A. INTRODUCTION

According to the *CEQR Technical Manual*, a shadow is defined as the circumstance in which a building or other built structure blocks the sun from the land. An adverse shadow impact is considered to occur when the shadow from a proposed project falls on a publicly accessible open space, historic landscape, or other historic resource if the features that make the resource significant depend on sunlight, or if the shadow falls on an important natural feature and adversely affects its use and/or important landscaping and vegetation. In general, shadows on city streets and sidewalks or on other buildings are not considered significant under CEQR. In addition, shadows occurring within an hour and a half of sunrise or sunset generally are also not considered significant under CEQR.

The reasonable worst case development scenario (RWCDS) for the proposed action would result in a net increment of approximately 1.3 million gsf of new development on the project site. The proposed project would include an approximately 900 dwelling unit (DU) residential tower, retail, health club space, automobile dealership, and a NYPD Mounted Unit facility. The proposed action would also introduce up to 225 accessory parking spaces to the project site. The Build Year for the proposed project is 2011.

In accordance with CEQR guidelines, this chapter provides a shadows assessment, to determine whether the proposed action would result in new shadows long enough to reach a publicly accessible open space or sunlight-sensitive historic resource (except within an hour and a half of sunrise or sunset). As discussed below, the proposed action would result in minimal new shadows being cast on only one existing open space resource, which would not be significant in terms of frequency, duration, or coverage. Therefore, the proposed action is not expected to generate any incremental shadows that would create significant adverse impacts on open space resources surrounding the project site. The proposed action would result in significant adverse shadows impacts on Centro Maria (former Saint Ambrose Church), which features a stained glass rose window located above its entryway.

As discussed in Chapter 19, "Mitigation," measures to mitigate this impact were identified but are not feasible and it would remain unmitigated. This is disclosed in Chapter 22, "Unavoidable Adverse Impacts."

B. METHODOLOGY

Building Heights

According to the *CEQR Technical Manual*, the longest shadow a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. This area

surrounding the structure is defined as the shadow radius and is used to determine which open space resources or sunlight-sensitive historic resources would be affected by the shadows cast from the structure. For actions resulting in structures less than 50 feet high, a shadow assessment is generally not necessary unless the site is adjacent to a park, historic resource, or important natural feature (if the features that make the structure significant depend on sunlight).

As described in Chapter 1, "Project Description," the proposed action would result in a mixed-use development, irregularly shaped with a sloping elevation to keep the project's mass away from the park and setback from the side streets. The sloped roof line would create a series of stepped outdoor terraces as the building moves diagonally across the site, in an "S" shape (See Figure 1-5 in Chapter 1 "Project Description"). As a result, the western side of the building would stand at approximately 120 feet tall, while the sloped elevation would reach 340 feet tall on the eastern side.

A screening analysis was conducted for the proposed project. Following the *CEQR Technical Manual* guidelines, a radius of 4.3 times the maximum projected height of the anticipated new development was drawn, approximately 1,452 feet from the project site boundary (See Figure 6-1). For conservative analysis purposes, the radius was drawn for the eastern building height of 340 feet, even though the western side of the building would only rise to 120 feet tall. In the RWCDS, the proposed project would therefore cast a maximum shadow of approximately 1,452 feet long. According to the *CEQR Technical Manual*, shadows cast by proposed developments fall to the north, east, and west. In New York City, the shadow area is between -108 degrees from true north and 108 degrees from true north as shown in Figure 6-1.

Any open space resources that fall outside the shadow radius were screened out and not considered for further shadow analysis, as no shadows cast by projected RWCDS development on the project site would reach such resources. The remaining open space resources (those falling within the shadow radius) were subjected to additional screening, as discussed below.

Resources of Concern

In coordination with Chapter 5, "Open Space," and Chapter 7, "Historic Resources", publicly accessible open spaces and sunlight-sensitive architectural resources to the north, east, and west of the projected development on the project site were identified, as shadows created by the development associated with the RWCDS could fall in the direction of these resources. According to the *CEQR Technical Manual*, historic resources that need to be considered in a shadows analysis must have sunlight-dependent features such as stained glass windows or historic landscapes.

Open Space Resources

As shown in Figure 6-1 and Table 6-1a, there are six open space resources in the vicinity of the project site that fall within the shadow radius.

Four open space resources in the vicinity of the project site do not fall within the shadow radius as they are located within the triangular area south of the proposed development where no shadow would be cast. Table 6-1b and Figure 6-2 show these four open space resources and the shadow radius accounts for the triangular area south of the proposed project where no shadows would be cast.

Table 6-1a
Open Space Resources within the Shadow Radius of the Project Site

Map No.	Name	Location	Amenities	Hours	Sunlight-Sensitive?
1	DeWitt Clinton Park	Btw. W. 52nd & 54th Sts and Eleventh & Twelfth Aves.	Ball fields, basketball courts, benches, trees, plantings, walkways, play equipment, dog park, rocks	Park closes at 11pm	Yes
2	Clinton Towers Plaza	790 Eleventh Ave.	Trees, benches, slides	Restricted hours	No
3	Harborview Terrace Plaza	W. 54th St. btw. Tenth & Eleventh Aves.	Seating, plantings, flowers	8am - 10pm	No
4	St. Luke's - Roosevelt Hospital Entrance Plaza	Tenth Ave. btw. W. 58th & W. 59th Sts.	Trees, planters, benches, flowers	8am-sunset	Yes
5	555 W. 57th Street	555 W. 57th St. btw. Tenth & Eleventh Aves.	Benches, trees	24 hours	Yes
6	Hudson River Park/Clinton Cove	Hudson River btw. W. 55th & W.57th Streets	Boathouse, eateries, museums, paved walkways, seating, lawn, trees, viewing area	Closes at 1am, bike path open 24 hours	Yes

Table 6-1b
Open Space Resources Outside of the Shadow Radius of the Project Site

Map No.	Name	Location	Amenities	Hours
A	Oasis II Community Garden	W. 52nd Street btw. Tenth & Eleventh Aves.	Vegetables, seating, picnic tables, meeting area	Unknown
B	P.S. 111 Playground	Tenth Ave btw. W. 52nd & W. 53rd Sts.	Playground, basketball courts, paved ball field, community garden	School hours
C	Hudson View Terrace Plaza	Tenth Avenue btw. W. 50th & W. 51st Sts.	Seating, plantings	24 hours
D	Gutenberg Playground	W. 49th St. btw. Ninth & Tenth Avenues	Handball & basketball courts, bleachers	Closes at dusk

It should be noted that an existing open space, the Amsterdam Plaza at the Harborview Terrace, which currently contains outdoor basketball courts, plantings, seating and a paved playground would be replaced by parking facilities and a residential expansion of Harborview Terrace by 2011 (see Chapter 2, "Land Use, Zoning, and Public Policy"), when the proposed action is expected to be completed and therefore is not included in the shadows analysis.

It should also be noted that two of the open space resources listed in Table 6-1a are mostly paved with concrete, contain very few or no plantings, and therefore have been screened out

of the detailed shadows analysis. Clinton Towers Plaza (Table 6-1a, #2) and Harborview Terrace Plaza (Table 6-1a, #3) are mostly paved open spaces used for sitting and some recreation for young children. These are not considered sun-light sensitive features and it is not expected that any shadows resulting from the proposed action would affect these open space resources. Therefore, they have been screened out of the detailed analysis.

As discussed in Chapter 1, "Project Description," the RWCDS assumes that approximately 52,569 sf, or 1.2 acres, of private open space would be provided on the project site as part of the proposed action. The private open space would be located on two triangular-shaped landscaped terraces, approximately 39 feet above ground, adjacent to the residential tower portion of the building. Following the guidelines of the *CEQR Technical Manual*, private open space is not included in the shadows analysis.

Historic Resources

Also shown in Figure 6-1, there are three historic resources eligible for listing on the State and National Registers of Historic Places (S/NR) within the shadow radius, two to the south of the project site and one to the north. The two adjoining buildings to the south are the former 53rd Street Industrial School, now the Old School, at 552 W. 53rd Street, and the building formerly known as The Emerson, now called The Flats, at 554 W. 53rd Street. According to the eligibility determination forms for these properties, the 53rd Street Industrial School building constructed in 1894 appears to be S/NR eligible given its association with important historical events as it operated as a school with industrial training and other classes for immigrants and later housed a school for children with tuberculosis and other maladies. The Emerson's importance is associated with its historic and architectural significance as a surviving example of a model tenement from the early twentieth century. Recently, these buildings were reconfigured into a single 7-story affordable housing development, which included internal renovations and cleaning and repointing of the brick façades. For more details, refer to Chapter 7, including Figure 7-2 which shows their locations and Figure 7-3, which shows photographs of these resources. The details of the features of the above mentioned historic resources, which are not the primary historic characteristics resulting in their eligibility for S/NR listing, are not dependent on sunlight during the day to the extent that shadows would diminish their significance. While the proposed development could potentially cast shadows on the above listed structures, such shadow effects do not require further assessment of these historic resources.

The historic resource north of the project site is Centro Maria, a woman's residence operated by an order of Catholic nuns. As discussed in Chapter 7, Centro Maria is located at 539 W. 54th Street, formerly Saint Ambrose Roman Catholic Church. The building was originally constructed as a church, school and rectory for the Saint Ambrose parish in the early 1900s, the 4-story midblock brick building is an example of neo-Gothic institutional design with several notable architectural details.[1] According to the *CEQR Technical Manual*, sensitive features on a historic structure include details or characteristics that make the resource

[1] "Resource Evaluation: Current Centro Maria, 539 West 54th Street." NY State Office of Parks, Recreation, and Historic Preservation, 14 April 2008.

significant. Examples of sensitive features include stained glass windows and highly carved ornamentation, both of which are featured on the entrance to the Centro Maria building, directly north of the project site (see Figure 6-3). As these potentially sunlight-sensitive resources on a building eligible for S/NR would be affected by shadows cast by the proposed development, the proposed action may have some significant shadow impacts on this historic resource.

Apart from these three resources, there are no other historic resources within the shadows study area.

C. ASSESSMENT OF SHADOW IMPACTS

An adverse shadow impact is considered to occur when the shadow from projected/potential development falls on a publicly accessible open space, historic landscape, or other historic resource if the features that make the resource significant depend on sunlight, or if the shadow falls on an important natural feature and adversely affects its use and/or important landscaping and vegetation. The uses and vegetation in an open space establish its sensitivity to shadows. Uses that rely on sunlight include passive use, such as sitting or sunning, and such activities as gardening, or children's wading pools and sprinklers. Vegetation requiring sunlight includes tree canopy and flowering plants. Where lawns are actively used, the turf also requires extensive sunlight. For these activities and plants, four to six hours a day of sunlight, particularly in the growing season (defined as April to October), is often a minimum requirement. In general, shadows on city streets and sidewalks and on other buildings are not considered significant under CEQR.

The shadow analysis considers the times when the proposed development would increase shadows falling on open space or historic resources. As the sun travels across the sky during the day, shadows fall in a curve on the ground opposite the sun. When the sun rises, shadows fall to the west. As the sun travels across the southern part of the sky throughout the day, shadows move in a clockwise direction until they stretch east as the sun sets in the west. Midday shadows are always shorter than those at other times because the sun is highest in the sky at that time. Further, because of the tilt of the earth’s axis, the angle at which the sun’s rays strike the earth varies throughout the year, so that during the summer, the sun is higher in the sky and shadows are shorter than during the winter. Winter shadows, although longest, move the most quickly along their paths (because of the earth’s tilt) and do not affect the growing season of outdoor trees and plants.

As directed by the *CEQR Technical Manual*, shadow analyses were performed for the four resources identified in Table 6-1a, for four representative days of the year: March 21, the vernal equinox (and equivalent to September 21, the autumnal equinox); May 6, the midpoint between the summer solstice and the equinox (and equivalent to August 6); June 21, the summer solstice and the longest day of the year; and December 21, the winter solstice and shortest day of the year. The *CEQR Technical Manual* defines the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset.

Shadows Analysis

The detailed shadows analysis first used building heights and footprints of existing structures surrounding the project site to determine existing shadows cast on the open space resources noted in Table 6-1a on the four representative days of the year. Using a 3D AutoCAD modeling program, shadows cast by the proposed development were then compared to existing shadows on these same four days to assess the incremental impacts of shadows created by the proposed action (See Figures 6-4 to 6-7).

The detailed shadows analysis shows that two open space resources included in the analysis, DeWitt Clinton Park (Table 6-1a, #1) and Clinton Towers Plaza (Table 6-1a, #2) and one historic resource, Centro Maria, would be affected by incremental shadows as a result of the proposed action (Figures 6-4 to 6-7). No other open space resources included in the detailed shadows analysis were found to be affected by shadows created by the proposed action. The results of the shadow analysis on these resources are discussed below.

DeWitt Clinton Park

DeWitt Clinton Park is the closest prominent open space resource to the project site. It encompasses approximately 5.9 acres of active and passive open space on the block directly west of the project site, and contains baseball and soccer fields, basketball courts, playgrounds, seating and walking areas, and a dog run. The baseball and soccer fields and dog run are located along the eastern side of DeWitt Clinton Park, closest to the project site. As discussed in Chapter 5, "Open Space," DeWitt Clinton Park is a heavily utilized open space resource in fair condition.

Clinton Towers Plaza Open Space

Clinton Towers Plaza features a small privately owned, publicly-accessible accessory open space located just north of the project site, across W. 54th Street. The open space is entirely covered with pavement and features slides, benches, and some trees in a small paved plaza. As discussed in Chapter 5, Clinton Towers Plaza Open Space is a lightly utilized open space resource in fair/poor condition.

Centro Maria

As discussed above, Centro Maria features a single recessed stained-glass rose window and highly carved ornamentation over its entryway, fronting on W. 54th Street just north of the project site. Although Centro Maria is currently utilized as a residence, and not a church, it has been included in this detailed shadows analysis because of these features, which could potentially be significantly impacted by shadows.

Table 6-2 shows the duration of incremental shadows created by the proposed development cast on DeWitt Clinton Park, the Clinton Towers Plaza open space, and Centro Maria. The longest shadow duration on Dewitt Clinton Park occurs on December 21, for 3 hours and 19 minutes, while the longest shadow durations for the Clinton Towers Plaza open space and

Centro Maria both occur on March 21, for 6 hours and 21 minutes and 5 hours and 59 minutes, respectively. Durations for each representative day are further discussed below.

Table 6-2
Incremental Shadow Durations on Open Space and Sunlight-sensitive Resources Within the Shadow Radius

		Analysis Date			
Resource	**Incremental Shadow**	**March 21**	**May 6**	**June 21**	**December 21**
Dewitt Clinton Park	Start	7:36am	6:27am	5:57am	8:51am
	End	10:43am	9:27am	9:00am	12:09pm
	Duration	**2 hrs, 41 mins**	**2 hrs, 0 min**	**3 hrs, 3 mins**	**3 hrs, 18 mins**
Clinton Towers Plaza	Start	9:33am	10:31am	3:57pm	9:30am
	End	9:52am	12:11pm	5:45pm	10:49am
	Duration	**0 hrs, 19 mins**	**1 hr, 40 mins**	**1 hr, 48 mins**	**1 hr, 19 mins**
	Start	10:27am	3:45pm	**	11:07am
	End	4:29pm	5:18pm	**	2:53pm
	Duration	**6 hrs, 2 mins**	**1 hr, 33 mins**	****	**3 hrs, 46 mins**
	Total Duration	**6 hrs, 21 mins**	**3 hrs, 13 mins**	**1 hr, 48 mins**	**5 hrs, 5 mins**
Centro Maria	Start	10:30am	11:15am	11:48am	9:56am
	End	4:29pm	2:58pm	2:23pm	2:53pm
	Duration	**5 hrs, 59 mins**	**3 hrs, 43 mins**	**2 hrs, 35 mins**	**4 hrs, 57 mins**

Note: All times are Eastern Standard Time; Daylight Savings Time was not accounted for (as per the CEQR Technical Manual).
A review of conditions with Eastern Daylight Savings Time(in effect during the all but the December 21 analysis date) indicated that shadow duration and coverage would not be affected by daylight savings time.
Sources: Building footprints and heights from TEN Arquitectos, SC and NYC Dept. of Information Technology and Telecommunications used to determine shadow increment using 3D AutoCAD and SketchUp modeling programs.

March 21 (September 21)

On the equinoxes, there are expected to be some incremental shadows from the proposed action that would fall on DeWitt Clinton Park. Shadows would be cast on portions of the baseball field and trees lining the park's eastern edge, located on the northeastern portion of the park grounds, first entering at 7:36 AM, and exiting at 10:43 AM, for a total duration of approximately 3 hours and 7 minutes (Table 6-2, Figure 6-4). Incremental shadows would be cast on Clinton Towers Plaza during two periods over the course of the day, from 9:33 AM to 9:52 AM (for a duration of 19 minutes) and again from 10:27 AM to 4:29 PM (for a duration of 6 hours and 2 minutes), for a total duration of 6 hours and 21 minutes. Incremental shadows would also be cast on the entrance of Centro Maria from 10:30 AM to 4:29 PM, for a total duration of 5 hours and 59 minutes.

May 6 (August 6)

Between the equinoxes and the summer solstice, incremental shadows cast by the proposed action would enter DeWitt Clinton Park at 6:27 AM and exiting at 9:25 AM, for a duration of 2 hours and 58 minutes (Table 6-2). The shadows would lie on a small portion of the eastern edge of the park, where the baseball fields and trees lining the park's eastern edge are located (Figure 6-5). There would be some minimal incremental shadows cast on the Clinton Towers Plaza open space from 10:31 AM to 12:11 PM (for a duration of 1 hour and 40 minutes) and

again from 3:45 PM to 5:18 PM (for a duration of 1 hour and 33 minutes), for a total duration of 3 hours and 13 minutes. However, these shadows would only cover a small paved corner of the Clinton Towers Plaza open space. Incremental shadows would also be cast on Centro Maria, from 11:15 AM to 2:58 PM for a total duration of 3 hours and 43 minutes. However, these shadows are not expected to reach the second floor of the building, where the stained-glass rose window and ornamentation are located.

June 21

On the summer solstice, June 21, the sun is most directly overhead and shadows are shortest for most of the day. Incremental shadows cast by the proposed action would reach DeWitt Clinton Park, entering at 5:57 AM and exiting at 8:58 AM, for a duration of 2 hours and 4 minutes (Table 6-2). These shadows would also be cast along the eastern portion of the park, slightly larger than the May 6/August 6 shadows (Figure 6-6), where the baseball fields, and some trees and benches are located. On this day, minimal incremental shadows would be cast on a paved corner of the Clinton Towers Plaza open space for 1 hour and 48 minutes, between 3:57 PM and 5:45 PM. Incremental shadows would also be cast on Centro Maria for 2 hours and 35 minutes, between 11:48 AM between 2:23 PM. Similar to the May shadows, these incremental shadows are not expected to reach the second floor of Centro Maria and therefore would not reach the stained-glass windows and ornamentation.

December 21

On the shortest day of the year (winter solstice) when the sun is low in the sky, shadows are the longest they will be all year. The analysis shows that small incremental shadows would be cast on DeWitt Clinton Park for most of the morning, first entering the park at 8:51 AM, and exiting at 12:10 PM, for a total duration of 3 hours and 19 minutes (Table 6-2). These shadows are cast on the northern border of the park, just outside of the baseball field (Figure 6-7). In December, incremental shadows would be cast on the Clinton Towers Plaza open space from 9:30 AM to 10:49 AM (for a duration of 1 hour and 19 minutes) and again from 11:07 AM to 2:53 PM (for a duration of 3 hours and 46 minutes), for a total duration of 5 hours and 5 minutes. Incremental shadows would also be cast on Centro Maria for 4 hours and 57 minutes, between 9:56 AM to 2:53 PM.

D. CONCLUSION

Overall, the proposed action would not result in significant adverse shadow impacts on Dewitt Clinton Park. The incremental shadows from the projected RWCDS development would reach DeWitt Clinton Park on all four representative analysis days in the early morning, and range in duration from 2 hours and 4 minutes on June 21 to 3 hours and 19 minutes on December 21. Moreover, as shadows travel throughout the day, following the sun's path in the sky, they would not cover any substantial portion of this open space resource at any given time. A majority of the recreational usage of DeWitt Clinton Park is located further west of where the shadows created by the proposed action would be cast. The shadows would be generally small in size and cast mostly upon outlying, minimally utilized portions of the baseball field near a chain-link fence, as shown in the analysis. Although incremental

shadows cast by the proposed development would fall on trees of Dewitt Clinton Park lining Eleventh Avenue, the duration of these shadows would be between about two to three hours in the early morning hours during March, May and September, and there would be very minimal incremental shadows cast on the park for just over three hours in December. Due to the limited duration during mostly early morning hours, and minimal incremental affect on the resource, these shadows are not expected to create significant adverse impacts on Dewitt Clinton Park.

The limited shadows falling on DeWitt Clinton Park can be primarily attributed to the building design, which concentrates most of the bulk and height of the development on the eastern portion of the project site, closer to the AT&T building and further away from the park (See Figure 1-8, Chapter 1 "Project Description"). The height of the existing AT&T Building would exceed the height of the tallest point of the proposed development and therefore minimize any incremental shadows created as a result of the proposed action. This is an intentional effort to design a building that would not create an overbearing presence across the street from DeWitt Clinton Park, and therefore the building would be an optimal designed to limit the potential of obtrusive shadows on DeWitt Clinton Park.

The proposed development would cast some incremental shadows on the Clinton Towers Plaza open space on all four analysis days. For both May 6 and June 21, the shadows would be cast on small, paved corners of the open space for a maximum of 3 hours and 13 minutes (May) and would not affect any sunlight-sensitive features. In March, the incremental shadows cast by the proposed development would cover the Clinton Towers Plaza open space, for a total duration of 6 hours and 21 minutes. Although the open space would be covered in shadows for over 6 hours during the majority of the day, significant adverse impacts are not expected as the open space is covered with pavement. Trees in this open space are expected to be tended to by maintenance staff of Clinton Towers Plaza, as this space is accessory to the residential building. In December, incremental shadows would cover the open space for a total duration of 5 hours and 5 minutes. Shadows are not expected create a significant impact on the Clinton Towers Plaza open space for reasons discussed under the March analysis and further, utilization of this open space would likely decrease and sunlight is expected to be minimal during the winter months.

The proposed project would cast shadows on Centro Maria, the former Saint Ambrose Church located at 539 W. 54th Street, which was built in the early twentieth century with neo-Gothic institutional design. It is eligible for listing on the State/National Registers of Historic Places and includes several notable architectural features including a single stained glass rose window and highly carved ornamentation located at the second floor level above the entryway. It no longer operates as a church, but now is a young women's residence operated by Catholic nuns. Similar to the Clinton Towers Plaza open space, minimal incremental shadows from the proposed development would be cast on the Centro Maria, but are not expected to reach the stained-glass rose window and highly carved ornamentation during both May and June. During March and December, the incremental shadows would cover Centro Maria. Project-generated shadows on Centro Maria would have durations of 5 hours, 59 minutes on March 21 and 4 hours, 57 minutes on December 21. New incremental shadows cast on the building may detract from its functions and architectural significance and impact

the enjoyment of the stained glass window by building occupants. As such, this would be considered a significant adverse shadow impact. Possible mitigation measures for this impact are discussed in Chapter 19, "Mitigation." Given the location of Centro Maria approximately 60 feet north of the project site on W. 54th Street, any building with a continuous streetwall on the project site likely such as would occur under as-of-right conditions or could occur under a lesser density alternative (refer to Chapter 20, "Alternatives") would cast shadows of some duration on this sunlight-sensitive resource.

Overall, there would be no noticeable reduction in the usability of any open space resources as a result of the proposed action. The analyses presented in this EIS found that the proposed action would create significant adverse shadows impact on Centro Maria, which is eligible for listing on the State/National Registers of Historic Places. As discussed in Chapter 19, "Mitigation," mitigation measures for this impact have been identified, but such measures are not feasible and this impact would be unmitigated. This is disclosed in Chapter 22, "Unavoidable Significant Adverse Impacts."