II*, p. 2-2, 6-1 (April 26, 2007).
- ⁶⁵ URS at 2-2.
- ⁶⁶ URS at 2-2.
- ⁶⁷ URS at 2-3.
- ⁶⁸ URS at 6-1.
- ⁶⁹ URS at 6-1.
- ⁷⁰ URS at 6-1.
- ⁷¹ URS at 6-2.
- ⁷² URS at 6-2.
- ⁷³ URS at 6-2.
- ⁷⁴ Id.
- ⁷⁵ URS at 4-6.

Leslie Torres left her position at the Department of Buildings on April 6, 2007.

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Page 3, Photo 1: MRCE Report to the Board of Inquiry, Photo Taken by MRCE in 2002, Plate Number 13

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Page 4, Photo 3: MRCE Report to the Board of Inquiry, Photo Taken by MRCE in 2002, Plate Number 5

Page 8, Photo 1: www.answers.com/topic/castle-village

Page 8, Photo 2: <http://gis.nyc.gov/doitt/cm/CityMap.htm>

Page 8, Photo 3: www.washington-heights.us/history/archives/dr_charles_v_paterno_48.html

Page 9, Photo 1: URS Report to the Board of Inquiry, Photo Taken by Langan in November 2002, URS Figure Number 18

Page 9, Photo 2: MRCE Report to the Board of Inquiry, Photo Taken by Castle Village 5/9/05, Plate Number 21

Page 10, Photo 1: MRCE Report to the Board of Inquiry, Photo Taken by Castle Village 5/9/05, Plate Number 22

Page 10, Photo 2: MRCE Report to the Board of Inquiry, Photo Taken by Langan Engineering 5/12/05, Plate Number 12

Page 10, Photo 3: MRCE Report to the Board of Inquiry, Photo Taken by Langan Engineering 5/12/05, Plate Number 10

Page 13, Photo 1: Retaining Wall Collapse 5/12/05

Page 13, Photo 2: MRCE Report to the Board of Inquiry, Photo Taken by Thornton-Tomasetti, Plate Number 2

Page 14, Photo 1: MRCE Report to the Board of Inquiry, Photo Taken by Thornton-Tomasetti, Plate Number 3

Page 14, Photo 2: Photo Taken by MRCE 5/14/05

Page 17, Photo 1: MRCE Report to the Board of Inquiry, Photo Taken by Castle Village 5/9/05, Plate Number 20

Carlos Pellecier *Doorman at 1380 Riverside Drive*

On August 2, 2005, Carlos Pellecier testified before the Board of Inquiry. Mr. Pellecier has been employed as the doorman at 1380 Riverside Drive for 24 years. 1380 Riverside Drive is the building directly next to the Castle Village retaining wall. According to Mr. Pellecier, during his tenure as the doorman he has had many opportunities to observe the wall and the surrounding areas. Each night before starting his shift, Mr. Pellecier patrolled the area beneath the wall. During these nightly patrols, he searched for suspicious persons, collected trash and debris, and investigated resident complaints. He recalled several resident complaints about the wall including dampness along the bottom portion, cracks, and falling rocks. He also remembered that at some point drainage work was performed at the top of the wall and that there was visible bulging in the middle-to-bottom portion of the wall.

At approximately 4:00 p.m. on May 12, 2005, Mr. Pellecier was sitting in the lobby eating when a loud boom startled him. He testified that the sound appeared to be emanating from the retaining wall area. To him, it resembled the sound of an oversized truck hitting an overpass. He decided to investigate when he noticed smoke filling the air and left his post to do so. He then discovered that the lower portion of the retaining wall had collapsed. Mr. Pellecier described the wall after the first collapse as a slice shaved off the bottom of the wall.

After observing the collapse, Mr. Pellecier immediately returned to his post and dialed 911. The police and firefighters arrived on the scene shortly after the emergency call. The remainder of the wall collapsed soon afterwards. According to Mr. Pellecier, he and approximately 11 emergency personnel were standing in close proximity to the retaining wall during the second collapse. He further explained that prior to the second collapse, he felt a rumbling and that the time lag between the first and second collapse was approximately 10 to 12 minutes.

Following the second collapse, Mr. Pellecier ran away to avoid falling debris. He observed that as the bottom portion of the wall slid down to the highway, a tree, a park bench, and rocks were projected over the top of the wall. Immediately afterwards, he ran to the corner of 181st Street and Riverside Drive and remained there until he was comfortable that there would be no further collapse. Mr. Pellecier then returned to 1380 Riverside Drive and advised the tenants to vacate immediately.

Joseph Byrne *New York City Firefighter*

On August 2, 2005, Joseph Byrne testified before the Board of Inquiry. Mr. Byrne has been a firefighter with the New York City Fire Department for eighteen years. On May 12, 2005, he responded to a call about a partial collapse of a retaining wall near 181st Street and the Henry Hudson Parkway. Upon arrival, he noticed that a wall had collapsed on top of a couple of vehicles parked on Riverside Drive. This prompted him to check inside the vehicles in order to ensure that nobody was trapped in the vehicles. At some point after his arrival, Mr. Byrne heard a rumble that prompted him to run. He witnessed the second collapse occurring behind him as he ran.

Brian Masterson *New York City Firefighter*

On August 2, 2005, Brian Masterson testified before the Board of Inquiry. Mr. Masterson has been a firefighter with the New York City Fire Department for fifteen and one half years. Mr. Masterson responded with Joseph Byrne to a collapse at the intersection of 181st Street and the Henry Hudson Parkway on May 12, 2005. Upon his arrival, he noticed that a portion of the retaining wall had collapsed and sent debris to the street below that covered a couple of cars. He was looking at the top of the wall and noticed that it started to waver. Approximately two to three minutes later, he observed the second collapse. He described the second collapse as the whole wall letting loose all at once and falling vertically. As the wall collapsed, Mr. Masterson ran away to avoid the debris. He noticed water coming out from behind the wall after it fell.

Because he was uncertain about what portion of the wall was going to fall next, Mr. Masterson evacuated the adjoining building south of the wall. Prior to the collapse, Mr. Masterson drove by the retaining wall on many occasions over the past 15 years. Throughout those 15 years, he noticed that the wall was bulging outwards but he does not recall ever receiving a complaint from the public about the wall.

Jonathan Wally *New York City Police Officer*

On August 2, 2005, Jonathan Wally testified before the Board of Inquiry. Mr. Wally has been a police officer with the New York City Police Department for three years. At approximately 4:00 p.m. on May 12, 2005, Mr. Wally responded to a call that a wall collapsed near the junction of the Henry Hudson Parkway and Riverside Drive. Upon arrival, he noticed that the lower half of the retaining wall collapsed onto the roadway. Rocks and dirt from the initial collapse flattened about five or six cars. He began checking the cars for people trapped inside. Approximately five minutes after his arrival, the second part of the wall collapsed. The second collapse occurred over approximately a 20 second period of time. The collapse caused Mr. Wally to run north on the ramp, but he hesitated and reverted south. After the wall fell, he noticed that there was a pipe leaking water. Mr. Wally patrolled the area surrounding the retaining wall daily in the past and did not notice any rocks or pebbles that fell from the wall.

Donna Rounds *President, Castle Village Owner's Corporation*

Donna Rounds testified before the Board of Inquiry on October 21, 2005. Ms. Rounds is the president of the Castle Village Owner's Corporation. She began her presidency in 2004. As the president, she is responsible for presiding over the monthly meetings and reviewing management reports and documents.

Ms. Rounds testified that she did not have much personal or physical contact with the retaining wall. She stated that she only observed the wall during the period when Langan was making proposals regarding the retaining wall. Also, when she occasionally went to the Riverside Park along the Hudson River she would cross the bridge beneath the wall that carried pedestrians over the Henry Hudson Parkway.

While Ms. Rounds was president, Langan was contracted to monitor the retaining wall. She testified that Langan was chosen because they were impressed by the comprehensive program presented to them by Langan that involved the use of laser monitoring to check for any movement of the wall. She stated that Castle Village was concerned about movement and spalling of the face of the wall. During the monitoring program, Langan reported to Castle Village every three months. In one of their reports, Langan recommended that the drainage system in the land above the wall needed to be replaced. Due to Langan's recommendation, Morris Park Contracting Corporation installed the drainage system in the fall of 2004 under the supervision of Langan.

Prior to the collapse, Ms. Rounds was not concerned that the wall was in danger of falling. In April of 2005, Frank Nadal brought his concerns about subsidence in the area above the wall to her attention. Cracks had started to appear close to the wall and along the sidewalks on the grounds above the wall. Because of these concerns, Castle Village contacted Langan about the cracks and remained in contact with Langan on a regular basis. Langan suggested that the wall needed to be pinned back to stabilize it. However, before that could be done it needed a brace installed at its base to provide immediate stabilization. Langan was authorized to solicit bids for the stabilization work. The wall collapsed before any work could be done. Ms. Rounds testified that it is her understanding that they were waiting for the appropriate city permits before Langan could begin working.

Ms. Rounds testified that she did not witness the wall collapse. Once alerted to the situation, she called Castle Village's attorneys and notified their insurance carriers. She scheduled a meeting with Langan and they discussed the stabilization of the slope. Upon the city's request that they hire an engineering firm for oversight of Langan as a peer reviewer, they hired Weidlinger Engineering to oversee the monitoring work.

that was being done by Langan. Weidlinger is also doing the preliminary design for the new wall that will eventually replace the wall that collapsed.

According to Ms. Round's testimony, Castle Village never refused to comply with any of Langan's suggestions about the wall. She also testified that maintenance of the wall was never subject to any monetary constraints because Castle Village had refinanced their underlying mortgage and had a large capital reserve. She testified that Castle Village executed all of Langan's recommendations.

James Berlin *Board Member, Castle Village Owner's Corporation*

On October 21, 2005, James Berlin testified before the Board of Inquiry. Mr. Berlin is a retired physics and computer science teacher and a resident of Castle Village for the past twelve years. He has served in some capacity with the Castle Village Owner's Corporation every year since 1998 with the exception of the 2000-2001 term. Mr. Berlin attends all meetings, serves as a member of the admissions committee, and attends meetings with architects and engineers hired by Castle Village.

Mr. Berlin testified that approximately four or five years ago, a rock fell out of the wall. The wall was repaired with mortar and, as a precaution, a sidewalk bridge was installed underneath that section of the wall. Mr. Berlin does not recall personally receiving any complaints about the condition of the wall.

On the day of the collapse, Mr. Berlin was in his apartment. His apartment does not face the wall and therefore he was unaware that it had collapsed. He last observed the wall on May 10, 2005, during his daily walk. He testified that he has taken daily walks since 1998 and that, on occasion, he would walk past the retaining wall. He noticed some bulging, but he never reported this observation to Langan. In addition, Mr. Berlin recalled that an indentation near the bottom of the walk had increased in size over the years.

Mr. Berlin was present for most of the meetings between Langan and Frank Nadal. He was present when Langan came to investigate the cracks in the ground above the wall in April of 2005. According to Mr. Berlin, the cracks under investigation measured two inches. He mentioned that Gregory Biesiadecki was the Langan engineer who conducted the April 2005 investigation.

According to Mr. Berlin, Castle Village authorized all of Langan's recommendations regarding the construction of a new drainage system. He recalls Langan advising Castle Village that a new drainage system would prevent some of the changes that were taking place on the grounds and also reduce the hydrostatic pressure behind the retaining wall. Castle Village relied on Langan's expertise and followed their recommendations.

On the morning of May 12, 2005, Mr. Berlin was informed that the gap between the sidewalk slabs had increased by over one inch over the past two days. He conveyed this information to Langan.

Gail Berson *Board Member, Castle Village Owner's Corporation*

On October 21, 2005, Gail Berson testified before the Board of Inquiry. Ms. Berson has lived in Castle Village since 1968. She testified that she has served in some capacity with the Castle Village Owner's Corporation from 1987 to 1992 and from 2002 to the present.

Ms. Berson testified that she never received any complaints about the condition of the retaining wall. She testified that she did observe tilting of the sidewalks on the Castle Village property near the retaining wall. She was satisfied with the work Langan Engineering performed. However, Ms. Berson testified that she had little direct contact with Langan or involvement with issues regarding the retaining wall.

Ms. Berson testified that she was in her apartment at the time of the wall's collapse. While she did hear sounds that she associated with the collapse of the wall, she did not personally observe it.

George Melendez *Castle Village Superintendent*

On October 28, 2005, George Melendez testified before the Board of Inquiry. Mr. Melendez is the superintendent at Castle Village and is responsible for maintenance of its grounds and buildings. On May 12, 2005, he was asked to tie the parapet of the retaining wall to the trees behind it. Several other Castle Village employees were assisting him. As he was performing this work, he heard a loud rumbling noise. As he looked over the parapet down to Riverside Drive, he saw that a portion of the wall had collapsed. Police officers and firefighters responding to the scene ordered him to move away from the wall, which he immediately did. As he was leaving the area, the top part of the wall collapsed.

Gregory Biesiadecki *Langan Engineering*

On November 15, 2005, Gregory Biesiadecki, a Senior Associate at Langan Engineering, testified before the Board of Inquiry. Mr. Biesiadecki is a licensed New York State Professional Engineer and he has experience with stone masonry retaining walls. Prior to working for Langan, Mr. Biesiadecki worked at Mueser Rutledge Consulting Engineers for 14 years. During this time, Mueser Rutledge was hired to install tiebacks to secure the Castle Village retaining wall. He was not involved with the Mueser Rutledge retaining wall project and he did not see any Mueser Rutledge report regarding the Castle Village wall until after he began working for Langan. Mr. Biesiadecki testified that, based on his professional opinion, the tiebacks installed by Mueser Rutledge in 1986 had been installed according to the accepted standards of the industry.

Mr. Biesiadecki testified that he became involved with the Castle Village retaining wall in 2002 when Langan Engineering was asked to do a topographic survey of the grounds. Castle Village became concerned with conditions at the top of the wall and contacted Langan to complete an inspection. Langan was never asked to determine the safety factor or the stability of the wall. In his opinion, there probably were other criteria that Castle Village could have requested within this inspection to provide a more comprehensive appraisal of the condition of the wall. Due to the large amount of information that would have been needed to calculate the safety factor of the wall, Mr. Biesiadecki was not surprised that Castle Village only asked for a global assessment of the wall.

The initial January 2002 proposal included a site inspection, record search, topographic survey, inspection of the retaining wall, and preparation of a report based on their findings. This proposal was modified in June 2002, at which time Langan was asked to discontinue the other work and simply perform a site survey. Mr. Biesiadecki testified that in August 2002, Langan was asked to propose an inspection of the wall. Langan's subsequent proposal to Castle Village included investigatory work, which Castle Village denied because it was determined to be too expensive. In September 2002, Langan submitted a revised proposal to inspect the wall which included the preparation of a report and setting up a one year monitoring program. This revised proposal would have cost Castle Village less than \$20,000 while the original proposal would have cost \$30,000. Langan's primary contact person at Castle Village was Frank Nadal, who is also a licensed engineer.

Mr. Biesiadecki explained that the wall monitoring program was a twelve month process. Langan established a baseline reading in November 2002 and took additional readings at the three-month, six-month and twelve-month marks. They established six stations along the 600-foot length of the wall. A series of five laser targets at varying heights of the wall were established at each station.

Langan issued an initial monitoring report dated January 2003. In their report, Langan assigned sections of the wall a numerical rating from one to three. Some sections were given a rating of one, which indicated fair condition. Other sections were given a rating of two, which indicated possible stability and safety concerns. No area was given a rating of three, which indicated probable stability and safety concerns. In assigning ratings to the various sections of the wall, Langan looked at such criteria as the overall number of cracks, the size of the cracks, the positioning of the cracks, and protrusions found in the masonry. Langan established

a trend in the movement of the wall in two of the stations. These stations were given a rating of two. Mr. Biesiadecki testified that there was also some movement at station five, monitoring points 21 to 25. Langan told Castle Village that the movement of these stations could be related to the weather conditions and they suggested that additional readings be obtained, which Castle Village authorized.

Langan prepared another proposal in February 2003 for additional consulting services. The proposal was broken into tasks. Langan outlined what needed to be done in order to repair the wall. Mr. Biesiadecki testified that the scope of the repair program was relatively conservative because Langan did not know what was behind the wall and that in order for Langan to create a repair plan for the wall, they would first have to perform a subsurface investigation.

Representatives from Langan visited the site again on September 12, 2003, to observe the wall and look for any changes. Based on this inspection, a follow-up memo was written to Castle Village which recommended the implementation of a repair stabilization program. Mr. Biesiadecki testified that Langan was certain that a section of the wall, rather than the entire wall, needed to be addressed, although they could not be certain what the specific problem was. Langan advised Castle Village that this condition was not critical. Langan was authorized to do the subsurface investigation on September 24, 2003.

The subsurface investigation was performed in October and November of 2003. Langan issued their subsurface investigation report in December 2003. They determined that the material behind the wall was made of boulders and soil. They also identified voids in the material in the wall. Langan was able to confirm that the wall was constructed of backfill for the full height of the wall. They also identified safety concerns with the walkways. While Langan made no proposals for repairs of the wall, they did make recommendations for walkway repair and site drainage. Mr. Biesiadecki testified that Langan then began discussions with Castle Village about drainage improvements and walkway improvements.

After their investigation, Castle Village decided to do the drainage improvements first and then repair the wall at a later date. There was an immediate safety concern because residents were using the damaged sidewalks. Mr. Biesiadecki testified that Langan considered the drainage improvements to be a step towards stabilizing the wall, but not a substitute for the wall repair.

The drainage work was performed in the fall of 2004. Langan did not believe that the delay between the subsurface investigation report and the performance of the drainage work was going to result in a collapse of the wall. They were comfortable with the delay. Mr. Biesiadecki testified that during the nine month delay period, Langan did not monitor the wall. The major reason for the delay was that Castle Village wanted its residents to be able to use a majority of the grounds on top of the wall during the summer months so they insisted on waiting until the fall of 2004 to conduct the drainage work.

In March 2005, after the drainage work was completed, Frank Nadal called Langan to resurvey the monitoring points on the wall and examine the condition of the wall. From the time following the completion of the drainage work up until March 2005, Langan was not authorized to do any work. Langan went to the retaining wall site on April 11, 2005. At that time, Mr. Biesiadecki testified that Langan noticed new cracks in the lower portions of the wall, new sinkholes at the terrace level, and separation in the newly installed sidewalks. Langan suspected that the wall had moved and recommended that temporary stabilization be performed. Langan expected the wall to continue to move over time, but this was not considered to be an emergency situation. Castle Village approved their recommendations and Langan began creating contract documents to be sent out for bids.

In early May 2005, proposals were received from two contractors and Castle Village authorized one of them, Urban Foundations Engineering, to do the work. Urban was going to install rakers to stabilize the lower portion of the wall. At the time of the collapse, Urban was obtaining work permits from the Department of Transportation.

Mr. Biesiadecki testified that nobody ever told DOT that the work was urgent, but there were discussions with the contractor's expeditor to find the quickest way to get the permits. According to Mr. Biesiadecki, in his professional opinion, if this work had been performed in time it would have prevented the wall from collapsing.

Mr. Biesiadecki testified that looking at the condition of the wall over the preceding years, nothing suggested to him that the wall was about to collapse. However, the risk of the wall collapsing increased as it moved further. In his opinion, the collapse could have occurred because the tiebacks supporting the wall failed or because there could have been water built up behind the wall. He believes that it was unlikely rainfall caused the water to build up. The vegetation growing on the wall could have caused decay, but should not have endangered the wall. Mr. Biesiadecki would classify this collapse as a progressive collapse since the lower portion of the wall collapsed first and there was a delay before the other portion of the wall collapsed.

David Gockel *Langan Engineering*

On November 15, 2005, David Gockel, the President of Langan Engineering, testified before the Board of Inquiry. Mr. Gockel did not become involved with the Castle Village retaining wall until May 12, 2005, at approximately 5 p.m. During the first few days after the collapse, Mr. Gockel was involved in finding a way to stabilize the collapsed sections of the wall. He advised that the removal of the rubble would cause further instability and that the debris should not be removed. Subsequently, he assisted Castle Village with the preparation of correspondence to various New York City agencies.

Mr. Gockel testified that, in his opinion, he did not believe that the collapse was foreseeable. He believed it to be significant that Mr. Biesiadecki and another Langan engineer were standing at the base of the wall the morning of the day it collapsed, something that would not have happened if they thought the wall was in imminent danger of collapse.

Frank Nadal *Castle Village Property Manager*

On October 21, 2005, and again on January 6, 2006, Frank Nadal testified before the Board of Inquiry. Mr. Nadal holds a civil engineering degree and is a licensed Professional Engineer in New York. He was the Castle Village contact person for Langan Engineering and was present at all Castle Village Owner's Corporation meetings. Generally, Langan would present their findings and recommendations to him and he would then present those findings and recommendations to Castle Village.

Langan was originally called in because there was some spalling of rock on the face of the wall and there were some sinkholes at ground level directly above the wall. Langan recommended monitoring the wall to determine what was happening. Prior to April 2005, Langan never told Mr. Nadal or Castle Village that the retaining wall was unstable. They maintained that monitoring the wall was the most important thing that could be done.

Langan drafted a proposal dated February 27, 2003, which called for Castle Village's authorization to perform certain tasks listed as Task 1 through Task 6. During the period from February 27, 2003, to September 24, 2003, Langan continued to monitor the wall and evaluate what tasks needed to be performed. On September 24, 2003, Mr. Nadal gave authorization for Langan to do Task 2, a subsurface conditions investigation. On September 22, 2004, Mr. Nadal gave authorization for Langan to do Task 3, the preparation of contract documents for maintenance. Mr. Nadal also authorized Task 4, the preparation of contract documents for rehabilitation and repair. On Langan's recommendation, additional tasks were not authorized because of unfeasibility.

As part of the subsurface investigation, borings and probes were done in October 2003. Castle Village never refused to allow any probes or borings that were suggested by Langan's engineers. Langan originally called for more probes and borings to be done, but later decided that they didn't need them because the information they already obtained was sufficient.

Task 3, the preparation of contract documents for maintenance, was never implemented by Langan. They felt that it would make more sense to finish the work at the top of the wall before the maintenance work began. Mr. Nadal testified that he didn't understand this because he thought the work could be performed simultaneously, but that ultimately it was Langan's decision.

On December 30, 2003, after the subsurface investigation was completed, Langan issued a report. They recommended that it was more important to do the grading and drainage work instead of doing Task 4, which was to repair the portions of the wall exhibiting structural distress. The drainage work was supposed to stop the movement of the wall (about three inches, which Langan said was a very small amount and was nothing to be concerned about) and prevent future sinkholes from appearing. The drainage work was performed from August 2004 to November 2004. During this time, Langan supervised the work.

Between November 2004 and March 2005, Langan didn't visit the retaining wall site. According to Mr. Nadal, Langan didn't think it was necessary. Mr. Nadal called them either in late March or early April of 2005 because he noticed settlement in areas above the wall and the separation of the sidewalks on top of the wall. He also noticed some sink holes near the catch basins, additional spalling of rock on the face of the wall, and water ponding on the top of the wall. Mr. Nadal also began noticing failures of the drainage system such as water not flowing properly into the catch basins. Langan said that they would inspect the wall, but they didn't seem motivated and did not show up. Mr. Nadal followed up with a fax, which prompted Langan to visit the wall. They noticed the previously described conditions and told Mr. Nadal to keep the area roped off. They began to monitor and survey the wall to determine the cause. The surveys were done on a weekly basis and indicated that the wall was moving. At this time, Langan recommended a bracing system for the wall, but didn't indicate that it was critical. As the cracks in the sidewalk were getting bigger, Mr. Nadal called Langan on a daily or weekly basis to let them know what was happening. Langan would come and inspect, but still didn't indicate that the bracing system had to be done immediately.

During this time, Langan made a presentation to a few board members regarding the bracing system. A contractor, Urban Foundations Engineering, was hired by Castle Village to install the brace. Langan said that the bracing measures were meant to stabilize the wall and prevent continued movement. Castle Village approved the contract.

On the day of the collapse, the superintendent of Castle Village noticed that the gaps between the sidewalks had widened and called Langan to alert them. When Mr. Nadal arrived at Castle Village, he also called Langan to ask them to inspect the wall. Langan engineers arrived and observed the conditions at the top of the wall. They instructed Mr. Nadal to have his men tie the parapet at the top of the wall back to the trees because it was tilting forward. Urban had already applied for a permit to do the bracing work, but the Department of Transportation had to conduct a site visit before the permit would be issued. The site visit was set for the following day. According to Mr. Nadal, Langan said that there was nothing they could do until the permit was issued. Langan never informed Mr. Nadal that it was possible to perform certain types of emergency work without a permit.

David Van Leeuwen/Anthony Mazzo *Urban Foundations Engineering*

On February 10, 2006, David Van Leeuwen and Anthony Mazzo from Urban Foundations Engineering testified before the Board of Inquiry. Mr. Van Leeuwen is a vice president at Urban and has been employed there since 1988. He is a licensed New York State Professional Engineer. As vice president, his duties include project management and estimations.

Mr. Van Leeuwen became involved with the Castle Village retaining wall in the last week of April 2005. At that time, Langan was soliciting bids for the retaining wall work. They accepted Urban's \$67,000 bid to install a brace in front of the wall. On April 27, 2005, Mr. Van Leeuwen visited the retaining wall and he noticed that there were bulging areas near the bottom portion of the wall.

Urban received authorization from Castle Village to proceed with the bracing system on May 6, 2005. Under this agreement, Urban would install the bracing system designed by Langan that consisted of four sets of braces aligned at the bottom 25 to 30 feet of the wall. Each set contained a steel brace placed against the wall, a steel brace underneath the sidewalk, and an incline brace tying the two together with a concrete block out in the street to support the bracing.

However, before Urban could begin construction on the bracing system, the retaining wall collapsed. Urban had applied for a Department of Transportation permit for a sidewalk closure and a partial roadway closing of Riverside Drive the day before the wall collapsed. The slight delay existed because DOT wanted to survey the site prior to issuing the permit and both parties agreed to conduct the site visit on May 12, 2005. The wall collapsed before the site visit could take place.

Mr. Van Leeuwen testified that the delay in obtaining the permits concerned Langan's engineers. They sent a letter to DOT asking them to expedite the permit process so that the bracing system could be installed promptly. The letter was dated May 9, 2005.

Anthony Mazzo is the president of Urban Foundations Engineering. As president, he is the chief administrative officer of the company. Mr. Mazzo is licensed New York State Professional Engineer. Although Mr. Mazzo was never personally involved with the Castle Village project, he did approve the bid submitted to Langan.

Joseph Urbanati, Jr. *Morris Park Contracting Corporation*

On February 10, 2006, Joseph Urbanati, Jr., testified before the Board of Inquiry. Mr. Urbanati is the vice president of Morris Park Contracting Corporation. As vice president, Mr. Urbanati finalizes bids and prices and submits proposals. Morris Park is a family-owned business that deals primarily with renovation, new construction, and demolition.

On July 20, 2004, Morris Park submitted a proposal to Langan for the installation of a drainage system on the grounds above the Castle Village retaining wall. In September 2004, Morris Park received authorization from Castle Village to begin the work. The drainage work consisted of filling sinkholes with gravel, removing and replacing sidewalks, and installing catch basins, pipes, and manholes throughout the site. Langan observed every step of the process.

Mr. Urbanati first observed the Castle Village property during the first week of August 2004. He visited the grounds above the wall where the drainage work was to be performed, but he never actually observed the retaining wall itself. Langan did not inform Morris Park that the retaining wall was moving. After beginning construction, Morris Park learned of the movement of the wall from Frank Nadal and Gregory Biesiadecki. Both men were under the impression that the drainage work was being done in response to the movement.

Morris Park believed the drainage system would function properly since they installed it as instructed by Langan. During the construction of the drainage system, Mr. Urbanati voiced concerns that the trees above the wall could be a contributing factor to the wall's damage. He suggested removal of the trees but Frank Nadal and Castle Village wanted the trees to remain at the site. The system was not checked after construction was completed. Morris Park revisited the site in the spring of 2005 because grass had failed to grow above the new drainage system and they agreed to seed the area again.

Dennis Delaney *New York City Department of Environmental Protection*

On April 7, 2006, Dennis Delaney testified before the Board of Inquiry. Mr. Delaney is employed as the Deputy Chief of Maintenance for the New York City Department of Environmental Protection. For the past 25 years, he has worked in the Water and Sewer Maintenance Department.

Mr. Delaney's involvement with the Castle Village retaining wall began on May 13, 2006, the day after the collapse. His primary function at the site included the inspection of the city water pipes and sewers to determine if they were compromised by the collapse. He inspected the sewers and water pipes on Cabrini Boulevard, Riverside Drive south of 180th Street, and along the Henry Hudson Parkway. These locations were chosen because they were located near the collapse site. The inspection was conducted using a robot camera that went through the sewer system checking for any obstructions or damage. The sewer system was found to be in good condition. Mr. Delaney also testified that he had no personal knowledge of any recent repairs to the sewer system.

In addition to inspecting the city sewer system, Mr. Delaney also inspected Castle Village's internal sewer system approximately one week after the collapse. The inspection consisted of a visual survey of the existing pipes and the use of a robotic camera to inspect the areas that were not physically accessible. He observed that there were tunnels which appeared to be in disrepair.

Mr. Delaney testified that Castle Village's sewer system entered the city sewer at Cabrini Boulevard. Any water entering the city sewer system from Castle Village would have then traveled down through Manhattan until eventually ending up at a city water treatment facility.

Simon Sauberman *New York City Department of Design and Construction*

On April 7, 2006, Simon Sauberman testified before the Board of Inquiry. Mr. Sauberman has been employed as the Chief Engineer of Technical Support for the New York City Department of Design and Construction for the past eight years. His duties include resolving disputes, reviewing inspections, investigations, and research and development for new material and technology.

Mr. Sauberman arrived at the Castle Village collapse site the day after the wall fell. His primary function at the scene consisted of talking to Langan and reviewing their action plan, coordinating the removal of the debris, and stabilizing the slope. When questioned about the condition of the site when he arrived, Mr. Sauberman responded that the site was disturbed by the time he arrived. He did remember that the soil was discolored which would indicate wetness. During the excavation, he also noticed that the debris consisted of a mixture of fill, boulders, clay and silt. He also noticed organic matter at the top of the site. He testified that while excavating, he observed that there were deficiencies in the drainage system but he was unaware whether the broken pipes resulted from the collapse or if the broken pipes were present before the collapse.

Charlie Hernandez *New York City Department of Design and Construction*

On April 7, 2006, Charlie Hernandez testified before the Board of Inquiry. Mr. Hernandez has been employed as the Construction Administrator for the New York City Department of Design and Construction for the past ten years. His duties include supervising construction activities for the design and construction of capital projects.

At approximately 5:30 p.m. on May 12, 2005, Mr. Hernandez arrived at the Castle Village site. His primary purpose at the site was to supervise the clearing of the roadway and ensure the safety of the public. He was responsible for making sure the removal of the debris conformed to city codes. On the day of the collapse, Mr. Hernandez remembers that the soil was wet in some areas and dry in other areas. The debris consisted of heavy boulders, foundation, fill, and landscaping fabric.

Gary Smalls *New York City Department of Transportation*

On April 12, 2006, Gary Smalls testified before the Board of Inquiry. Mr. Smalls has been employed as a Manhattan Borough Coordinator for the New York City Department of Transportation for the past sixteen years. His duties include issuing permits for roadway closures.

Mr. Smalls' involvement with the Castle Village retaining wall began on May 11, 2005, when Urban Foundations requested a road closure permit for the portion of Riverside Drive that ran directly below the retaining wall. He informed Urban that he would have to visit the site before he could issue the permit and he arranged to visit the site on May 13, 2005. However, the wall collapse before the site visit occurred.

Mr. Smalls testified that he needs to thoroughly examine the reasons why a permit for a road closure is necessary due to the potential traffic hazards that result from a road closure. Once a permit request is submitted, a clerk stamps the request and forwards the request to Mr. Smalls for further investigation. He would then make arrangements to visit the site before issuance of the permit. However, in emergency situations this process may be bypassed. When anyone believes that an emergency situation exists, they may close the roadway immediately and begin repairs. The Department of Transportation has an emergency number that can be called to inform them that such a closure is taking place. Alternatively, someone facing an emergency situation can contact the Office of Emergency Management, the police department, or the fire department to arrange an emergency street closure.

Dresdner Robin Engineering *Subcontractor Hired by Mueser Rutledge Consulting Engineers*

On April 12, 2006, Fred Worstell from Dresdner Robin Engineering testified before the Board of Inquiry. Dresdner was hired by MRCE to conduct a further investigation of the drainage system designed by Langan for Castle Village. Dresdner used the design plans prepared by Langan, storm water information, and general engineering principles to compute pipe flow in their investigation into whether the drainage system contributed to the pressure behind the Castle Village retaining wall.

Although Dresdner did not know the intent of the drainage design, they were able to determine that the drainage system was designed to drain storms dropping a maximum of .29 inches per hour of rain. Based on this finding, Dresdner concluded that the drainage system would have been discharging water to the beds for storms over a .29 intensity. This would have caused a backflow of water in the pipes towards the wall.

Dresdner also determined that portions of the drainage system had settled. Evidence supporting the settlement theory is based on the tilting of the sidewalks observed on the ground above the wall. If portions of the system settled, water collected would build-up and push back eventually discharging into the beds.

Dresdner testified that the fabric used to line the drainage system may have contributed to the increased saturation of the soil behind the wall. Increased saturation could have increased the pressure behind the wall and contributed to the wall's failure. The fabric used was non-woven and would have allowed for water flow. The fabric has the same saturation capacity as loose gravel.

Joseph Noto *New York City Department of Transportation*

On April 17, 2006, Joseph Noto of the New York City Department of Transportation testified before the Board of Inquiry as to the traffic conditions in the area of the collapse site. He indicated that the Henry Hudson Parkway, which runs next to the wall site, may not be used by trucks or other commercial vehicles. He also stated that the speed limit on the parkway is 50 miles per hour and the speed limit on the approach is 30 miles per hour. He explained that the wall was most closely abutted by a service road that had an entry ramp beside it which led to the Henry Hudson Parkway.

Gregory Pillori *Geotechnical Engineer, Pillori and Associates*

On April 21, 2006, Gregory Pillori testified before the Board of Inquiry. Mr. Pillori is a geotechnical engineer who was called upon to do work at Castle Village in the late 1990's. He was hired by Cutsogeorge & Tooman to prioritize the repair work that had to be performed on the smaller retaining walls located throughout the Castle Village property.

Although Mr. Pillori was not hired to work on the retaining wall that collapsed, he was asked to evaluate it and provide a proposal regarding repairs for the wall. He inspected the retaining wall and observed that it was bulging in the area that eventually collapsed and that there was a large crack on the side of the wall. Mr. Pillori also noticed that there was a serious drainage problem on the property, as evidenced by standing pools of water and numerous sinkholes. He examined the wall but determined that it was difficult to provide a complete proposal since he did not know how the wall had been built. Mr. Pillori examined the wall and observed that there was no water draining from the wall itself, but that there were several weepholes which contained sand. This condition indicates shifting of the soil behind the weepholes. Pieces of the wall were observed falling to the ground. Mr. Pillori submitted a proposal for approximately \$26,000 to excavate behind the wall in order to examine the construction of the wall. The proposal was rejected by Castle Village. In his opinion, Castle Village seemed very reluctant to spend any large sums of money on the maintenance of the retaining wall.

Mr. Pillori further testified that when he was performing his work at the site, he had the opportunity to review the report on the condition of the retaining wall that had been prepared by Mueser Rutledge in the 1980's. In his professional opinion, had Castle Village followed the advice from Mueser Rutledge in the report, it would have been possible to save the wall. Mr. Pillori believed that at the time he began his work, the wall was beyond repair and the collapse was inevitable.

Douglas Cutsogeorge *Cutsogeorge, Tooman, & Allen Architects*

On May 1, 2006, Douglas Cutsogeorge testified before the Board of Inquiry. Mr. Cutsogeorge's firm was retained in 1995 with respect to litigation that Castle Village was undertaking related to its garage. The firm later became Castle Village's architect for apartment alterations, masonry waterproofing, and building facade restoration. It noted the retaining wall in a 1998-1999 report of the entire complex and recommended construction of a sidewalk bridge, removal of vegetation, and removal of loose masonry. The report also referred Castle Village to soils engineer Gregory Pillori, who Castle Village later hired. Mr. Cutsogeorge could not remember the specific recommendations or whether they were implemented, but did know that Mr. Pillori was hired.

Joseph Noto *New York City Department of Transportation*

On May 3, 2006, Joseph Noto testified again before the Board of Inquiry. Mr. Noto described the procedure taken to close a street in an emergency situation. In a case like that of the Castle Village retaining wall, Noto said that their duty is only to reach out to the police and OEM. Mr. Noto was asked whether his office received a letter from Langan Engineering (which Langan claims to have sent) stating why they needed a street permit at the Castle Village site. He said that such a letter may have been forwarded to the Bureau of Management and Construction Control but neither he nor the bureau had record of it.

Mahabal Shah *New York City Department of Transportation*

On May 3, 2006, Mahabal Shah testified before the Board of Inquiry. Mr. Shah is an engineer with DOT who worked on a 1998-1999 inventory of retaining walls in NYC that were next to roads and at least six feet tall. The inventory included locations and measurements, but full inspections were not done. Visual inspections were done of City-owned walls, but non-City walls were not inspected in any way. An identification number was assigned to the Castle Village wall, but no inspection was done because it is privately owned.

David Gockel *Langan Engineering*

On May 5, 2006, David Gockel testified again before the Board of Inquiry. Mr. Gockel is the president of Langan Engineering. He recommended to the Board that an investigation was still being done at the wall collapse site and since many uncertainties remained, no findings should be issued yet. Mr. Gockel claimed that his firm has not been sufficiently included in the Board's investigation despite its willingness to do so and asked that they be permitted to make a comprehensive presentation in the future.

Michael Pressel *RPO, Inc.*

On May 11, 2006, Michael Pressel testified before the Board of Inquiry. Mr. Pressel is the president of RPO, Inc., which employs expeditors that interact with various city agencies on behalf of RPO's clients. RPO's client, Urban Foundation Engineering, requested that they obtain a partial street closure permit from DOT for the Castle Village site on May 9, 2005. RPO and Urban have had an ongoing business relationship since 1987. RPO was to obtain a permit from the Department of Transportation to close the sidewalk and the curb lane adjacent to the retaining wall. RPO is an authorized representative of Urban and is their liaison with DOT. They prepared paperwork for the permit and were told by Urban that braces and other on-site structures were to be installed. There was a sense of extreme urgency during the conversation with Urban regarding the permit request. The permit was denied on May 9th because a letter from the engineer was needed to justify the request. RPO contacted Urban who got a letter from Langan Engineering detailing the urgency of the work. The letter was brought to DOT on May 11, 2005 and a site visit was scheduled for May 13, 2005. It is very uncommon for a site visit to be scheduled so quickly. Due to the wall's collapse, the site visit never took place.

Ginette Celestin *RPO, Inc.*

On May 11, 2006, Ginette Celestin testified before the Board of Inquiry. Ms. Celestin is an expeditor with RPO, Inc. Celestin has been employed by RPO for 19 years. She is responsible for handling all filings with DOT. May 9, 2005, was the first time she became involved with the Castle Village permit request. The urgency of the situation had been communicated directly to her from Urban. Celestin said she went to DOT on May 9th and she was told that she needed to bring a letter detailing the work that was to be done. She got the letter the next day and returned to DOT on May 11th. At that point, DOT scheduled a site visit for May 13th to determine if a permit was necessary.

Ed Sonn *Castle Village Board Member*

On July 18, 2006, Ed Sonn testified before the Board of Inquiry. Mr. Sonn became a member of the Castle Village Board of Directors after the death of his brother in 2002. His brother had served on the board for many years. He lives in Connecticut and listens in on a majority of the board meetings by phone. He visits Castle Village an average of 3-4 times a year. At the time of the wall collapse, Mr. Sonn was in Connecticut and learned about the collapse through phone calls from other board members and family members. He recalls that before the collapse, the Castle Village Board of Directors was given a presentation by Langan Engineering, the company that Castle Village hired to monitor the wall. Mr. Sonn states that Langan made several suggestions concerning the wall's drainage system. He claims that the Board of Directors always followed the advice given to them by Langan because none of the board members were civil engineers. He further states that Castle Village had sufficient money to fund Langan's suggestions. Mr. Sonn asserts that Langan never indicated the wall presented any immediate danger to public safety and that he personally did not have any reason to believe the retaining wall was unstable.

Lara Sheikh *Castle Village Board Member*

On July 18, 2006, Lara Sheikh testified before the Board of Inquiry. Ms. Sheikh is no longer a board member on the Castle Village Board of Directors but was a member at the time of the retaining wall collapse. She is an attorney and has been a resident of Castle Village since 2001. At the time of the collapse, Ms. Sheikh was at a meeting in Brooklyn. She learned about the collapse from a voicemail left on her cell phone by another member of the board. She recalls that the board received a presentation by Langan several months before the collapse recommending changes to the wall's drainage system. She remembers noticing cracks in the sidewalks adjacent to the wall and uneven ground around Castle Village. She states that the grounds closest to the wall were closed for reseeding around the time of the collapse so she did not notice anything that suggested the wall was unstable. Ms. Sheikh further states that the Castle Village Board members always approved Langan's proposed plans, funded them fully, and had faith in their expertise and reputation. Langan never gave her any indication that the wall was unstable.

Erica Lindenstrauss *Castle Village Board Member*

On July 18, 2006, Erica Lindenstrauss testified before the Board of Inquiry. Ms. Lindenstrauss is no longer a member of the Castle Village Board of Directors but was a member at the time of the collapse. She is a retired psychotherapist and has been a resident of Castle Village since 1961. Ms. Lindenstrauss was home at the time of the collapse and saw the collapse from her window. She remembers hearing the sound of brakes coming from the Henry Hudson Parkway and going to the window to see if there was a car accident. She then heard a loud noise and saw the wall lift up and then crash down, uprooting full-grown trees and turning them upside down. She vaguely remembers a presentation by Langan before the collapse referencing the wall's drainage system. She also recalls that the Board of Directors for Castle Village always deferred to the expertise of Langan when it came to engineering decisions. Ms. Lindenstrauss stated that there were no visual indications of instability of the wall and that she had received no complaints about instability or potential danger from Langan or members of the public.

David Libchaber *Castle Village Board Member*

On July 18, 2006, David Libchaber testified before the Board of Inquiry. Mr. Libchaber is no longer a member of the Castle Village Board of Directors but was a member at the time of the wall collapse. He is a real estate agent and resident of Castle Village who was on a bus on the east side of Manhattan at the time of the collapse. He recalls that the Castle Village Board of Directors was always very receptive to any suggestions by Langan and remembers that before the collapse, Langan was performing work on the wall's drainage system and had installed a laser system to monitor any movement of the wall. He also recalls that Langan hired a contractor who was in the process of installing support beams (tiebacks) at the wall before the collapse. Mr. Libchaber said he had no reason to believe, either personally or through information provided by Langan, that the wall presented any imminent danger to the Castle Village community or members of the public. He further recalls an information session that the president of Langan held after the collapse of the wall for all tenants of Castle Village. Mr. Libchaber states that the presentation gave information on potential solutions going forward after the collapse but no explanation as to why the collapse occurred.

EXHIBIT #	RECEIVED FROM	DOCUMENT
1	Commissioner Lancaster	Memorandum Convening Board of Inquiry
2	BOI	Member List
3	Ilyse Fink	Castle Village Articles
4	BOI	Agenda for 1st Board of Inquiry Meeting – 6/23/05
5	BOI	Washington Heights & Inwood Online Article
6	BOI	Minutes from 6/23/05 Board of Inquiry Meeting
7	BOI	Potential List of Witnesses
8	BOI	Applications Concerning the Site
9	BOI	Minutes from Testimony Held on 7/8/05
10	BOI	Questions for 8/2/05 Testimony
11	BOI	FDNY and NYPD Appearance Letters
12	BOI	Photographs Marked by Carlos Pellecier
13	BOI	Photographs Marked by Joe Byrne
14	BOI	Photographs Marked by Brian Masterson
15	BOI	Photographs Marked by Jonathan Wally
16	BOI	Minutes from Testimony Held on 8/2/05
17	BOI	Questions for Testimony Held on 10/21/05
18	BOI	Letters and Subpoenas
19	Castle Village	Documents Produced by Castle Village
20	BOI	Request for Fire Department Report and FDNY Response
21	Langan Engineering	Castle Village Photos
22	BOI	Minutes from Testimony Held on 10/21/05
23	BOI	Questions for Testimony Held on 10/28/05
24	BOI	Subpoenas
25	BOI	Minutes from Testimony Held on 10/28/05
26	BOI	Questions for Testimony Held on 11/04/05
27	Langan Engineering	Documents Produced by Langan Engineering
28	Mueser Rutledge	CD of MRCE presentation on 10/28/05
29	BOI	Minutes from Testimony Held on 11/4/05
30	BOI	Appearance Letters
31	BOI	Questions for Testimony Held on 11/15/05
32	Langan Engineering	Large Chart Showing 3-D Wall Diagram
33	Langan Engineering	Large Chart Showing Wall Cross-section
34	Langan Engineering	Chart with Wall Movement Data
35	Langan Engineering	Wall Graphs
36	BOI	Minutes from Testimony Held on 11/15/06

DOCUMENTS RECEIVED

EXHIBIT #	RECEIVED FROM	DOCUMENT
37	B0I	Questions for Testimony Held on 1/6/06
38	Langan Engineering	Two Binders Provided by Langan Engineering
39	Ross & Cohen	Binder Provided by Ross & Cohen
40	B0I	Minutes from Testimony Held on 1/6/06
41	B0I	Questions for Testimony Held on 2/10/06
42	B0I	Subpoenas
43	Commissioner Lancaster	E-mail Delegating Commissioner's Subpoena Power to Deputy Commissioner Fatma Amer
44	Urban Foundations	Documents Produced by Urban Foundations Engineering
45	B0I	Minutes from Testimony Held on 2/10/06
46	B0I	Questions for Testimony Held on 4/7/06
47	DEP	DEP Chart #1
48	DEP	DEP Chart #2
49	DEP	DEP Chart #3
50	B0I	Minutes from Testimony Held on 4/7/06
51	B0I	Questions for Testimony Held on 4/12/06
52	B0I	Second Set of Questions for Testimony Held on 4/12/06
53	Urban Foundations	DOT Permit Application
54	Urban Foundations	Letter to DOT from Langan Engineering
55	Dresdner Robin	Documents Produced by Dresdner Robin
56	B0I	Minutes from Testimony Held on 4/12/06
57	B0I	Questions for Testimony Held on 4/17/06
58	Morris Park	Documents Produced by Morris Park Contracting Corporation
59	B0I	Subpoenas
60	B0I	Minutes from Testimony Held on 4/17/06
61	B0I	Questions for Testimony Held on 4/21/06
62	Gregory Pillori	Documents Produced by Gregory Pillori
63	Castle Village	Castle Village Site Plan
64	B0I	Minutes from Testimony Held on 4/21/06
65	Douglas Cutsogeorge	Packet of Documents
66	B0I	Minutes from Testimony Held on 4/28/06
67	B0I	Questions for Testimony Held on 5/1/06
68	Douglas Cutsogeorge	Report from Gregory Pillori
69	B0I	Minutes from Testimony Held on 5/1/06
70	B0I	Questions for Testimony Held on 5/3/06
71	B0I	Minutes from Testimony Held on 5/3/06
72	Lawrence Klein	Letter Dated 4/18/06

DOCUMENTS RECEIVED

EXHIBIT #	RECEIVED FROM	DOCUMENT
73	Lawrence Klein	Letter Dated 4/28/06
74	DEP	Packet of Documents
75	DEP	Packet of Documents
76	David Gockel	Packet of Documents
77	David Gockel	Packet of Documents
78	BOI	Minutes from Testimony Held on 5/5/06
79	BOI	Questions for Testimony Held on 5/11/06
80	RPO, Inc.	Packet of Documents
81	BOI	Questions for Testimony Held on 7/18/06
82	DOT	Letters Dated 3/8/07
83	BOI	Subpoena Dated 4/11/06
84	BOI	Subpoena Dated 4/11/06
85	BOI	Subpoena Dated 4/11/06
86	BOI	Subpoena Dated 4/11/06
87	BOI	Subpoena Dated 4/11/06
88	BOI	Subpoena Dated 4/24/06
89	BOI	Subpoena Dated 5/3/06
90	BOI	Subpoena Dated 5/8/06
91	BOI	Subpoena Dated 5/10/06
92	BOI	Subpoena Dated 7/29/06
93	BOI	Subpoena Dated 7/29/06
94	BOI	Subpoena Dated 2/1/07