



**Final Report on New York City Emergency Response and Evacuation
Plans in the Event of a Weather-Related Emergency**

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“People would stop evacuating simply because they were unable to evacuate.”
-New York City Hurricane Evacuation Behavioral Analysis, April 2005¹

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Section 1. Background

Hurricane Katrina made clear how vulnerable our cities and how unprepared are government agencies responsible for emergency and evacuation planning. The clear and disproportionate impacts on the poor, the disabled, and minority communities were especially unacceptable. The tragedy of Hurricane Katrina required an immediate, thorough, and public review of existing plans. It is clear that the Plan had not been seriously reviewed, or improved for years, as evidenced by its cover which in 2005 referred to Rudy Giuliani as Acting Mayor, cited Bell Atlantic as the phone carrier, and listed Seven World Trade Center as the staging area for public information.² The purpose of this Report is to improve emergency preparedness of New York City.

This investigation results from the Committee's responsibility to oversee New York State authorities, many of which have important roles in emergency planning for the City. The Committee gained deep familiarity with disaster and evacuation planning issues when, in 2002, it issued a Report on the failures of the evacuation plan for the Indian Point Nuclear Facility.³

I. Weather-Related Evacuation Plans

There are two kinds of evacuation and emergency response plans for New York City. The first type is weather-related, and focuses on low-lying areas with the assumption of significant lead time for an evacuation. The second is an "area evacuation," in which specific areas or the entire City will be evacuated because of a serious disaster, including incidents without any advance notice. According to emergency response professionals, the disclosure of weather-related evacuation plans do not raise significant security related issues, but area evacuation plans may be more security-sensitive.⁴ This Report and the Committee's investigation focus exclusively on weather-related evacuations, with particular attention paid to hurricane evacuations.

II. Government Evacuation Structure and Chain-of-Command

Emergency and evacuation planning for the City is the legal responsibility of the Office of Emergency Management ("OEM") under the supervision of the Mayor, and depends on cooperation with roughly 130 state and local agencies and authorities as well as non-governmental and private organizations.⁵ At the state level, the State Emergency Management Office ("SEMO") is responsible for coordinating the response of State agencies in the event of an emergency and develops disaster preparedness plans with local governments. At the federal level, the Federal Emergency Management Agency ("FEMA") coordinates the federal response to a disaster and helps equip local emergency preparedness efforts.⁶ The ultimate legal responsibility for a successful evacuation is New York City's.

III. Chronology of the Committee's Investigation

For a chronology of the Committee's investigation see Appendix A.

Section 2. A Major Hurricane is Likely to Strike New York City in the Near Future

I. There is a Significant Likelihood of a Strong Hurricane Striking New York City

Recently, AccuWeather, a private not-for-profit weather firm, stated that "the Northeast coast is long overdue for a powerful hurricane" and warns that a "weather disaster of historic proportions could strike as early as this year."⁷ New York City is the third most vulnerable major American city to a hurricane disaster, behind only New Orleans and Miami, and has been hit by several hurricanes.⁸ Experts believe that a Category 3 hurricane will hit New York once every eighty years.⁹ The last Category 3 hurricane hit in 1938, 68 years ago.

**"The Northeast coast is long overdue for a powerful hurricane...[a] weather disaster of historic proportions could strike as early as this year."
--AccuWeather**

New York City and the Long Island region have been directly hit by 11 hurricanes over the last 120 years, for an approximate frequency of one hurricane every 10 years.¹⁰ The most severe hurricane to hit the New York coastal region has been a Category 3 hurricane. According to historical records, since 1815 there have been four Category 3 hurricanes that have hit the New York City region: 1815, 1821, 1893, and 1938.

In addition to Category 3 storms, New York has been regularly hit by hurricanes and tropical storms capable of requiring evacuation and shelter. Hurricane Carol in 1954 struck Eastern Long Island and Southeastern Connecticut with sustained winds over 100 mph. In 1985 residents braced for Hurricane Gloria which, although originally was considered a Category 3 hurricane, dramatically decreased in strength as the storm ran ashore. Hurricanes Felix (1995), Bertha (1996), Edouard (1996), Floyd (1999), and Isabel (2003), all were eventually downgraded to tropical storms before hitting the City and caused heavy rain and at times flooding in the region. In fact, Floyd forced the closure of the New York City schools and required the City to take prudent measures by opening up emergency storm shelters.

Furthermore, experts believe that 1995-2015 is a period of above-normal hurricane activity, and that global warming has increased ocean temperatures and thus the strength of hurricanes.¹¹ It's not a question of whether a strong hurricane will hit New York City; it's just a question of when.¹²

II. New York City's Special Vulnerabilities to Hurricanes

Several unique physical characteristics enhance the danger and likely damage from hurricanes in New York City.

A. Geography

The City is especially vulnerable to storm-surge flooding because of the New York bight: the right angle formed by Long Island and New Jersey. The New York bight makes storm-surge values in New York City higher than anywhere else along the eastern seaboard.¹³ New York Harbor and the surrounding rivers essentially act as a funnel, and the water will have nowhere to go but on land. While a Category 3 storm will cause a 12-13 foot storm surge in Florida, the same hurricane will cause a storm surge above 20 feet for most of New York City's coast.¹⁴

A Category 3 hurricane will cause overwhelming flooding. An article, published one-month prior to Hurricane Katrina gave a sobering account of what will happen if a Category 3 hurricane makes a direct hit on the City:

Everything below Broome Street will be inundated, some parts under as much as 20 and 30 feet of water. Chelsea and Greenwich Village are completely flooded, with the Hudson spilling over all the way to 7th Avenue. Likewise, the East River and East Village become one, with ocean water surging all the way to 1st Avenue...A major hurricane will push ocean water down from the Long Island Sound into the Upper East Side, South Bronx and northern Queens, flooding those areas severely. Vast stretches of southern Brooklyn, Queens and Staten Island will be devastated.¹⁵

The City is due for a major hurricane and a direct hit would cause enormous and pervasive damage. It is imperative that the City has plans in place to successfully evacuate in the event of a major hurricane.

B. High-Rise Buildings and Bridges

New York City is vulnerable because of its numerous sky scrapers and tall bridges are especially susceptible to wind damage. Hurricane winds often move twice as fast at a height of 350 feet than they do on the ground.¹⁶ The strong winds combined with the City's glass-skinned towers will cause windows to break and make it extremely dangerous for any people near windows or caught outside in the debris.¹⁷ Additionally, the height of the City's bridges will make them unusable long before a hurricane landing.

Section 3. Findings: The Existing Plan Fails to Protect the Life, Safety and Property of the City's Residents

The existing evacuation plan for New York City is incapable of protecting the life, safety, and property of the City's residents. The Plan needs major and continuing improvements in order to maximize the number of people protected. Commissioner Bruno, to his credit, has conceded shortcomings in the Plan and is addressing some of the deficiencies identified by the Committee in its September 15, 2005 *Preliminary Report*. However, the fundamental failures remain.

These fundamental failures include a cumbersome two-tiered shelter system, inadequate shelter capacity, inability to protect vulnerable special populations, inadequate public education, failure to address evacuation time issues, and confused lines of responsibility.

I. Two-Tiered Shelter System

A) The Plan Relies on a Cumbrous Two-Tiered Shelter System That Forces Residents to First Go To a Reception Center Before Proceeding to a Shelter

The Plan forbids residents from going directly to a shelter. Instead residents are required to go first to a reception center. OEM claims that people who go directly to shelters rather than reception centers will not be turned away if the hurricane is close to striking, however if residents arrive earlier they may be re-directed somewhere else. It is unclear how (or if) the Plan instructs reception officials to make such a determination.¹⁸ To implement the two-tiered system, the Plan divides the City into "solar systems," each containing a reception center and several shelters. Residents must first go to a designated reception center to receive vital information including where to shelter. Residents must then proceed to their designated shelter. Currently, there are 23 reception centers and 881 public shelters.¹⁹

B) Substantial Numbers of Residents Would Not Follow the Plan's Two-Tiered Shelter Process

Substantial numbers of residents would not follow the Plan's multi-tiered shelter process. An Army Corps of Engineer's study concluded that approximately 40% of residents intending to go to a public shelter would not do so after learning about the reception center process.²⁰ The Army Corps of Engineers survey found that people would not go to shelters when they discover the "less desirable aspects of public shelters."²¹ These less desirable aspects include the two-tiered reception center process itself and the refusal to allow pets into shelters.²²

C) The Two-Tiered System Creates Transportation Problems

The two-tiered system creates transportation problems. The two-tiered system doubles the amount of transportation resources necessary which would dramatically increase traffic

congestion. Evacuees who arrive at reception centers by either public or private transportation will then be transported to individual shelters via school bus.²³ According to the Plan, the Department of Education will provide 6,000 school buses, which will be driven by the usual school bus operators.²⁴ It is unclear whether the Education Department has actually contacted the school buses drivers about their responsibilities.²⁵ It is similarly unclear whether the Plan will work when school is not in session and employees are unavailable. In the event that these school bus drivers are unavailable, City employees with the capacity to drive would act as replacements. Officials testified that they were unable to provide statistics on the number of City employees that would be available to transport evacuees from the reception centers to the shelters.²⁶

Furthermore, not all reception centers are available by public transportation. According to the Plan, there are three reception centers that are not accessible by public transportation, nine reception centers that are not accessible by subway and four reception centers that are not accessible by bus.²⁷ Persons who are not easily mobile and rely on public transportation may have serious difficulty traveling from their homes to a safe shelter.

D) The Two-Tiered System Creates Parking Problems

The two-tiered shelter system will create parking problems. Because the Plan transports evacuees to shelters on school buses, parking will only be available at reception centers. But even at reception centers, there will be limited parking. Currently, only 11 of the 23 reception centers have parking, and out of 6 reception centers in Manhattan there is not one with parking capabilities.²⁸

II. The Plan Does Not Identify Sufficient Shelter Space and Reception Areas

Under many likely hurricane scenarios, the Plan's reception and shelter capacities are inadequate. Although the Plan's shelter estimate was recently revised, there continues to be a major discrepancy between the City's current shelter capacity and the results of a survey conducted by the Army Corps of Engineers.²⁹ In the Army Corps of Engineer's survey, 45%, or 3.4 million people, intending to evacuate stated that they would seek public shelter during a Category 3 hurricane.³⁰ This is far more than the 800,000 person shelter capacity that evacuation officials currently estimate is available.³¹ These numbers do not include those seeking shelter from outside the evacuation zones. This "self-evacuation" phenomenon is reviewed below.

The Army Corps of Engineers recognized, however, that while millions of residents would try to shelter, the two-tiered shelter system would significantly reduce the numbers of people who would actually shelter. Bizarrely, instead of calling into question the realistic use of a two tiered system, the Army Corps of Engineers simply eliminated those people from their findings.³²

The Army Corps of Engineers states that there would be significant "jamming of the evacuation reception centers."³³ Additionally, Commissioner Bruno testified on October 31

that OEM had significantly increased the number of public shelters, and thus must increase the number of reception centers.³⁴ However, the City has not yet expanded the number of reception centers, which increases the potential for confusion and crowding at reception centers.

The lack of adequate shelter capacity on Staten Island highlights the Plan's deficiencies. During testimony on September 29, Commissioner Bruno estimated that 46 shelters exist on Staten Island.³⁵ The average shelter capacity is 1,000 people per shelter, so the City has the capacity to shelter roughly 46,000 residents. However, the U.S. Army Corps of Engineers survey found that 86,518 Staten Island residents would seek public shelter during a Category 3 hurricane,³⁶ leaving half of the residents on Staten Island without shelter. OEM's response to this conundrum has been one of wishful thinking. Commissioner Bruno stated at the hearing that "we hope that not that many people will come to shelters" even though the City has told them to evacuate.³⁷ Unfortunately, Staten Island residents may have no choice but to rely on the 46 shelters currently provided. This scenario could very well play out across New York City. Inadequate shelter space could lead to overcrowding and insufficient food and medical supplies at the City's shelters.

Although the City's current shelter capacity is inadequate, the Plan has significantly increased shelter usage estimates since the problem was identified by the Committee in its *Preliminary Report*. In 2004, the Plan estimated that 1 million people would attempt to evacuate during a major hurricane and 224,000 would seek public shelter.³⁸ In 2005, OEM revised the Plan's estimates considerably to 3.4 million evacuees and 727,745 people will be seeking public shelter during a Category 3 hurricane.³⁹ OEM must continue to revise the Plan's estimates to make them more realistic and closer to the Army Corps' survey. It is crucial that the City has accurate evacuation and shelter usage estimates since these assumptions will dramatically alter the amount of lead time needed for an evacuation, required resources, shelter space, and traffic congestion.

III. The Plan Is Completely Unable to Evacuate Special Populations Such as Nursing Home Residents and Hospital Patients

The Plan has no effective way of moving special populations in nursing homes, hospitals, and other institutions and these individuals remain in a particularly vulnerable situation. Special populations persons with specific medical needs and individuals, in institutions or homebound, who will need assistance during an evacuation; they include: patients in hospitals or psychiatric centers, seniors in nursing homes, children in group homes, people in homeless shelters, prisons, and the disabled. The lack of coordinated evacuation plans for hospitals and nursing homes, inadequate medical transportation, and the lack of a centralized database for monitoring homebound residents are additional shortcomings.

A) Hospitals and Nursing Homes' Evacuation Plans Were Inherently Flawed and Had Never Been Reviewed

The City's 19 hospitals and 58 nursing homes that are located in hurricane evacuation zones⁴⁰ are completely unprepared to evacuate the thousands of special needs individuals who will require assistance during a hurricane emergency. While there has been a legal requirement since 1985 that these facilities have evacuation plans in place,⁴¹ at the time of the issuance of the *Preliminary Report* these plans were not reviewed, not complete, seriously deficient, and did not consider a multi-facility evacuation.⁴² Instead, the plans, to the extent they even existed, were meant for evacuating single institutions during events such as a fire or a localized power outage.

To the credit of DOH and OEM, after the Committee's *Preliminary Report* made these failures public, an attempt is being made to upgrade the plans. DOH sent a letter to all nursing homes requiring that they submit individualized evacuation plans to DOH and OEM by December 31, 2005.⁴³ On November 22, DOH sent a letter to all hospitals requiring that they submit evacuation plans by January 31, 2006.⁴⁴ DOH provided guidelines to nursing homes and hospitals when developing evacuation plans, including identifying the facilities where patients would be transferred and transportation resources.⁴⁵ According to these letters, the submitted plans are reviewed by DOH to identify concerns and the facilities will be notified of necessary adjustments to their plans. As of early March 2006, DOH reported that 636 of the 638 nursing homes in the state had complied and submitted evacuation plans.

B) Even the Improved New Plans Cannot Function If a Regional Evacuation Is Required

The Committee has reviewed the new plans recently filed with the DOH. These plans are an improvement but cannot work simultaneously in the case of a regional evacuation. Many facilities' plans would simply evacuate their patients to other facilities in the City, some requiring as much as 50 miles of travel.⁴⁶ In many cases, there are multiple hospitals and nursing homes relying on the same transportation assets.⁴⁷ It is unclear if institutions will have the lead time or an adequate number of available resources to move their patients to safety in the event of a weather related emergency. In other cases, institutions did not have any plan whatsoever for transporting their patients out of an evacuation zone. In many cases, institutions either fail to specify where patients would be moved to in the event of an evacuation or have plans to move patients to buildings that are also located in hurricane evacuation zones. There is no realistic probability of a successful evacuation of special populations.

C) Other Special Populations, Such As Group Homes, and Public Shelters Have No Evacuation Plans on Record

Other special populations, such as group homes, and public shelters do not have weather-related evacuation plans on record. OEM is currently working with different agencies and departments, including the NYS Office of Mental Retardation and Developmental

Disabilities (“NYS OMRDD”), the NYC Department of Homeless Services (“DHS”), and the End Stage Renal Disease (“ESRD”) Network, to develop evacuation plans. The NYC Department of Correctional Services claims that other special populations, including jails and prisons, have evacuation plans, however, they may not be able to release the specifics to the Committee due to security reasons. The Committee is engaged in ongoing discussions with the different agencies for outstanding information and is waiting for plans of institutions located in flood zones from the NYS Office of Mental Health in order to review them. It is clear, however, that the agencies and departments that oversee institutions taking care of special populations need to develop plans that would be effective in addressing the needs of the different individuals and in safely evacuating them.

D) There is Inadequate Transportation for Special Populations

The transportation resources needed to evacuate special populations do not exist. The Chief of Emergency Planning for the MTA testified that the MTA has 800 paratransit vehicles currently in operation, and each ambulance is capable of carrying between 1 to 2 people.⁴⁸ Thus, if operating at full capacity over a non-stop 24-hour period of time, the MTA has the capability of moving 19,200-38,400 people. In a city of roughly 8 million people, the MTA does not have the capacity to move the 893,867 “residents with a mobility disability” that OEM estimates live in New York City.⁴⁹ In addition to these 800 vehicles, the MTA may be able to use additional vehicles provided by hospitals and nursing homes.⁵⁰ Under the current Plan, OEM would be notified by these institutions as to the availability of ambulances during a weather related emergency. These vehicles are by no means guaranteed to be available during a crisis.

Many of the institutions rely on their own ambulances and vehicles, as well as private companies, to evacuate their patients and residents and transport medical records. In most cases, institutions either failed to list their assets or listed the same private ambulance companies as their primary evacuation resource. Of the 24 nursing homes’ plans reviewed by the Committee, 10 listed specific private transportation companies and many repeatedly listed the same companies. A total of 26 separate companies were listed. One medical transportation company, which has only fifty vehicles with a total capacity of one hundred people, was listed as a primary source of ambulance service on six different evacuation plans. In addition, six companies were listed in two different plans and two other companies were listed in four different plans. These duplicated transportation companies were not the only private companies listed by these institutions. However, it is clear from a review of the plans that institutions in the same area will be competing for a limited number of ambulances when the need to evacuate arises. The City admits, “it’s a problem [their] absolutely aware and are working on.”⁵¹ Neighboring institutions need to collaborate with each other, as well as with DOH and OEM to avoid competing for the same limited transportation resources.

E) The Plan Does Not Identify Homebound Residents in Need of Special Transportation, Nor Provide for Their Evacuation

New York City does not know who will need evacuation assistance from their home, where these individuals live, or how to provide assistance to them. Neither OEM nor DOH has a centralized database identifying and monitoring homebound residents, such as the elderly, frail and or ill who will need evacuation assistance.⁵² Instead, the Plan relies on private agencies to tell OEM who will need such services and to provide them. These agencies include: Meals on Wheels, NYS DOH, NYC Department for the Aging (“DFTA”), and NYC Human Resources Administration (“HRA”). When the Committee raised the issue, OEM testified that a centralized database was difficult to maintain due to the constant turnover among the City’s homebound special needs population.⁵³

In a public statement about plans for his second term, Mayor Bloomberg pledged to create a City wide special needs registry. Commissioner Bruno testified on October 31 that OEM would immediately begin work on such a registry if Mayor Bloomberg makes it an initiative.⁵⁴ The Committee requested that OEM provide an update on this proposed initiative. After repeated attempts to acquire this information, as of early March 2006, the Committee has yet to receive any evidence that the special needs registry is being developed.⁵⁵

IV. The Public Has Not Been Educated About a Hurricane Evacuation

More than 85% of respondents had never seen the Ready New York Household Preparedness Guide, which is OEM’s public outreach and education guide to prepare the public for the prospect of a weather-related disaster.

--Army Corps of Engineers

The Plan has failed to adequately educate citizens to effectively respond to a hurricane evacuation.

Currently, the City’s public education campaign is inadequate, the City’s public documents are not available in enough languages, and it is unclear whether the City will be able to communicate instructions to residents during an evacuation.

A) The Plan Does Not Have the Funding to Mount a Successful Public Education Campaign

Despite a rudimentary public education campaign, most residents are uninformed about the dangers of a hurricane striking New York City and how to proceed during an evacuation and City officials have testified that public education campaigns are not adequately funded. The City’s current public education campaign centers on a series of *Ready New York* guides⁵⁶, a limited advertising campaign and a recent forum with the local media.⁵⁷ To receive specific information residents must actively seek information about whether they are in an evacuation zone by using the Emergency Online Locator System (“EMOLS”) available on OEM’s website, or by calling 311 which is the City’s information hotline.

A 2005 study by the U.S. Army Corps of Engineers showed just how uninformed the residents of New York are when it comes to hurricanes.⁵⁸ The study revealed the following:

- **More than 85% of respondents had never seen the *Ready New York Household Preparedness Guide*, which is OEM's public outreach and education guide to prepare the public for the prospect of a weather-related disaster.⁵⁹**
- **More than 75% of the 2.3 million New Yorkers living in an evacuation zone susceptible to storm-surge flooding are unaware that they live in a zone.⁶⁰**
- **Only 33% of residents living in areas that will experience storm surge inundation during a Category 1 hurricane believe their buildings will flood during a Category 1 storm.⁶¹**
- **Almost 50% of New Yorkers living in areas that will *not* be affected by storm surge still expect their buildings to flood during a Category 3 hurricane,⁶² which is significant when planning for self evacuation.**

Although there have been attempts by City and community leaders to begin a public education campaign, the majority of City residents know little or nothing about the risk of hurricanes and steps to take during an evacuation.

Commissioner Bruno testified that additional funding is needed for the City's public awareness campaign, and Chairman Brodsky has requested that the Commissioner provide a recommendation to the Committee on the amount of money needed.⁶³ OEM is currently working with Columbia University to develop a more comprehensive public education strategy,⁶⁴ and has provided elected officials with educational materials for their constituents.⁶⁵ These steps are encouraging, but the City must engage in a much more thorough public education campaign to ensure that residents are informed.

B) The Plan Does Not Account For the Language Diversity Within the City

The City's public documents on emergency preparedness are not available in many languages commonly spoken by New York City residents. There are more than 1.75 million non-English speakers in New York City, which includes 431,407 who live in a hurricane evacuation zone.⁶⁶ However, the *Ready New York Household Preparedness Guide* is only available in nine languages: English, Arabic, Chinese (Traditional and Simplified), Haitian Creole, Korean, Polish, Russian, and Spanish. The *Ready New York: Hurricanes and New York City* pamphlet is only available in five languages: English, Chinese, Haitian Creole, Russian, and Spanish.

C) The City Has Not Educated Residents about Evacuation Routes

The Plan has mapped routes within the City to evacuate residents. The Plan calls on the City to clearly mark and educate citizens about the designated evacuation routes. OEM has stated that people need to educate themselves and know where the evacuation routes are

prior to a storm.⁶⁷ However, many residents do not know about their existence or their locations.⁶⁸

V. The Plan Does Not Address the Length of Time it Will Actually Take to Evacuate Residents, and the Corresponding Lead Time Needed for An Effective Evacuation

It would take at least 48 hours to effectively evacuate.⁶⁹ During this time the location of the storm's landfall and the severity of the hurricane will likely change significantly. The Plan is vague and confused about how long it will actually take to evacuate residents because it is unclear when residents should begin to, it does not include traffic congestion models and it makes unrealistic assumptions.

A) The Plan Includes Unclear Estimates of When to Begin the Evacuation

The Plan does not clearly confront the difficulty of knowing when to begin an evacuation. "Lead time" is the amount of time necessary to evacuate in advance of a hurricane. It is critical to know the lead time necessary for evacuation because hurricane forecasts made more than a day before landfall are often unreliable and lead to significant margins of error.⁷⁰ Beginning an evacuation too late could result in stranding millions of New Yorkers in harms way. However, declaring an evacuation too early could lead to the unnecessary evacuation of millions of people, which would threaten public safety and significantly burden the transportation system. For both reasons, it is imperative that the City know precisely how long it will take to evacuate the City under a multitude of different scenarios. The absence of a computer model predicting the time needed to evacuate is a crucial failure of the Plan.

Currently, the City's public documents conflict with sworn testimony given by OEM officials. On September 29, Commissioner Bruno testified that the City would need at least 48 hours to evacuate in advance of a hurricane.⁷¹ However, OEM's *Hazard Overview* informational pamphlet states that the City only needs 17.5 hours to complete an evacuation.⁷² The public documents must reflect the most accurate lead time estimates to ensure that residents do not wait until it is too late to evacuate.

Complicating the starting point of an evacuation is severe weather including gale force winds and heavy rain prior to the actual hurricane touching land. Flooding and high winds can occur several hours before a storm runs ashore, the amount of time available for an evacuation could be reduced by as much as twenty-four hours which could stop public transportation well before the hurricane reaches land.⁷³

B) The Plan Does Not Include a Traffic Congestion Model to Determine the Actual Time it Would Take to Evacuate Residents

The Plan lacks any formal model that predicts traffic congestion and travel patterns during a large-scale evacuation.⁷⁴ After the failure was pointed out by the *Preliminary Report* the City asked the Army Corps of Engineers began to construct a computer model that would

have provided information on traffic congestion and evacuation times but the project has been halted due to a lack of funding. It is still unclear as to whether or not this study will recommence at a later date.⁷⁵

There must be a comprehensive model of all transportation assets, the number of people each asset can transport, how many people can be transported per hour, how assets are to be marshaled and delivered, and realistic assumptions about how residents would behave.

C) The Plan Ignores the Consequences of "Self Evacuation" and its Effect On Traffic Congestion

The Plan ignores the consequences of "self evacuation" during a weather-related emergency which will result in a serious strain on the transit system and cause major traffic congestion. In any emergency, many people will "self evacuate" a phenomenon in which people in areas not designated for evacuations evacuate voluntarily. The problem of self-evacuation is illustrated by the Army Corps of Engineers' survey, which found that 71% of residents who live in areas unaffected by storm surge still intend to leave if there is an evacuation anywhere in the City.⁷⁶ Despite this finding, the Plan ignores the serious traffic congestion and shelter usage problems that will result from self-evacuation.

The Committee's 2002 investigation into the evacuation plan for the Indian Point Nuclear Facility concluded that based on expert testimony, emergency officials must factor in "self evacuation" when planning for evacuations.⁷⁷

D) The Plan's Call to "Phase" the Evacuation Will Not Work

The Plan's call to "phase" the evacuation will not work. The Plan divides the City into three levels of evacuation zones and calls on residents in the zones most at risk from storm surge flooding to evacuate before residents in safer areas. The Plan asserts that "phasing" the evacuation is critical because:

Evacuees in private vehicles can cause congestion on roadways and have the potential to bring the evacuation to a standstill. In response to this concern, the evacuation will be "phased" to allow residents in the areas most at-risk to leave first.⁷⁸

In order to successfully phase an evacuation, emergency officials would notify certain areas to evacuate in advance. There is no basis for assuming that people not in the Phase I area will remain home while other areas are ordered to evacuate. In an era of instant communication including cell phones, the Internet, Wi-Fi, 24-hour news, it is unrealistic for the City to assume that it's possible to effectively "phase" an evacuation.⁷⁹

E) The Plan Fails to Analyze How Severe Weather, including Flooding Could Make Subways, Bridges, and Tunnels Inoperable and Lead to Traffic Congestion Problems

Severe weather including gale force winds, heavy rain and flooding would limit the transportation options for residents, but City officials have not undertaken any formal study to examine the impact on of severe weather on transportation. Flooding could make the City's subway system inoperable; during a Category 3 hurricane, 22 out of 26 NYC subway lines would be susceptible to flooding.⁸⁰ Some hurricanes have been preceded by over 20 inches of rain 24 hours before they make landfall,⁸¹ which could make it impossible to evacuate the City using the subway system. OEM testified it was unable to estimate the impact of severe weather on their ability to move people, and had never undertaken a study to investigate this problem.⁸² The Port Authority was also unable to answer this question and stated, "That's something we're going to have to work with DOT on."⁸³

F) The Plan Does Not Account for Traffic Routes Needed By Emergency Personnel Heading Towards Evacuation Zones

A key component of the Plan is to have emergency personnel reenter evacuation zones. During a mass evacuation, the City turns all vehicle pathways into out-bound routes while reserving one lane for inbound emergency vehicles and the Plan has not taken into account for possible traffic congestion personnel would face in their effort to reach areas in need of evacuation. In the past, non-security personnel have been denied re-entry, and the MTA has not informed its employees of their authority to travel in the opposite direction during an emergency.⁸⁴ Additionally, it is unclear whether medical personnel will be allowed to re-enter New York City during an evacuation.⁸⁵

VI. The Plan Does Not Clearly Establish Evacuation Responsibilities Among Agencies and Authorities and Employees

The Plan has not clearly established responsibilities for the numerous agencies and authorities that will be involved in an evacuation. The Plan significantly relies on public transportation and places great responsibility in the hands of the MTA, the Port Authority and other government agencies. A successful evacuation is impossible without plans that are clearly coordinated between agencies and neighboring municipalities that may have competing demands on public pathways and transportation assets. The MTA asserts that they do not need their own evacuation plan, but will instead marshal and deliver transportation assets as directed by OEM.⁸⁶

The notification and training of public employees required to successfully implement the Plan is inadequate. Despite requests by the Committee and Transport Worker Union Local 100 ("TWU"), it appears that neither the City nor the MTA has reached out to their employees about their responsibilities in a weather-related evacuation. Commissioner Bruno testified on September 29 that there is no need for additional training of transit workers for weather-related emergencies.⁸⁷ According to testimony from Ed Watt of TWU, the MTA has not provided their employees with adequate catastrophe prevention and

response training despite the fact that the federal government has recommended this training for transit workers since 1985.⁸⁸ Public employee participation has been a significant issue in other evacuation and emergency response plans,⁸⁹ and it is crucial that the City informs these workers about their responsibilities and provides them with adequate training.

VII. The City Is Making Efforts to Improve the Plan

The City, in the Fall of 2005, began good faith efforts to improve the Plan in certain areas. It's unclear what improvements have actually resulted and unclear if OEM has the resources to do what it knows must be done.

Section 4. Recommendations

1. There needs to be adequate financial resources available to successfully execute the evacuation plan.

The State and Federal governments have failed to provide the necessary resources to execute an evacuation plan. The Committee has introduced legislation that would give every county up to \$1 million and the City up to \$25 million for evacuation planning.

2. The Plan must reconsider the two-tiered shelter system.

The Plan's two-tier shelter system process is greatly flawed. The Committee found that the two-tiered shelter system will fail because a large percentage of residents would not follow the system and it will cause transportation and parking problems. The City must abandon the current system in favor of a sheltering process that is easily accessible to residents.

3. The Plan must increase reception area and shelter space.

The Committee found that the City has not adequately planned for enough shelter and reception space. While the Army Corps of Engineers found that during an evacuation there would be significant "jamming of the evacuation centers" and while the City has increased shelter usage estimates after the issuance of the Committee's *Preliminary Report* there has been no follow through to find and increase shelter space. The City must increase shelter availability for the millions of residents that would seek shelter during an evacuation.

4. The Plan must be amended to realistically plan for the successful evacuation of special populations.

The City must plan for the most vulnerable populations. The Committee found that plans recently submitted for nursing homes and hospitals are inherently flawed. In addition, other special populations such as group homes, and public shelters have no adequate evacuation plan on record. Finally, the City admits that there may not be enough transportation to evacuate special populations. The Committee introduced legislation that

would require that SEMO develop minimum standards for the evacuation plans of hospitals, nursing homes, schools, and other institutions that are consistent with the plans of municipal governments as well as require the City to provide adequate evacuation resources.

5. The Public must be educated about a hurricane evacuation.

The Committee has found that most residents are uninformed about the Plan. This occurs because: the City has not adequately taken into account linguistic and cultural characteristics of the City's residents, has not clearly marked evacuation routes, and lacks the funding to mount a successful public education campaign. The Committee introduced legislation which would require that local disaster preparedness plans include a public education component that takes into consideration the linguistic and cultural characteristics of residents. The Committee has also pushed for increased education funding.

6. The Plan must confront the problem of how long it will actually take to evacuate residents and the lead time needed for an effective evacuation.

The Plan does not clearly confront the difficulty of knowing when to begin an evacuation, does not adequately account for traffic congestion, it ignores the consequences of "self evacuation", unrealistically calls for a phased evacuation, fails to analyze how severe weather could effect the evacuation effort, and does not account for traffic routes needed by emergency personnel heading towards evacuation zones. All of these problems will dramatically affect the evacuation times needed. The City must confront these issues and develop realistic evacuation time estimates and models. The Committee has introduced legislation that would require the City to develop realistic traffic modeling, including using state of the art traffic models.

7. The Plan must clearly establish evacuation responsibilities among agencies and authorities and employees.

The Committee's investigation has revealed that the City has not established evacuation responsibilities among agencies, authorities and employees. Without clearly defined roles and responsibilities the Plan simply cannot work. The Committee introduced legislation that would require municipalities to adequately train public employees that perform critical functions during an evacuation as well as establish regional and agency responsibilities.

8. The Committee's comprehensive legislative package must be implemented.

The Committee introduced a comprehensive package to better prepare for a weather related evacuation. Included in the Committee's comprehensive package are:

- Cooperative planning between institutions (e.g. hospitals and nursing homes) and local authorities to ensure that special populations are safely evacuated,

- The legal requirement that cities use the best technology available to develop concise and accurate evacuation models,
 - Increased evacuation planning funding for localities,
 - A real public education component to release critical evacuation information to residents,
 - The development of a regional evacuation plan, and;
 - Adequate training of public employees and formalized roles and responsibilities by employees, agencies, and authorities.
-

Francesca Alesi, Scott Dolan, Adam Langley, Jim Malatras, and Jeff Nelson of Assemblyman Brodsky's staff made major contributions to the Report.

Appendix A. The Chronology of the Committee's Investigation

The Committee has conducted the first systematic, independent, and detailed investigation of New York City's evacuation plan for a weather-related emergency. This investigation began in early September 2005, little more than a week after Hurricane Katrina.

September 7, 2005: Chairman Brodsky notified OEM Commissioner Joseph F. Bruno and the Mayor's Office of the Committee's interest in reviewing the City's evacuation plans. Initial replies from the Office of the Mayor indicated that neither the Mayor's Office, OEM nor any other City employee would cooperate or provide any relevant documents to the Committee.¹ The Committee continued to review and analyze all public documents related to New York City's evacuation planning.

September 15, 2005: The Committee released its *Preliminary Report*,¹ which revealed significant flaws in the emergency preparedness of OEM, the MTA, PANY/NJ and other agencies. The following day, Commissioner Bruno agreed to meet with Chairman Brodsky to discuss the City's plans. After canceling and then rescheduling the meeting, the Mayor's Office informed Chairman Brodsky that OEM would not respond to the Committee's ongoing investigation or to the *Preliminary Report*.

September 26, 2005: Both Commissioner Bruno and Chairman Brodsky testified before the New York City Council's Public Safety Committee.¹ The hearing confirmed many of the findings in the Committee's *Preliminary Report*, and thus revealed significant flaws in the plans as well as raising additional questions about the City's ability to successfully evacuate.

September 29, 2005: A joint hearing was convened by the Committee on Corporations, Authorities, and Commissions Chaired by Assemblyman Richard Brodsky; the Committee on Cities, Chaired by Assemblyman Scott Stringer; and the Committee on Governmental Operations, Chaired by Assemblywoman RoAnn Destito.¹ Commissioner Bruno, as well as the Director of the Office of Emergency Management for PANY/NY, Chief of Emergency Planning for the MTA, the District Manager of the Far Rockaways Community Board, and other experts testified during the hearing.

October 14, 2005: Because of OEM's failure to produce needed documents, Chairman Brodsky issued a subpoena requiring the production of all of OEM's evacuation related documents by October 31, 2005.¹ While Commissioner Bruno had pledged to cooperate with the Committee at the September 29 hearing, essential non-security related documents were not provided.

October 31, 2005: Commissioner Bruno testified pursuant to the subpoena and produced documents relevant to the Committee's investigation.¹ Representatives from the Greater New York Health Care Facilities Association ("GNYHCFA") also testified at the hearing.

March 15, 2006: The Committee reviewed copies of hospitals and nursing homes' evacuation plans, requested by the NYS Department of Health (DOH).

March 16, 2006: The Committee requested from the NYS Office of Mental Health (OMH) copies of evacuation plans for the psychiatric centers located on evacuation zones.

March 20, 2006: The Committee requested the progress that OEM has made in developing a database for special populations that would need assistance during an evacuation.

Appendix B. Historic New York Hurricanes and Storms

Since the late 1800s, nearly 1000 tropical cyclones have occurred within the Atlantic tropical cyclone basin.¹ Since the end of the seventeenth century, more than forty documented hurricanes and tropical storms have directly affected New York State.¹ The following is a list of New York City hurricanes and tropical storms since the 19th century:

1. **1804 - Two Hurricanes**

Two tropical cyclones affected New York State in 1804. On September 8, the Carolina Hurricane struck eastern Long Island. On October 9, the Snow Hurricane produced a pressure reading of 28.87 inches in New York City and caused 8 inches of snow over western New York State.¹

2. **1815 - Great September Gale Hurricane**

One of the most powerful hurricanes (Category 3) to have struck Long Island brought considerable damage across the entire New York City area.¹

3. **1821 - Long Island Hurricane of September 1821**

This Category 3 storm was one of the few hurricanes to have passed directly over New York City, and shows what a direct hit could do to modern New York City. The tide rose 13 feet in one hour, and caused the East River to converge into the Hudson River across lower Manhattan as far north as Canal Street.¹

4. **1846 - The Great Havana Hurricane**

This Category 5 hurricane was reduced to Category 1 status before hitting New York, and caused 82 mph winds.¹

5. **1893 - Savannah-Charleston Hurricane**

This Category 1 storm is known for its complete destruction of Hog Island, which had formerly been a resort island off the Rockaways in southern Queens.¹

6. **1934 - Morro Castle Hurricane**

This Category 2 hurricane hit eastern Long Island, causing heavy winds and a barometric reading of 28.56 inches.¹

7. **1938 - Long Island Express**

The last Category 3 hurricane to land near New York City caused the death of nearly 200 people in Long Island and New England.¹

8. **1954 - Hurricane Carol**

Carol was the most destructive hurricane to hit the Northeast since the Long Island Express in 1938. The storm had sustained winds over 100 mph and gusts of 115-125 mph in Long Island, and resulted in major flooding throughout New York City despite sparing the City a direct hit.¹

9. **1955 - Tropical Storms Connie & Diane**

These tropical storms caused severe floods in New York City and Long Island. During Connie, 12 inches of rain were recorded at LaGuardia Airport.¹

10. **1960 - Hurricane Donna**

This hurricane produced 11 foot high storm surge in the New York harbor and caused extensive pier damage.

11. **1971 - Hurricane Doria**

This hurricane reached New York City as a Category 1 storm with 80 mph winds, and forced the closure of Kennedy Airport.¹

12. **1972 - Tropical Storm Agnes**

This tropical storm flooded areas from North Carolina to New York State, and caused 122 deaths and \$ 6 Billion in damage (Adjusted for inflation).¹

13. **1976 - Hurricane Belle**

On August 10, this Category 1 hurricane caused the death of one person in New York City.

14. **1985 - Hurricane Gloria**

This Category 3 storm weakened before it hit New York City as a tropical storm, but caused gusts of 125 mph in Long Island and killed two people in NYC. The U.S. Army Corps of Engineers said the Hurricane could have been catastrophic if it arrived at high tide and had been just a little closer to New York City.¹

15. **1992 - Nor'Easter**

This tropical cyclone forced the evacuation of coastal areas, as well as closing the FDR Highway and the L Train. Three people were killed.¹

16. **1995 - Hurricane Felix**

The hurricane lingered off the East Coast for nearly a week, but never hit land.¹

17. **1996 - Tropical Storm Bertha**

This tropical storm brought heavy rain to the NYC region in July 1996.¹

18. **1999 - Tropical Storm Floyd**

This storm brought sustained 60 mph winds and dumped 10-15 inches of rain over parts of New York State over a 24-hour period. NYC schools were closed and emergency shelters were opened.¹

19. **2003 - Hurricane Isabel**

This hurricane barely missed New York City, but caused coastal erosion in the Rockaways.¹

Appendix C. Assemblyman Brodsky's Legislative Package

A9055: Requires the metropolitan transportation authority, the New York City office of emergency management, and the port authority of New York and New Jersey to report to the governor and the legislature on weather-related evacuation capabilities; requires the metropolitan transportation authority to certify as to its facilities and equipment.

A9159: Requires certain institutional entities to cooperate with local authorities in the development of local disaster preparedness plans to address their needs; directs the state emergency management office to promulgate regulations more particularly specifying the entities so required and minimum standards for such parts of such plans; maintains localities' onus of providing services.

A9160: Requires any city having a population of 500,000 or more use the best technology available, including computer models, to develop evacuation time estimates, which shall be used to complete such plan; requires the state emergency management office to assist therewith; requires such time estimates to be made available to the public, unless the state emergency management office declares that there is a compelling security reason to withhold such information from the public.

A9161: Requires local disaster preparedness plans to be made widely available to the public unless the state emergency management office determines that there is a compelling security reason to withhold specific security-related information from public disclosure.

A9162: Requires that local disaster preparedness plans of a county, city, town, or village not conflict with those of others; disputes with a county are to be resolved by the county; disputes crossing county lines are to be resolved by the state emergency management office; New York city is to be treated as a county for such purposes.

A9163: Requires local disaster preparedness plans to include a public education component as part of disaster prevention, which shall be widely disseminated and shall take into consideration the linguistic and cultural characteristics of the inhabitants.

A9164: Requires training of public employees in the implementation of local disaster preparedness plans and the active and affirmative outreach of localities to offer certain other entities the opportunity to memorialize their roles in local disaster preparedness plans.

Funding: Would provide \$1 million for counties and \$25 million for New York City for evacuation planning.

Appendix D. Areas of NYC Most at Risk from Coastal Flooding

Bronx

- Edgewater Park
- Silver Beach
- Locust Point
- Classon Point
- Troggs Neck

Brooklyn

- Coney Island
- Brighton Beach
- Manhattan Beach
- Sheepshead Bay

Manhattan

a) Lower Manhattan

- Battery Park
- South Street Seaport Area

b) Lower West Side

- Battery Park to Midtown

c) East Side

- Entire FDR Drive

d) Lower East Side

- East of Avenue C
- East of 14th Street to Houston Street

Queens

- The Rockaway Peninsula
- Broad Channel
- Howard Beach
- West Hamilton Beach

Staten Island

- New Dorp Beach
- Oakwood Beach
- Foxwood Beach
- Great Kills
- Tottenville

Appendix D. New York City's Vulnerable Populations in Evacuation Zones

Demographic	All Zones	Zone A	Zone B	Zone C
Total Population	2,267,196	246,695	711,737	1,308,764
Below Poverty Line	290,843	40,276	93,865	156,702
Residents with Mobility Disability	471,798	56,043	140,698	275,057
Non-English Speakers	257,896	31,086	78,264	148,546
Households	870,734	101,571	260,020	509,143
<i>Number</i> of Households w/out Vehicle	389,034	44,185	130,068	214,781
<i>Percentage</i> NYC Households w/out Vehicle	44.7%	43.5%	50.0%	42.2%

Source: OEM Citywide Asset and Logistics Management System (CALMS), based on 2000 Census data.

Appendix E. Evacuation for Category 3 Storm - U.S. Army Corps of Engineers Survey

Borough		Zone A	Zone B	Zone C	Non-Surge	Total
Manhattan	Population	52,986	209,106	303,267	971,836	1,537,195
	Evacuation Rate	.87	.86	.80	.78	
	Total	46,098	179,831	242,614	758,032	1,226,575
Bronx	Population	5,039	9,535	183,595	1,134,481	1,332,650
	Evacuation Rate	.92	.80	.85	.84	
	Total	4,636	7,628	156,056	952,964	1,121,284
Brooklyn	Population	117,251	322,699	549,048	1,476,328	2,465,326
	Evacuation Rate	.83	.84	.80	.83	
	Total	97,318	271,067	439,238	1,225,352	2,032,976
Queens	Population	26,866	160,553	226,177	1,815,783	2,229,379
	Evacuation Rate	.88	.85	.86	.94	
	Total	23,642	136,470	194,512	1,706,836	2,061,460
Staten Island	Population	44,553	9,844	46,677	342,654	443,728
	Evacuation Rate	.84	.92	.85	.87	
	Total	37,425	9,056	39,675	298,109	384,265
Plan to Evacuate - Citywide						6,826,560

Note: "Non-Surge" refers to those areas of the City that are not in an evacuation zone but will still have residents seeking public shelter due to self evacuation.

Note: "Evacuation Rate" refers to the percentage of residents who intend to evacuate.

Source: Population data for each evacuation zone by borough provided by OEM Citywide Asset and Logistics Management System (CALMS), which is based on 2000 Census Data. Survey responses for residents intending to evacuate are from *NYC Hurricane Evacuation Behavioral Analysis* Table 38.

Public Shelter Use for Category 3 Storm - US Army Corps of Engineers Survey

	Zone A	Zone B	Zone C	Non-Surge	Total
Population	209,119	604,053	1,072,095	4,941,293	6,826,560
Shelter Rate	.35	.45	.57	.53	
Shelter Use	73,192	271,824	611,094	2,618,885	3,574,994

Note: "Shelter Rate" refers to the percentage of residents who intend to seek public shelter.

Source: Population data for each evacuation zone is based of Table E1. Survey responses for residents seeking public shelter are from *NYC Hurricane Evacuation Behavioral Analysis* Table 46.

ENDNOTES

- ¹ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 32. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).
- ² New York City Office of Emergency Management. *Coastal Storm Contingency Plan – Public Information Annex*. August 2000.
- ³ Assemblymen Richard Brodsky and Paul Tonko. *Interim Report on the Evacuation Plan for the Indian Point Nuclear Facility*. February 20, 2002.
- ⁴ Commissioner Joseph Bruno in a conversation with Chairman Richard Brodsky, September 7, 2005
- ⁵ New York City Office of Emergency Management. *Coastal Storm Contingency Plan – EOC Activation List*. September 2005.
- ⁶ Marcel Van Ooyen, Theodore Baecher, Nahreen Khandker, and Jennine Ventura. *Briefing Paper of the Government Affairs Division*. Prepared for the NYC Council’s Committee on Public Safety. September 26, 2005. Pg. 4-6.
- ⁷ “Threat of Major Hurricane Strike Grows for Northeast. March 20, 2006. Available Online: <http://www.accuweather.com/promo-ad.asp?dir=aw&page=nehurr> (Last Visited March 22, 2006).
- ⁸ New York City Office of Emergency Management. *Hazard Overview*. 2004. Pg 4. Available online: http://www.nyc.gov/html/oem/html/readynewyork/hazard_info.html (Last Visited February 17, 2006).
- ⁹ Mandia, Scott A. *The Long Island Express, The Great Hurricane of 1938* (No Date). Available Online: <http://www2.sunysuffolk.edu/mandias/38hurricane/index.html> (Last Visited February 17, 2006).
- ¹⁰ New York State Emergency Management Office, Federal Emergency Management Agency, U.S. Army Corps of Engineers. *New York State Hurricane Evacuation Study*. 1993. Pg. 7.
- ¹¹ Naparstek, Aaron. “The Big One.” *New York Press*. July 20, 2005. Available Online: <http://www.nypress.com/18/29/news&columns/aaronnaparstek.cfm> (Last Visited February 17, 2006).
- ¹² *It Could Happen Tomorrow*. Weather Channel Documentary.
- ¹³ New York State Emergency Management Office, Federal Emergency Management Agency, U.S. Army Corps of Engineers. *New York State Hurricane Evacuation Study*. 1993. Pg. 3.
- ¹⁴ Naparstek, Aaron. “The Big One.” *New York Press*. July 20, 2005. Available Online: <http://www.nypress.com/18/29/news&columns/aaronnaparstek.cfm> (Last Visited February 17, 2006).
- ¹⁵ *Ibid.*
- ¹⁶ *Ibid.*
- ¹⁷ *Ibid.*
- ¹⁸ OEM stated “(c)ommon sense will dictate this.” (Letter from Stella J. Guarna, OEM, to Assemblyman Brodsky, dated March 22, 2006)
- ¹⁹ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 32.
- ²⁰ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 32. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).
- ²¹ *Ibid.*
- ²² *Ibid*, Pg. 35.
- ²³ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 106.

Added to this problem is the fact that the City has not analyzed how many residents would use public transportation. The Plan relies heavily on the use of public transportation, arguing that it is the most efficient strategy for moving residents from flood zones to higher ground. OEM’s website instructs residents to use public transportation:

“In a coastal storm, plan to use mass transit as much as possible, as it offers the fastest way to reach your destination. Using mass transit reduces the volume of evacuees on the roadways, reducing the risk of dangerous and time-consuming traffic delays.”

Out of a total of 3.4 million people that the Plan assumes would evacuate, 1.8 million are assumed to use public transportation. The MTA asserts that they have the capacity to move over a half a million people per hour via subway and 300,000 via bus, which OEM believes is sufficient to evacuate all those needing transport. However, officials testified that there has been no formal study to analyze the number of people who would evacuate via bus versus the number of people who would use the subway system.

²⁴ *Ibid*, Pg. 21.

²⁵ *Ibid*, Pg. 108.

²⁶ *Ibid*, Pg. 106.

²⁷ New York City Office of Emergency Management. *NYC Hurricane Evacuation Zones Map*. Available Online: <http://www.nyc.gov/html/oem/html/resources.html> (Last Visited March 13, 2006).

²⁸ New York City Office of Emergency Management. *NYC Hurricane Evacuation Zones Map*. Available Online: <http://www.nyc.gov/html/oem/html/resources.html> (Last Visited March 13, 2006).

²⁹ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 32. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).

³⁰ *Ibid*, Pg. 36.

³¹ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 22.

³² U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 32. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).

³³ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 32. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).

³⁴ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. October 31, 2005. Pg. 110.

³⁵ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 99.

³⁶ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. Pg. 35. Overview of findings available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February, 25, 2006).

³⁷ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 100.

³⁸ New York City Office of Emergency Management. *Hazard Overview*. 2004. Pg 4. Available Online: http://www.nyc.gov/html/oem/html/readynynewyork/hazard_info.html (Last Visited February 17, 2006).

³⁹ New York City Office of Emergency Management. *Coastal Storm Contingency Plan – Evacuation Plan*. September 2005. Pg. 2.

⁴⁰ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 23.

⁴¹ *Ibid*, Pg.10.

⁴² As part of their accreditation process these facilities had to develop a plan. However, these plans were never looked at by the DOH.

⁴³ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. October 31, 2005. Pg. 65.

⁴⁴ Letter from State Department of Health to Chief Executive Officers of hospitals. November 22, 2005.

⁴⁵ Letter from DOH to the nursing homes, October 21, 2005; and letter from DOH to the hospitals, November 22, 2005.

⁴⁶ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. October 31, 2005. Pg. 20.

⁴⁷ *Ibid*, Pg. 31.

⁴⁸ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 151.

⁴⁹ *Ibid*, Slide # 3 entitled, “New York City’s Vulnerable Populations.”

⁵⁰ *Ibid*, Pg. 152.

⁵¹ “Nursing Homes’ ‘Cane Woe.’” *The New York Post*. March 22, 2006.

⁵² Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 40.

⁵³ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. October 31, 2005. Pg. 80.

⁵⁴ *Ibid*, Pg. 80.

⁵⁵ Phone conversation between Stella Guarna of New York City’s Office of Emergency Management and Scott M. Dolan of Assemblyman Brodsky’s Office. February 17, 2006.

⁵⁶ These guides include: *Ready New York: A Household Preparedness Guide* that provides information on many different types of disasters, as well as a shorter *Hurricanes and New York City* pamphlet.

⁵⁷ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 13.

⁵⁸ U.S. Army Corps of Engineers. *New York City Hurricane Evacuation Behavioral Analysis*. April 2005. An overview of the findings is available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February 25, 2006).

⁵⁹ *Ibid*, Pg. 4.

⁶⁰ *Ibid*, Pg. 5.

⁶¹ *Ibid*, Pg. 11.

⁶² *Ibid*, Pg. 14.

⁶³ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. October 31, 2005. Pg. 125-26.

⁶⁴ Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. September 29, 2005. Pg. 89.

⁶⁵ *Ibid*, Pg. 87.

⁶⁶ OEM Citywide Asset and Logistics Management System (CALMS). Based on 2000 Census data.

⁶⁷ *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 93.

⁶⁸ *Ibid*, Pg. 92.

⁶⁹ OEM claims they can complete the evacuation of 2.5 million residents “within 48-hours of the arrival of tropical storms force winds.” (Questions & Answers, General Evacuation, submitted to the Committee by OEM during the Public Hearing on September 29, 2005) During the September 29, 2005 Hearing, Bruno testified that it will take OEM at least 48 hours to evacuate. (September 29, 2005 Hearing Transcript, page 101)

⁷⁰ The National Hurricane Center, Hurricane Research Division, FAQ #6. Available Online: <http://www.aoml.noaa.gov/hrd/tcfaq/F6.html> (Last Visited March 7, 2006)

⁷¹ *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency* (Hearing #2). Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 104.

⁷² New York City Office of Emergency Management. *Hazard Overview*. 2004. Pg 4. Available online: http://www.nyc.gov/html/oem/html/readynewyork/hazard_info.html [Last Visited, February 17, 2006].

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- ⁷³ The National Hurricane Center, Hurricane Research Division, FAQ #6. Available Online: <http://www.aoml.noaa.gov/hrd/tcfaq/F6.html> (Last Visited February 24, 2006).
- ⁷⁴ *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 139.
- ⁷⁵ <http://www.sam.usace.army.mil/hesdata/HES/Usace/QueryReport.asp?PWI=83785&ID=29>
- ⁷⁶ *New York City Hurricane Evacuation Behavioral Analysis*. Prepared for U.S. Army Corps of Engineers. April 2005. Pg. 19. An overview of the findings is available online: http://chps.sam.usace.army.mil/USHESdata/NY/NY_city_behave_report.htm (Last Visited February 25, 2006).
- ⁷⁷ Assemblymen Richard Brodsky and Paul Tonko. *Interim Report on the Evacuation Plan for the Indian Point Nuclear Facility*. February 20, 2002. Available: NYS Assembly.
- ⁷⁸ *Coastal Storm Contingency Plan – Evacuation Strategy*. NYC OEM. September 2005. Pg. 3.
- ⁷⁹ This is complicated by the fact that the official notification network has often failed. The National Oceanic and Atmospheric Administration’s (“NOAA”) hazard radio station, which is used to transmit emergency weather information, is known to be unreliable. The system often experiences power outages that incapacitate the system. The most recent documented power outage was on October 15, 2005.
- ⁸⁰ Map available at <http://www.nyc.gov/html/oem/> (Last visited on September 14, 2005).
- ⁸¹ New York State Emergency Management Office, Federal Emergency Management Agency, U.S. Army Corps of Engineers. 1993. *New York State Evacuation Study*. Pg. 54.
- ⁸² *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 139.
- ⁸³ *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 139.
- ⁸⁴ *Ibid*, Pg 166.
- ⁸⁵ Public hearing on “The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency.” New York State Assembly Standing Committees: Corporations, Authorities, and Commissions; Cities; and Governmental Operations. October 31, 2005. Pg. 43.
- ⁸⁶ Public hearing on “The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency.” New York State Assembly Standing Committees: Corporations, Authorities, and Commissions; Cities; and Governmental Operations. October 31, 2005. Pg. 120.
- ⁸⁷ *The New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency*. Assembly Standing Committees on Corporations, Authorities and Commissions; Cities; and Governmental Operations. September 29, 2005. Pg. 79.
- ⁸⁸ *Ibid*, Pg 157.
- ⁸⁹ Assemblymen Richard Brodsky and Paul Tonko. *Interim Report on the Evacuation Plan for the Indian Point Nuclear Facility*. February 20, 2002. Available: NYS Assembly.