

# **West 108<sup>th</sup> Street Development Parking Study**

**March 2016; Revised June 2016**



## Table of Contents

	Page
<b>1 Background.....</b>	<b>1</b>
<b>2 Existing Use and Capacity .....</b>	<b>2</b>
<b>3 Local Parking Supply .....</b>	<b>9</b>
<b>4 Feasibility of On-Site Parking Replacement.....</b>	<b>14</b>

## Table of Figures

	Page
Figure 1 West 108 <sup>th</sup> Street Development Study Area.....	1
Figure 2 Occupancy Survey Schedule .....	2
Figure 3 Garage Parking Supply.....	2
Figure 4 Parking Fees at West 108 <sup>th</sup> Street Garages.....	3
Figure 5 Average Parking Utilization at West 108 <sup>th</sup> Street Garages .....	3
Figure 6 Average Occupied Parking Spaces at West 108 <sup>th</sup> Street Garages.....	4
Figure 7 Parking Utilization at West 108 <sup>th</sup> Street Garages by Survey Period.....	4
Figure 8 Occupied Parking Spaces at West 108 <sup>th</sup> Street Garages.....	5
Figure 9 Parking Utilization at West 108 <sup>th</sup> Street Garages.....	6
Figure 10 Residential Zip Codes of Monthly Parking Subscribers at West 108 <sup>th</sup> Street Garages .....	7
Figure 11 Residential Zip Codes of Monthly Parking Subscribers at West 108 <sup>th</sup> Street Garages .....	8
Figure 12 Off-Street Public Parking Supply.....	10
Figure 13 Off-Street Public Parking Supply (12 block radius).....	11
Figure 14 Average Catchment Area Vacant Parking Spaces.....	13
Figure 15 Conceptual Diagram of Below-Grade Self-Park Operations ( <i>diagram represents floor area allowance, not building plan</i> ) .....	15
Figure 16 Conceptual Diagram of Below-Grade Valet-Parked Operations ( <i>diagram represents floor area allowance, not building plan</i> ) .....	16
Figure 17 Conceptual Diagram of Below-Grade Mechanical Stackers ( <i>diagram represents floor area allowance, not building plan</i> ) .....	17
Figure 18 Conceptual Diagram of Below-Grade Automated Parking Operations ( <i>diagram represents floor area allowance, not building plan</i> ) .....	17
Figure 19 Conceptual Diagram of Below-Grade Automated Parking Operations with Full Lot Coverage ( <i>diagram represents floor area allowance, not building plan</i> ) .....	18
Figure 20 Conceptual Diagram of Below-Grade Valet Operations with Full Lot Coverage ( <i>diagram represents floor area allowance, not building plan</i> ) .....	19
Figure 21 Conceptual Diagram of Multi-Level Below-Grade Automated Parking Operations with Full Lot Coverage ( <i>diagram represents floor area allowance, not building plan</i> ) .....	20

## WEST 108TH STREET DEVELOPMENT PARKING STUDY

Figure 22	Conceptual Diagram of Multi-Level Below-Grade Valet Operations with Full Lot Coverage ( <i>diagram represents floor area allowance, not building plan</i> ).....	21
Figure 23	Estimated Construction Costs for Parking Supply and Operations.....	23
Figure 24	Estimated Pricing to Recover Parking Costs and Achieve Profit.....	24

# 1 BACKGROUND

Two development sites on West 108th Street between Amsterdam Avenue and Columbus Avenue in Manhattan are currently under consideration for the development of affordable housing. Development Site 1 includes two lots owned by the New York City Department of Housing Preservation and Development (HPD), and one lot owned by West Side Federation for Senior and Supportive Housing (WSFSSH) and operated as the Valley Lodge shelter, shown in Figure 1. Development Site 2 is owned by HPD. Currently, the three HPD lots are occupied by multistory parking structures operated on month-to-month leases.

The new development will include demolition of the three garages in order to redevelop the site for affordable housing and a ground level community/public use. Nelson\Nygaard was retained by WSFSSH under the auspices of HPD to research existing parking conditions and potential future parking considerations. This report specifically addresses: existing use and capacity of West 108th Street garages, local parking availability, and the feasibility of providing replacement parking on-site as part of the new affordable housing developments.

**Figure 1**    **West 108<sup>th</sup> Street Development Study Area**



The study findings were originally drafted in March 2016 and presented to Community Board 7 at a meeting on March 16, 2016. The study was updated based on additional feedback received and data collected, including:

- An occupancy survey of parking facilities in the catchment area was completed with garage representatives;
- Diagrams illustrating the replacement parking scenarios;
- Additional scenarios for replacement parking were investigated; and
- Updated construction costs and parking fees based on new data received.

## 2 EXISTING USE AND CAPACITY

### Methodology

Nelson\Nygaard undertook an assessment of the inventory and occupancy of parking spaces in the three garages on West 108<sup>th</sup> Street shown in Figure 1 on February 2-4, 2016. The occupancy counts were conducted during a.m. and p.m. peak periods, as well as evening, as shown in Figure 2. Surveys were conducted on weekdays, not including Monday or Friday, in order to minimize the impact of weekend vehicle use on occupancy rates.<sup>1</sup>

**Figure 2      Occupancy Survey Schedule**

Date	A.M. Peak	P.M. Peak	Evening
Tuesday , February 2, 2016	7:30 AM - 8:30 AM	5:30 PM - 6:30 PM	8:30 PM - 9:30 PM
Wednesday, February 3, 2016	7:30 AM - 8:30 AM	5:30 PM - 6:30 PM	8:30 PM - 9:30 PM
Thursday, February 4, 2016	7:30 AM - 8:30 AM	5:30 PM - 6:30 PM	8:30 PM - 9:30 PM

### Study Area Parking Supply

Currently, 675 off-street spaces are officially listed in the garages, as shown in Figure 3 below. Since the garages are operated with valet parking, however, the total capacity of each facility is dependent on how efficiently vehicles are parked; more vehicles can be parked on each floor if distance between cars is minimized. While some may find a valet parking arrangement less convenient, valet operations have become fairly common in NYC and other large city parking garages. Observations of existing occupancy and potential capacity indicate that vehicles parked inside can exceed the official capacity if aisles and elevator access are used.

**Figure 3      Garage Parking Supply**

Garage Lot	Garage Name	Address	Parking Spaces Listed	Floors
Lot 5	HRF Operating Corp.	151-159 W 108 <sup>th</sup> St	250	5
Lot 13	E. & B. Operating Corp.	143 W 108 <sup>th</sup> St	300	6
Lot 26	Ca-Li Automatic Transmission Corp.	103 W 108 <sup>th</sup> St	125	3
Overall			675	

### Study Area Parking Fees

Figure 4 presents a summary of parking fees for each of the West 108<sup>th</sup> Street garages. The garages on lot 5 and lot 13 are operated by the same company and share the parking fee structure: a base rate of \$372 per month for small vehicles, \$17 for up to 24 hours, and \$9 for up to 2 hours. The garage at lot 26

<sup>1</sup> Due to a blizzard on January 22-24, the surveys originally scheduled for January 26-28, 2016 were postponed to allow time for snow clearance and drivers to resume typical use of vehicles.

## WEST 108TH STREET DEVELOPMENT PARKING STUDY

charges similar rates for monthly and daily parking, but higher rates for 24-hour parking. All fees include New York City's 18.375% parking tax, not the reduced long-term parking tax rate of 10.375% for Manhattan residents who register their cars in Manhattan.

**Figure 4**      **Parking Fees at West 108<sup>th</sup> Street Garages**

Garage	Monthly	24 hours	Day Rate	2 hours
Lot 5	\$372	\$17	\$12	\$9
Lot 13	\$372	\$17	\$12	\$9
Lot 26	\$385	\$30	\$12	\$10

### **Study Area Parking Utilization**

Utilization surveys were conducted during three time periods that commonly exhibit levels of overall demand, representing weekday peaks:

- 7:30 a.m. – 8:30 a.m. (a.m. peak)
- 5:30 p.m. – 6:30 p.m. (p.m. peak)
- 8:30 p.m. – 9:30 p.m. (evening)

Figure 5 and Figure 6 present a comparison of overall utilization levels observed during these various time periods at each garage and overall, while Figure 7 shows the parking utilization at each survey period. Overall, the parking garages are well-utilized during all periods. Target occupancy rates of 90% are effective industry standards for off-street parking, which help ensure that off-street facilities maintain adequate maneuverability and availability for daily parking demand. Based on these broad utilization measures, a few patterns are worth noting:

- The maximum parking occupancy observed was 99% (667 vehicles) during the Tuesday a.m. peak period. Parking occupancy never exceeded the listed capacity of 675 spaces for the West 108<sup>th</sup> Street garages combined.
- Off-street parking at lot 5 consistently exceeds marked spaces in the garage, owing to valet parking operations which maximize use of overall floor space.
- Parking utilization is highest during the a.m. peak period, partially attributable to higher occupancy rates on Tuesday. This may be attributable to fewer people using their cars following the blizzard on January 22-24 and the suspension of alternate side parking through January 29.

Parking occupancy counts and utilization rates for each survey period are provided in Figure 8 and Figure 9.

**Figure 5**      **Average Parking Utilization at West 108<sup>th</sup> Street Garages**

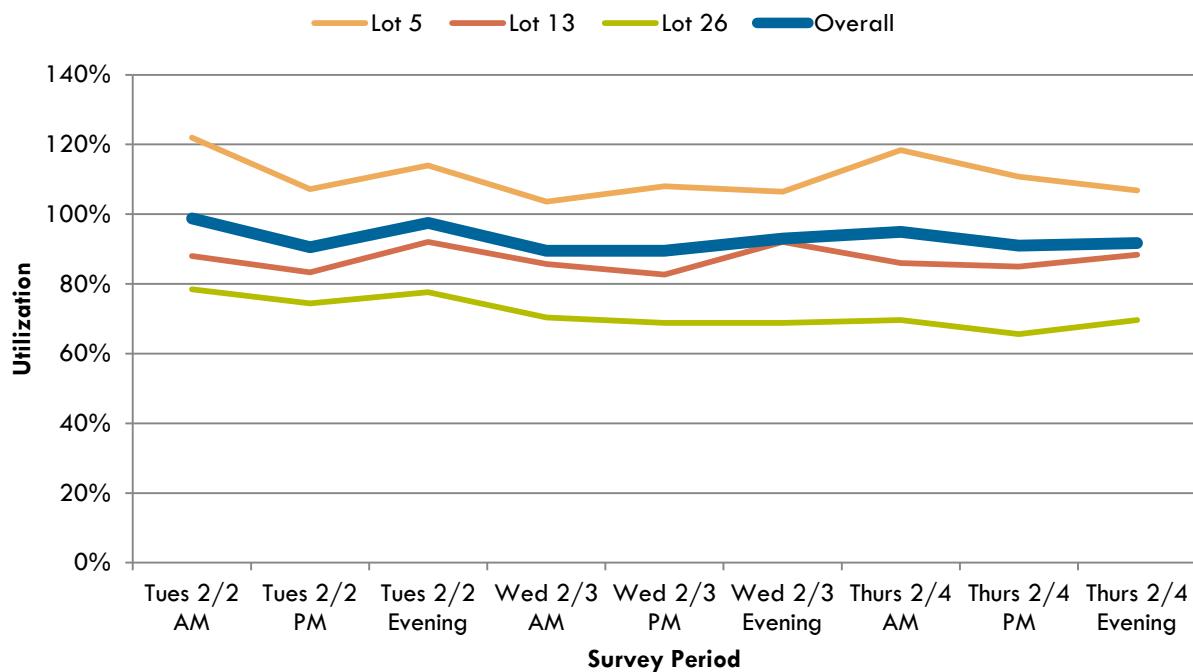
Garage	AM Peak 7:30 AM - 8:30 AM	PM Peak 5:30 PM - 6:30 PM	Evening 8:30 PM - 9:30 PM
Lot 5	115%	109%	109%
Lot 13	87%	84%	91%
Lot 26	73%	70%	72%
<b>Overall</b>	<b>94%</b>	<b>90%</b>	<b>94%</b>

## WEST 108TH STREET DEVELOPMENT PARKING STUDY

**Figure 6**      Average Occupied Parking Spaces at West 108<sup>th</sup> Street Garages

Garage	AM Peak 7:30 AM - 8:30 AM	PM Peak 5:30 PM - 6:30 PM	Evening 8:30 PM - 9:30 PM
Lot 5	287	272	273
Lot 13	260	251	272
Lot 26	91	87	90
Overall	637	610	635

**Figure 7**      Parking Utilization at West 108<sup>th</sup> Street Garages by Survey Period



**WEST 108TH STREET DEVELOPMENT PARKING STUDY**

**Figure 8 Occupied Parking Spaces at West 108<sup>th</sup> Street Garages**

Day	Tuesday 2/2/2016			Wednesday 2/3/2016			Thursday 2/4/2016		
	AM	PM	Evening	AM	PM	Evening	AM	PM	Evening
<b>Lot 5 (151-159 W 108<sup>th</sup> St) – 250 listed spaces</b>									
Basement	52	35	33	29	28	27	32	40	35
Floor 1	57	41	39	40	38	32	58	44	38
Floor 2	61	63	68	65	69	69	67	64	65
Floor 3	64	64	69	58	69	71	66	63	63
Floor 4	71	65	76	67	66	67	73	66	66
<b>Total</b>	<b>305</b>	<b>268</b>	<b>285</b>	<b>259</b>	<b>270</b>	<b>266</b>	<b>296</b>	<b>277</b>	<b>267</b>
<b>Lot 13 (143 W 108<sup>th</sup> St) – 300 listed spaces</b>									
Basement	44	41	45	47	47	55	48	47	44
Floor 1	37	32	41	30	26	37	36	34	38
Floor 2	41	38	37	37	36	40	40	35	40
Floor 3	46	47	47	45	47	46	43	46	48
Floor 4	56	44	60	49	46	52	48	51	49
Floor 5	40	48	46	49	46	46	43	42	46
<b>Total</b>	<b>264</b>	<b>250</b>	<b>276</b>	<b>257</b>	<b>248</b>	<b>276</b>	<b>258</b>	<b>255</b>	<b>265</b>
<b>Lot 26 (103 W 108<sup>th</sup> St) – 125 listed spaces</b>									
Floor 1	23	22	20	18	19	19	17	18	24
Floor 2	38	37	42	36	33	33	36	34	33
Floor 3	37	34	35	34	34	34	34	30	30
<b>Total</b>	<b>98</b>	<b>93</b>	<b>97</b>	<b>88</b>	<b>86</b>	<b>86</b>	<b>87</b>	<b>82</b>	<b>87</b>
<b>All West 108<sup>th</sup> Street Garages – 675 listed spaces</b>									
<b>Overall</b>	<b>667</b>	<b>611</b>	<b>658</b>	<b>604</b>	<b>604</b>	<b>628</b>	<b>641</b>	<b>614</b>	<b>619</b>

**WEST 108TH STREET DEVELOPMENT PARKING STUDY**

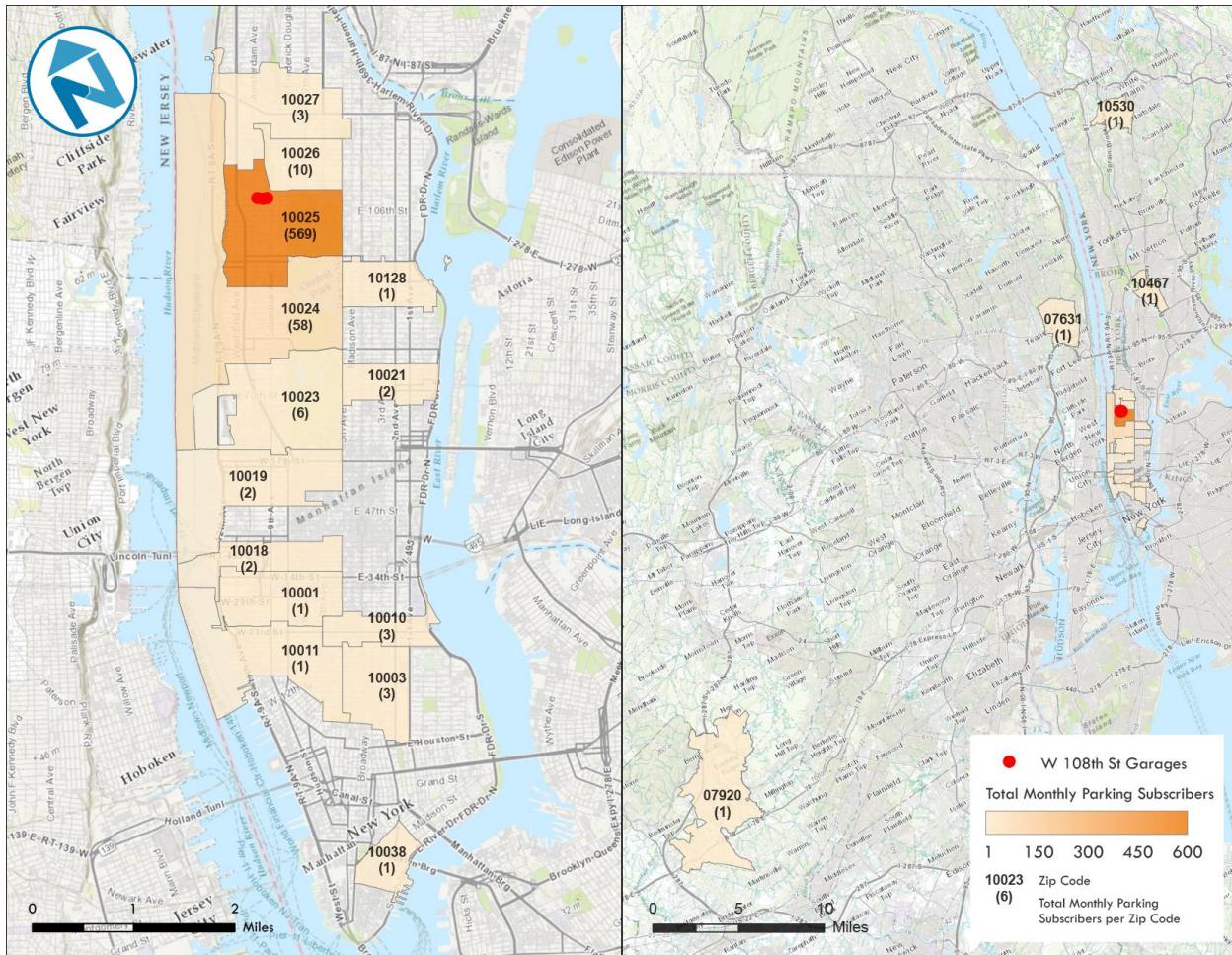
**Figure 9**      **Parking Utilization at West 108<sup>th</sup> Street Garages**

Day	Tuesday 2/2/2016			Wednesday 2/3/2016			Thursday 2/4/2016		
	AM	PM	Evening	AM	PM	Evening	AM	PM	Evening
<b>Lot 5 (151-159 W 108<sup>th</sup> St) – 250 listed spaces</b>	122%	107%	114%	104%	108%	106%	118%	111%	107%
<b>Lot 13 (143 W 108<sup>th</sup> St) – 300 listed spaces</b>	88%	83%	92%	86%	83%	92%	86%	85%	88%
<b>Lot 26 (103 W 108<sup>th</sup> St) – 125 listed spaces</b>	78%	74%	78%	70%	69%	69%	70%	66%	70%
<b>All West 108<sup>th</sup> Street Garages – 675 listed spaces</b>	99%	91%	97%	89%	89%	93%	95%	91%	92%

## Origin of Monthly Parking Subscribers

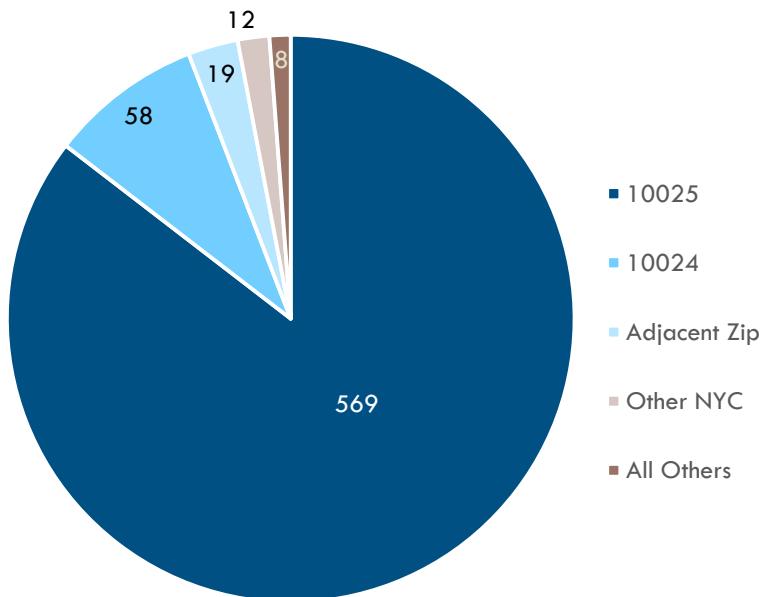
Limited information is available from garage owners on the origin locations of people parking at the West 108<sup>th</sup> Street garages. A list of residential zip codes of monthly parking subscribers was requested of each garage owner and received for all lots, indicating a total of 666 monthly parking subscribers at the garages. Available data is mapped in Figure 10 and summarized in Figure 11, indicating that monthly parking subscriptions are predominantly registered to addresses in the 10025 zip code, which encompasses the West 108<sup>th</sup> Street garages, followed by the 10024 zip code. This suggests that monthly parking subscribers are predominantly local, potentially storing vehicles in the garage near their home. The available data does not include patrons who use the garages for periods less than one month, which may include visitors and occasional commuters.

**Figure 10 Residential Zip Codes of Monthly Parking Subscribers at West 108<sup>th</sup> Street Garages**



## WEST 108TH STREET DEVELOPMENT PARKING STUDY

Figure 11 Residential Zip Codes of Monthly Parking Subscribers at West 108<sup>th</sup> Street Garages



## 3 LOCAL PARKING SUPPLY

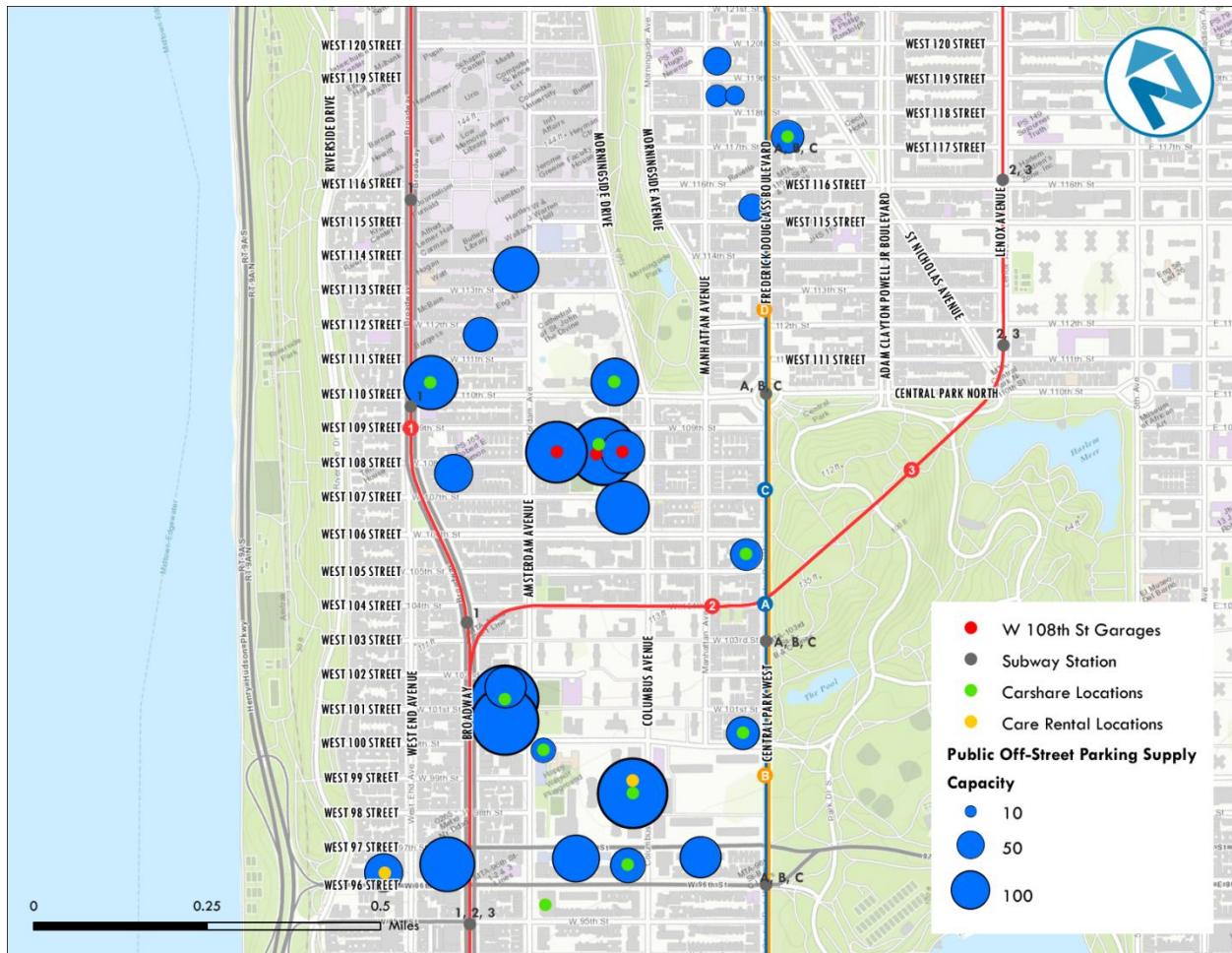
This section describes the public off-street parking supply found within a maximum distance of 12 blocks, or approximately 0.6 miles, of the West 108<sup>th</sup> Street garages. This catchment area covers much of the 10025 zip code in which many monthly parking subscribers live, and represents a 12-15 minute walking radius of the West 108<sup>th</sup> Street garages. This catchment area captures those who might engage in typical everyday walk access, and also includes those occasional users who might be willing to travel greater distances to access the garages.

Figure 12 provides a visual summary of the public off-street parking supply in the catchment area. This data, provided by the New York City Department of Consumer Affairs (DCA), represents parking spaces that are available to anyone. As shown in Figure 13, the West 108th Street garages represent 675 parking spaces, or 19% of the off-street public parking supply in the catchment area. As noted previously, the data represents DCA's listed parking capacity or marked spaces, which may differ from the number of spaces available based on each garage's floor area and type of operations. Self-park facilities tend to provide a fixed number of marked spaces, while valet operations may allow a garage to park more vehicles than its listed capacity.

In addition to public parking facilities, car share vehicles are available at garages throughout the area. Car sharing is a model of car rental that allows people to rent cars in hourly increments for trips as short or long as desired. The service, operated by ZipCar and Enterprise in this area, is a practical and cost-effective alternative to owning and parking a personal vehicle that is driven less than roughly 6,000 miles per year. Car sharing also reduces the amount of parking spaces necessary to accommodate people who want access to a car occasionally, semi-frequently, and on short notice. In addition, traditional car rental is available at three garages between West 95th and West 99th Streets. The local parking supply does not include garages that are not yet in operation, such as the Champion Parking garage at 400 West 113<sup>th</sup> Street, scheduled to open later in 2016 with 193 spaces.

## WEST 108TH STREET DEVELOPMENT PARKING STUDY

**Figure 12** Off-Street Public Parking Supply



The West 108<sup>th</sup> Street garages are substantially less expensive in comparison to other parking facilities in the area. Figure 13 indicates the garages at lots 5 and 13 charge approximately 50% less than average 24-hour rates and nearly 30% less than average rates for monthly parking.

**WEST 108TH STREET DEVELOPMENT PARKING STUDY**

**Figure 13 Off-Street Public Parking Supply (12 block radius)**

Garage	Address	Capacity	24-Hour Cost	Monthly Cost per Car
<b>West 108<sup>th</sup> Street Garages</b>				
Lot 5 – HRF Operating Corp.	151 W 108 <sup>th</sup> St	250	\$17	\$343
Lot 13 – E. & B. Operating Corp.	137 W 108 <sup>th</sup> St	300	\$17	\$385
Lot 26 – Ca-Li Automatic Transmission Corp.	103 W 108 <sup>th</sup> St	125	\$30	\$343
	<b>West 108<sup>th</sup> St Garages Total</b>	<b>675</b>		
<b>Catchment Area Parking Supply</b>				
1. West 108th Street Parking Garage Corp.	234 W 108th St	98	\$24	\$414
2. SP Plus Corporation	1090 Amsterdam Ave	135	\$37	\$520
3. Quik Park	801 Amsterdam Ave	40	\$31	\$425
4. QP Columbia Garage LLC	2561-2579 Broadway	200	\$38	\$769
5. Standard Parking Corporation	455 Central Park W	66	\$35	\$491
6. Quik Park 808 Garage LLC	808 Columbus Ave	324	\$31	\$404
7. Discover 97 Parking LLC	750 Columbus Ave	80	\$40	\$456
8. Park 115th LLC	2131 Frederick Douglass Blvd	47	\$28	\$375
9. 444 Manhattan Parking Corp.	444 Manhattan Ave	33	n/a	n/a
10. Manhattan Ave. Garage Corp.	454 Manhattan Ave	50	\$25	n/a
11. Rapid Park Industries	911 W 100th St	75	\$35	\$491
12. KRW Operating Corp.	204 W 101st St	300	\$40	\$562
13. KRW Operating Corp.	205 W 101st St	300	\$40	\$562
14. Rapid West 102 Corp.	206 W 102nd St	114	\$40	\$562
15. Oliantha Garage Corp.	102 W 107th St	188	\$17	\$343
16. Manhattan Parking 110 LLC	543 W 110th St	190	\$35	\$500
17. Central Parking System of New York, Inc.	401 W 110th St	148	\$32	\$450
18. 512-520 W. 112th St. Garage Corp.	516 W 112th St	77	\$35	\$474
19. Park 117th, LLC	279 W 117th St	71	\$28	\$350
20. 444 Manhattan Parking Corp.	309 W 118th St	24	n/a	n/a
21. Empire Parking Corp.	303 W 96th St	95	\$39	\$586
22. MP West 97 LLC	120 W 97th St	147	n/a	\$400
23. Kensington Enterprises LLC	50 W 97th St	114	\$45	\$500
	<b>Catchment Area Total</b>	<b>2,916</b>		
	<b>Combined Total</b>	<b>3,591</b>		

## Local Parking Supply Survey

The study included a survey of parking garages in the catchment area in order to collect available data on garage operations, occupancy levels, and parking availability. Surveyors attempted to administer survey questions to garage owners and attendants via phone and in-person surveys. Garage owners and attendants were informed that all responses would be anonymized, including whether or not a garage responded to the survey question. This helped to improve the survey response rate and time.

### Survey Questions

1. Is the garage a valet operation or self-park?
2. What is the maximum capacity of the garage under this condition?
3. How many cars are typically parked in the garage at the following times: 8:00 a.m., 12:00 p.m., 6:00 p.m., and 9:00 p.m. on both weekdays and weekends.
4. Do you have monthly parking subscribers? If yes, how many?
5. Do you have capacity for new monthly parking subscribers? If yes, how many?
6. How much do you charge for monthly parking per car? Per truck? Per van?
7. Would you be willing or able to rent a block of spaces (e.g., 5, 10, 20, or more) at your current rate? If yes, how many space?
8. If you are not able to rent a block of spaces at your current rate, would you be willing or able to rent a block of spaces at a higher rate? If yes, how many spaces? If no, why not?

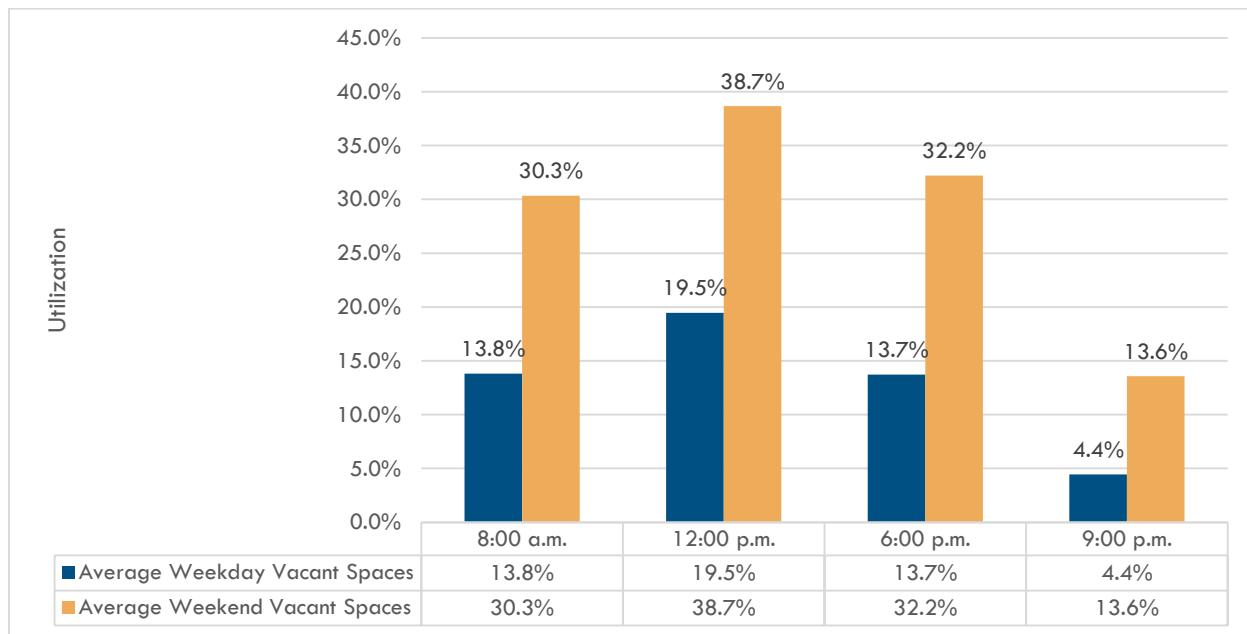
### Key Findings

Of the 23 garages surveyed, 14 garages, or 61%, responded to the survey after multiple attempts to conduct the survey by phone and in person. The following are the key findings of the survey, aggregated to anonymize the individual responses and participation of garage representatives.

- The majority of garages in the catchment area, 21 out of 23 (91%), are valet operated, while the remainder use self-park operations.
- The maximum capacity of garages that responded to the survey is 4.7% higher than the listed capacity, likely due to the ability of valet operations to fit more vehicles than self-park operations.
- Average weekday vacancy of catchment area garages ranges from a high of 19.5% at 12:00 p.m. to a low of 4.4% at 9:00 p.m. as shown in Figure 14, according to garage representatives that responded to the survey.
  - Note: The change in weekday vacancy rates does not necessarily reflect the number of daily car users in the garages. –
- Garage vacancy rates are higher on weekends than weekdays, ranging from a high of 38.7% at 12:00 p.m. to 13.6% at 9:00 p.m., according to garage representatives that responded to the survey.
  - Note: The change in vacancy rates from weekday to weekend does not necessarily reflect the number of weekend car users in the catchment area garages.

## WEST 108TH STREET DEVELOPMENT PARKING STUDY

**Figure 14      Average Catchment Area Vacant Parking Spaces**



- 82% of spaces in catchment area garages are reserved for monthly parking, according to survey respondents.
- 4.9% of monthly parking spaces are currently vacant in catchment area garages, based on a survey of all garages in a 12-block or 0.6 mile radius around the West 108<sup>th</sup> Street garages with a response rate of 61%.
- At a current average rate of \$470 monthly cost for cars, the likely fee for new parkers would be approximately 29% higher than the prices at the West 108<sup>th</sup> Street garages.
- The survey asked garage representatives whether they could hold a block of monthly parking spaces for future use; the majority of survey respondents noted that they would not likely be willing or able to do reserve spaces for future use.

## 4 FEASIBILITY OF REPLACING PARKING ON-SITE

Nelson\Nygaard was asked to assess the parking that could be provided within the footprint of the development sites (the Development Sites), along with estimated construction costs and projected revenue required to support a private parking operation. Variables included the type of parking (self-park, valet-park, automated), the depth of the space and the footprint of the parking lot. These factors impact the number of available spaces and the cost to build them. Figure 23 provides a summary of potential parking options in the new construction. The findings show that the Development Sites would support substantially fewer parking spaces than the existing garages at a much higher rate than the existing lots and other local garages.

Development Site 1 is the larger of the two development sites and has been identified as the location to assess the potential for providing on-site parking. Lot 26 is considered too small to include both affordable housing and parking. Providing below-grade parking on-site would require relocating essential building services and operational facilities, as well as relocating or removing community facilities, which would potentially impact the building or site program, likely resulting in fewer residential units or community facilities, a larger building or some other component of the site.

### Buildable Parking Area

The following assumptions were made for the calculation of parking spaces that could be accommodated within the development plans for Development Site 1:

- A 30,300 square foot lot area, including lot 5, 10, and 13, based on data provided by Dattner Architects.
- Based on the current site plan and program, the building footprint is expected to be 18,000 square feet with below-grade parking within the footprint. The building footprint is estimated to be approximately 300 feet long along West 108<sup>th</sup> Street and 60 feet deep. The full lot coverage is expected to be 27,000 square feet with below-grade parking inside the building footprint and extending towards the rear of the lot. The full lot coverage is estimated to be 300 feet long along West 108<sup>th</sup> Street and 90 feet deep.
- An estimated 1,500 square feet of basement area devoted to building services, including electrical, plumbing, stairs, and elevators.
- An estimated 1,500 square feet of basement area devoted to providing a ramp or elevator from street level at the lowest point of entry on the east side of the building frontage.
- Foundation support walls will be approximately 3 feet thick. Based on the assumed dimensions of the building footprint (300 feet long, 60 feet deep), foundation walls require approximately 2,100 square feet.
- For the full lot coverage, additional structural support for the building above will be required, and 9,000 square feet of additional parking area is assumed.

Based on the above assumptions, we estimate that approximately 12,900 square feet could be available for parking in a potential single-level below-grade garage facility within the new building footprint, or 21,900

square feet could be accommodated within the full lot scenario. Multi-level scenarios are summarized in the following section.

## Potential Parking Capacity

The potential parking capacity for a facility of this size is determined by the type of parking operations and the parking efficiency. A scenario for using mechanical stackers with full lot coverage is not included since the lot depth is not sufficient to allow for three rows of stackers with two access aisles; there would be no additional capacity in that scenario. A scenario for building to the rear lot line is not included as this scenario might not be feasible, and the additional 10' feet of space does not add substantial capacity above the base configuration.

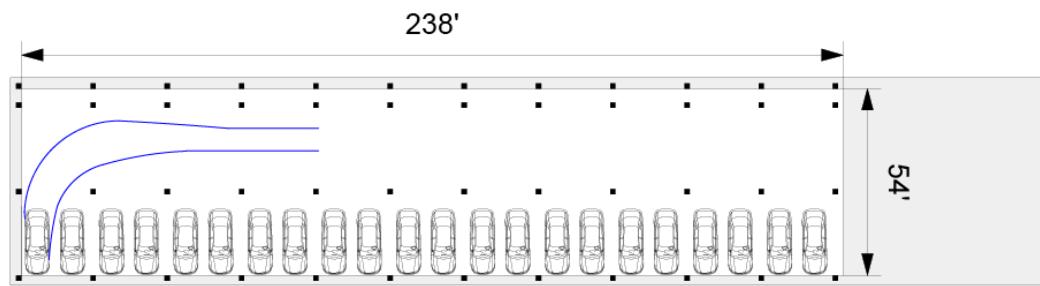
### 1. Below-Grade Self-Park Operations

For the self-park parking capacity analysis, the following assumptions were made:

- 12,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- A single two-way circulation aisle will be used along one side with vehicles parked along the opposite edge. The parking floor area is only deep enough to accommodate a single row of perpendicular parking, while maintaining an access aisle.
- A total depth of one parking level below grade with 7.5 feet clearance for vehicles.

Based on the above assumptions, we estimate that 22 vehicles could be accommodated in a below grade self-park facility. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

**Figure 15      Conceptual Diagram of Below-Grade Self-Park Operations**



*Note: diagram represents conceptual spatial parking allowance, not building plan.*

### 2. Below-Grade Valet-Parked Operations

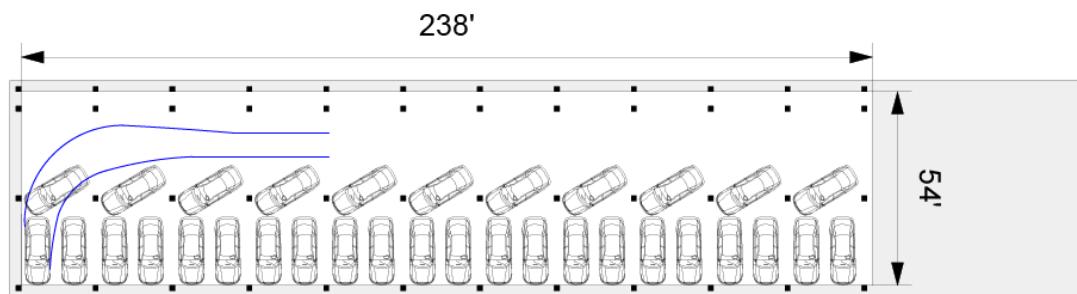
For the valet-parking capacity analysis, the following assumptions were made:

- 12,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.

- Vehicles are parked along one the long edge of the basement. The parking floor area is only deep enough to accommodate a second row of angled parking while maintaining reasonable access for valet operations.
- A total depth of one parking level below grade with 7.5 feet clearance for vehicles.

Based on the above assumptions, we estimate that 33 vehicles can be reasonably accommodated in a below grade valet parking facility. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

**Figure 16 Conceptual Diagram of Below-Grade Valet-Parked Operations**



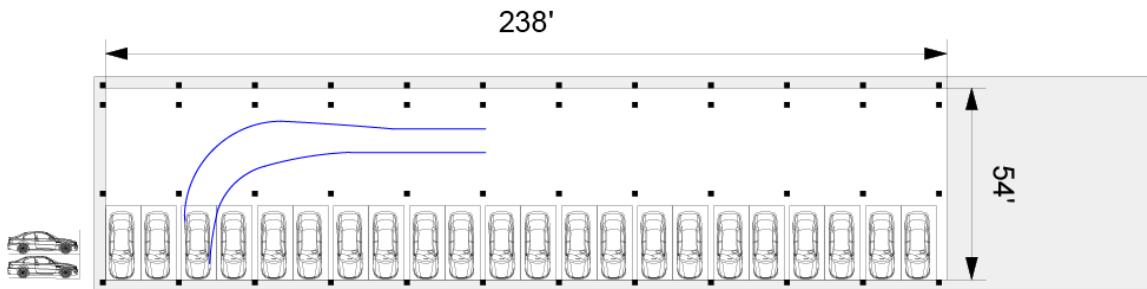
*Note: diagram represents conceptual spatial parking allowance, not building plan.*

### 3. Below-Grade Mechanical Stackers

For the mechanical stackers with valet-parking capacity analysis, the following assumptions were made:

- 12,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- A single two-way circulation aisle will be used along one side with vehicles parked along the opposite edge. The parking floor area is only deep enough to accommodate a single row of mechanical stackers, while maintaining an access aisle.
- A total depth of one parking level below grade with 10.5 feet clearance for stackers.

Based on the above assumptions, we estimate that 44 vehicles can be reasonably accommodated in a below grade valet parking facility. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

**Figure 17** Conceptual Diagram of Below-Grade Mechanical Stackers

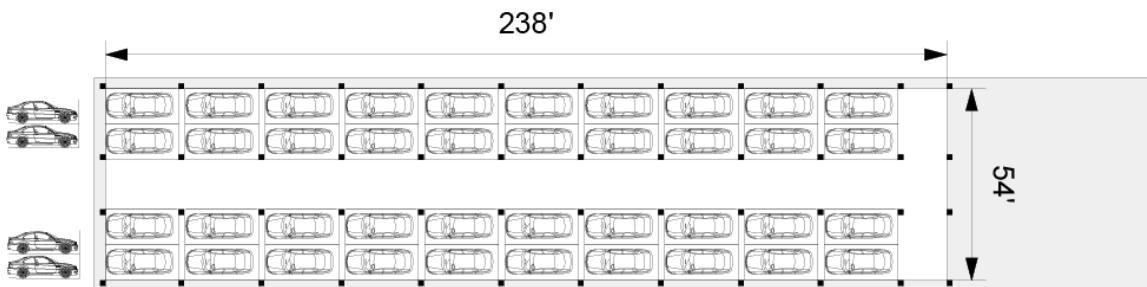
*Note: diagram represents conceptual spatial parking allowance, not building plan.*

#### 4. Below-Grade Automated Parking Operations

For the automated parking capacity analysis, the following assumptions were made:

- 12,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- A single circulation aisle will be used to access vehicles.
- 400 square feet required for a transfer area where users park the vehicle and exit. The transfer area could also utilize space dedicated to a ramp depending on the design of the site.
- A total depth of one parking level below grade with 14.5 feet clearance for two levels of parking.

Based on the above assumptions, we estimate that 80 vehicles can be reasonably accommodated in a below grade automated parking facility. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

**Figure 18** Conceptual Diagram of Below-Grade Automated Parking Operations

*Note: diagram represents conceptual spatial parking allowance, not building plan.*

#### 5. Below-Grade Automated Parking Operations with Full Lot Coverage

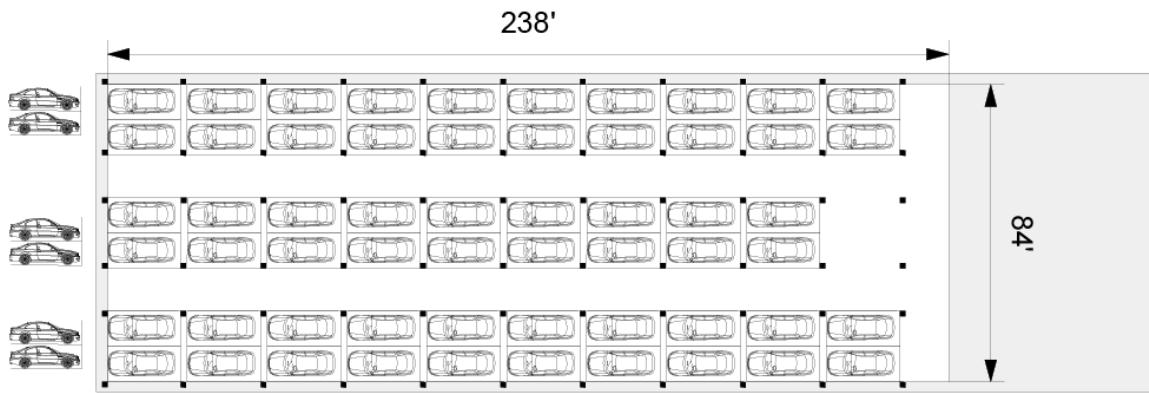
For the automated parking capacity analysis, the following assumptions were made:

- 21,900 square feet available for below-grade parking. This requires additional redesign of the building, potential conflict with adjacent buildings and terrain, and additional costs.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.

- Two circulations aisle will be used to access vehicles, with provision for movement between aisles.
- Two additional rows of vehicles will be added with the additional lot coverage.
- 400 square feet required for a transfer area where users park the vehicle and exit. The transfer area could also utilize space dedicated to a ramp depending on the design of the site.
- A total depth of one parking level below grade with 14.5 feet clearance for two levels of parking.

Based on the above assumptions, we estimate that 116 vehicles can be reasonably accommodated in a below grade automated parking facility using the full lot coverage. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

**Figure 19 Conceptual Diagram of Below-Grade Automated Parking Operations with Full Lot Coverage**



*Note: diagram represents conceptual spatial parking allowance, not building plan.*

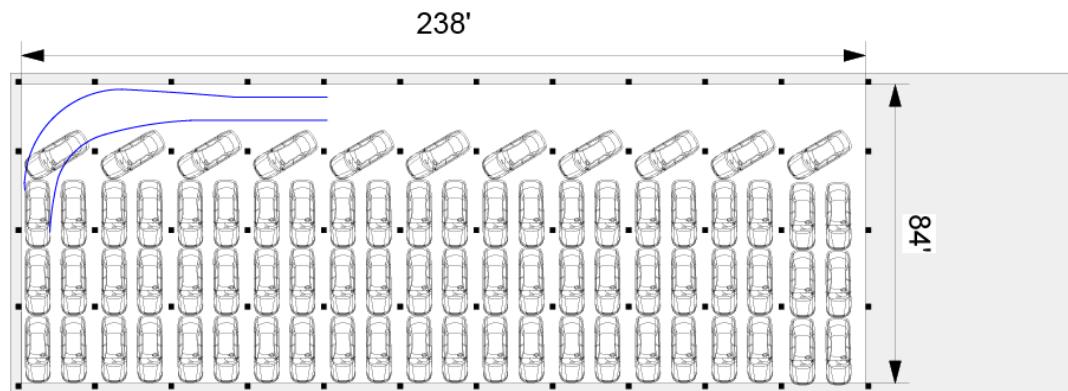
## 6. Below-Grade Valet-Parked Operations with Full Lot Coverage

For the valet-parking capacity analysis, the following assumptions were made:

- 21,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- Vehicles are parked along one the long edge of the basement. The parking floor area is only deep enough to accommodate three rows of perpendicular parking and one row of angled parking while maintaining reasonable access for valet operations.
- A single circulation aisle will be used to access vehicles.
- A total depth of one parking level below grade with 7.5 feet clearance.

Based on the above assumptions, we estimate that 66 vehicles can be reasonably accommodated in a below grade valet parking facility using the full lot coverage. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

Figure 20 Conceptual Diagram of Below-Grade Valet Operations with Full Lot Coverage



*Note: diagram represents conceptual spatial parking allowance, not building plan.*

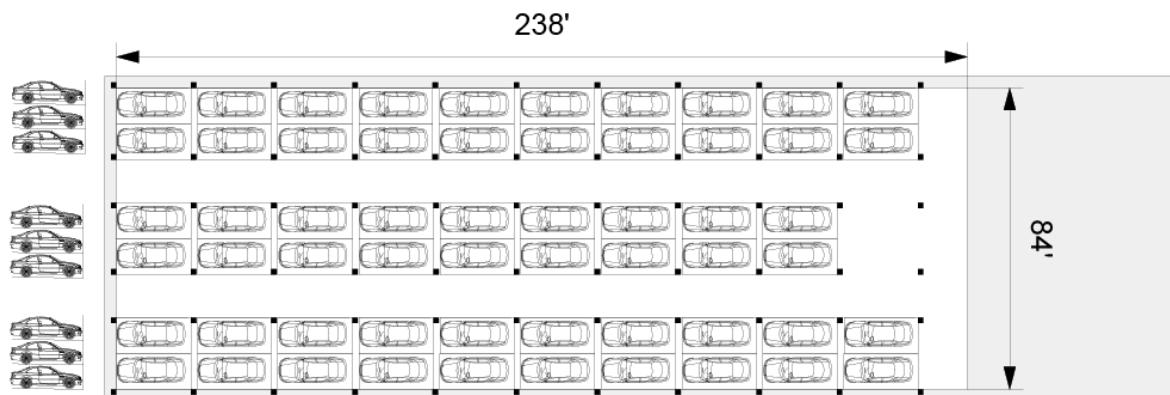
## 7. Multi-Level Below-Grade Automated Parking Operations with Full Lot Coverage

For the automated parking capacity analysis, the following assumptions were made:

- 21,900 square feet available for below-grade parking. This requires additional redesign of the building, potential conflict with adjacent buildings and terrain, and additional costs.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- Two circulations aisle will be used to access vehicles, with provision for movement between aisles.
- Two additional rows of vehicles will be added on each level with the additional lot coverage.
- 400 square feet required for a transfer area where users park the vehicle and exit. The transfer area could also utilize space dedicated to a ramp depending on the design of the site.
- A total depth of one parking level below grade with 22 feet clearance to accommodate three levels of parking.

Based on the above assumptions, we estimate that 174 vehicles can be reasonably accommodated in a below grade automated parking facility using the full lot coverage and increasing the basement depth to approximately 10 feet below the existing basement depth, where bedrock has been found. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

Figure 21 Conceptual Diagram of Multi-Level Below-Grade Automated Parking Operations with Full Lot Coverage



*Note: diagram represents conceptual spatial parking allowance, not building plan.*

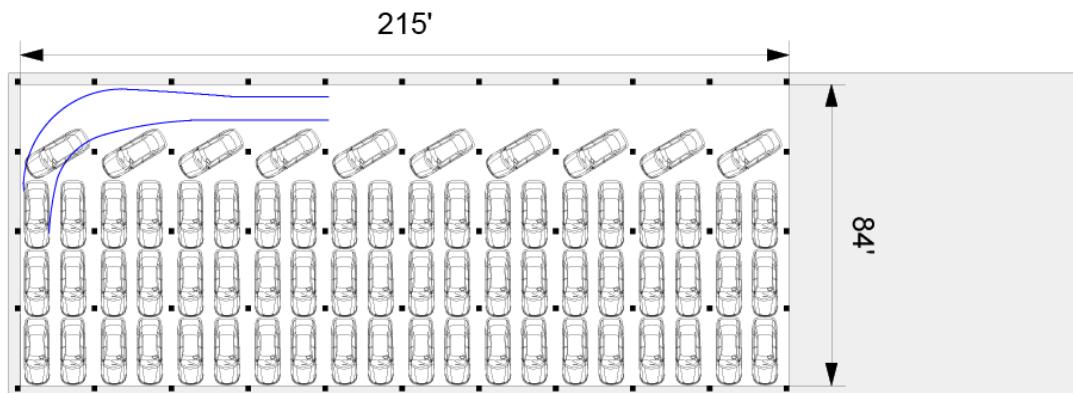
## 8. Multi-Level Below-Grade Valet-Parked Operations with Full Lot Coverage

For the valet-parking capacity analysis, the following assumptions were made:

- 21,900 square feet available for below-grade parking.
- The short-span structural system of the development requires column spacing approximately every 25 square feet to support slab and building above.
- A third row of vehicles will be added with the additional lot coverage; 300 feet by 90 feet.
- A single circulation aisle will be used to access vehicles.
- A total depth of two parking levels below grade with approximately 7.5 feet clearance per level and a total basement clearance of approximately 21 feet.

Based on the above assumptions, we estimate that 140 vehicles can be reasonably accommodated in a below grade automated parking facility using the full lot coverage and increasing the basement depth to approximately 10 feet below the existing basement depth, where bedrock has been found. The following conceptual diagram illustrates a layout for maximizing the number of spaces provided for this type of parking operation, not accounting for potential parking spaces lost due to final placement of building services.

Figure 22 Conceptual Diagram of Multi-Level Below-Grade Valet Operations with Full Lot Coverage



*Note: diagram represents conceptual spatial parking allowance, not building plan.*

## Potential Construction Costs and Parking Fees

Planning-level costs estimates for each type of parking supply are included below. The chart summarizes the parking structure data for each type, and cost breakdowns per square foot and per vehicle stall. As the development site is relatively small and only accessible from one side, the costs per space are higher due to the inefficiency of parking vehicles around support columns and corners. Due to the unknowns of the building site and constraints, a 30% contingency is added to these estimates. Additionally, the cost of extended construction time, insurance, and contractors may increase the capital costs further.

### Comparable Costs

Parking construction costs in Manhattan vary based on the size and constraints of the site, volume of parking, and site conditions, among other factors. Limited data is available for construction costs of below-grade parking on development sizes of this size in Manhattan. The following are examples of below grade parking construction costs for comparison.

- Construction of below grade parking in New York City typically costs \$30,000 to \$40,000 per space, or roughly \$150-\$200 per square foot, on larger, unconstrained sites.
- At an underground automated parking garage built at 123 Baxter Street in Chinatown, 68 parking spaces cost an average of \$40,000 each to construct in 2006. The corner site offers access from two sides.
- At 1 York Street in Tribeca, spaces in a 40-car automated parking cost \$130,000 to construct in 2006 due to complicated excavation. Tenants were expected to purchase spaces for \$175,000 to \$200,000.

### Assumptions

- The base construction cost is assumed to be \$225 per gross square foot, including leveling the site, changing the building structure to incorporate parking, excavation, support of excavation, and exhaust ventilation.
- The structural design of the building requires more complicated steel construction than anticipated to accommodate below-grade parking.

- A cost contingency of 30% is included to account for environmental and additional geotechnical issues on site. While the site profile and depth of bedrock is fairly clear, the cost contingency accounts for possible contamination, project delays, and other factors related to excavating a deeper footprint to accommodate the potential parking scenarios.
- Costs for additional excavation are assumed to be \$10 per cubic foot of soil and \$30 per cubic foot of rock to cover excavation, disposal, support of excavation, additional time, as well as the significant slope and physical constraints of the site. These estimates are based on data provided by project architects and engineering cost estimators for excavating similar materials in similar New York City contexts. Excavation costs for each scenario include an additional 3 feet for the foundation and floor to support vehicles.
- On-site borings indicate bedrock located between 5 feet and 15 feet below the existing foundations of buildings on the site. As the depth of bedrock and depth of the existing foundation varies across the site, this estimate assumes an average existing foundation depth across the site. The bedrock depth on the west half of the site is assumed to be an average of 5 feet below the existing foundation, and the bedrock depth on the east half of the site is assumed to be 15 feet below the existing foundation.
- Operations and maintenance costs for valet parking include a 24-hour attendant, paid \$15 per hour with a 1.5 cost multiplier value for benefits and overhead costs. It is assumed that one attendant is required for every 300 spaces.

Based on comparable construction costs and constraints of building parking on site, it is estimated that on-site parking would cost a minimum of \$150,733 per space using automated parking and excavating 22 feet deep to accommodate three levels of parking. Construction of below grade parking in New York City typically costs \$30,000 to \$40,000 per space on larger, unconstrained sites. Construction costs are calculated on per square foot of gross floor area, including the cost contingency for known unknowns, additional excavation cost per square foot based on the clearance height, and the equipment cost per space. The total construction cost is calculated based on the construction cost per square foot and the gross floor area of the scenario.

**WEST 108TH STREET DEVELOPMENT PARKING STUDY**

**Figure 23 Estimated Construction Costs for Parking Supply and Operations**

	Facility Type	Potential # of Spaces	Lot Depth Coverage	Minimum Floor Clearance Height (ft.)	Cost Contingency for Known Unknowns	Additional Excavation Cost per Square Foot	Equipment Cost per Space	Construction Cost per Square Foot	Estimated Construction Cost per Parking Space	Estimated Total Construction Cost
1	Below-Grade Self-Park	22	60 ft. (Planned Development Footprint)	7.5	30%	\$160	\$0	\$453	\$370,227	\$8,145,000
2	Below-Grade Valet-Park	33	60 ft. (Planned Development Footprint)	7.5	30%	\$160	\$0	\$453	\$246,818	\$8,145,000
3	Below-Grade Mechanical Stackers	44	60 ft. (Planned Development Footprint)	10.5	30%	\$220	\$2,500	\$519	\$212,159	\$9,335,000
4	Below-Grade Automated Parking Operations	80	60 ft. (Planned Development Footprint)	14.5	30%	\$325	\$20,000	\$706	\$158,938	\$12,715,000
5	Below-Grade Automated Parking Operations with Full Lot Coverage	116	90 ft. (Existing Building Footprint)	14.5	30%	\$325	\$20,000	\$703	\$163,728	\$18,992,500
6	Below-Grade Valet-Park with Full Lot Coverage	66	90 ft. (Existing Building Footprint)	7.5	30%	\$160	\$0	\$453	\$185,114	\$12,217,500
7	Below-Grade Automated Parking with Full Lot Coverage and Increased Depth	174	90 ft. (Existing Building Footprint)	22	30%	\$550	\$20,000	\$971	\$150,733	\$26,227,500
8	Below-Grade Valet Park with Full Lot Coverage and Increased Depth	140	90 ft. (Existing Building Footprint)	21	30%	\$520	\$0	\$813	\$156,696	\$21,937,500

## Estimated Revenue Projections

Based on the estimated construction costs, the following table provides the estimated fees required to generate enough revenue over the facility's 30-year lifespan to reach the desired 10% profit margin. This estimate for suitable private non-subsidized parking operation assumes the garage is 90% occupied an average of 25 days per month. The monthly and daily revenue per space for expected profit is calculated by adding a 10% profit margin to the total annual cost per space (construction costs and operations and maintenance costs), and dividing by the assumed occupancy and days of operation. Estimated monthly and daily parking fees for customers, including the full 18.375% parking tax, are also included. The monthly and daily parking fees for customers add the 18.375% parking tax to the revenue required per space for expected profit.

Estimated customer parking fees to cover facility costs in each scenario range from \$56 to \$132 per day or \$1,411 to \$3,303 per month. Estimated monthly parking fees include the full 18.375% parking tax, not the reduced long-term parking tax rate of 10.375% for Manhattan residents who register their cars in Manhattan. For comparison, the estimated daily fees are substantially higher than the existing average in the catchment area, \$34 per day and \$482 per month.

**Figure 24      Estimated Pricing to Recover Parking Costs and Achieve Profit**

	Facility Type	Potential # of Spaces	Estimated Construction Cost per Parking Space	Estimated Total Construction Cost	Annualized Construction Costs per Space	Annual O & M Costs per Space	Monthly Revenue per Space for Expected Profit	Daily Revenue per Space for Expected Profit	Monthly Parking Fee for Customer w/ Parking Tax	Daily Parking Fee for Customers w/ Parking Tax
1	Below-Grade Self-Park	22	\$370,227	\$8,145,000	\$26,897	\$500	\$2,790	\$112	\$3,303	\$132
2	Below-Grade Valet-Park	33	\$246,818	\$8,145,000	\$17,931	\$6,473	\$2,486	\$99	\$2,942	\$118
3	Below-Grade Mechanical Stackers	44	\$212,159	\$9,335,000	\$15,413	\$4,980	\$2,077	\$83	\$2,459	\$98
4	Below-Grade Automated Parking Operations	80	\$158,938	\$12,715,000	\$11,547	\$750	\$1,252	\$50	\$1,483	\$59
5	Below-Grade Automated Parking Operations with Full Lot Coverage	116	\$163,728	\$18,992,500	\$11,895	\$750	\$1,288	\$52	\$1,525	\$61

**WEST 108TH STREET DEVELOPMENT PARKING STUDY**

	Facility Type	Potential # of Spaces	Estimated Construction Cost per Parking Space	Estimated Total Construction Cost	Annualized Construction Costs per Space	Annual O & M Costs per Space	Monthly Revenue per Space for Expected Profit	Daily Revenue per Space for Expected Profit	Monthly Parking Fee for Customer w/ Parking Tax	Daily Parking Fee for Customers w/ Parking Tax
6	Below-Grade Valet-Park with Full Lot Coverage	66	\$185,114	\$12,217,500	\$13,448	\$3,486	\$1,725	\$69	\$2,042	\$82
7	Below-Grade Automated Parking with Full Lot Coverage and Increased Depth	174	\$150,733	\$26,227,500	\$10,951	\$750	\$1,192	\$48	\$1,411	\$56
8	Below-Grade Valet Park with Full Lot Coverage and Increased Depth	140	\$156,696	\$21,937,500	\$11,384	\$1,908	\$1,354	\$54	\$1,603	\$64