
SURPRISE!

The World Trade Center Rebuilding Pays Off
for the Port Authority – and the Region



INTRODUCTION

For many years after the terrorist attacks of September 11, 2001, the redevelopment of the World Trade Center site seemed stuck in a quagmire of competing priorities, planning mistakes, unrealistic schedules, cost overruns and delays. As the years passed, some observers became convinced that the Port Authority of New York and New Jersey (PA) should never have taken on the job of redeveloping the World Trade Center site. Others expressed concern that the rising cost of redeveloping the site would seriously weaken the PA's ability to invest in the region's vitally important trade and transportation infrastructure. In short, it was argued, the redevelopment of the World Trade Center was a questionable investment of public dollars by the Port Authority.

Yet, even as the news seemed to get worse, real work was getting done – selection of a design for the September 11 memorial, the restoration of PATH and subway service, the construction of a new 7 World Trade Center¹, the rebuilding (often invisible) of the site's basic infrastructure, and completion and opening of the National September 11 Memorial.

During the past two years, the redevelopment of the World Trade Center site has achieved considerable momentum.

- In November 2013, Silverstein Properties, Inc. (SPI) opened 4 World Trade Center, the first office tower to be completed on the original 16-acre World Trade Center site.
- In May 2014, the Museum component of the National September 11 Memorial and Museum opened to the public; in its first year the Museum attracted 2.7 million visitors.
- A few months later, the PA and SPI reached agreement on a plan for financing and completing construction of 3 World Trade Center, with branding and advertising behemoth Group M taking more than 500,000 square feet of the building's office space. Construction is now progressing rapidly.
- In the fall of 2014, Condé Nast, the PA, and other tenants began to move into One World Trade Center and 4 World Trade Center.

- In December 2014, Westfield began to announce some of the tenants that would be moving into the World Trade Center's retail space.
- In May 2015, One World Observatory – the new observation deck atop One World Trade Center – opened to the public. The Observatory is expected to attract 3.8 million visitors per year.
- In June 2015, News Corp, 20th Century Fox and SPI announced a non-binding agreement to have the two Murdoch-controlled companies lease nearly half of the office space planned for 2 World Trade Center.

Much work remains to be done, and the project still entails considerable risks, for the PA, SPI, and Westfield, the company that controls the World Trade Center's retail space. But the outlook for the World Trade Center is brighter now than it has been at any time since the twin towers fell. Therefore, it seems like an appropriate time to test the conventional wisdom and more rigorously analyze the question, "Was the redevelopment of the World Trade Center a worthy investment for the PA?"

The answer is a resounding yes. Not only is the PA likely to essentially recoup its investment in the redevelopment of the World Trade Center, but that investment is having and will continue to have a major positive impact on the region's economy.

Part One of the report examines what the redevelopment of the World Trade Center site will have cost the PA by the time it is completed, and the extent to which the Authority might be able to recover what it will have spent from the revenues the site will generate.

Part Two analyzes the economic impact of the investment of nearly \$15 billion in redevelopment of the site through the end of 2014.

Part Three examines the World Trade Center's role in the ongoing revitalization of Lower Manhattan, and how that contribution is likely to grow during the next several years.

Part Four discusses the World Trade Center's contribution to the economic vitality of New York City and the New York-New Jersey region.

Part Five concludes with some brief observations about the lessons that can be taken from the redevelopment of the World Trade Center – for the PA, the City and the region.

¹The rebuilding of 7 World Trade Center, located just north of the original World Trade Center site, was completed in 2006. The building is now fully leased.

KEY HIGHLIGHTS

REBUILDING THE WORLD TRADE CENTER: NET COST TO THE PORT AUTHORITY

- Based on data obtained from the PA, we estimate that from 2002 through 2019 (when the work for which it is directly responsible is scheduled to be substantially completed), the PA will have spent a total of \$16.76 billion in capital and operating funds on redevelopment of the World Trade Center.
- By 2019, the PA will have recovered approximately \$10.1 billion of this total from a variety of sources, including insurance proceeds, federal reimbursement of PA capital expenditures, lease payments by SPI, payments by Westfield for acquisition of the PA's interest in World Trade Center retail space, and other sources.
- We estimate that on a net present value basis, the PA is likely over time to recover almost its entire investment in the redevelopment of the site (97.4 to 98.6 percent of its total spending through 2019). This estimate takes into account:
 - World Trade Center capital and operating expenses and World Trade Center revenues from 2002 through 2014;
 - Future World Trade Center operating expenses and payments in lieu of taxes (PILOTs) paid to New York City; and
 - The PA's future World Trade Center revenues, including net operating revenues from One World Trade Center, ground lease payments from SPI, the PA's share of the proceeds of any future refinancing of 2, 3 and 4 World Trade Center, additional payments by Westfield, and income from the sale or lease of the site of 5 World Trade Center.
- While the PA may not in the end recover every last dollar it has invested in the project, redevelopment of the World Trade Center has generated substantial economic benefits to the New York-New Jersey region, and will generate even greater benefits in the years ahead.

THE ECONOMIC IMPACT OF WORLD TRADE CENTER CONSTRUCTION

- Between 2002 and 2020 (the target date for completion of 2 World Trade Center), spending by the PA and SPI on redevelopment of the World Trade Center will have directly supported more than 88,300 person-years of work in construction and related industries, with wages and salaries totaling \$11.9 billion (in 2015 dollars).
- Taking into account standard economic multiplier metrics, World Trade Center construction spending will have directly and indirectly supported:
 - More than 198,700 person-years of work in the 18-county New York-New Jersey region – an average of more than 10,400 full-time-equivalent (FTE) jobs per year;
 - Nearly \$19.4 billion in salaries and wages (in 2015 dollars); and
 - \$43.9 billion in regional economic output (in 2015 dollars).

REVITALIZING LOWER MANHATTAN

- When the World Trade Center is fully built out and occupied, we estimate that more than 51,100 people (on an FTE basis) will be employed at the World Trade Center, with more than \$7.3 billion in salaries and wages.
- We estimate that between 2014 and 2025, growth in the number of people working at the World Trade Center will account for about two-thirds of all job growth in Lower Manhattan.
- Through its success in attracting leading companies in media and information services, professional and business services and technology the World Trade Center has been and will be a major contributor to the continuing diversification of Lower Manhattan's economy.
- With more than 460,000 square feet of high-quality retail and restaurant space, the World Trade Center will make Lower Manhattan a major retail destination. When fully built out and occupied, we estimate that World Trade Center's shops and restaurants will generate gross sales totaling more than \$900 million.

- The National September 11 Memorial and Museum and One World Observatory have made the World Trade Center a major destination for visitors to New York City, with the Memorial attracting 5.5 million visitors annually and the Observatory expected to attract 3.8 million.
- The rebuilding of the World Trade Center has fostered private development of more than 3,000 new residential units and more than 3,000 hotel rooms in the surrounding area.

STRENGTHENING THE REGIONAL ECONOMY

- When the complex is fully built out and occupied, the operations of the World Trade Center and its tenant companies will directly and indirectly account for more than 128,200 FTE jobs throughout the region, with more than \$13.0 billion in wages (in 2015 dollars) and nearly \$33.8 billion in regional economic output.
- Redevelopment of the World Trade Center enables New York City to meet a critical need for new, high-quality office space. Increasing the supply of such space is essential to the continued growth of New York City's office-based industries, and to maintaining the City's competitiveness as a center for leading companies in high-value industries.
- The 7 million square feet of new, technologically advanced office space built at the World Trade Center since 2005 accounts for about 19 percent of all Manhattan office space in buildings less than 20 years old; and an additional 5.3 million square feet of such space is scheduled for completion by 2020.
- When the World Trade Center is fully built out and occupied, the complex and its tenant businesses will directly generate more than \$800 million in New York City and New York State revenues (in 2015 dollars), including:
 - Nearly \$353 million annually in City personal income, sales and business taxes, and payments in lieu of taxes; and
 - \$449 million in State personal income, business and sales taxes.



PART ONE: MEASURING THE COST TO THE PORT AUTHORITY

Assessing the value of redeveloping the World Trade Center site – for the PA, New York City and the region – requires that we start with a clear understanding of what that undertaking has and will cost. From 2002 through 2014, the PA spent nearly \$12.6 billion on redevelopment of the site, including approximately \$11.4 billion in capital and nearly \$1.2 billion in operating expenses. By the time its part of the work is completed in 2019, we estimate that the PA will have spent more than \$16.76 billion on redeveloping the World Trade Center.

Table 1 provides a summary of the major costs incurred by the PA through the end of 2014, along with an estimate of remaining costs through 2019.

Table 1: Port Authority spending on World Trade Center redevelopment (\$ millions)

Redevelopment program component	Total spending, 2002-2014	Projected, 2015-2019	Total
Capital spending			
WTC site common infrastructure	\$1,571.80	\$1,104.70	\$2,676.50
One World Trade Center	\$3,317.10	\$117.10	\$3,434.20
Memorial and Museum	\$515.10	\$0.00	\$515.10
Transportation Hub	\$3,401.10	\$648.30	\$4,049.40
Retail development	\$1,322.40	\$1,447.00	\$2,769.40
Vehicle security center and parking	\$1,126.60	\$ 247.00	\$1,373.60
Security improvements	\$61.70	\$0.00	\$61.70
Other	\$100.90	\$0.00	\$100.90
Subtotal, capital spending	\$11,416.70	\$3,564.10	\$14,980.80
Port Authority WTC operating expenses	\$1,165.90	\$615.20	\$1,781.10
TOTAL PA SPENDING ON REDEVELOPMENT			\$16,761.90

Along with these costs, however, we need to consider:

- The offsetting insurance proceeds and capital contributions the PA has received from the federal government, other public agencies and its private partners;
- Capital contributions the Authority will receive or gains it will realize in the future; and
- The stream of lease revenues and financial gains the PA has received and will receive over time.

INSURANCE PROCEEDS AND CAPITAL CONTRIBUTIONS TO DATE

From September 2001 through the end of 2014, the PA received more than \$3.1 billion in insurance proceeds related to the destruction of the World Trade Center, including insurance payments the Authority received directly and its share of insurance proceeds paid to SPI.

During this period the PA also received nearly \$2.6 billion in capital contributions from the federal government and other public agencies, \$752 million from Westfield for a partial purchase of its interest in World Trade Center retailing, and a \$100 million equity investment from the Durst Organization in One World Trade Center.

As shown in Table 2, insurance proceeds and capital contributions together totaled nearly \$7.6 billion through the end of 2014.

Table 2: Capital reimbursement or investment, 2002-2014 (\$ millions)

Source of capital reimbursement or investment	Received by the PA, 2002-2014
Insurance proceeds (direct or through SPI)	\$3,158.80
Federal reimbursement and grants	\$2,513.20
Other public agencies	\$1,075.70
Westfield retail joint venture payments	\$752.10
Durst equity investment in 1 WTC	\$100.00
TOTAL	\$7,599.80

FURTHER CAPITAL CONTRIBUTIONS AND GAINS

Over time, the PA will realize additional capital gains or contributions from several sources:

- Additional payments due to the PA from Westfield for its interest in World Trade Center retailing, including space in the WTC Transportation Hub and 2, 3 and 4 World Trade Center. While these payments could vary (based on the timing of delivery of retail space by the PA, and the market value of retail space at the base of 2 World Trade Center at the time that space is delivered), we estimate for purposes of this analysis that between 2016 and 2020 they will total slightly more than \$1 billion.

- The proceeds of an eventual sale or leasing of World Trade Center Site 5 – a site south of Liberty Street that will most likely be used for residential or hotel development. While the value of this site too will be determined by market conditions at the time it is sold or leased, recent sales of sites for residential development in Manhattan suggest that at 2015 prices the site could be worth \$800 million to \$1 billion.
- The PA's 15 percent share of the net proceeds of any future refinancing or sale of SPI's leasehold interests. Given the uncertain timing and value of these "capital events," it is difficult to estimate with any precision the value that the PA will ultimately derive from such events. Nevertheless, based on some reasonable assumptions we can estimate that between 2016 and 2030 the PA could realize more than \$1 billion in additional gains from the refinancing of 2, 3 and 4 World Trade Center, with the potential for significant additional gains over the next several decades.

LEASE REVENUES

In addition to one-time or intermittent infusions of capital, the PA also receives an ongoing stream of lease revenues. These are generally from two sources:

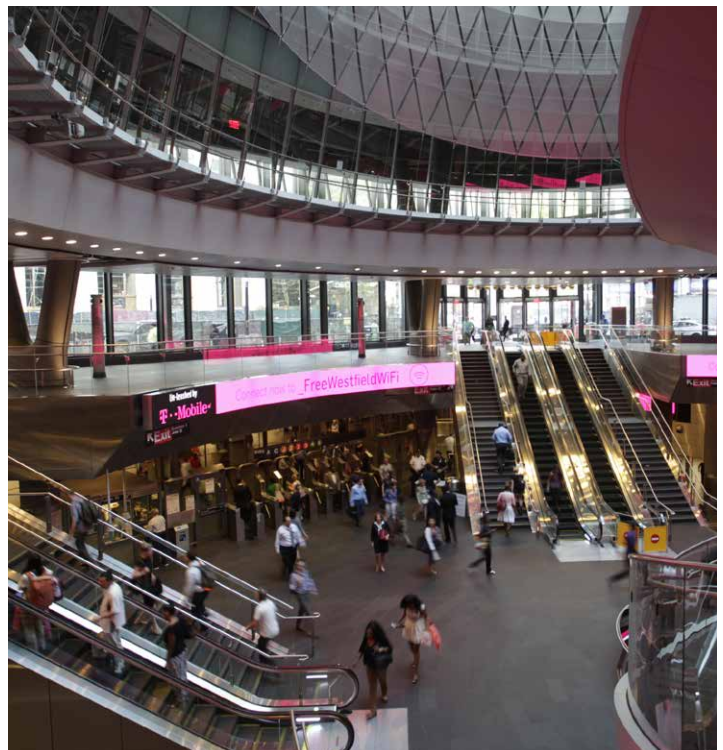
- Lease payments made to the PA by SPI. From September 2001 through the end of 2014, the PA received more than \$1.55 billion in lease and common facility construction and maintenance payments from SPI, and will continue to receive such payments every year through the expiration of SPI's ground lease.
- Lease revenues from office tenants in One World Trade Center and from One World Observatory.

For purposes of this analysis, we estimate that in 2020 the PA's net operating income from the World Trade Center – including its share of net operating revenues from One World Trade Center and ground lease payments from SPI, offset by the costs incurred by the PA in managing and operating the complex, and in making payments in lieu of taxes to New York City – will total approximately \$177 million before debt service.

EVALUATING THE NET PRESENT VALUE OF THE PORT AUTHORITY'S INVESTMENT

To assess the long-term impact of the PA's investment in redevelopment of the World Trade Center, the Rudin Center and Appleseed, in collaboration with Real Estate Solutions Group, analyzed the net present value (NPV) of Authority spending on World Trade Center redevelopment and operations, capital contributions and gains, and World Trade Center operating revenues. For this analysis, we used data obtained from the PA, SPI and other sources. We analyzed the NPV of the PA's spending and revenues using a discount rate of 6.25 percent (consistent with rates used by the New York City Economic Development Corporation in its analyses of the costs and benefits of City investments in economic development projects).

we estimate that in 2020 the Port Authority's net operating income from the World Trade Center will total approximately \$177 million





the Port Authority could recover (in net present value terms) 97.4 to 98.6 percent of what it will have spent through 2019

Over the life of SPI's ground lease (approximately the remainder of this century), we estimate that in net present value terms the net cost to the PA of redeveloping, operating and maintaining the World Trade Center will total approximately \$250 to \$450 million, or 97.4 to 98.6 percent of total PA spending.

This should be treated as strictly a provisional estimate. Not all of the data needed for a more precise analysis of future PA costs and revenues are publicly available. Moreover, there are many factors that could drive the project's ultimate value to the PA higher or lower. For example, our analysis assumes that:

- SPI's leases with News Corp and 20th Century Fox will be signed and construction of 2 World Trade Center (including the final phase of Westfield's retail space) completed by 2020; any delay in building 2 World Trade Center could increase the PA's net cost.
- The occupancy rate for office space in One World Trade Center will stabilize in 2021 at 90 percent; a faster rent-up or a higher long-term average occupancy rate would reduce the PA's net cost.
- The PA receives no income from World Trade Center retail beyond the \$1.75 billion in payments from Westfield cited above. Under its agreement with Westfield, however, the PA could potentially receive additional payments if Westfield's revenues exceed specified levels.

- The PA will realize approximately \$800 million to \$1 billion from selling or leasing Site 5; market conditions could result in this total being higher or lower.

If our analysis is correct, over time the PA could recover (in net present value terms) 97.4 to 98.6 percent of what it will have spent through 2019 on redeveloping, operating and maintaining the World Trade Center.

While the PA's net contribution to the redevelopment of the World Trade Center has thus been substantial, it should be kept in perspective. The PA has a long history of investing in major projects that create value for the New York-New Jersey region, but on which the Authority itself may never fully recover its investment – including some projects on which it recovers virtually nothing.

For this and other projects on which the PA does not fully recover its costs, the real issue is whether the benefits to the New York-New Jersey region justify the cost. The next three sections of the report seek to provide some answers to that question.

PART TWO: THE IMPACT OF WORLD TRADE CENTER CONSTRUCTION

Creating thousands of jobs for construction workers representing a broad range of skills, as well as engineers, planners, architects, and interior designers, has been the most direct economic impact of the redevelopment of the World Trade Center site. Based on data obtained from the PA, SPI and other sources, we estimate that from 2002 through 2020:

- The PA will have spent a total of approximately \$14.98² billion on redevelopment of the site (including construction of One World Trade Center, the WTC Transportation Hub, retail space and common infrastructure); and
- SPI will have spent a total of approximately \$9.1 billion on construction of 2, 3, 4 and 7 World Trade Center.

For purposes of this analysis, we assume that 80 percent of this spending was for contract construction, and 20 percent for “soft” costs such as architecture and engineering, environmental consulting, insurance, legal services, bank fees, etc.

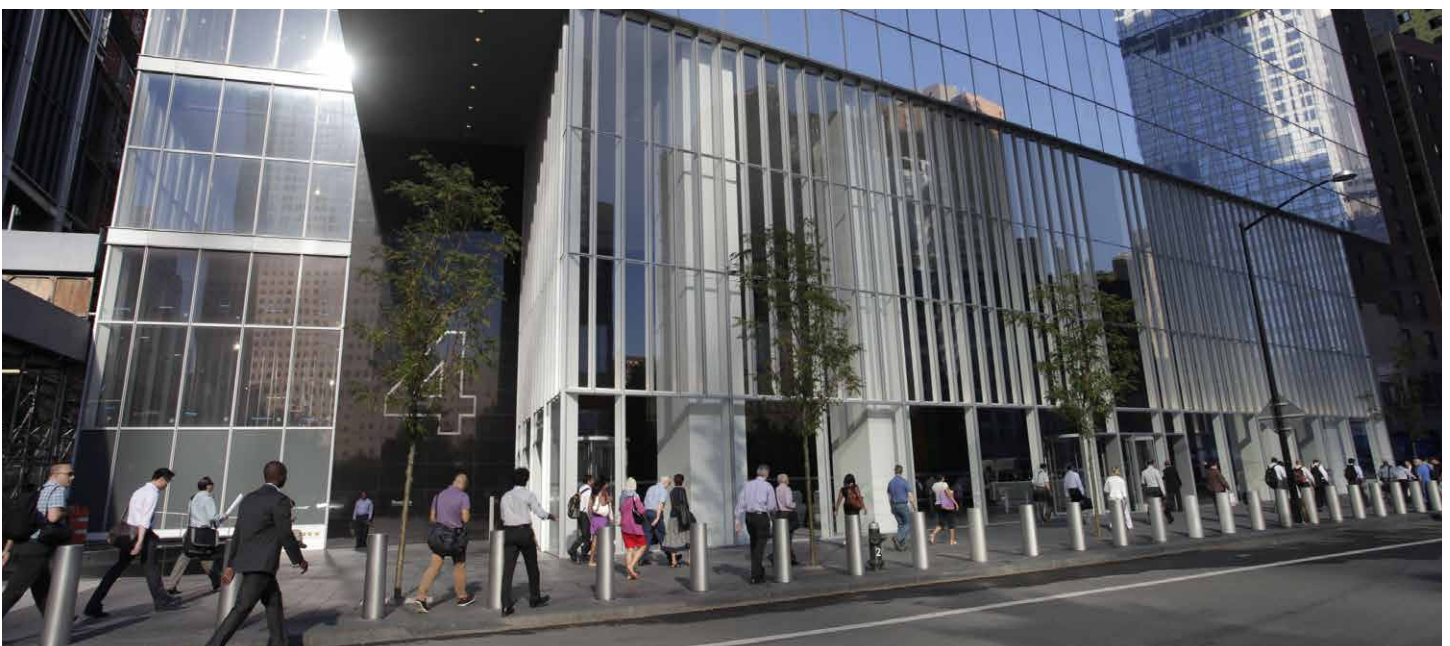
DIRECT IMPACT OF WORLD TRADE CENTER CONSTRUCTION – JOBS AND WAGES

Using the IMPLAN input-output modeling system (an economic modeling tool commonly used in economic impact studies), we estimate that from 2002 through 2020, the \$24.1 billion spent by the PA and SPI on construction at the World Trade Center site will have directly supported approximately 88,300 person-years of employment³ in construction and related industries. Wages and salaries paid to those employed in the rebuilding of the World Trade Center will have totaled \$11.9 billion.

This translates into an average of approximately 4,650 full-time-equivalent (FTE) jobs each year in construction and related industries, including 3,265 in contract construction and 1,385 in related industries such as architecture and engineering, insurance, banking and real estate, with earnings per FTE averaging \$135,000 (in 2015 dollars).

² This total does not include the cost of construction of a temporary PATH station, which for purposes of this analysis is treated as a PATH capital cost.

³ A person-year is equivalent to the time worked by one full-time employee over the course of one year. In addition to one person working full-time for a year, it could, for example, represent the work of two people, each of whom is employed full-time for six months; or two people who each work half-time for the full year.



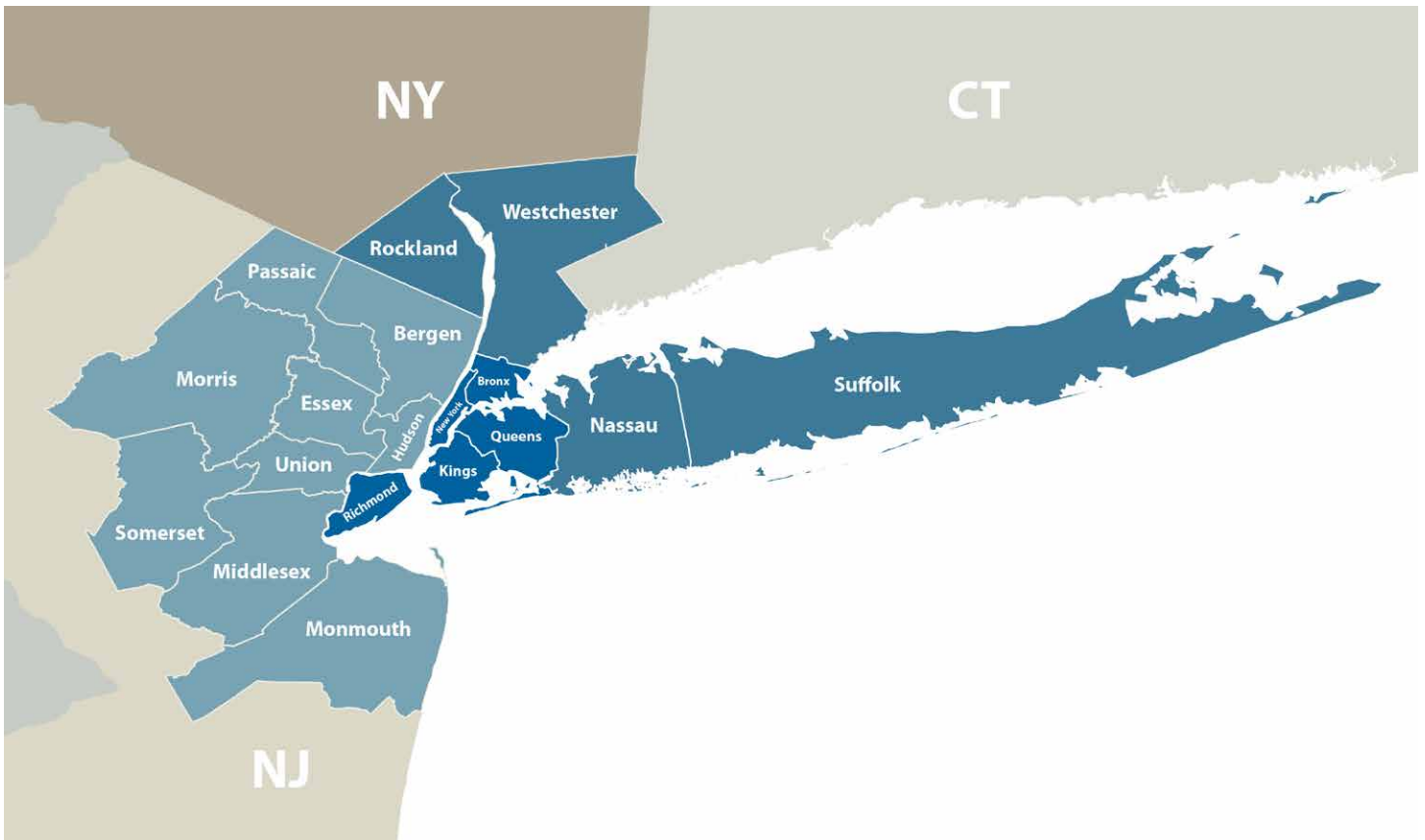
INDIRECT, INDUCED AND TOTAL EFFECTS

The impact of World Trade Center redevelopment on New York City's economy and the regional economy extends beyond these direct effects. A substantial portion of the funds that the PA and SPI pay to its contractors and other suppliers is used by these firms to buy goods and services from other local companies; and these latter companies in turn buy goods and services from other local businesses.

Similarly, construction workers, architects, engineers and others who are employed directly in the rebuilding of the World Trade Center use part of their earnings to buy a wide variety of goods and services – housing, utilities, food, personal services, and other household needs – from local businesses; and the employees of those businesses do the same. Using IMPLAN, we can measure these “indirect and induced” effects.

For this analysis, we use a definition of the region that is typically used by the PA – the 18-county area shown in Figure 1.

Figure 1 - The New York-New Jersey region.



From 2002 through 2020, spending on construction at the World Trade Center will have indirectly accounted for:

- More than 110,000 person-years of employment in New York-New Jersey region, with earnings totaling \$7.45 billion; and
- More than \$18.68 billion in regional economic output.

When we combine these indirect and induced effects with the direct effects cited previously, we estimate that from 2002 through 2020 (as shown below in Table 3), spending by the PA and SPI on World Trade Center

construction directly and indirectly accounted for:

- More than 198,700 person-years of employment in the region, with earnings totaling more than \$19.38 billion; (in 2015 dollars); and
- More than \$43.9 billion in regional economic output.

This means that each year from 2002 through 2020, an average of 10,458 people in the New York-New Jersey region (on an FTE basis) will have been employed in jobs that are directly or indirectly attributable to the redevelopment of the World Trade Center.

Table 3: Direct, indirect and induced impact of WTC construction, 2002-2020 (jobs I, person-years, wages, value-added and output in millions of 2015 dollars)

	Jobs	Wages	Value Added	Output
Impact of hard costs				
Direct impact	62,025	\$8,915.40	\$10,746.00	\$20,149.80
Indirect effects	34,744	\$2,519.00	\$3,928.10	\$6,312.50
Induced effects	49,344	\$3,081.60	\$5,217.40	\$7,998.00
Subtotal, hard costs impact	146,113	\$14,516.00	\$19,891.50	\$34,460.30
Impact of soft costs				
Direct impact	26,304	\$3,022.20	\$3,568.70	\$5,067.90
Indirect effects	10,289	\$844.20	\$1,200.10	\$1,773.30
Induced effects	16,065	\$1,003.00	\$1,697.80	\$2,602.80
Subtotal, soft costs impact	52,658	\$4,869.40	\$6,466.60	\$9,444.00
Total impact				
Direct impact	88,329	\$11,937.60	\$14,314.70	\$25,217.70
Indirect effects	45,033	\$3,363.20	\$5,128.20	\$8,085.80
Induced effects	65,409	\$4,084.60	\$6,915.20	\$10,600.80
TOTAL	198,771	\$19,385.40	\$26,358.10	\$43,904.30

NEW JERSEY – SHARING THE BENEFIT OF WORLD TRADE CENTER CONSTRUCTION

While the WTC is physically located in New York, the impact of World Trade Center construction is directly felt in New Jersey, in several ways. Based on Census Bureau data on where people who work in Lower Manhattan live, we estimate that at least 20 percent of those directly employed in the development of the World Trade Center live in New Jersey. This means that between 2002 and 2020, World Trade Center redevelopment provided New Jersey residents with approximately 17,660 person-years of employment in construction and related industries, with aggregate earnings of more than \$2.4 billion. This translates into an average of 929 FTE jobs each year, with average earnings of \$135,000 per FTE.

Moreover, a significant portion of the work involved in redeveloping the World Trade Center site is performed by New Jersey-based engineering firms, contractors and specialized service providers. Examples include:

- The Louis Berger Group, a planning and engineering firm based in East Orange
- Railroad Construction Corporation, based in Paterson
- Ferreira Construction – a minority-owned contracting firm with its headquarters in Branchburg
- Penoni Associates, a provider of inspection and testing services, based in Cedar Knolls

each year from 2002 through 2020, an average of 10,458 people in the New York-New Jersey region (on an FTE basis) will have been employed in jobs that are directly or indirectly attributable to the redevelopment of the World Trade Center

New Jersey firms have also supplied a wide range of sophisticated construction materials. Examples include:

- Turtle & Hughes, a supplier of electrical equipment for the transportation hub, based in Linden
- MetFab Metals, a specialty metals fabricator based in Midland Park

Finally, New Jersey also benefits through the indirect and induced effects generated by direct spending on the World Trade Center – that is, spending within the Garden State by New Jersey residents who are employed on the project, by New Jersey-based suppliers and contractors, and by their employees. Overall, we estimate that about 20 percent of the indirect and induced impact of total spending on redevelopment of the site – that is, more than 22,000 person-years of employment, with more than \$1.49 billion in wages and more than \$3.7 billion in regional economic output – accrues to New Jersey.



PART THREE: REVITALIZING LOWER MANHATTAN

Beyond the immediate impact of spending billions of dollars on construction, the redevelopment of the World Trade Center site has played and continues to play a central role in the ongoing transformation of Lower Manhattan. The redevelopment of the World Trade Center has been a catalyst for attracting new investment and new residents, and for the transformation of Lower Manhattan into a dynamic economic center as well as a vibrant community and a magnet for tourists.

- By attracting companies that are contributing to the ongoing diversification of Lower Manhattan's economy;
- By re-establishing Lower Manhattan as a cultural and retail destination;
- By attracting visitors to Lower Manhattan; and
- By stimulating private investment in retail, hotels and housing in the area surrounding the World Trade Center.

ATTRACTING COMPANIES TO LOWER MANHATTAN

For purposes of this analysis we assume that the World Trade Center will be fully built out by 2020, and fully occupied by 2025. When the complex is fully built out and occupied, we estimate that more than 51,000

people will be employed at the World Trade Center – about 89 percent of them in private-sector jobs – with earnings totaling more than \$7.3 billion (in 2015 dollars).

To put these numbers into perspective, we estimate that growth in the number of people working at the World Trade Center will account for approximately two-thirds of all private-sector job growth in Lower Manhattan between 2014 and 2025.

However, the World Trade Center's impact on the Lower Manhattan economy extends beyond the total number of people employed. Lower Manhattan's role as one of the City's and the region's leading centers of economic activity depends in part on the increasing diversity of its economy. From 2001 through 2014, the financial services sector's share of private payroll employment in Lower Manhattan fell from 54 to 34 percent, while employment in media and information services, professional services, retailing, hospitality, health care, and community services increased.

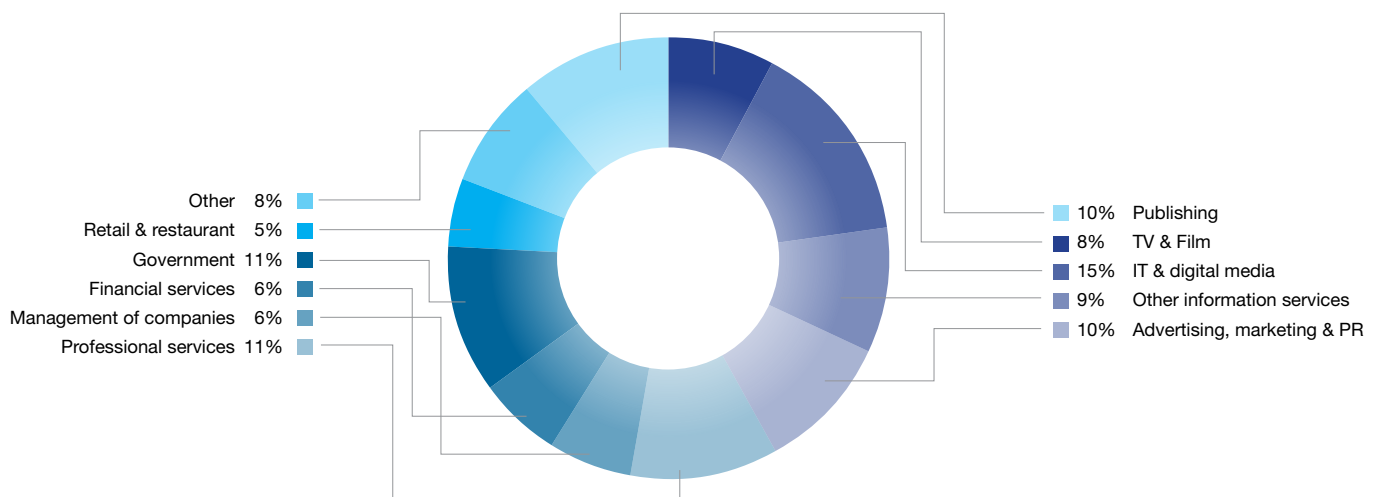
As new office and retail space comes on line and is occupied, the redevelopment of the World Trade Center site reinforces this process of diversification. Several notable examples of media, technology and professional, and business service companies that have moved to or signed leases for space at the World Trade Center are listed below in Table 4.

Table 4: Selected WTC tenants in media, information, technology and business and professional services

Tenant	Building	Square footage	Business/Industry
Moody's	7 & 1 WTC	760,000	Financial information
Wilmer Hale	7 WTC	210,000	Law
BMI	7 WTC	58,000	Music publishing & licensing
Fast Company	7 WTC	40,000	Publishing
Condé Nast	1 WTC	1,130,000	Publishing
High 5 Games	1 WTC	87,663	Casino, online and social media games
xAD	1 WTC	43,849	Location-based mobile marketing
Kids Creative	1 WTC	34,775	Advertising
Symphony	1 WTC	8,950	Communications technology
Group M	3 WTC	515,000	Advertising
MediaMath	4 WTC	106,000	Digital marketing technology
Morningstar	4 WTC	30,000	Financial information
IEX	4 WTC	13,000	Financial technology

Taking into account tenants already occupying space at the World Trade Center, other companies that have signed or are expected to sign leases, and broader trends affecting Lower Manhattan's industry mix, we expect that by 2025 the mix of industries at the World Trade Center could approximate that shown in Figure 2. As the graph shows, office-based businesses will account for about 90 percent of total employment at the World Trade Center in 2025. Using IMPLAN, we estimate that in 2025 – consistent with the high-value character of these businesses – the earnings of employees of office-based businesses at the World Trade Center will average approximately \$152,000 per worker (in 2015 dollars).

Figure 2: Estimated distribution of WTC employment by industry, 2025



The World Trade Center's impact on the growth of these industries in Lower Manhattan is not limited to the tenants that occupy its buildings. Condé Nast's move to One World Trade Center has made the entire area a more appealing location for media companies. Since Condé Nast announced that it would be moving downtown, Time Inc. and Associated Press have announced plans to move to Brookfield Place, and Macmillan Science and Education is moving to 1 New York Plaza.

Based on press reports on the number of employees involved in these various moves, we estimate that employment in media, advertising, technology and information firms in Lower Manhattan will increase by at least 12,000 from the last quarter of 2014 through the last quarter of 2016.

Other industries have been affected as well. Newmark Grubb Knight Frank recently reported that since Condé Nast announced its move to One WTC, fashion firms have leased 850,000 square feet of space in Lower Manhattan. Since the spring of 2015, Gucci has announced it is moving its headquarters to 195 Broadway, and Alexander Wang is moving his headquarters to 115 Broadway.

Moreover, the migration to downtown is gaining in strength. In June 2015, News Corp, 20th Century Fox and SPI announced that they had reached agreement in principle to have the two Murdoch-controlled companies take 1.3 million square feet in 2 World Trade Center, a 2.8 million square-foot building designed by Bjarke Ingels Group (BIG). Having these two companies (and their approximately 5,000 employees expected to move to the new building when it is completed in 2020) would confirm Lower Manhattan's emergence as one of the world's leading centers for media and communications.

REVIVING LOWER MANHATTAN AS A RETAIL DESTINATION

The opening of Westfield's retail space at the World Trade Center – expected to occur in early 2016 – will be a major step in the revival of Lower Manhattan as a retail destination. Under its current agreement with the PA, Westfield will initially develop and manage approximately 364,800 square feet of retail space in the World Trade Center transportation hub and in 3 and 4 World Trade Center. This will be followed by 96,300 square feet of above-ground retail space at the base of 2 World Trade Center.

Tenant signings announced to date suggest that the World Trade Center retail complex will mix destination shopping and dining with retailers and restaurants that serve area residents and workers. Retailers will range from H&M and Banana Republic to Apple and Tiffany & Co., and restaurants from FIKA Coffee to Eataly and Epicerie Boulud.

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We estimate that when Westfield's space is fully leased and occupied, retailers and restaurants at the World Trade Center will:

- Generate more than \$900 million (in 2015 dollars) in annual gross sales; and
- Employ approximately 2,600 people (on a FTE basis), with average earnings (in 2015 dollars) of nearly \$43,000 per FTE.

Moreover, by creating a critical mass of high-quality retail stores and restaurants, the World Trade Center – combined with other major developments such as the innovative redesign of Brookfield Center's retail space, the reinvention of Pier 17, and a major new retail development planned for 28 Liberty Street – will make Lower Manhattan a shopping destination for residents of other City neighborhoods and New Jersey waterfront communities, and for visitors from around the U.S. and the world. A new report prepared by the Alliance for Downtown New York estimates that from the end of 2014 through the end of 2019, recently-completed, under-construction and planned developments:

- Will increase the total volume of active retail space in Lower Manhattan by more than 2.3 million square feet (an increase of more than 53 percent); and
- Could more than double the dollar value of retail and restaurant sales in the area.

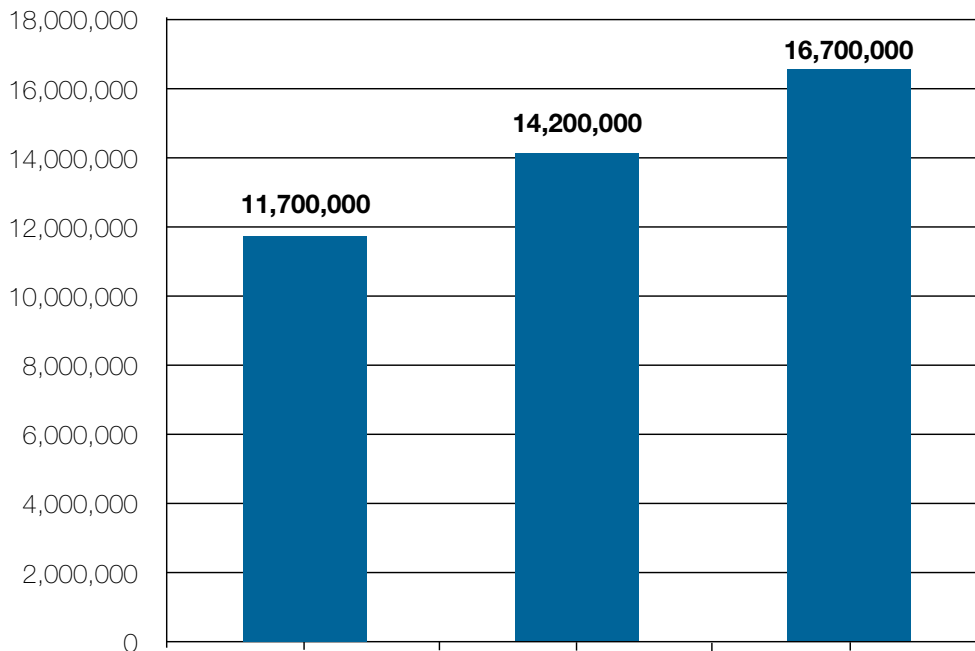
ATTRACTING VISITORS TO LOWER MANHATTAN

The World Trade Center is a major factor in the dramatic increase in visitors to Lower Manhattan. Since its opening in 2011, the National September 11 Memorial has attracted a total of 22 million visitors – an average of about 5.5 million annually. Visitors range from school children, City residents and tourists to Presidents Clinton, Bush and Obama, Prime Ministers Cameron of the United Kingdom, Abe of Japan, Modi of India and Abbott of Australia, the Duke and Duchess of Cambridge, and Pope Francis.

In its first year of operation, the September 11 Museum drew 2.7 million visitors (broadly speaking, a subset of visitors to the Memorial). Legends Hospitality estimates that One World Observatory – the recently-opened observation deck atop One World Trade Center – will draw 3.8 million visitors each year.

Research conducted for the Alliance for Downtown New York has found that Lower Manhattan drew an estimated total of 14.2 million unique individual visitors in 2014 – a 21 percent increase from the 11.7 unique visitors estimated to have come to the area in 2012, and a great deal larger than in prior years. This total is expected to increase to approximately 16.7 million by 2019 – a further increase of nearly 18 percent.

Figure 3: Estimated number of unique individual visitors to Lower Manhattan



When viewed against the estimated increase in visitor traffic between 2012 and 2014 and the projected further increase through 2019, actual attendance figures for the September 11 Museum and projected attendance figures for the Observatory suggest that these facilities have played and will play a significant role in attracting visitors to Lower Manhattan. They further suggest that about half of all visitors to area currently visit the Memorial and Museum, the Observatory or both while they are in Lower Manhattan.

The rebuilt World Trade Center has already become a magnet for visitors from throughout the U.S and across the world – a role that will be further enhanced if a new performing arts center is completed as planned.

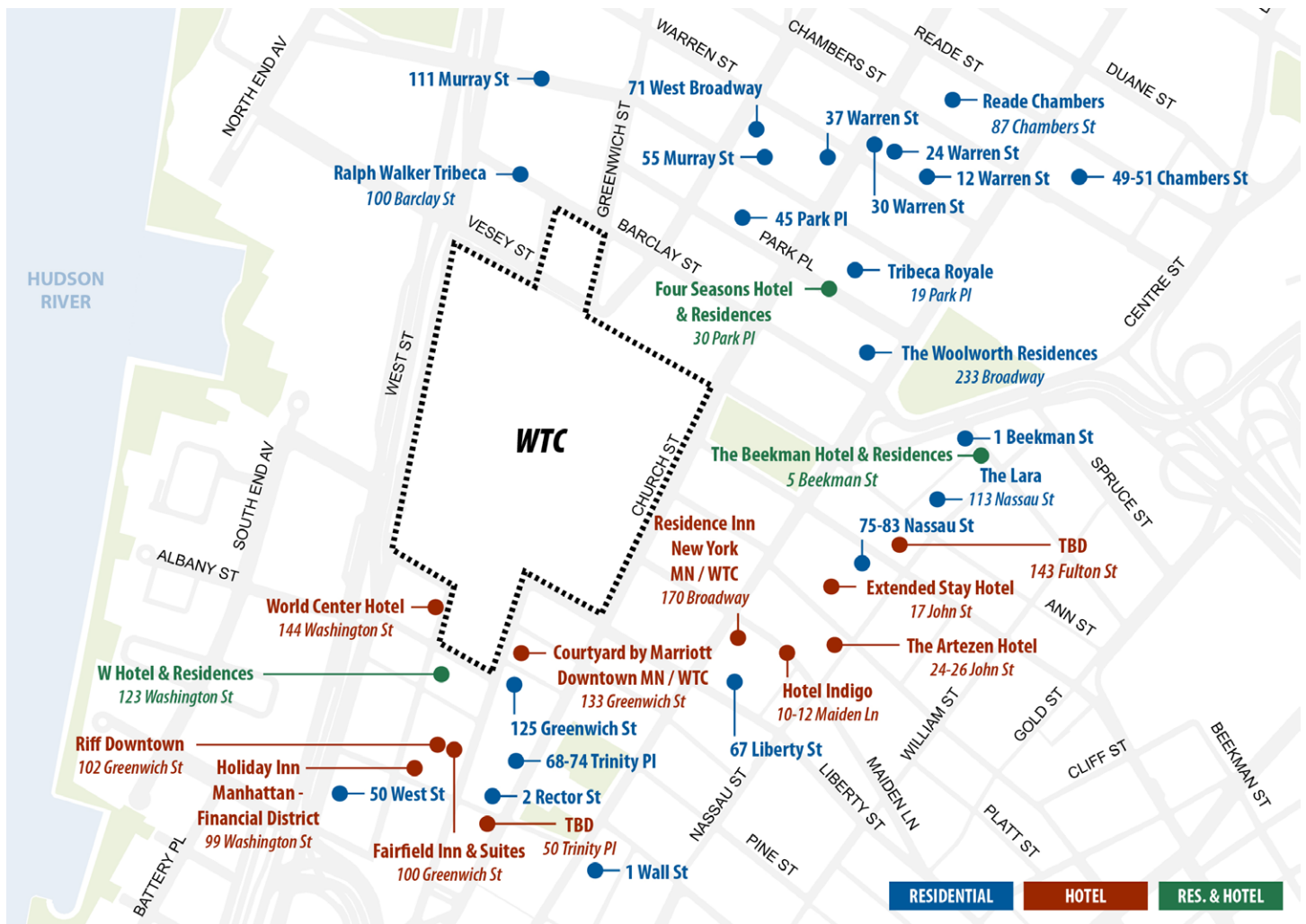
ATTRACTING PRIVATE INVESTMENT

The development of the World Trade Center has fostered substantial new investment in the surrounding area. Figure 4 shows the location of residential developments and hotels completed since 2010, under construction or planned. These projects include:

- 25 residential developments with a total of 3,004 units; and
- 14 hotels with a total of 3,034 rooms.

These new residential developments will strengthen Lower Manhattan's identity as a live-work, 24/7 community, and will further stimulate the growth of businesses that serve neighborhood residents. New hotels will similarly enhance Lower Manhattan's attractiveness as a destination for both business and leisure travelers to New York City.

Figure 4: Map of development projects in the area surrounding the World Trade Center



PART FOUR: STRENGTHENING THE REGION'S ECONOMY

Beyond its contribution to the revitalization of Lower Manhattan, the redevelopment of the World Trade Center benefits New York City's and the New York-New Jersey region's economy in multiple ways.

A MAJOR REGIONAL IMPACT

As with construction, the economic impact of the ongoing operations of the World Trade Center and its tenant companies ripples outward from Lower Manhattan to encompass the entire region. We estimate that when the World Trade Center is fully built out and occupied (that is, in 2025), tenant companies and others doing business at the site will:

- Directly employ more than 51,000 people (on an FTE basis), with aggregate wages and salaries totaling more than \$7.33 billion (in 2015 dollars); and
- Directly generate \$19.66 billion in economic output.

Using IMPLAN, we can also measure the indirect and induced (or “multiplier”) effects of ongoing operations at the World Trade Center. We estimate that in 2025, ongoing operations at the site will indirectly account for:

- More than 77,000 FTE jobs with companies throughout the New York-New Jersey region, with aggregate wages and salaries totaling \$5.73 billion (in 2015 dollars); and
- \$14.13 billion in regional economic output.

Combining these direct and indirect effects, we estimate that when it is fully built out and occupied, companies doing business at the World Trade Center (as shown below in Table 5) will directly and indirectly account for:

- More than 128,000 FTE jobs in the New York-New Jersey region, with \$13.0 billion in earnings (in 2015 dollars); and
- Nearly \$33.8 billion in regional economic output.

Table 5: Estimated impact of WTC operations, 2025 (jobs in FTE, dollar values in millions of 2015 dollars)

	Jobs	Wages	Value Added	Output
Direct impact	51,126	\$7,332.0	\$12,286.3	\$19,660.0
Indirect effects	35,308	\$3,119.4	\$4,932.5	\$7,354.9
Induced effects	41,804	\$2,610.4	\$4,419.0	\$6,774.4
TOTAL	128,238	\$13,061.8	\$21,637.8	\$33,789.3

Since some of the redeveloped World Trade Center's initial tenants are moving from other locations in New York City, many of the jobs included in Table 5 do not – at least in the first instance – represent “net new jobs” for New York City or the region. But in the long run, as discussed below, the development of new office space (and in this case, the replacement of space that was lost on September 11, 2001) is essential to the continued growth of New York City's economy.

MEETING THE DEMAND FOR NEW OFFICE SPACE

Over time, the continued growth of New York's office-based industries depends on continued growth and replenishment in the City's stock of office space. To support an average annual increase of 1.5 percent in office-based employment from now through 2025, New York City will need to provide space for about 208,000 additional workers. If we assume an average of 200 square feet per worker, this translates into a need for more than 41 million square feet over the next ten years. Some of this demand, of course, can be met through leasing of existing, currently vacant space. Offsetting this possibility, however, is the reality that about 1 to 2 million square feet of the City's existing supply of office space will be lost each year through the demolition of older buildings or their conversion to residential use.

To accommodate potential growth in its office-based industries – and at the same time, to maintain a high enough vacancy rate to ensure that space is available when companies need it, and to avoid rapid escalation of office rents – New York City will probably need to develop at least 35 to 40 million square feet of new office space during the next ten years.

The need for new office space, however, is not simply a matter of increasing the total supply of such space. New York's existing inventory is old, and getting older. According to data obtained from Costar (as shown below in Figure 4), buildings that are less than 20 years old account for less than 7 percent of Manhattan's total supply of office space, while 65 percent of all such space is in buildings that are at least 50 years old.

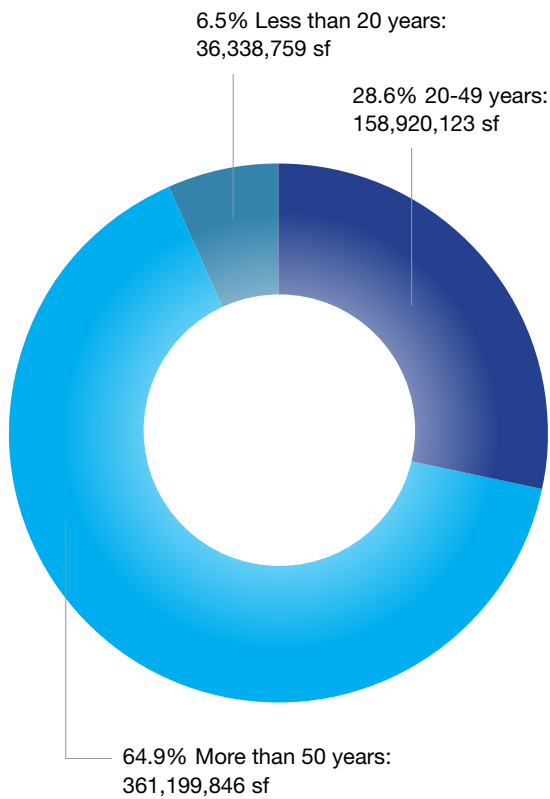
New York City's competitiveness as a location for leading companies in high-value industries depends in part on the availability of modern, flexible, technologically advanced office space. Such space is essential to accommodate changes in how these companies function, and how their employees work.

Since 2007, SPI and the PA have completed the development of about 7 million square feet of new office space at the World Trade Center; and by 2020 will deliver about 5.3 million square feet of additional space in Towers 2 and 3.

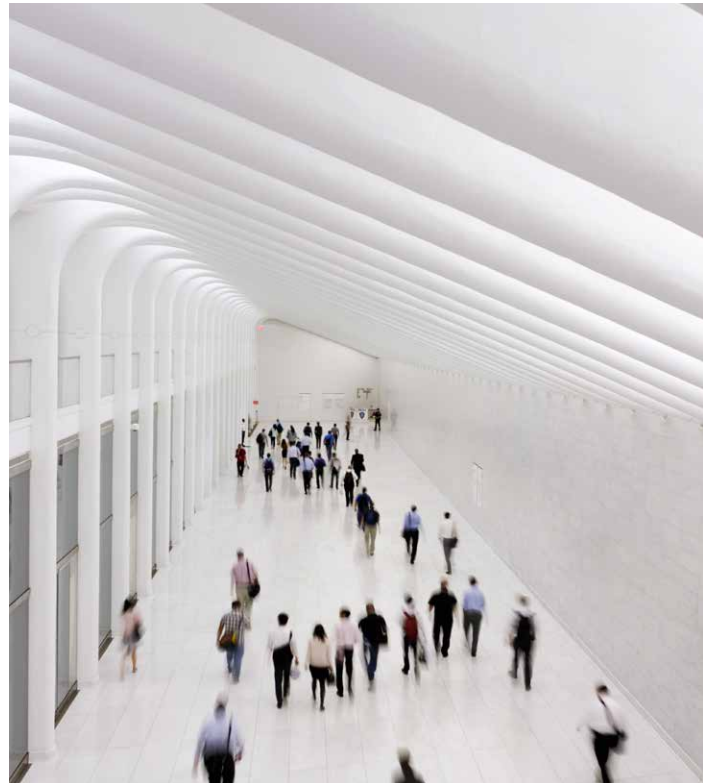


The World Trade Center has thus made a major contribution in recent years to meeting New York City's and the region's need (both quantitative and qualitative) for new office space. By adding more than 12 million square feet of office space to the Manhattan market between 2005 and 2020, the World Trade Center is helping to support the continued growth of the City's and the region's high-value industries, well into the next decade and beyond.

Figure 5: Composition of Manhattan's supply of office space, by age of building



Moreover, by providing a critical mass of such space in one highly accessible location, the World Trade Center is helping to create a new clustering of media, information, technology and business and professional service companies along with amenities and support services that will encourage these firms to stay and grow – and encourage their workers to live – in the New York-New Jersey region.



ACCESS TO A SKILLED LABOR POOL; ACCESS TO HIGH-QUALITY JOBS

The rebuilding of the World Trade Center has (as noted above) provided highly-paid jobs to thousands of workers each year in construction and related industries. And when the complex is completed and occupied, its operations and those of its tenant companies will directly provide more than 51,000 FTE jobs in a wide range of industries, with average earnings across all industries of more than \$143,000 per FTE.

The World Trade Center's value to New York City and the region as a center of high-quality employment is enhanced by its accessibility from neighborhoods throughout the City and communities elsewhere in the region. The complex is served either directly or at the Fulton Center by eleven subway lines (A, C, E, 1, 2, 3, 4, 5, J, Z and R) and two PATH lines (to Newark and Hoboken), and with the Hudson River ferry network just two blocks to the west in Battery Park City.

Figure 6 maps census tracts within the region whose residents can reach the World Trade Center via mass transit in 45 minutes or less. As Table 6 shows, as of 2013 the population of this area was estimated to be nearly 4.3 million, including 2.33 million working-age residents who were counted as being in the labor force.

Figure 6: Census tracts within a 45 minute public transit commute to the WTC

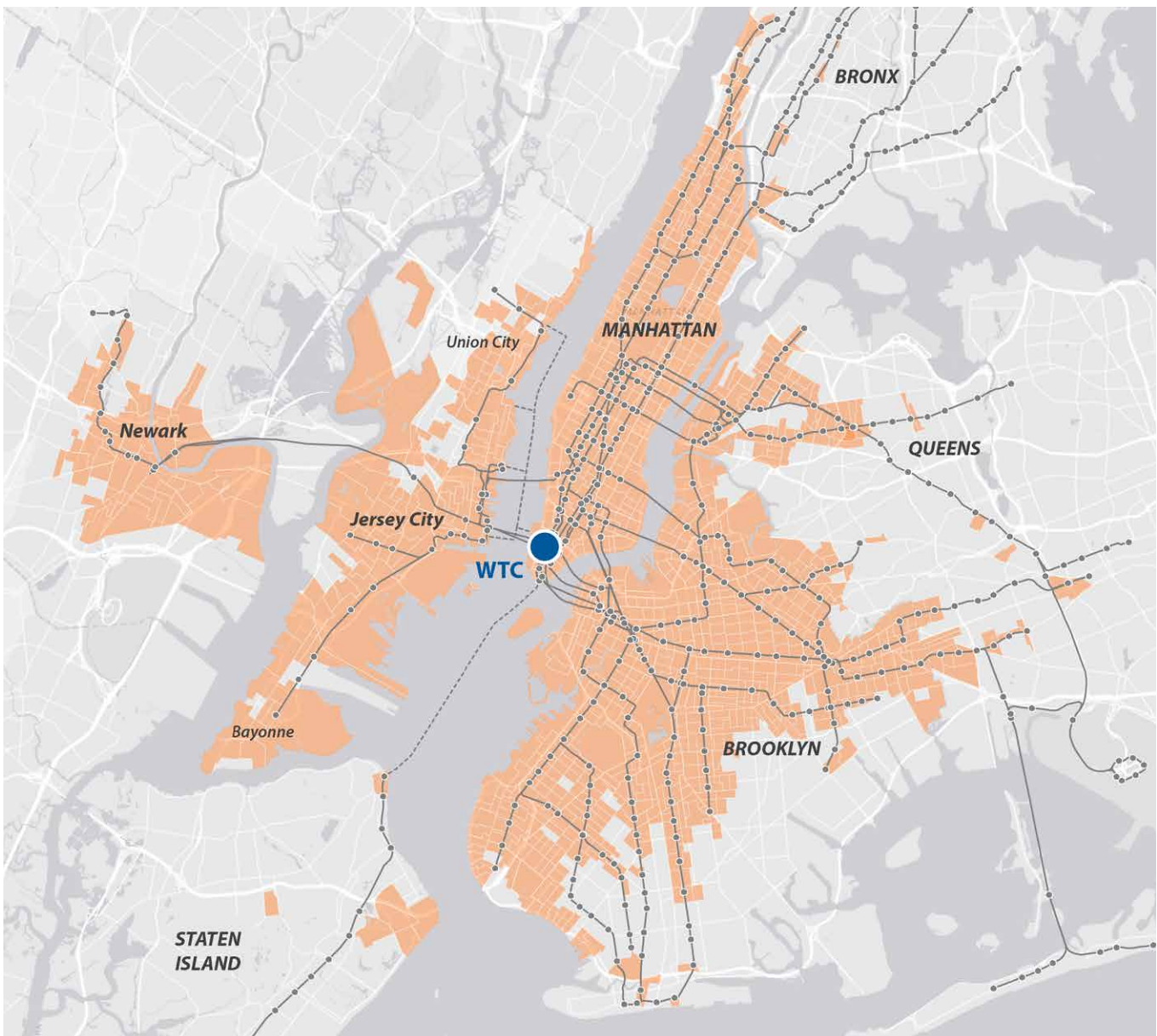


Table 6: Population within a 45 minute public transit commute to the WTC, by county, 2013

County	Total Population	In Labor Force
Manhattan	1,485,505	875,634
Brooklyn	1,799,628	901,086
Queens	346,710	195,892
Bronx	46,088	19,969
Staten Island	18,075	8,742
Hudson County, NJ	481,753	274,603
Essex County, NJ	118,506	57,874
TOTAL	4,296,265	2,333,800

Source: ACS 2009-2013 5-Year Estimate

These connections make the World Trade Center a place of opportunity for residents of New York City and northeastern New Jersey, and offer World Trade Center tenant companies easy access to the nation's largest concentration of highly skilled workers.

PATH and ferry access is particularly important for connecting the World Trade Center to New Jersey. Data on where Lower Manhattan workers live, and patterns of commutation to the World Trade Center prior to 2001 suggest that 20 percent or more of all those eventually employed at the World Trade Center – more than 10,200 people – are likely to be New Jersey residents. Easy connections to the World Trade Center (and Lower Manhattan as a whole) also make the New Jersey waterfront a more attractive place to live, work and do business.

CONTRIBUTION TO CITY AND STATE TAX REVENUES

In addition to generating jobs, wages and economic output, the ongoing operations of the World Trade Center and its tenants will be a significant source of tax revenues, including:

- Payments in lieu of taxes paid to the City by the PA;
- Personal income taxes paid by City residents employed at the World Trade Center;
- Corporation and Unincorporated Business Taxes paid by companies doing business at the World Trade Center; and
- The City's share of sales taxes paid on purchases from World Trade Center retailers and restaurants and at One World Observatory.

As Table 7 shows, we estimate that by 2025, taxes and PILOT payments generated directly by ongoing operations at the World Trade Center will total more than \$352 million annually (in 2015 dollars).

Table 7: Summary of the WTC's estimated contribution to New York City tax revenues, 2025 (in millions of 2015 dollars)

Tax	FY 2025 Amount
WTC PILOT	\$64.40
Personal income tax	\$183.30
Corporation and UBT	\$60.80
Sales tax	\$44.40
TOTAL	\$352.90

Sources: NYC Office of Management and Budget, NYC Department of Finance and Applesseed calculations

Similarly, as shown in Table 8, we estimate that New York State will realize \$449 million in personal income, sales and corporate taxes.

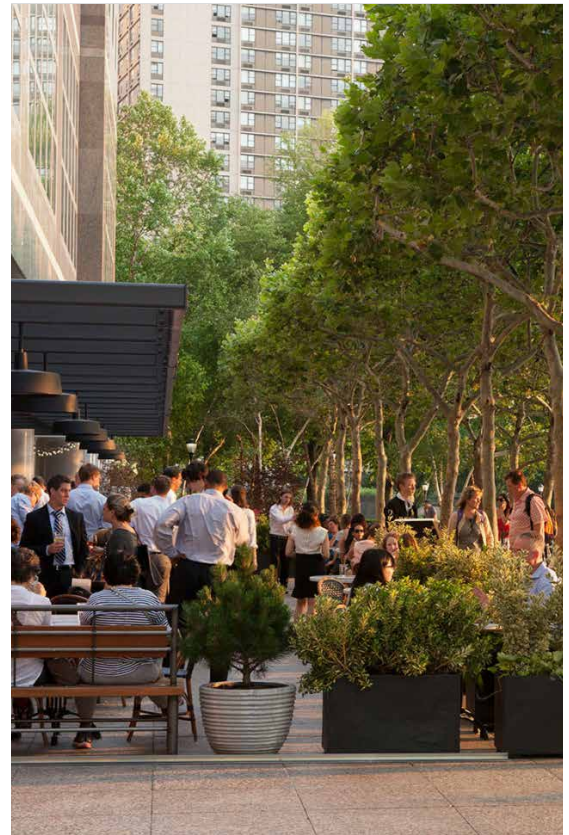
Table 8: Summary of the WTC's estimated contribution to New York State tax revenues, 2025 (in \$ millions)

Tax	FY 2019 Amount
Personal income tax	\$388.40
Corporate franchise tax	\$17.40
Sales tax	\$43.20
TOTAL	\$449.00

Sources: New York State Budget Division and Applesseed calculations

As with employment, not all of the tax revenues derived from ongoing operations at the World Trade Center will in the first instance be “net new” revenue for the City and the State. But as the midtown office space vacated by Condé Nast, GroupM and other firms moving to the World Trade Center becomes available to support the continued growth of New York’s office-based industries, the distinction between the World Trade Center’s net new and total contribution gradually disappears.

Although it is more difficult to quantify, redevelopment and ongoing operations of the World Trade Center will have a positive fiscal impact in New Jersey as well – through property, sales and other taxes paid by New Jersey residents working at the World Trade Center, and through taxes generated by New Jersey’s share of the complex’s indirect and induced effects.



CONCLUSION:

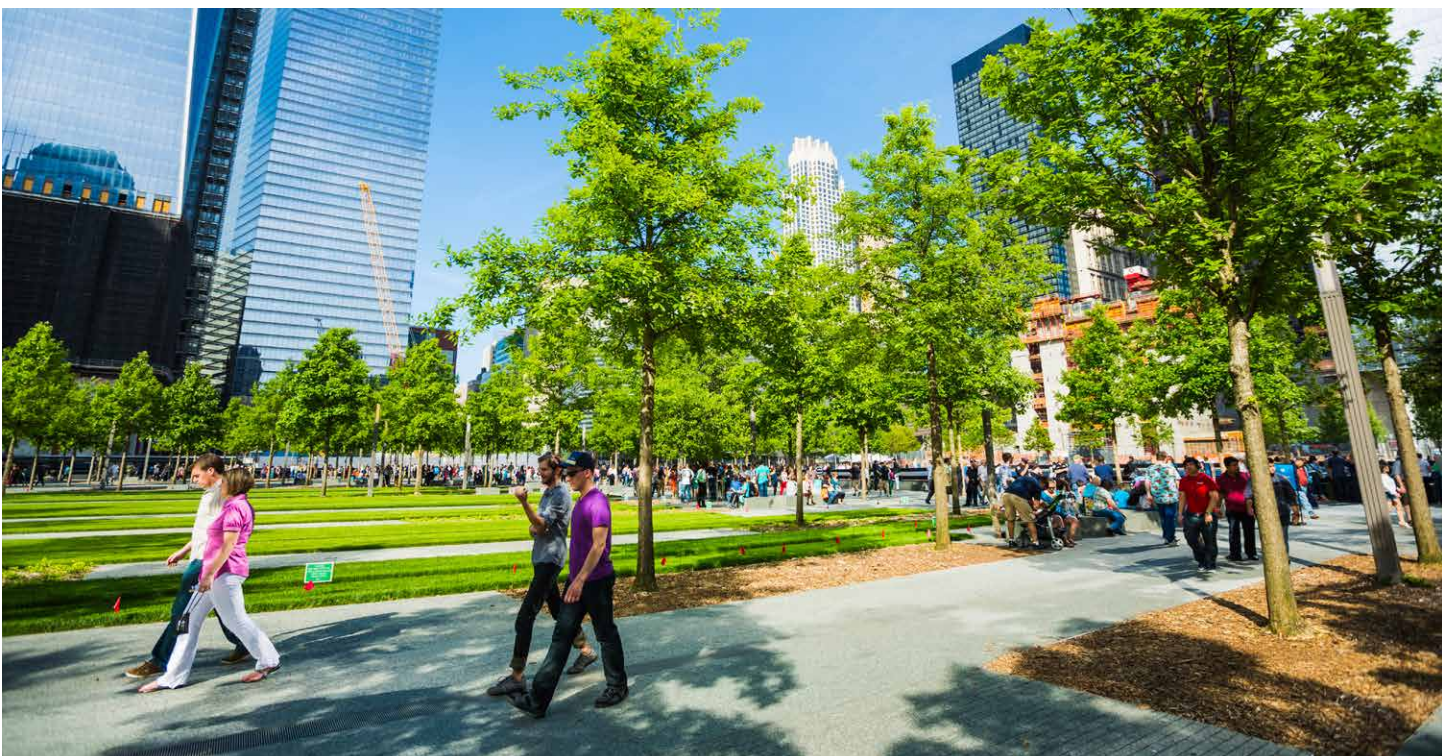
THE LONG-TERM IMPACT OF THE REDEVELOPMENT OF THE WORLD TRADE CENTER

The September 11, 2001 attack on the World Trade Center and the Pentagon changed the nation and the world. The death of almost three thousand individuals at the site is a permanent source of loss and grief from which there is no recovery. The September 11 Memorial and Museum was created to honor those who gave their lives and to provide a setting for the families and friends to recognize their painful loss.

For the PA, rebuilding the site has required balancing competing visions, coordinating jurisdictional conflicts, and accommodating the needs of commercial development, security, and transportation infrastructure on a complex and difficult construction site.

This report highlights the results to date of more than a decade of efforts to plan and redevelop the World Trade Center site, and the further results that lie ahead. Despite intense debates, a messy planning process, and the challenge of financing new development during uncertain economic times, the decisions made among the PA, the two States and the City have brought to life a successful multi-use development that strengthens Lower Manhattan and the surrounding communities in New Jersey and New York.

Most important, the redevelopment of the World Trade Center has created employment opportunities that serve the entire New York-New Jersey region. This is largely due to the unmatched transportation infrastructure at and surrounding the World Trade Center site. Eleven subway lines, direct service on the PATH system and a network of trans-Hudson ferry services make the World Trade Center one of the most accessible office locations in the western hemisphere.



The New York City-owned and operated Staten Island Ferry is within walking distance at the southern tip of Manhattan. For automobile access, the site's proximity to the Hugh L Carey Tunnel and to the Holland Tunnel make its location on the western edge of Lower Manhattan a distinct asset.

Without the new public and private investment at the World Trade Center site, the remarkable surge of housing construction in Jersey City and downtown Manhattan during the past decade probably would not have occurred on anything like its current scale. Without the creation of the September 11 Memorial and Museum, the sharp increase in visitors to Lower Manhattan would similarly not have occurred. Within a relatively short period of time, the September 11 Memorial and Museum together have eclipsed long established cultural institutions with regard to the number of visitors each year.

The up-front costs incurred by the PA in rebuilding have been high. Nevertheless, our analysis suggests that the PA is likely to recover, on a net present value basis, almost all of the money it has invested from its own resources in the World Trade Center. Moreover, the complex will for decades to come be a major generator of tax revenues for both New York City and New York State (and to a lesser extent, for New Jersey). Ten years ago, no one anticipated that redevelopment of the World Trade Center would produce such a favorable set of outcomes.

In hindsight, it is clear that with better planning and with different decisions at some key points, the PA might have been able to reduce its costs (and perhaps increase its revenues) to the point that redevelopment of the World Trade Center might have become a modestly profitable undertaking. And it is clear as well that for several years the high up-front costs incurred by the PA limited its capacity to address other needs. Nevertheless, it is important to remember that for good reasons, not committing the resources needed to redevelop the World Trade Center site was never an option.

Had the PA not been willing to make a significant commitment to the project, or had the two states not been willing to let it do so, it is probably no exaggeration to say that the site today would consist of 7 World Trade Center, the September 11 Memorial, and acres of barren ground.

Much still remains to be done. But even with all the problems that have plagued the redevelopment process, our answer to the question "Was it worth it?" is unequivocally "yes." The PA and its partners are homing in on completion of a project that will produce lasting value for decades to come – for New York City, for the New York-New Jersey region and for the PA itself.

