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Cost of Rehabilitation versus the Cost of Replacement Across NYCHA's Portfolio

Prepared for the New York City Housing Authority

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INTRODUCTION

New York City Housing Authority's ("NYCHA" or "the Authority"), the largest public housing authority in North America, has a mission "…to increase opportunities for low- and moderate-income New York City residents by providing safe, affordable housing and facilitating access to social and community services." In supporting this mission, NYCHA owns and operates approximately 179,000 units of housing in 334 developments consisting of 2,600 residential buildings that contain over 400 community facilities – including senior, community, health care, and day care centers. Over 400,000 residents live in NYCHA-owned housing; another 225,000 residents obtain Section 8 rental subsidies through NYCHA to live in over 92,000 privately-owned housing units throughout New York City.

The Authority's housing portfolio consists of a diverse building stock that ranges significantly in age and size. The portfolio includes pre-War developments from the turn of the 20th century to modern developments constructed in the 1990s. Several developments have as few as 10 units and the largest NYCHA development, which is also one of the largest housing developments in the City, has approximately 3,150 units. About 40% of the developments are comprised of one or two buildings, and 15% of the developments have between 15 and 45 buildings. Many of the larger developments are organized in campuses and include significant amounts of open space, resident parking, community facilities, and shared infrastructure.

From 2009 to 2011, NYCHA spent approximately $400 million annually to address the capital needs of its housing portfolio. However, the 2011 Physical Needs Assessment ("PNA") commissioned by NYCHA per U.S. Department of Housing and Urban Development ("HUD") requirements to determine physical deficiencies in the units, infrastructure and grounds, found an immediate need for $1.5 billion to address deficiencies in urgent need of repair in that year, and a $7.2 billion unmet capital need over three years.[1] The Authority is committed to the continued preservation and maintenance of its housing portfolio, but faces ongoing funding challenges to support capital investment and an increasing unmet capital need.

NYCHA retained HR&A Advisors, Inc. ("HR&A"), an independent real estate, policy and economic development consulting firm, to perform a high-level assessment comparing the cost of rehabilitating the Authority's housing portfolio to the cost of replacing that housing on existing NYCHA land. This analysis was based on research regarding NYCHA's and other New York City affordable housing providers' experience, and did not include physical inspection, architectural design or detailed cost estimates by HR&A. HR&A partnered with BJH Advisors, LLC, a New York City based real estate consulting firm, to conduct the research and analysis.

OVERVIEW: REHABILITATION AND REPLACEMENT

In this report, ***rehabilitation is defined as a capital investment to repair existing building deficiencies and replace equipment approaching or beyond the end of useful life – e.g. bring the unit to a state of good repair – and in some but not all cases, this rehabilitation could be characterized as a gut renovation.*** To understand the cost of rehabilitation, HR&A reviewed and assessed NYCHA's 2011 Physical Needs Assessment Report, which provided comprehensive cost estimates for repairing deficiencies and replacing systems/equipment nearing end of useful life at each of NYCHA's[2] developments, and data regarding historical renovation

[1] NYCHA 2012 – 2016 Capital Plan

[2] Physical Needs Assessments of NYCHA's developments are required by the U.S. Department of Housing and Urban Development. The cost estimate includes all capital investments corresponding with addressing a building's 400 components over 15 years.

costs for comprehensive rehabilitation of NYCHA properties within the past five years. To benchmark estimates, HR&A also interviewed private affordable housing developers in New York regarding their rehabilitation and new construction costs and evaluated similar affordable and middle-income rehabilitation projects undertaken by private developers with financial support from the New York City Housing Development Corporation ("HDC") and the New York City Department of Housing Preservation and Development ("HPD"). Based on discussions with NYCHA Capital Projects staff, HR&A determined that the PNA cost estimates for years 0 to 5 were the best proxy for state-of-good-repair rehabilitation for NYCHA's developments.

Replacement is defined as the demolition of existing housing stock and replacement through new construction of the same number of units of permanent affordable housing, and includes the temporary relocation and rehousing of NYCHA's residents during the construction period. To estimate the cost of constructing the replacement units, HR&A researched and analyzed data provided by NYCHA, HDC, and HPD regarding recently constructed new affordable housing, as well as data obtained through original research sourced from private developers of affordable housing who were constructing affordable housing on private land. All of the cost structures for affordable housing construction assume a mixture of public and private funding, including financing mechanisms such as Low-Income Housing Tax-Credits and tax-exempt bond financing. In an effort to verify the accuracy of all of these cost sources, HR&A also analyzed construction estimates from third party data provider RS Means as a benchmark for private, market-rate new construction estimates. To estimate the cost of demolition, HR&A used information provided by local real estate professionals and contractors. For the cost of relocation, HR&A used historical NYCHA costs for relocating tenants in Section 8 Housing, costs eligible under NYCHA's Standard Procedure Manual[3], and derived an estimate for the temporary rehousing of tenants during construction periods by reviewing current NYC private rental rates.

COST OF REHABILITATION VS. COST OF REPLACEMENT

NYCHA's portfolio and capital needs are diverse; the findings of this report provide an average and order-of-magnitude range for the potential cost of rehabilitation or replacement, which is influenced by a multitude of contributing factors. The per unit and portfolio-wide averages for the cost of rehabilitation and cost of replacement are presented next to a range of per unit and portfolio-wide costs for both categories – these ranges represent a ±30% spread around the provided averages for rehabilitation and replacement. HR&A also compared these estimates to similar development and rehabilitation projects in the private affordable housing market, the findings of which are presented in the main body of the report.

Estimated Cost Range* of Rehabilitation versus Estimated Cost of Replacement, $2013

	Cost of Rehabilitation		Cost of Replacement	
	Average	Range*	Average	Range*
Per Unit	$99,000	$70,000 - $130,000	$370,000	$265,000 - $475,000
Portfolio-Wide	$17 billion	$12 - $23 billion**	$66 billion	$47 - $85 billion**

**For rehabilitation, the range captures 70% of the portfolio using 0 to 5 year PNA data. For replacement, the ±30% range represents the average weighted cost per unit derived from total range of project costs for seven recent projects.*

***Portfolio-wide cost estimates reflect the average cost per unit applied to NYCHA's 179,000 unit portfolio and do not account for phasing, inflation, contingency, or additional costs associated with implementation on a portfolio-wide scale.*

[3] NYCHA Standard Procedure Manual. "Section VI. Relocation Options" Index No. 002:06:1 Page 4

- ***The cost for NYCHA to replace its housing stock in-kind considerably exceeds the cost of rehabilitation by a factor of at least 105% portfolio-wide.*** The cost estimate for replacement exceeds the entire range of cost estimates for rehabilitation at a minimum of 105%, but could range up to over seven times costlier.
- ***The average estimated cost of rehabilitation is substantially defined by project scope; in this study, the average cost per unit across the portfolio is defined by the comprehensive scope identified as part of the Physical Needs Assessment, which is higher than average historical capital repair costs.*** Like most private affordable housing developers, NYCHA is budget-constrained and repairs are often limited to essential items. Current funding commitments for extensive renovation projects at NYCHA developments range from about $70,000 to $95,000 per unit.[4] The costs associated with the PNA-derived estimates range higher: 50% of the portfolio has project cost of rehabilitation over $100,000 per unit. This is likely due to the fact that the associated scope outlined in the PNA addresses all building deficiencies within 0 to 5 years and economies of scale for contracting multiple repairs at once are not factored into the way the costs are estimated. The PNA-estimated average cost of rehabilitation is $99,000 per unit across NYCHA's portfolio.
- ***The average estimated cost of replacement per unit falls within a wide range as a result of the various data sources and various approaches to construction of affordable housing across the City of New York– these draw from interviews with affordable housing developers, analysis of actual completed costs figures from public finance agencies, and review of budgets for affordable housing public-private partnerships that have yet to break ground.*** More specifically, the replacement cost data for publicly subsidized affordable housing developments was drawn from two main sources: interviews with developers who constructed new affordable multifamily housing on recently acquired land from NYCHA or another public entity, and completed and budgeted HPD, HDC, or NYCHA projects, provided by NYCHA. Projects included: The Eltona, Highbridge Terrace, Dumont Green, Arbor House, Harlem RBI Houses, Elliott-Chelsea, and Via Verde. HR&A compared the costs of affordable housing development to private market-rate housing development as a reference. The cost differential between publicly subsidized affordable and market-rate housing is likely due to, among other factors, fully private structures having more flexibility with respect to scale and wage (prevailing wage) requirements, which helps to reduce overall project costs. ***In summary, publicly subsidized affordable housing development costs are on average $370,000 per unit and private market-rate housing development costs average around $271,000 per unit, including the cost of relocation, temporary housing, and demolition and excluding land costs.***

ADDITIONAL CONSIDERATIONS

The report findings provide a foundation of cost information for both rehabilitation and replacement of NYCHA's affordable housing units, and an understanding of the order of magnitude capital investment that would be required under each scenario for a like-for-like rehab or replacement. The purpose of the report is to focus on total order of magnitude costs, and as such the report does not consider public-private financing mechanisms or development partnership structures that might result in reduced public subsidies to meet such costs. Furthermore, in the wake of Superstorm Sandy, while efforts to improve building resilience across NYCHA's portfolio are well underway, this analysis does not take into account the incremental costs associated with building resiliency in flood-prone areas.

[4] NYCHA's "Five Year Capital Plan 2012 – 2016" and interviews with Capital Projects Administration

1. INTRODUCTION

1.1 PURPOSE OF THE STUDY

As the New York City Housing Authority ("NYCHA" or "the Authority") has recently reaffirmed its commitment to the preservation of public housing through *Plan NYCHA – a Roadmap for Preservation*, published in December 2011 – it is seeking additional information and third party verification regarding the average per unit costs of preserving, through rehabilitation, its existing housing units versus replacement of existing units through new construction. NYCHA has reaffirmed this commitment to the direct provision of affordable housing in the face of severe federal capital and operating funding cutbacks and funding reduction due to altered long-term grant formulae. This financial reality poses significant challenges to NYCHA's ability to maintain and repair its housing stock, and NYCHA is analyzing the most efficient and appropriate way to expend limited resources for the delivery of its services.

NYCHA retained HR&A Advisors, Inc. ("HR&A") to provide high-level estimates for the cost of rehabilitating the Authority's housing portfolio and the cost of replacing its portfolio with the same number of residential units on existing NYCHA land. HR&A is a New York City-based real estate, economic development and public policy consulting firm founded in 1976. HR&A advises both public and private sector clients on complex real estate analysis throughout the country and internationally. HR&A worked with BJH Advisors, LLC, a New York City based real estate consulting firm, to undertake the analysis.

The result of this study is a comparative analysis of the hypothetical, order-of-magnitude costs associated with comprehensive repair versus that of demolishing existing buildings, constructing new affordable housing units, and temporarily relocating residents during the replacement period. The information provided in this report represents research and analysis into the potential costs required for provision of equivalent affordable housing services – whether through preservation or the demolition of existing buildings and new construction of residential units. This report also examines how the estimated costs derived from NYCHA's extensive data and experience compare to associated development costs seen in the NYC private affordable housing market.

1.2 ORGANIZATION OF THE REPORT

This study is divided into four sections following this introduction:

- **Section 2. Portfolio Background:** Provides background on the study context, including the magnitude and physical properties of NYCHA's housing portfolio.
- **Section 3. Rehabilitation Cost Analysis:** Provides detailed estimates and methodology for derivation of rehabilitation costs across NYCHA's portfolio.
- **Section 4. Replacement Cost Analysis:** Provides detailed methodology for derivation of replacement cost estimates across NYCHA's portfolio.
- **Section 5. Comparative Analysis of Rehabilitation vs. Replacement Costs:** Provides a comparative analysis for the cost of rehabilitation versus the cost of replacement across NYCHA's portfolio, as well as information on additional considerations and cost sensitivities.

2. NYCHA HOUSING PORTFOLIO

2.1 PORTFOLIO OVERVIEW

NYCHA is North America's largest public housing authority, and is like a city unto itself in terms of the amount of infrastructure, developments, buildings, and programming for which it is responsible. In 2012, NYCHA directly housed over 400,000 individuals in over 179,000 housing units, representing 2,600 residential buildings within 334 distinct development projects owned and operated by the Authority throughout NYC.

Key Portfolio Statistics *(2013)*

- **334** developments
- **2,600** residential buildings with over **179,000 residential units**
- **108 million** square feet in all 5 NYC boroughs
- **0.7% vacancy** for residential units
- **3.3% turnover rate** for 2012 calendar year
- **80%** of developments are over 30 years old
- **$6.1 billion** invested in modernization and preservation of buildings since 1994

The Authority's housing portfolio consists of a diverse building stock that ranges significantly in age and size. The portfolio includes pre-War developments from the turn of the 20th century to modern developments constructed in the 1990s. Several developments have as few as 10 units and the largest NYCHA development, which is also one of the largest housing developments in the City, has approximately 3,150 units. About 40% of the developments are comprised of one or two buildings, and 15% of the developments have between 15 and 45 buildings. Many of the larger developments are organized in campuses and include significant amounts of open space, resident parking, community facilities, and shared infrastructure.

From 2009 to 2011, NYCHA spent approximately $400 million annually on capital expenditures to address its development repair needs. However, the 2011 Physical Needs Assessment commissioned by NYCHA found an immediate need for $1.5 billion of repairs to address deficiencies in urgent need in 2011 (a 0 to 1 year cost estimate for deficiency repair), $17 billion over the next 5 years (in 2011-dollars), and a $24 billion need over the next 15 years (in 2011-dollars). Physical Needs Assessments (PNAs) are required by the U.S. Department of Housing and Urban Development to profile the physical condition of buildings, infrastructure, and sites in order to identify deficiencies and prioritize capital needs. The Authority must overcome capital funding changes to maintain its commitment to the ongoing preservation and maintenance of its complex and varied housing portfolio.

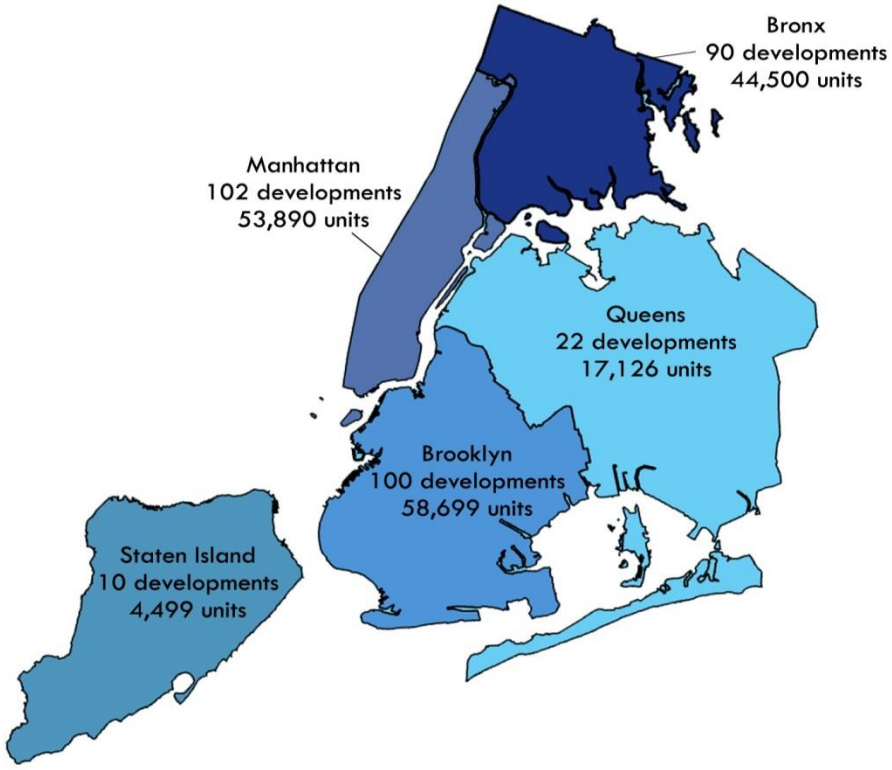
2.2 PHYSICAL CHARACTERISTICS OF NYCHA'S PORTFOLIO

Location and Concentration

NYCHA has 334 conventional public housing developments that were constructed or acquired and then rehabilitated by the Authority. Across New York City's five boroughs, the Authority's conventional development residential units are concentrated as follows, and as seen in *Figure 1*:

- 33% located in Brooklyn
- 30% located in Manhattan
- 25% located in the Bronx
- 10% located in Queens
- 2% located in Staten Island

Figure 1. NYCHA Conventional Public Housing Developments and Residential Units by Borough, 2013

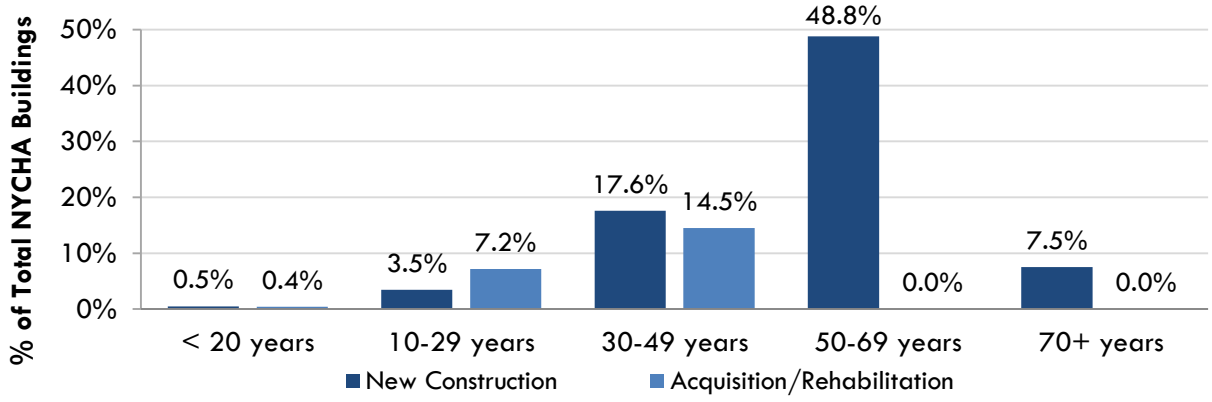


Source: NYCHA 2013; HR&A

Development Age

NYCHA's portfolio includes conventional and turnkey new construction projects, as well as properties acquired then rehabilitated by the Authority. Nearly 75% of NYCHA's new construction developments are 30 or more years old, built before 1981, and over 55% are 50 years or older, built before 1961. 15% of developments were acquired/rehabilitated by NYCHA over 30 years ago. Though some developments have been modernized, many older developments suffer from decaying infrastructure and facades, broken elevators, poor insulation, and inefficient (or poorly functioning) base building systems.[5]

Figure 2. NYCHA Buildings by Age, 2013



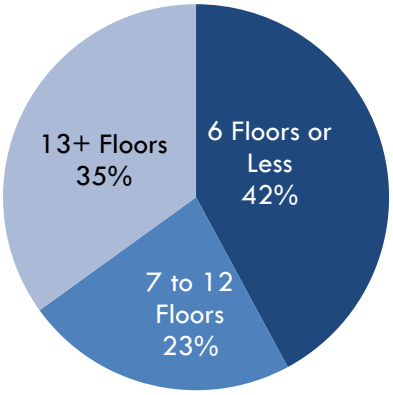
Source: NYCHA's Bluemoon Database, 2013

[5] *Plan NYCHA 2011*

Development Building Height

From examining the individual building heights at each of NYCHA's developments, HR&A derived an average height for each development, sorted by one to six (1 – 6) stories; seven to twelve (7 – 12) stories; and 13 stories or more. NYCHA employees and local real estate professionals confirmed that these building height categories corresponded to building construction methodology (for example need for and use of an elevator in taller structures – the Authority's portfolio contains 3,300 elevators in approximately two-thirds of its 2,600 buildings). The Authority's portfolio contains a fairly even distribution of average building height by development as seen through the chart in *Figure 3*, though building height may vary widely in certain developments.

Figure 3. NYCHA Developments by Height, 2012

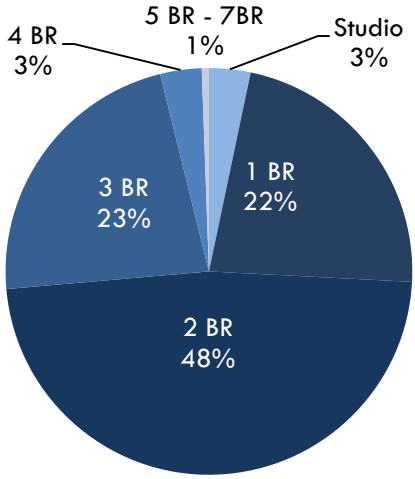


N=334 developments
Source: NYCHA Blue Moon Property Directory 2012; HR&A Analysis

Portfolio Unit Type

Only 5% of NYCHA's 179,000+ residential units have more than three bedrooms; 70% of NYCHA's residential units have one or two bedrooms only. *Figure 4* indicates the breakdown of NYCHA's housing portfolio by number of bedrooms:

Figure 4. NYCHA Portfolio by Unit Type, 2012



N=179,000+ units
Source: NYCHA Blue Moon Property Directory 2012; HR&A Analysis

3. REHABILITATION COST ANALYSIS

This section of the report explains the methodology, assumptions, and sources underlying the rehabilitation cost estimate. Information is presented as follows: an estimate of NYCHA's rehabilitation costs per unit and portfolio-wide based on the PNA data and benchmarked against two recent NYCHA gut rehabs (Section 3.2); an analysis/breakdown of the PNA cost data by building characteristic such as height and age (Section 3.3); an alternative rehabilitation cost estimate that incorporates incremental cost of code compliance and undertaking green measures (Section 3.4); and private affordable housing rehabilitation cost estimates to serve as an external benchmark against the NYCHA estimates derived from the PNA report (Section 3.5).

3.1 METHODOLOGY FOR ESTIMATING COST OF REHABILITATION

The cost of rehabilitation for NYCHA's housing portfolio includes capital repair of multifamily residential buildings, site improvements, and other infrastructure upgrades. HR&A reviewed several key data sources to estimate the average cost per unit for rehabilitation, identify additional implications for cost of rehabilitation, estimate alternative costs of rehabilitation, and benchmark the cost of rehabilitation against the private affordable market:

1) To establish an average cost of rehabilitation per unit across NYCHA's diverse housing portfolio, HR&A used the 2011 Physical Needs Assessment ("PNA") Report, commissioned as part of NYCHA's U.S. Department of Housing and Urban Development ("HUD") reporting requirements. The PNA was used to establish the estimated cost of rehabilitation that addresses all critical capital needs within a building, or the level of investment required to bring the building to a state of good repair. HR&A compared this PNA-estimated cost of rehabilitation to actual costs of renovation at two NYCHA developments. HR&A referred to historical cost of comprehensive rehabilitation for recent projects at the Whitman-Ingersoll and Johnson Houses to compare to the PNA-estimated cost of rehabilitation.
2) HR&A then analyzed the PNA-estimated costs to understand and estimate how the PNA-estimated cost of rehabilitation varies with respect to developments' physical condition and characteristics. HR&A worked with NYCHA staff to identify true development age or year built, and identify categories for further understanding the cost of rehabilitation across NYCHA's diverse housing portfolio.
3) HR&A calculated the cost implication for compliance with New York City's Local Law 11 using recent bid estimates for code-compliant façade and exterior capital work at the Pomonok Houses supplied by NYCHA, as well as an economic green measures analysis performed by Parsons Brinckerhoff within the 2011 PNA Report, to estimate an incremental factor for cost of rehabilitation per unit.
4) To benchmark the PNA-estimated cost of rehabilitation, HR&A conducted interviews with private developers of affordable multifamily housing to compare against their reported historical average costs of rehabilitation per unit. HR&A also obtained information from HDC on the hard cost per unit for Mitchell-Lama rehabilitation projects completed from 2010 to 2012. Mitchell-Lama buildings have similar age, configuration, and size as many NYCHA developments; historical costs were benchmarked against the cost of comprehensive rehabilitation projected in the PNA report.

These data sources and methodologies for analyzing the cost of rehabilitation are described in greater detail in the following sub-sections.

3.2 REHABILITATION COST FOR NYCHA

Using the PNA Report Data

To derive an average cost of rehabilitation per unit, HR&A used the 2011 PNA Report issued by Parsons Brinckerhoff. In 2005, Parsons Brinckerhoff (PB) conducted Facilities Condition Assessments of all 334 of NYCHA's developments to examine the physical condition of 400+ building components. PB determined remaining useful life of systems/equipment and identified any deficiencies associated with those components. In the summary PNA Report, each building component was assigned a recommended action with an associated cost and urgency of need within 15 years of evaluation. In 2011, Parsons Brinckerhoff updated this study (capital need and associated costs) through a combination of physical inspection and extrapolation, which incorporated any previous actions undertaken to address capital needs between 2005 and 2011. The 2011 PNA Report looked at five main categories of improvements:

- *apartment* (e.g., fixtures, appliances, and closets);
- *architectural* (e.g., exterior façade and lobby);
- *electrical* (e.g., common area lighting and security systems);
- *mechanical* (e.g., boilers and risers); and
- *site* (e.g., landscaping, sidewalks and playgrounds).

The 2011 PNA Report describes the comprehensive capital needs and projects the associated costs by deficiency over a 15-year time horizon for each NYCHA development. All costs determined in the PNA, either to remediate deficiencies or replace/upgrade systems that had exceeded anticipated lifecycle, were calculated by Parsons Brinckerhoff using current unit costs associated with observed capital needs. The PNA estimates costs organized by three time horizons: the immediate 0 to 1 year needs, 2 to 5 year needs, and 6 to 15 year needs. The 6 to 15 year estimates may include repeated costs for deficiencies with a useful life that is less than 5 years.

For this reason, as advised by NYCHA's Capital Projects team, HR&A aggregated deficiencies by building and development in its analysis for the total cost estimate represented by 0 to 5 years as the total estimated cost of comprehensive rehabilitation across NYCHA's portfolio. The 0 to 5 year cost is representative of the required investment to bring a building to a state of good repair.[6] For more on the methodology used to calculate cost of rehabilitation, please refer to the *2011 Physical Needs Assessment Report,* which is not included in this report.

PNA-Estimated Cost of Rehabilitation for NYCHA's Portfolio

The 2011 PNA Report found that total estimated cost of rehabilitation across NYCHA's portfolio was $17 billion within 0 to 5 years, averaging $99,000 per unit as seen below in *Figure 5*. Analyzed costs are presented per unit; cost per unit is a standard measurement of multifamily building rehabilitation and includes expenses for items within individual apartments, common areas, infrastructure, and the development site.

[6] As indicated by NYCHA's Capital Projects team, the 0 to 15 Year PNA Cost included in a HUD PNA assessment was not used here as this number may include duplicative costs for smaller items with useful lives shorter than the 15-year period (e.g., light bulbs). The 0 to 15 Year PNA may also include costs beyond the immediate need for repair and improvement of building condition and represent less urgent/necessary investment in the 400 defined components.

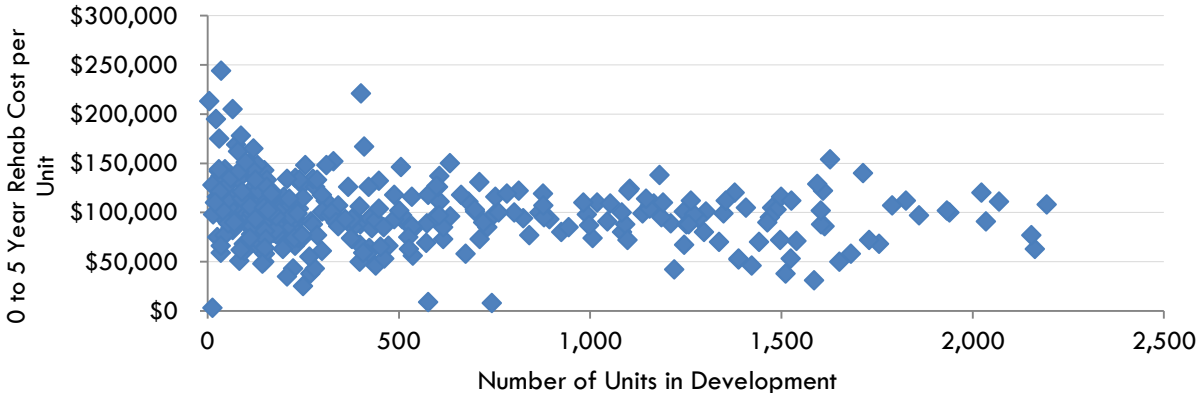
Figure 5. PNA-Estimated Cost of Rehabilitation per Unit, 2011

2011 PNA	Average Cost per Unit	Lowest Cost per Unit	Highest Cost per Unit	Median Cost per Unit
0 to 5 Year Estimate	$99,000	$3,000	$244,000	$99,000

Sources: NYCHA PNA Database; HR&A Analysis

Approximately 70% of NYCHA's portfolio has a PNA-estimated rehabilitation cost of between $70,000 and $130,000 per unit. Assuming the 0 to 5 year PNA cost estimates, another 15% of the portfolio had an estimated rehabilitation cost of less than $70,000 per unit, and about 15% of the portfolio had an estimated rehabilitation cost over $130,000 per unit, as seen in *Figure 6*.

Figure 6. PNA-Estimated Rehabilitation Cost per Unit (0-5 Years) by Development Size, 2011



Source: 2011 PNA Database, NYCHA

Comparison to Historical NYCHA Cost of Rehabilitation

HR&A also reviewed recently completed or in-progress rehabilitation projects at Whitman-Ingersoll Houses and Johnson Houses to compare against the PNA estimates and found these projects had much lower estimated rehabilitation costs per unit of $70,000 and $95,000 respectively. PNAs are projected cost estimates that do not reflect final bid estimates; therefore, HR&A benchmarked PNA estimates against recent historical costs of comprehensive rehabilitation per unit for comparable NYCHA projects.[7] The scope of work for the comparison projects includes enlarging apartments, improving elevators and base building systems, replacing roofs, repairing stairs, and broader modernization. The Whitman-Ingersoll project required temporary relocation and housing for residents to implement the full scope of rehabilitation in apartment units; therefore to obtain a full rehabilitation estimate using the Whitman-Ingersoll budget, the analysis adds a temporary relocation and housing cost per unit (around $10,000, assuming a one year rehabilitation period). The methodology for estimating relocation and temporary housing costs are reviewed in greater detail in the Section 4 ("Replacement Cost Analysis") of this report.

[7] The historical cost per unit for these projects represents a committed budget amount. Portions of these projects may be in progress, and the final average per unit cost across the development rehabilitation could change. The average cost per unit for each development stated here is current as of the date of this report.

3.3 ADDITIONAL CONSIDERATIONS FOR REHABILITATION COSTS

Using NYCHA's PNA-estimated costs of rehabilitation by development, HR&A considered additional factors that might further influence rehabilitation costs within NYCHA's portfolio. HR&A divided NYCHA's portfolio by physical characteristics, such as size, height, and year built (or building age), for a more detailed examination of trends relative to rehabilitation cost. It should be noted that capital work implemented after 2011 has not been taken into consideration for each comparative size, height, or age group.

Trends in PNA-Estimated Rehabilitation Cost by Development Age

HR&A divided NYCHA's portfolio into three age groupings, seen in *Figure 7*. Buildings were organized by these age groups due to similarities in construction type, building systems, and infrastructure across developments constructed (or rehabilitated) in the same period. It should be noted that the development age cited in this section of the report represents year built by NYCHA in a conventional building scenario, or year acquired by NYCHA. Therefore, the year associated with the PNA estimates might not represent actual year built, but likely represents acquisition and improvement (or rehabilitation) by the Authority.

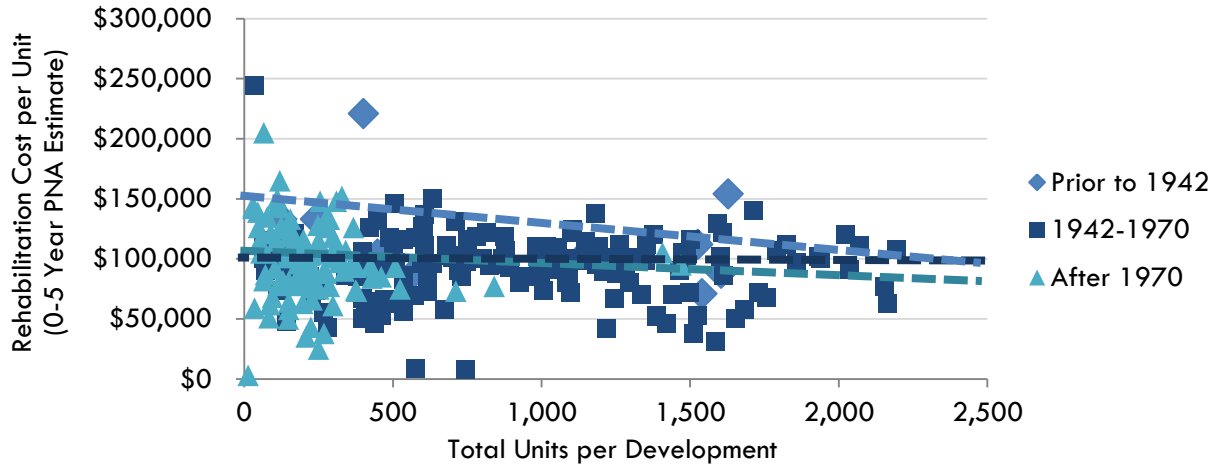
Figure 7. NYCHA Developments by Year Constructed or Rehabilitated, 2013

	# of Developments	Total # of Units	Units per Development	% of Total Units
New Construction				
before 1942	12	12,980	1,082	7%
1942-1969	154	135,998	883	76%
1970 or later	102	23,150	227	13%
Acquired/Rehabilitated				
before 1942	–			
1942-1969	3	599	200	0%
1970 or later	63	6,757	107	4%
Total	**334**	**179,484**	**537**	

Source: NYCHA's Blue Moon Database, 2013

In analyzing NYCHA's developments (either as conventional or turnkey developments) by age, modern buildings built after 1970 and developments built prior to 1942 show distinct economies of scale in renovation cost. That is to say, the larger the development built after 1970, the lower the projected PNA cost to rehabilitate the development per unit, as indicated by the trend line in *Figure 8*. In contrast, the average PNA-projected per unit cost of rehabilitation for post-War buildings constructed between 1942 and 1969 remain relatively constant, at about $92,000 per unit. On average, developments constructed prior to 1942 were projected as the most expensive to rehabilitate, about $120,000 per unit.

Figure 8. PNA Estimated 0-5 Year Rehabilitation Cost by Building Age Group, 2011*



**Includes new construction developments only and excludes developments acquired and rehabilitated by NYCHA.*

Source: NYCHA 2011 PNA Report; NYCHA Blue Moon Database; HR&A Analysis

Trends in PNA-Estimated Rehabilitation Cost by Development Height

Buildings with common floor area ranges and heights also share similar capital needs, given the commonalities of construction materials as well as methodologies and systems associated with grouping by this characteristic. HR&A divided NYCHA's developments by average building height in the following three categories: one to six (1 – 6) stories; seven to twelve (7 – 12) stories; and 13 stories or more. For example, most buildings under six stories in New York City are walk-ups, originally constructed without elevators. This implies a different approach to construction versus a modern, 15-floor building with an elevator, and thereby a different scope of rehabilitation.

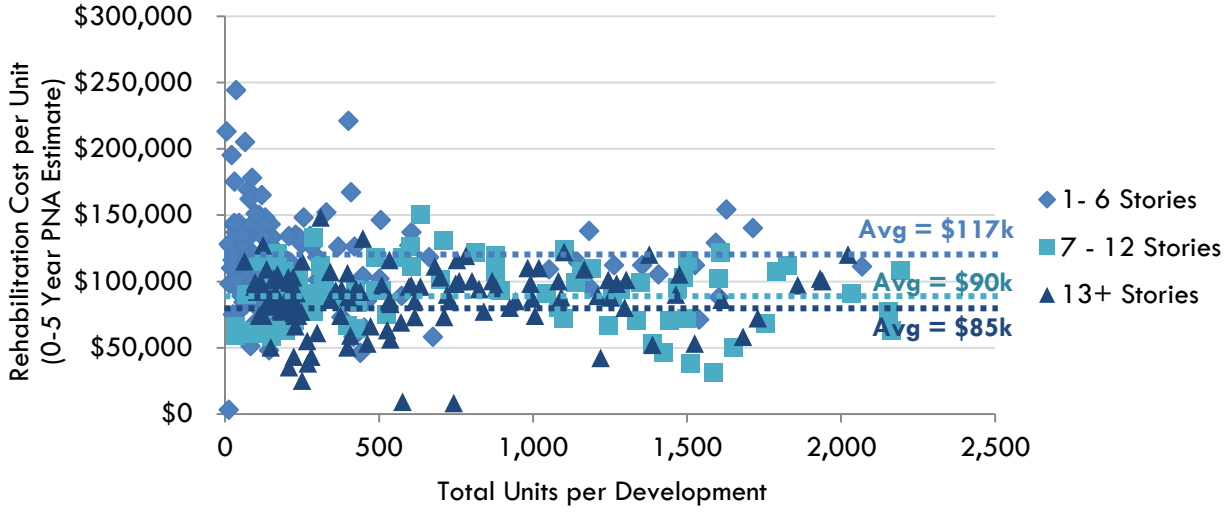
Figure 9. Developments by Building Height, 2012

Development Height (floors)	**# of Developments**	**Average # of Units per Development**
1 – 6	145	300
7 – 12	79	795
13 or more	110	620
Total	334	

Source: NYCHA's Blue Moon Database; HR&A Analysis

The average PNA-estimated cost of rehabilitation was lowest per unit for buildings over 12 stories. When analyzing rehabilitation cost by development height and size, the per unit cost is highest among 1 to 6 story developments, averaging $117,000 per unit. Within this group, developments with less than 50 units reported an average rehabilitation cost per unit of about $130,000 and developments with 50 units or more had an average per unit rehabilitation cost of approximately $115,000. Buildings over 6 stories remained within a tighter range for their comparative grouping, and rehabilitation costs were less dependent on development size by total units. The cost of rehabilitation for developments with a height of 7 to 12 stories was on average $90,000 per unit; developments taller than 12 stories had an average 0 to 5 year PNA rehabilitation cost of $85,000 per unit.

Figure 10. PNA Estimated 0-5 Year Rehabilitation Cost by Development Height, 2011



Source: HR&A Analysis; 2011 PNA Database, NYCHA

3.4 ALTERNATIVE REHABILITATION COST

As mentioned in Section 3.1, HR&A created an "alternative" rehabilitation unit cost estimate by adding in the additional cost of i) Local Law 11 ("LL11") compliance and ii) green measures. In the case of LL11, while the PNA captures a significant amount of the required improvements, it fails to capture all compliance-required repair work. In the case of green measures, this "alternative" rehabilitation cost estimate provides a measure of the additional expense of a more robust set of improvements and infrastructure considerations over and above the PNA rehabilitation cost estimate.[8] The following sections represent an order-of-magnitude estimate for incremental costs associated with alternative rehabilitation; HR&A recognizes that there are a number of other factors that can impact project cost and these two alternative rehabilitation factors are not inclusive of all cost-impacting factors.

Incremental Rehabilitation Cost: Local Law 11 Compliance

NYCHA made a distinct commitment, seen in the Authority's 2012 – 2016 Capital Plan, to address and remediate buildings violating LL11 requirements for exterior conditions in structures that are six or more stories. The code is intended to prevent and mitigate any danger associated with deteriorating facades. To establish an incremental cost associated with LL11 compliance by development, HR&A compared the estimated PNA costs for exterior work eligible under the Local Law[9] to the scope of work sent to bid with finalized cost estimates for a sample development, Pomonok Houses in Queens. The development's building envelope and brickwork is confirmed by NYCHA's Capital Projects staff as representative of the portfolio relative to capital needs and costs per unit associated with LL11 compliance.

HR&A obtained an estimate for LL11 compliant façade work for 15 of Pomonok Houses' 35 buildings. HR&A compared the cost estimate for similar exterior work at those 15 buildings from the 2011 PNA of

[8] Green measures include common, low-tech improvements to building energy performance such as weatherization, installing sensors and controls, improving ventilation and insulation, installing low flow fixtures, and lighting upgrades.
[9] PNA exterior estimates include façade, lintel and sill, and coping/parapet improvements

Pomonok Houses to derive an incremental cost of compliance. HR&A then applied that estimate to all 35 Pomonok House buildings and replaced the original PNA estimate with an alternative PNA estimate that includes LL11 compliant exterior improvements to derive a theoretical percent increment for total project cost associated with LL11 capital improvements. ***While the LL11 bid estimate was about 30% higher than the PNA exterior costed actions, as part of the total rehabilitation the increment represented a 2% increased total rehabilitation project cost.***

Figure 11. Incremental Project Cost Associated with Local Law 11 Compliance

	Original PNA Estimate	PNA Exterior Estimate	LL11 Bid Cost Estimate	New LL11 PNA Estimate	Incremental Project Cost
Pomonok Houses	$230,328,000	$16,800,000	$22,165,000	$235,693,000	2%

Sources: 2011 PNA Costed Action for Pomonok Houses; NYCHA A/E Data Sheet of Cost Estimate/Bid Comparison for Exterior Brickwork Restoration at Pomonok Houses; HR&A Analysis

Incremental Rehabilitation Cost: Green Measures

Using the "Green Alternatives Economic Analysis" prepared by Parsons Brinckerhoff as part of the *2011 PNA Report*, HR&A compared the initial estimate of cost of rehabilitation with the incremental costs associated with green measures and improved energy efficiency. The "Green Alternatives Economic Analysis" presents the additional costs associated with implementing a series of common green measures in ten facilities as part of six developments. "Common" green measures are those measures that do not involve particularly advanced or new technologies, such as combined heat and power or renewables, and are considered conventional system, equipment, and building upgrades. These measures include weatherization, sensors, boiler controls, improved fan ventilation, low flow fixtures, and lighting upgrades. ***HR&A compared the original estimated costs of rehabilitation from the PNA report to the incremental cost of efficiency measures provided through the Green Alternatives Economic Analysis to derive an average percentage increment of 3%***, as seen in *Figure 9*, to be applied across the portfolio.

Figure 12. Incremental Project Cost of Implementing Green Measures

Development	Conventional Systems (per PNA)	Green Alternative Measures (GAMs)	Original PNA Estimate *Total Project Cost*	PNA with GAMs Estimate *Total Project Cost*	Increment
Bronxchester	$436,000	$1,576,000	$27,700,000	$28,840,000	4%
East 120th Street	$219,000	$440,000	$6,800,000	$7,021,000	3%
Campos Plaza I	$913,000	$1,349,000	$32,700,000	$33,136,000	1%
East 4th Street	$194,000	$268,000	$4,900,000	$4,974,000	2%
Milbank-Frawley	$173,000	$674,000	$15,500,000	$16,001,000	3%
Saratoga Square	$667,000	$1,578,000	$25,900,000	$26,811,000	4%
Total/Average	**$2,602,000**	**$5,885,000**	**$113,500,000**	**$116,783,000**	**3%**

Source: Parsons Brinckerhoff 2011 PNA Executive Summary; HR&A Analysis

Total Alternative Rehabilitation Cost Associated with LL11 Code Compliance and Green Measures

HR&A added the incremental cost per unit associated with Local Law 11 code compliance and green measures across a portion of NYCHA's portfolio to define the "alternative" cost of rehabilitation. Of NYCHA's residential buildings, 1,100 currently meet the standard set by Local Law 11 for physical exterior and façade condition and 1,500 do not currently comply. To estimate the incremental cost per unit of Local Law 11 compliance and green measures, HR&A derived a total incremental cost for buildings that currently comply (assuming green increment only) and for those that do not comply (assuming LL11 increment and green increment). *Figure 13* uses the percentage increment derived from each of the additional considerations for LL11 exterior façade improvement requirements and improved energy efficiency and "green" measures to estimate the potential average cost per unit for rehabilitation across NYCHA's portfolio. ***This increment represents a 5% increase, from $99,000 per unit to $104,000 per unit for NYCHA's 1,500 buildings pending LL11 compliance, and a 3% increase to $102,000 per unit for implementing exclusively green improvements.***

Figure 13. Estimated Alternative Rehabilitation Cost per Unit for NYCHA Portfolio

		Average Incremental Project Cost of:			
	Average PNA Rehabilitation Cost per Unit	*LL11 Compliance*	*Green Measures & Improved Efficiency*	*Total Increment*	**Average Alternative Rehabilitation Cost per Unit**
1,100 Buildings in Compliance	$99,000	-	*3%*	*3%*	**$102,000**
1,500 Buildings not in Compliance	$99,000	*2%*	*3%*	*5%*	**$104,000**

Source: HR&A Analysis

Assuming 179,000 units in NYCHA's portfolio, the total portfolio-wide cost of alternative rehabilitation is $18.6 billion. This assumes a baseline of the 0 to 5-year PNA capital needs estimate, upon which the incremental costs of exterior repair in compliance with Local Law 11 to NYCHA's 1,500 non-compliant building and green measures have been applied to all 2,600 buildings. For green or sustainable measures, it is critical to note that **this estimate is highly conservative,** in that it assumes the same incremental costs across NYCHA's portfolio and does not take into consideration any prior implementation of green capital improvements. Therefore, the average incremental cost of enhanced rehabilitation could be less than $102,000 to $104,000 per unit.

In the wake of Superstorm Sandy, it is critical to note that the alternative cost of rehabilitation does not include estimates for resiliency measures that repair and protect NYCHA's developments in storm-impacted and flood-prone areas, as defined by the impending NYC 2050 Flood Zones and FEMA's preliminary work maps. The undertaking of resiliency improvements at affected developments is an effort on which NYCHA is currently focused, and considerations for these measures would result in additional costs across the portfolio.

3.5 COMPARISON TO THE PRIVATE AFFORDABLE MARKET

HR&A conducted interviews with five private for-profit and nonprofit developers and owners of affordable housing with experience implementing extensive rehabilitation of NYC multifamily rental properties. For the purpose of this report, HR&A has found that the costs for rehabilitation derived from the private developers are not comparable to NYCHA's PNA estimates for the following reasons:

- Physical attributes of the private buildings (relative to original construction materials, building systems, size and organization of buildings) differ greatly from NYCHA's housing stock; and
- The typical scope of rehabilitation for private affordable multifamily buildings is likely not comparable to the comprehensive scope estimated by the PNAs (i.e. 400 building components and relative deficiencies/useful life within 5years of comprehensive building evaluation), and are primarily driven by project budget.

At the highest end of this spectrum, private affordable housing developers estimated a comprehensive renovation cost (inclusive of hard and soft costs) of approximately $65,000 per unit for older buildings in need of considerable infrastructure repair. Towards the lower end of the spectrum, rehabilitation costs were approximately $50,000 per unit for smaller affordable multifamily buildings. After reviewing a range of comparable projects, HR&A believes that the scale of rehabilitation discussed and estimated in this analysis exceeds the standard scope of rehabilitation most private building owners implement.

HR&A also obtained records for the underwritten total project costs and total project hard costs for the last fourteen Mitchell-Lama[10] project renovations financed by Housing Development Corporation (HDC) from 2010 to 2012. Project uses reported by HDC included a mix of rehabilitation, acquisition, and debt refinancing or debt repayment. In *Figure 14,* HR&A derived the total rehabilitation project cost per unit using the HDC-reported hard cost, which excludes debt repayment or refinancing. These properties are similar to those of NYCHA's in that many of the developments were constructed 60 years ago, consist of numerous buildings in campus-like arrangements and may have anywhere from between 100 to 2,000+ units. Some of the more comprehensive rehabilitation projects at Mitchell-Lama developments ranged from between $30,000 to about $70,000 per unit in 2010 to 2012, and averaged about $45,000 per unit.

Figure 14. Rehabilitation Cost per Unit for Select HDC Mitchell-Lama Projects

Rehabilitation Project by Year	Units per Development	Rehabilitation Hard Cost per Unit	Rehabilitation Project Cost per Unit*
2012	1,093	$24,000	$30,000
2012	1,093	$31,000	$39,000
2012	2,585	$36,000	$45,000
2012	871	$34,000	$43,000
2012	361	$30,000	$38,000
2012	84	$35,000	$44,000
2012	534	$26,000	$33,000
2011	216	$54,000	$68,000
2010	1,575	$39,000	$49,000
2010	320	$51,000	$64,000
Average	**873**	**$36,000**	**$45,000**

**Note: HR&A received hard cost per unit from HDC and assumed an increment of 20% for soft costs to calculate total rehabilitation cost per unit. All costs are rounded to the nearest thousand.*
Source: NYCHDC; HR&A Analysis

[10] Mitchell-Lama developments are similar to many of the developments in NYCHA's housing stock, given their age, size, and configuration. All were built in the 1970s, are on average 300+ units, and are configured as campus-style developments with complex site infrastructure networks.

4. REPLACEMENT COST ANALYSIS

Replacement cost estimates were derived by aggregating information from several data sources. This section provides information about the methodology and assumptions underlying replacement cost estimates. Information is presented as follows: a comprehensive methodology and analysis for the derivation of the replacement cost estimate for NYCHA's housing, per unit (Section 4.2); a summary for the range of replacement cost per unit (Section 4.3); and an estimate for the cost of replacement per unit in private market-rate housing as a benchmark for comparison (Section 4.4).

4.1 METHODOLOGY FOR ESTIMATING THE COST OF REPLACEMENT

Section 4.1: Methodology for Estimating Cost of Replacement

Section 4.2: Replacement Cost Analysis Methodology and Findings

Section 4.3: Summary of Replacement Cost

Section 4.4: Comparison to Private Market-Rate Housing Development

To estimate the cost of constructing the replacement units, HR&A collected and analyzed three primary types of data: (1) data provided to NYCHA by HPD and HDC; (2) data sourced from NYCHA in which affordable housing was developed on NYCHA land in partnership with private entities; and (3) data obtained through interviews and original research sourced from private developers of affordable housing who were constructing affordable housing on private land. All three of the data sources relate to affordable housing units that are to be or are already being privately operated and assume a mixture of public and private funding, including financing mechanisms such as Low-Income Housing Tax-Credits and tax-exempt bond financing.[11] There are no local comparables for the cost of construction of publicly operated affordable housing, hence the reliance on the private affordable housing construction comparables as a basis for the cost of replacement. HR&A also compared the estimated cost of replacement to the private, market-rate multifamily construction cost estimates derived using third-party construction cost estimation tool RS Means.

In this report, the **cost of replacement** is defined as the sum of residents' moving fees/relocation, cost of temporary housing for residents during construction, demolition of existing units to be replaced, and new construction of same number and general type of units, described below:

- **Relocation:** the one-time cost to support the relocation of its residents from one unit to another until the replacement unit is ready for occupancy.
- **Temporary housing:** the incremental cost to subsidize household rent in private housing units for displaced public housing residents, assumed over a 2 year construction period.
- **Demolition:** the one-time cost associated with complete demolition of existing buildings and site infrastructure.
- **New Construction:** development of a new residential building, site infrastructure, and potentially other on-site amenities, assuming today's materials, construction methodology, and labor costs.

It should be noted that HR&A performed this analysis exclusively as an economic analysis, and has not addressed the obvious social and political implications of temporarily relocating/displacing NYCHA residents nor does this study analyze the feasibility of demolishing, replacing, and operating the same number of units as NYCHA currently owns and operates.

[11] The analysis does not include a study of the various means of leveraging private funding for affordable housing or other funding or financing mechanisms that would affect the overall public subsidy required to provide for the development of newly constructed affordable housing.

4.2 REPLACEMENT COST ANALYSIS

Relocation, temporary housing, demolition, and new construction are the key factors defining the cost of replacement. HR&A quantified these four characteristics in a manner that enabled like-kind comparisons. All costs were estimated on a per unit basis, at an average assumed unit size of 900 square feet. All building replacement estimates are assuming new construction with 2013 construction methodologies, rather than replication of original NYCHA building construction technique (a number of poured concrete methods). The four categories contributing to the total cost of replacement were calculated as follows:

- **Relocation:** NYCHA tracks these costs per unit by fee type (i.e. moving and utilities). As of March 2013, HR&A calculated the average cost of relocation per unit per year from 2004 to 2013 using 50-units of data per year. ***This cost is approximately $1,000 per unit in 2013-dollars.***

- **Temporary Housing:** Given NYCHA's vacancy rate of less than 1%, and just slightly higher turnover rate of 3%, HR&A assumed that all relocated residents would reside in temporary privately provided housing for the duration of demolition and new construction. In this case, HR&A assumed that the incurred cost to NYCHA would be the difference between the average NYCHA resident rent and the average rent of the private rental market, similar to that of a Section 8 voucher. HR&A assumed that the duration of temporary housing and the construction period would be about 2 years on average.

  From 2010 to 2012, the average NYCHA resident paid $460 per unit per month as rent. The average HUD subsidy received in 2012 per unit was $440; therefore the total average rent in NYCHA housing is approximately $900 per month. According to 2011 *New York City Housing and Vacancy Survey,* the median rent is NYC $1,100 per month. As mentioned, HR&A assumes for temporary housing NYCHA would pay the difference between the average NYCHA rent and the private market rent, indicating an incremental incurred cost to NYCHA of $200 per month. *This cost is* ***approximately an additional $5,000 per unit*** *for the two-year construction period.* Across its portfolio, this would indicate an incremental cost of nearly $900 million to relocate residents in all 179,000 of NYCHA's units for the duration of construction.

- **Demolition:** HR&A estimates demolition per square foot based on recent bids for demolition of residential buildings provided by local real estate professionals. In order to better compare to the NYCHA costs and portfolio, HR&A assumes the higher end of the ranges provided, ***approximately $20 per square foot.***

- **New Construction:** HR&A developed a range for cost of constructing replacement units based on three different data sources, all from the private affordable housing market: i) HPD and HDC data supplied from completed private projects financed using public funding sources, provided by NYCHA; ii) recent cost estimates for privately developed and publicly subsidized projects on NYCHA-owned land, provided by NYCHA; and iii) interviews with developers of private affordable multifamily housing in New York City (assumed 100% operated by private developers). HR&A derived a weighted average for seven recent projects – 900 publicly subsidized affordable housing units – described by points i) and ii) above, ***of approximately $346,000 per unit.*** These projects can be seen in *Figure 15* below, and are briefly described on the following page. ***The lowest cost per unit is about 30% lower than the average cost per unit, and the highest cost per unit is approximately 30% higher than the average cost per unit; therefore, the plausible range for cost of new construction is ±30% the $346,000 cost per unit.***

Figure 15. Select Publicly Subsidized Affordable Housing New Construction Projects, 2009 - Present

Development	Borough	Total Project Cost ($millions)	Number of Units	Total Project Cost per Unit	Status
The Eltona	Bronx	$16.5	63	$262,000	Completed
Highbridge Terrace	Bronx	$18.3	65	$282,000	Completed
Via Verde	Bronx	$98.0	222	$441,000	Completed
Dumont Green	Brooklyn	$51.0	176	$290,000	Completed
Arbor House	Bronx	$37.7	124	$304,000	Completed
Harlem RBI Houses	Manhattan	$27.7	89	$311,000	*In Progress*
Elliott-Chelsea	Manhattan	$64.9	168	$386,000	Completed
Total/Weighted Average		**$314.1**	**907**	**$346,000**	

Source: NYCHA; HDC 2011 Annual Report; HR&A Analysis

**Note: Projects represent a mixture of program subsidies, including Low Income Housing Tax Credits and Mixed-Income. Total project costs include hard cost, soft cost, and developer's fee for the listed projects, but exclude the cost of land acquisition.*

- ***The Eltona*** is a 73,000 square foot multifamily building in the Melrose section of the Bronx built entirely of precast concrete. The building is LEED certified with on-site renewable energy features such as wind turbines and combined heat and power (CHP) systems.
- ***Highbridge Terrace*** is a 7-story rental apartment located on West 167th street in the Bronx with on-site program space and outdoor recreation space. The building will serve families earning less than 50% of Area Median Income (AMI), homeless families earning less than 50% AMI referred by the NYC Department of Homeless Services, and families earning less than 60% AMI.
- ***Via Verde*** is a 294,000 square foot development that includes 151 rental apartments and 71 co-ops, affordable to middle-income households, on 1.5 acres in the Melrose neighborhood of the Bronx. The development meets LEED Gold New Construction certification standards for environmental and energy efficient design, and includes a number of sustainability features. The project also includes a community facility and ground floor retail. The building ranges in height from 3- to 20-stories.
- ***Dumont Green*** is an 8-story green and energy efficient building in the East New York area of Brooklyn. The 172,000 square foot project has 44 on-site parking spaces, bicycle storage, and a large courtyard. The building also has on-site renewable energy, with the largest solar photovoltaic system to date in a NYC multifamily structure.
- ***Arbor House*** is an 8-story building constructed by a private developer adjacent to NYCHA's Forest Houses development in the Bronx. The building has a 10,000 square foot rooftop greenhouse, a living green wall, and energy efficiency and sustainability features.
- ***Harlem RBI Houses*** is a 151,000 square foot multifamily, mixed-use development on 104th Street in East Harlem. There will also be a 58,000 square foot charter school for 450 students in kindergarten through 8th Grade at the site as well as 6,000 square feet of office space. The project is under construction and is projected to open in 2014.
- ***Elliott-Chelsea*** is a new 22-story development constructed on a former parking lot for neighboring NYCHA properties in Manhattan's Chelsea neighborhood. The low- to middle-income housing has a rooftop garden and on-site parking.

As a benchmark for the range of new construction costs, HR&A compared the estimate in Figure 15 to our research based on conversations with private developers of publicly subsidized affordable housing. HR&A spoke to five developers of private multifamily affordable housing in New York City and obtained estimates of hard costs per unit and per square foot for new multifamily construction that had occurred over the past several years. Private affordable developer estimates of hard costs ranged from approximately $200 per square foot for new construction with limited use of union labor to $230 per square foot for a high-efficiency and sustainable building using union labor. The average across all interviews for general new construction of multifamily affordable housing of around 100 to 150 units was approximately $185 per square foot in hard costs. HR&A translated these cost estimates to an average unit cost estimate. For hard costs and soft costs, developer interviews indicated an average rule of thumb of 80% hard cost and 20% soft cost, to which HR&A added a 10% developer fee, based on NYC real estate market experience and conversations with private affordable developers. Therefore, at $185 per square foot, the total project cost would be about $230,000 per unit, assuming a unit of approximately 900 square feet. At $200 per square foot of hard costs, the total project cost per unit is about $250,000, and $285,000 per unit at $230 per square foot of hard costs, for the same unit size.

4.3 SUMMARY OF REPLACEMENT COST

The findings from the above methodology derive an overall estimated cost of replacement – including relocation, temporary housing, demolition and new construction – that ranges from approximately $264,000 to $474,000 per unit, as seen in *Figure 16*. Even in the absence of the costs of relocation, temporary housing, and demolition, the methodology indicated an average cost per unit (for a unit of 900 square feet) for new development of approximately $346,000. As described in the "*New Construction*" section above and illustrated in *Figure 15,* the sample new construction projects cited ranged from approximately 30% lower than the weighted average cost per unit to approximately 30% higher than the weighted average cost per unit. In developing a budget for a new construction project, it is conservative to assume that in bidding out work the final cost can vary (conservatively) after construction up to or more than 30% the original projected cost. The cost could also be lower, though it is less likely, by up to 30%. Therefore, in the replacement cost summary in *Figure 16*, HR&A estimates a range for new construction cost per unit that is up to 30% higher or lower than the estimated average cost.

Figure 16. Replacement Cost Summary per Unit, Average Range

	Average	30% Lower New Construction Cost	30% Higher New Construction Cost
Relocation (1-time moving cost)	$1,000	$1,000	$1,000
Temporary Housing	$5,000	$5,000	$5,000
Demolition	$18,000	$18,000	$18,000
New Construction	$346,000	$240,000	$450,000
Total	**$370,000**	***$264,000***	***$474,000***

Sources: NYCHA; Private developers and real estate professionals; HR&A Analysis, RS Means

**Note: Temporary Housing represents solely the incremental subsidy incurred by temporary housing of subsidized NYCHA residents.*

4.4 COMPARISON TO PRIVATE MARKET-RATE HOUSING DEVELOPMENT

As a benchmark, HR&A analyzed RS Means data for comparison to the construction cost estimate for affordable housing. RS Means is a construction cost estimation tool sensitive to construction methodology (materials), total building area, geography and relative labor rates for private market-rate housing. RS Means data is annually updated and segmented into over 20,000 building components based on information from contractors and suppliers, as well as adjusting for over 900 regional markets in the U.S.

For the RS Means analysis, HR&A input an assumed building area and zip code for a sampling of 40 different NYCHA developments located throughout the five boroughs to derive an average cost per square foot for new construction of a range of NYCHA building types. HR&A also included a developer fee of 8% as suggested by RS Means. RS Means provided the construction and development costs for the market-rate equivalent of this housing.

This cost per square foot was translated into per unit cost of new construction based on the report's average unit definition of 900 square feet. Given the other comparable cost estimates for the construction of affordable housing, HR&A selected a range of costs per square foot for comparable building typologies defined by NYCHA's portfolio (relative to location, number of units, number of buildings and total development square footage). *Figure 17* summarizes the cost of new construction for select comparable development sizes from across New York City.

Figure 17. RS Means-Estimated Cost per Unit for New Construction (Private, Market-Rate), 2013

Development Size (Units)	Total SF	Hard Cost per Unit*	Soft Cost per Unit	Developer Fees per Unit	Total Cost per Unit
168	198,400	$158,000	$39,000	$16,000	$213,000
186	193,140	$142,000	$36,000	$14,000	$192,000
200	195,230	$152,000	$38,000	$13,000	$203,000
78	131,000	$265,000	$66,000	$23,000	$354,000
82	103,400	$204,000	$51,000	$18,000	$273,000
Average		**$184,200**	**$46,000**	**$16,800**	**$247,000**

**Note: Hard costs assume construction type is brick façade with concrete block back-up and wood joist or steel frame structure.*
Source: RS Means 2013; HR&A Analysis

The cost of replacement – including relocation, temporary housing, demolition and new construction – in the private market-rate multifamily housing sector is approximately $271,000 per unit. Adding the average cost of relocation, temporary housing, and demolition per unit noted in *Figure 16* ($24,000) to the average cost per unit of market-rate new construction for multifamily housing in *Figure 17* ($247,000), the comparable cost of replacement for private market-rate multifamily would be about $271,000 per unit, or very near the bottom of the per-unit range that HR&A estimates for replacement of NYCHA's portfolio.

Figure 18. Replacement Cost per Unit for Private, Market-Rate Multifamily, 2013

	Average Cost per Unit
Relocation (1-time moving cost)*	$1,000
Temporary Housing*	$5,000
Demolition*	$18,000
New Construction**	$247,000
Total	**$271,000**

**Note: Assumes same relocation, temporary housing, and demolition costs as seen in Figure 16.*
***Note: Assumes average cost per unit for new construction calculated in Figure 17.*
Source: RS Means 2013; HR&A Analysis

5. COMPARATIVE COST OF REHABILITATION VS. REPLACEMENT

Building on the analysis in Sections 3 and 4, HR&A drew together and rationalized data sources, ensuring ability to make consistent comparisons of cost estimates for rehabilitation and replacement per unit.

5.1 COMPARING REHABILITATION VERSUS REPLACEMENT

Comparing all the ranges of costs per unit, it is clear that even though rehabilitation cost variances are greater on a percentage basis the cost of replacement would exceed that of comprehensive rehabilitation.

Figure 19. Cost of Rehabilitation versus Cost of Replacement

	Cost of Rehabilitation		Cost of Replacement	
	Average	**Range***	**Average**	**Range***
Per Unit	$99,000	$70,000 - $130,000	$370,000	$265,000 - $475,000
Portfolio-Wide	$17 billion	$12 - $23 billion**	$66 billion	$47 - $85 billion**

**For rehabilitation, the range captures 70% of the portfolio using 0 to 5 year PNA data. For replacement, the ±30% range represents the average weighted cost per unit derived from total range of project costs for seven recent projects.*

***Portfolio-wide cost estimates reflect the average cost per unit applied to NYCHA's 179,000 unit portfolio and do not account for phasing, inflation, contingency, or additional costs associated with implementation on a portfolio-wide scale.*

The cost for NYCHA to replace its housing stock in-kind considerably exceeds the Authority's cost of rehabilitation across the portfolio, by a factor of at least 105%. The order-of-magnitude cost estimate for replacement exceeds the entire range of costs for NYCHA rehabilitation at a minimum of 105% greater, but could range up to over seven times costlier.

5.2 ADDITIONAL CONSIDERATIONS AND IMPLICATIONS FOR NYCHA

Based on HR&A research and data analysis, there appears to be an inherent efficiency of cost and implementation for the purely privately undertaken rehabilitation and private market-rate construction projects. There are likely several key factors impacting the difference in these "private" versus "public" or "semi-public" cost structures, but a potential key impact is the labor wage requirement associated with public projects as well as scope requirements when projects are undertaken by publicly financed means. Public projects are required to meet prevailing wage requirements, which can range anywhere from 75% to 200% more than the private sector equivalent hourly wages for jobs like boilermakers, carpenters, electricians, engineers, and construction laborers.[12] Furthermore, building renovation and construction standards, including public amenities, are not directly comparable to private sector projects.

The additional costs of the publicly subsidized model are correlated with certain public benefits. Without public involvement, the market is unlikely to support the development of purely private affordable housing. As long as the projects are under restrictions of public financing mechanisms, there is certainty that the housing development will retain affordable criteria. Private market developments, on the other hand, face market pressures to roll units off of affordability standards when financing mechanisms that impose affordability restrictions expire. This is an unmeasured and significant benefit of the purely public housing model. However, interestingly, the purely public model was not a structure for which HR&A could find a recent comparable.

[12] Citizens Budget Commission. "6 Things New Yorkers Should Know About Prevailing Wage." February 2012.

As NYCHA moves forward to evaluate the most cost effective and efficient means of providing affordable housing and services to New York City's residents, it will continue to be imperative to work with key funding partners, including the U.S. Department of Housing Preservation and Development, U.S. Congress, New York City Housing Finance Agency, New York City Housing and Preservation Development Corporation, City Council, New York City Housing Development Corporation, and the State's Housing Finance Authority. Collectively these stakeholders will seek an understanding of the most effective investment and preservation strategies for maintaining public housing in New York City. Furthermore, as mentioned on page 18, in the wake of Superstorm Sandy it is critical to recognize the issue of resiliency and the cost associated with rebuilding and prevention of future damage to NYCHA's developments, particularly as FEMA and New York City redefine the flood zones and at-risk areas. Though HR&A cannot quantify the implications, resiliency and asset protection will certainly result in additional building costs, but may also bring new sources of funding to rehabilitation efforts.

Based on the need for a shared understanding, HR&A and BJH have undertaken the analysis contained within this report, and have provided an order of magnitude comparison of the two basic cost structures for preserving public housing in New York City. This comparison lays the groundwork for addressing more complex questions regarding funding, financing and subsidy models in developing a comprehensive capital planning strategy.