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Section 8

Section 8

8.0 AQUATIC RESOURCES

This section demonstrates that the proposed Combined Cycle Project's cooling system and discharge of low-volume waste streams, including stormwater, will be in compliance with the Federal Clean Water Act (CWA), the New York Code of Rules and Regulations (NYCRR) Part 704, the Federal Endangered Species Act and the Sustainable Fisheries Act. A description of the aquatic community of the East River, life history information for local fish species, thermal tolerance information for the local fish species and a discussion on endangered species has been provided in Appendix 8A.

8.1 Cooling System Design

The proposed Combined Cycle Project will use an air-cooled condenser (dry cooling tower) for the main system cooling. The proposed condenser cooling system uses no water for system operations and thus, will not require an intake structure or will not generate a discharge, as previously discussed in Section 7.4. Instead, ambient air will be used as a direct steam-cycle heat sink.

8.2 Low-Volume Discharge

The low-volume discharge of stormwater and process wastewater will contain relatively small quantities of heat, minerals, and suspended solids that will be released to the East River via a new 24-inch discharge pipe. The low-volume wastestreams and their characteristics were previously identified in Section 7.4.

8.3 Compliance with the Federal Clean Water Act

The use of an air-cooled condenser will assure that operation of the proposed Combined Cycle Project is compliant with both Sections 316(a) and (b) of the Federal Clean Water Act.

Section 316 (a) requires that the thermal effluent limitations for a point source assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water where the point source is located. As discussed in Section 7.4.3, the condenser cooling system for the proposed Combined Cycle Project will discharge no heat to the East River, and the thermal impact to the East River from the low-volume waste streams will be negligible. Also, the addition of stormwater to the discharge pipe during precipitation events will further reduce the temperature of the thermal effluent. As demonstrated previously in Section 7.4.3, assuming the maximum temperature difference between the discharge and the East River (during both the summer and the winter conditions), the temperature increase along the centerline of the thermal plume will be virtually indistinguishable from ambient temperature in the river within 20 meters downstream of the discharge. Therefore, this addition of heat will not change the natural temperature cycle of the East River within or among seasons or block the migration of any fish . Thus, the thermal effluent from the low-volume discharge of stormwater and process wastewater will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the East River.

Section 316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. The proposed condenser cooling system for the Combined Cycle Project does not use water and thus does not require an intake structure to withdraw water or aquatic organisms from the East River. If no aquatic organisms are entrained or impinged, there will be no adverse environmental impact on the East River. Thus, an air-cooled condenser is the best technology available for the proposed Combined Cycle Project.

8.4 Compliance with 6 NYCRR Part 704 (Criteria Governing Thermal Discharges)

The use of an air-cooled condenser will assure that operation of the proposed Combined Cycle Project is compliant with 6 NYCRR Part 704.5 for the same reasons that it will assure compliance with Section 316(b) of the Clean Water Act. Like Section 316(b), 6 NYCRR Part 704.5 requires that the location, design, construction and capacity of cooling water intake structures, in connection with point source thermal discharges, reflect the best technology available for minimizing adverse environmental impact.

The thermal effluent from the low-volume discharge of stormwater and process wastewater will be compliant with 6 NYCRR Part 704.1 for the same reasons that it will be compliant with Section 316(a) of the Clean Water Act. Similar to 316(a), 6 NYCRR Part 704.1 requires that all thermal discharges to the waters of New York State assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving body of water .

8.5 Compliance with the Federal Endangered Species Act (ESA)

The use of an air-cooled condenser will assure that operation of the proposed Combined Cycle Project is compliant with the ESA by eliminating the need for an intake structure. Section 9 of the ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered; under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation. "Take", as defined by the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill trap, capture, or collect, or to attempt to engage in any such conduct. The proposed Combined Cycle Project will have no intake to withdraw water or aquatic organisms from the East River. If no aquatic organisms are entrained or impinged, then the proposed Project will not "take" any aquatic organisms or wildlife, including those that may be threatened or endangered. In addition, the low-volume discharge of stormwater and process wastewater will not result in the "taking" of any endangered species.

8.6 Compliance with the Sustainable Fisheries Act (SFA)

The use of an air-cooled condenser will assure that operation of the proposed Combined Cycle Project is compliant with the SFA. Also known as the Magnuson-Stevens Fishery Conservation and Management Act, the SFA required Fishery Management Councils to define "those waters and substrate necessary for fish spawning, feeding or growth to maturity", i.e. essential fish habitat, for more than 600 fish stocks. In addition, the SFA also requires the Fishery Management Councils to identify threats to essential fish habitat from fishing and non-fishing activities, as well as steps to ameliorate those threats. The proposed condenser cooling system will have no structures to withdraw water from, or discharge water to, the East River. In the absence of intake or discharge structures, the proposed condenser cooling system cannot affect essential fish habitat. The installation of the proposed outfall (a 24-inch discharge pipe) to release the low-volume waste streams and stormwater to the East River may result in negligible and temporary loss of aquatic substrate during construction but will result in no loss of essential fish habitat.

8.0 AQUATIC RESOURCES

This section addresses the aquatic resources of the East River relative to the proposed NYPA Combined Cycle Project. Included is an overview of regulatory criteria pertaining to the siting, of the proposed intake structure, a list of species in the project vicinity, species life history for representative important species (RIS) and species recognized under the Magnuson Fishery Conservation and Management Act, and an assessment of alternative intake designs. Regulations governing the thermal component of the discharge are addressed in Section 7.0 of this Application.

8.1 Description of the Aquatic Community

The following sections provide a description of the East River aquatic community including seasonal changes due to migration patterns and the aquatic environment.

8.1.1. The East River Fish Community

The fish community of the New York Harbor area forms a discrete entity within the larger Hudson River estuary ecosystem (Woodhead, 1992). The composition of the New York Harbor community has remained remarkably stable, exhibiting little variation with respect to the numerically dominant species (Woodhead, 1992). The community is comprised of populations of residents, migrants, transients, and rare or exotic fishes (Woodhead, 1992). The consistently numerically dominant species include hogchoker, tomcod, winter flounder, white perch, and striped bass (Woodhead, 1992). The community of year-round resident fishes that can be observed within the East River include Atlantic tomcod, American eel, grubby, sculpin, red hake, mummichog, cunner, northern pipefish, striped bass, white perch, windowpane, winter flounder, and hogchoker. During the warmer months, bay anchovy flourish. Of these species, grubby, bay anchovy, mummichog, cunner and winter flounder exhibit spawning behavior within the East River/New York Harbor area (Woodhead, 1992).

Transient species generally enter the Harbor to feed and grow for one or two seasons, usually during the warmer months (Woodhead, 1992). Common transients to the New York harbor area include butterfish, scup, bluefish, striped bass, bay anchovy, black sea bass, northern and striped searobins, and fluke (Woodhead, 1992). Cold-water transients include Atlantic herring and juvenile silver hake. Exotics include those extremely infrequently occurring transients such as spotfin, butterfly fish, gray snapper, planehead filefish, cornetfish, and lookdown (Woodhead, 1992).

Interestingly, Woodhead (1992) notes that as early as 1938, assertions were being made that the reduction in the number of transient species may have been attributable to the pollution of New York Harbor. With an increase in water quality of the New York Harbor area in recent years, it seems plausible to suggest that the numbers of transient species may change.

Previous fisheries investigations conducted in the vicinity of the proposed site have documented that 60 species of fish were identified in the deeper, western portions of the East River channel including winter flounder, striped bass, Atlantic tomcod, grubby, bay anchovy, white perch, American shad, northern pipefish, herring, and conger eel. The shallow, eastern portions of the East River also support these species, and the shallow bays and marshes may function as nursery habitat for both marine and estuarine species.

The following sections focus on the flux in the composition of the East River fish community as a function of seasonal change and emigration/immigration.

8.1.2 Seasonal Change

Just as the relative importance of species will vary in space, their patterns of abundance will also change with time (Begon et al., 1996). Specifically, a species will occur only where and when: (i) it is capable of reaching a location; (ii) appropriate conditions and resources exist; and (iii) competitors, predators, and parasites do not preclude it (Begon et al., 1996). For many organisms, and particularly short-lived species, their relative importance in the community changes on a seasonal basis as the individuals act out their life cycles against a background of seasonal change (Begon et al., 1996).

Many fishes undergo long migration on an annual or seasonal basis for any of a number of reasons. As defined, migration includes any "mass movement from one habitat to another with characteristic regularity in time or according to life history stage" (Bond, 1996). This broad definition allows for the inclusion of both active and passive mass movements, whether they are seasonal or annual changes of habitat or short-term travels. The mechanisms underlying mass migrations include food gathering, adjustment to temperature, or reproduction (Bond, 1996).

As water temperatures fall in winter, many fish immigrate to the sea from New York Harbor via the Narrows (Woodhead, 1992). In the early spring, as water temperatures rise and the input of freshwater is at it's highest, there is a pronounced immigration of new species into the Harbor with a concomitant rise in species richness. In addition, hibernating species also become more active and begin to feed (Woodhead, 1992).

In many fishes, these factors take place on an annual basis or, in other species, may be restricted to ontogenetic shifts in habitat preference. On a much shorter time scale, fishes can exhibit diel variation, such as the daily vertical migration of fishes from the deep scattering layer, which is found at depths of 500-600 feet. Many marine fishes make similar on-shore movements at night only to return to deeper waters during the day. During the reproductive season, nocturnal movements can occur to concentrate spawning adults. For example, within the Hudson River species with pelagic eggs, such as clupeids, hiodontids, and percicthyid basses, the adults move upstream to spawn, and the fertilized eggs and subsequent larvae drift passively downstream before occupying their juvenile habitat.

8.1.3 Fishes and the Aquatic Environment

Water salinity, temperature, and the hydrodynamic regime shape, at least in part, the physiology, morphology, and both the spatial and temporal distribution of spawning fishes, eggs, larvae, and juveniles (Bond, 1996). Water temperature is particularly important in regulating the phasing of the developmental stages of fishes (Bond, 1996). For instance, the timing of the hatching of yolk sac larvae of *Morone saxatilis* (striped bass) will initiate within 25 to 109 hours depending on water temperature.

The distribution of juvenile and adult winter flounder within the Hudson-Raritan Estuary observed from 1984-1985 indicates a preference for a specific salinity range and to a lesser degree, temperature. Woodhead (1992) reports that juvenile densities were highest when salinity ranged from 21-31 parts per thousand (ppt) and water temperatures ranged from 32°F - 62.6°F. Conversely, the lowest juvenile densities were reported when salinity fluctuations were more pronounced (i.e., when salinities fluctuated between 1-35 ppt). Adult densities displayed a somewhat less dramatic response to salinity exhibiting peak density when salinity ranged from 22-34 ppt and lower densities when salinity ranged between 14-35 ppt (i.e., when salinity fluctuations were greater). The East River does not exhibit pronounced vertical stratification with respect to salinity. However, seasonal variability in salinity can be high.

Woodhead (1992) has characterized the variability and complexity observed within the East River fish community as follows:

1. "The fish community of the Harbor forms a distinguishable entity within the larger fish community along the tidal length of the Hudson (River) Estuary. It occupies the "polyhaline" ecological zone of the estuary."
2. "There is a diverse community of more than 60 fish species in the Harbor, which shows a regular cycle of seasonal change. There appears to be persistence from year to year and the same species are numerically dominant. However, individual species may change in abundance in very different ways during the annual cycle."
3. "Individual species occupy different habitats within the ecosystem, but successive life-stages of a species may also change the habitats which they occupy. Consequently, the characterization of a species' "critical habitat" is not simply done."

A number of studies conducted within the East River and the New York Harbor area have amply documented the natural flux in the composition of the aquatic community (see Table 8.1). Three major studies include trawl surveys conducted by Lawler, Matusky, & Skelly Engineers (Westway: LMS 1983); Lawler, Matusky, & Skelly Engineers (River Walk: LMS 1985), and Woodhead (SUNY at Stony Brook: Woodhead 1985). Additional studies summarized in this section include trawl surveys conducted by Woodward-Clyde Associates (1985); the U.S. Fish and Wildlife Service (USFW)(1985); Lawler, Matusky, and Skelly Engineers (Hunters Point: LMS 1985), Malcolm Pirnie, Inc. (1985); and Lawler, Matusky, & Skelly Engineers (East River: LMS 1989). The following sections outline these six river and harbor sampling programs as conducted over the seven-year period.

8.2 River and Harbor Sampling

As discussed in Woodhead (1992) a number of intensive, nearshore surveys were conducted within the reaches of the river from the Narrows to Spuyten Duyvil during 1982-1985. The first survey was conducted as a part of the Westway studies undertaken by Lawler, Matusky, and Skelly from 1982-1983. This study employed bottom trawl surveys with a 30-foot otter trawl. In addition, LMS conducted a second sampling effort spanning from March through October 1982 and from November 1983 to April 1984 for the River Walk Project. These surveys employed both bottom trawls and mid-water trawls combined with gill nets and trap nets (Parish & Wiener, 1989: in LMS, 2000). A third survey was undertaken by Woodhead/SUNY at Stony Brook within the deeper portions of the channels and was conducted concurrently with the USFW survey. Woodheads survey utilized a 30-foot otter trawl.

8.2.1 Westway Survey (LMS 1982-1983)

According to Woodhead (1992), the Westway studies recovered the lowest number of species, totaling 46. The top three dominant fishes reported during the 1982-1983 survey of the Manhattan reach of the Hudson River included hogchoker, Atlantic tomcod and winter flounder. Striped bass was the fifth most abundant species, grubby was eighth, and alewife was the tenth most dominant species.

8.2.2 River Walk Project (LMS, March 1982-April 1984; December 1984-May 1985)

Subsequent efforts undertaken by LMS from 1982-1984 yielded 36 species of fish (LMS, 2000). Samples were comprised as follows: winter flounder (55.6%), Atlantic tomcod (15.9%), grubby (11.1%), and striped bass (9.8%). The remainder of species collected, with the exception of bay anchovy, comprised less than 1% of the total sample. LMS found that winter flounder, striped bass, and grubby abundance exhibited a distinct seasonality, with distribution peaking from December through April (LMS, 2000).

Table 8.1: Species Collected in New York Harbor/East River Trawl Surveys (1982-1986)

COMMON NAME	SURVEYS						
	STATUS	Riverwalk[A]	Westway[B]	Gill 1985[C]	SUNY/[D] Woodhead	Woodward-Clyde[E]	LMS/Hunters Point[F]
Atlantic sturgeon	U			X	X		
American eel	R	X	X	X	X	X	X
Conger eel	U	X	X		X		X
Blueback herring		X	X	X	X	X	X
Hickory shad	U		X	X	X		
Alewife		X	X	X	X	X	X
American shad		X	X	X	X		X
Atlantic menhaden		X	X	X	X		X
Atlantic herring		X	X	X	X		
Gizzard shad	U		X				
Bay anchovy	U	X	X	X	X	X	X
Rainbow smelt	U	X	X		X		X
Inshore lizardfish	U			X			
Oyster toadfish	U		X		X		
Fourbeard rockling			X		X		
Silver hake		X	X	X	X	X	
Tomcod	R		X	X	X	X	X
Pollock	U	X	X				X
Spotted hake	R		X	X	X	X	X
Red hake	R	X	X	X	X	X	X
Atlantic cod	U			X			
Cusk eel			X		X		
Atlantic silverside		X	X	X	X		X
Threespine stickleback			X	X	X		
Lined seahorse	R	X	X	X	X	X	X
Northern pipefish	R	X	X	X	X	X	X

COMMON NAME	SURVEYS						
	STATUS	Riverwalk[A]	Westway[B]	Gill 1985[C]	SUNY/[D] Woodhead	Woodward-Clyde[E]	LMS/Hunters Point[F]
Mummichog	R			X	X		X
Striped killifish	U		X	X			X
Banded killifish	U			X			
Atlantic needlefish	U			X			
Grubby	R	X	X	X	X	X	X
Longhorn sculpin		X	X		X		
Black sea bass		X	X	X	X	X	X
Short bigeye	U				X		
Grey snapper	U				X		
White perch	R	X	X	X	X	X	
Striped bass	R	X	X	X	X	X	X
Bluegill	U		X				
Bluefish		X	X	X	X	X	X
Crevalle jack			X	X	X		X
Lookdown	U				X		
Rough scad	U				X		
Silver perch	U				X		
Weakfish		X	X	X	X	X	X
Spot	U	X	X		X		X
Northern kingfish	U			X			
Scup		X		X	X		X
Spotfin butterflyfish	U			X			
Striped mullet	U	X	X		X		X
White mullet	U			X			X
Tautog				X		X	X
Cunner	R	X	X	X	X		X
Rock gunnel		X	X	X	X		X
American sandlance				X	X		
Butterfish		X		X	X		X
Northern searobin		X	X	X	X		X

COMMON NAME	STATUS	SURVEYS					
		Riverwalk[A]	Westway[B]	Gill 1985[C]	SUNY/[D] Woodhead	Woodward-Clyde[E]	LMS/Hunters Point[F]
Striped searobin		X		X	X		X
Smallmouth flounder		X	X	X	X		X
Summer flounder			X	X	X	X	X
Four-spot flounder		X	X	X	X		
Windowpane	R	X	X	X	X	X	X
Winter flounder	R	X	X	X	X	X	X
Hogchoker			X	X	X	X	X
Planehead filefish	U				X	X	X
Northern puffer	U		X	X	X		
Naked goby	U					X	X
Atlantic moonfish	U					X	X
Pinfish	U					X	
Spotfin mojarra	U						X
Flying gurnard	U						X
Atlantic croaker	U						X

Sources: Table adapted from Woodhead (1992). R = Resident; U = Uncommon or rare in survey catches.

A. Lawler, Matusky, & Skelly Engineers (March-October 1982 and November 1983-April 1984: in Parish and Weiner, 1989). Data collected for the River Walk Project.
B. Lawler, Matusky and Skelly Engineers (1983). 1982-1983 Westway winter sampling program. Volume I. Trawl Data. Report prepared for the NYS DOT.
C. Gill, 1985; in Woodhead, 1992. A report on the fishery resources collected in conjunction with the project known as the widening and deepening of the Kill Van Kull. Unpublished Report from the Department of the Interior (USFW) to the ACOE District Engineer.
D. Woodhead, 1992. Trawl survey data collected in the channels during 1984-1985.
E. Woodward-Clyde Consultants (1986). East and Harlem River data set collected during October 1985-November 1986.
F. Lawler, Matusky and Skelly Engineers (1986). Hunters Point Project (March 1985-February 1986.

The dominant five species yielded in the December 1984 through May 1985 River Walk survey conducted by LMS were winter flounder (52.7%), striped bass (26.26%), grubby (6.91%), Atlantic tomcod (5.26%), and white perch (3.91%). The remainder of the species collected accounted for less than 5% of the total sample.

Based upon the combined results of the LMS sampling efforts, Parish & Weiner (1989) as presented in LMS, 2000, concluded that the trends in the spatial and temporal distribution of the fishes sampled indicate that the East River is more of a travel corridor for fishes rather than a point of extended congregation.

8.2.3 Woodhead/SUNY at Stony Brook (1984-1985)

Woodhead (1992) reports collecting 54 species during the 1984-1985 survey and attributes the higher numbers, i.e. the increase in observed species diversity, to differences in gear efficiency and sample location. The three most dominant fishes collected during this study included Atlantic tomcod, hogchoker, and bay anchovy. Winter flounder ranked seventh, and the blueback herring was tenth.

8.2.4 Other Studies

Additional studies within the reaches of the East River are listed below:

- **Malcolm Pirnie Inc. for the ACOE (January 1984-April 1984)**
  Dominant species were similar to those recorded during the LMS/Westway survey:
  Winter flounder
  Atlantic tomcod
  Striped bass
  Grubby

- **Woodward-Clyde Consultants (East/Harlem Rivers) (October 1985-November 1986)**
  Samples were co-dominated by winter flounder and hogchoker, which collectively accounted for 69% of the total number of individuals collected (1,359 individuals/27 species). Less frequently occurring species included Atlantic tomcod, blueback herring, grubby, striped bass, and white perch. Rarely occurring species (0.1% included Atlantic moonfish, bluefish, hake, naked goby, and planehead filefish.

- **Lawler, Matusky, & Skelly Engineers (Hunters Point) (March 1985- February 1986)**
  Winter flounder dominated the total sample, accounting for 63.9% of the total number of individuals collected (4,780 individuals/45 species). Less frequently occurring species included striped bass, Atlantic tomcod, grubby, bay anchovy, and American shad. Rarely occurring species (<0.1%) included scup, smallmouth flounder, summer flounder, planehead filefish, and striped mullet.

- **Lawler, Matusky, & Skelly Engineers (East River) (September, 1989)**
  According to LMS (1989), their July through September trawl survey only yielded six species of fish. Bay anchovy dominated the samples.

8.3 Entrainment

The intake of a power plant is usually equipped with screens to prevent clogging of the condenser cooling system and pumps. Along with the water, organisms smaller than the screen openings can be drawn into the cooling system. This process is called entrainment. Planktonic organisms such as fish eggs and newly hatched (larval) fish are susceptible to entrainment because they have little or no swimming ability. Entrained organisms experience a variety of stresses, some of which may cause death, as they pass through the condenser cooling system. Reducing the withdrawal requirements of a condenser cooling system substantially reduces the potential for entraining aquatic organisms.

While the eggs of most fishes identified in East River studies ranged from 1-2 millimeters (mm) in diameter, the smallest egg diameter range reported was 0.66-0.98 mm for the four-bearded rockling, and the largest egg diameter measured 3.2 mm for the striped bass (see Table 8.2). Although there are a few exceptions (i.e., bay anchovy) an overall trend was observed whereby most species were within a critical entrainment range (i.e., less than 15 mm in total length for a low velocity wedgewire screen) up through the latter half of the larval stage (i.e., transitional larvae).

From the transitional larval stage to the juvenile stage, most fishes are outside of this critical entrainment range and are not expected to be subject to entrainment at the new intake. Consequently, the developmental stages that are of interest span from embryonic development to the ending of the post yolk sac larval stage (i.e., pre-postflexion larvae).

Table 8.2: Egg Diameter (mm) and Total Length (mm) of Yolk Sac Larvae (YSL), Post Yolk Sac Larvae (PYSC), and Juvenile (JUV) Target Fishes

	EGGS	YSL	PYSL	JUV
Species	**Egg Diameter at Fertilization (mm)**	**Length (mm)**	**Larva Length (mm)**	**Length (mm)**
Cunner	0.75-0.85	2.0-6.5	6.5-15.0	15.0
Atlantic menhaden	1.5-1.8	4.5-9.0	9.0-23.0	23.0
Tautog	0.9-1.0	2.2-10.0	10.0-30	30.0
Windowpane Flounder	1.0-2.0	5.5-8.0	8.0-12.0	12.0
Bay anchovy	1.6	1.6-3.2	3.2-12.7	12.7
Winter flounder	0.74-0.85	5.0-9.0	9.0-12.0	12.0
Four-bearded Rockling	0.66-0.98	2.0-3.6	3.6-10.0	10.0
Grubby	1.0	2.0-6.0	6.0-8.0	8.0
Striped bass	3.2	3.2-6.3	6.3-25.0	25.0
White perch	1.6	1.6-3.2	3.2-25.4	25.4
Northern pipefish	(See Note A)	2.0-9.0	9.0-70.0	70.0
Black sea bass	0.9-1.0	UNK	UNK	UNK
Butterfish	0.7-0.8	2.0-6.0	6.0-15.0	15.0

(Source: Bigelow & Schroeder, 1953 (Adapted from Osee & van den Boogaart, 1995)

Note A: Internal Fertilization and Brooding to PYSL Stage.

The five most abundant species entrained at the three facilities (in decreasing order) included grubby, four beard rockling, northern pipefish, bay anchovy, and winter flounder (see Table 8.3). All of these species are considered commonly occurring resident fishes in the New York Harbor area and are consistent components of Woodhead's polyhaline assemblage (Woodhead, 1992).

a. Essential Fish Habitat (EFH) Fishes

The most obvious trend in the relative percent composition of entrained fishes is that the early phases of EFH fishes (eggs, YSL and PYSL) contributed very little to entrainment samples (typically 1-3 %), relative to Non-EFH fishes (95-99%) (Table 8.4). For these reasons it is believed that the East River channel is not nearly as critical for the successful breeding, spawning or growth to maturity of early life stages of these fishes as more offshore areas or

Table 8.3 Degree of Susceptibility to Entrainment (Species Ordered with Decreasing Susceptibility).

SPECIES	RAVENSWOOD								ASTORIA				POLETTI			
	1991-1992				1993-1994				January 1993-December 1993				January 1999-December 1999			
	EGG	YSL	PYSL	JUV/YOY	EGG	YSL	PYSL	JUV/YOY	EGG	YSL	PYSL	JUV/YOY	EGG	YSL	PYSL	JUV/YOY
1 Grubby		96.9	14		1.3	98.6	45.23	0.16	8.8	98	57	34.8		35.4	2.15	0.4
2 Fourbeard rockling	89.5				64.3				60.9			0.7	1.89			
3 Northern pipefish			0.1	68.3			0.17	55.03				35.5			0.23	3
4 Bay anchovy	3.5		13.5	0.6	6.16	0.98	42.49	8.08	11.1		19.9	8.14	1.56		20.1	1.3
5 Winter flounder	0.4		36.4	4.4	19.59	0.15	4.72		14.5		15.98	2.96	0.24	21.7	1.3	4.4
6 Atlantic menhaden	2.9		1.1		1.3		0.01		1.2				32	41.3	28.4	
7 Cunner			0.1		1.09		0.01						19		7	62.81
8 Gobiidae			12.9	8.9	0.01	0.06	3.48	7.05			1.95		0.001		7.7	15.1
9 Labrid													33.3		0.06	
10 Tautog	<0.1		0.7		2.78		0.05		0.4		0.2		2.13		15.5	
11 Smallmouth flounder			0.1	0.9			0.02	13.29			0.19					0.6
12 UID	0.2		6.5				0.02				0.07		7.65		0.58	0.06
13 Weakfish	0.1						0.22				0.2				8.4	5.9
14 Windowpane	0.1		2.5	3.2			0.28	3.58			0.34		0.54		1.3	1.13
15 American sandlance		3.1	2.8			0.19	1.4			2	3.17				0.02	0.03
16 Tomcod							1.63	2.05			0.45	8.14				0.03
17 Seaboard goby			0.2	3.3				2.95				2.2				0.6
18 Silver hake	3.3				2.7				2.29							
19 Summer flounder			3.1	0.6	0.39		0.03	0.44	0.006		0.15					0.5
20 Prionotus spp.								3.67					0.02		0.11	1
21 Cusk eel			2.5	2.1												
22 Northern stargazer				4.1				0.39								
23 Silver perch															3.8	0.5
24 Striped searobin				0.7								2.2				0.07
25 Naked goby				1.9				0.53								0.04
26 Northern searobin								0.82				1.48			0.01	
27 Atlantic herring							0.1				0.07			1.36	0.2	0.18
28 Spot			1.7													
29 Butterfish							0.02	1.29			0.07				0.1	0.1
30 Inshore lizardfish							0.02					1.48				
31 Northern puffer				0.9				0.42								
32 Rough silverside			1.2													
33 Sciaenidae			0.3												0.5	0.3
34 Striped bass												0.7			0.29	
35 Brook silverside													0.85			
36 Atlantic silverside					0.02		0.06		0.02		0.03	0.7				
37 Clupeidae					<0.001				0.3						0.5	
38 Oyster toadfish												0.7				
39 Northern porgy													0.69			
40 Feather blenny					0.01			0.26	0.006						0.07	
41 Conger eel									0.006							0.3
42 Blackcheek tonguefish			0.3													
43 Atlantic croaker							0.01								0.28	
44 American eel																0.2
45 Mummichog					0.2											
46 Serranidae															0.2	
47 White perch													0.005		0.15	
48 Wrasses					0.15											
49 Hogchoker	0.1				0.01		0.01		0.02							
50 Four-spot flounder					0.01				0.04							
51 Pollock													0.001			0.03
52 Red hake											0.03					
53 Black sea bass																0.03
54 Spotted hake							0.02		0.006							
55 Alewife							0.02									
56 Rock gunnel																0.02
57 Menidia sp.															0.01	
58 Northern kingfish															0.01	

Table 8.4: Relative Percent Composition of Designated EFH Species by Life Stage to Total Numbers Entrained at the Charles Poletti Power Project during 1999

	Life Stage									
EFH Species	*EGG-%*		*YSL-%*		*PYSL-%*		*JUV-%*		*ADULTS-%*	
Gadus morhua (Atlantic cod)		ND		ND		ND		ND		ND
Melanogrammus aeglefinus (haddock)		ND		ND		ND		ND		ND
Pollachius virens (Pollock)		**0.001**		ND		ND	X	**0.03**	X	ND
Merluccius bilinearis (whiting)		ND		ND		ND		ND		ND
Merluccius albidus (offshore hake)		ND		ND		ND		ND		ND
Urophycis chuss (red hake)		ND	X	ND	X	ND	X	ND	X	ND
Urophycis tenuis (white hake)		ND		ND		ND		ND		ND
Sebastes fasciatus (redfish)	NA	ND		ND		ND		ND		ND
Glyptocephalus cynoglossus (witch flounder)		ND		ND		ND		ND		ND
Pleuronectes americanus (winter flounder)	X	**0.24**	X	ND	X	**1.3**	X	**4.42**	X	ND
Pleuronectes ferruginea (yellowtail flounder)		ND		ND		ND		ND		ND
Scophthalamus aquosus (windowpane flounder)	X	**0.54**	X	ND	X	**1.3**	X	**1.13**	X	ND
Hippoglossoides platessoides (American plaice)		ND		ND		ND		ND		ND
Macrozoarces americanus (ocean pout)		ND		ND		ND		ND		ND
Hippoglossus hippoglossus (Atlantic halibut)		ND		ND		ND		ND		ND
Placopecten magellanicus (Atlantic sea scallop)		ND		ND		ND		ND		ND
Clupea harengus (Atlantic sea herring)		ND	X	**1.36**	X	**0.22**	X	**0.19**	X	ND
Lophius americanus (monkfish)		ND		ND		ND		ND		ND
Pomatomus saltatrix (bluefish)		ND		ND		ND	X	ND	X	ND
Loligo pealei (long finned squid)	NA	ND	NA	ND	NA	ND		ND		ND
Illex illecebrosus (short finned squid)	NA	ND	NA	ND	NA	ND		ND		ND

Table 8.4: Relative Percent Composition of Designated EFH Species by Life Stage to Total Numbers Entrained at the Charles Poletti Power Project during 1999

	Life Stage									
EFH Species	*EGG-%*		*YSL-%*		*PYSL-%*		*JUV-%*		*ADULTS-%*	
Peprilus tricanthus (butterfish)		ND	X	ND	X	**0.15**	X	**0.10**	X	ND
Scomber scombrus (Atlantic mackerel)		ND		ND		ND	X	ND	X	ND
Paralichthys dentatus (summer flounder)		ND	X	ND	X	ND	X	**0.25**	X	ND
Stenotomus chrysops (scup)	X	ND	X	ND	X	ND	X	ND	X	ND
Centropristus striata (black sea bass)	NA	ND		ND		ND	X	**0.04**	X	ND
Spisula solidissima (surf clam)	NA	ND	NA	ND	NA	ND		ND		ND
Artica islandica (ocean quahog)	NA	ND	NA	ND	NA	ND		ND		ND
Squalus acanthias (spiny dogfish)	NA	ND	NA	ND	NA	ND		ND		ND
Lopholatilus chamaeleonticeps (tilefish)		ND		ND		ND		ND		ND
Scomberomus cavalla (king mackerel)	X	ND	X	ND	X	ND	X	ND	X	ND
Scomberomus maculatus (Spanish mackerel)	X	ND	X	ND	X	ND	X	ND	X	ND
Rachycentron canadum (cobia)	X	ND	X	ND	X	ND	X	ND	X	ND
Odontaspis taurus (sand tiger shark)		ND	X	ND	X	ND		ND		ND
Charcharinus obscurus (dusky shark)		ND	X	ND	X	ND		ND		ND
Charcharinus plumbeus (sandbar shark)		ND	X	ND	X	ND		ND	X	ND
NON-EFH FISHES	**99.22%**		**98.64%**		**97.02%**		**93.8%**		**ND**	

Source: PBS&J, 2000

ND = Not Detected (in samples); X = EFH Designation; NA = Not Applicable freshwater zones in the Hudson River might be. It seems plausible, however, that habitat for certain of these fishes may be increasing within the New York Harbor area. For example, the reduction of the influx of raw or partially treated sewerage appears to be improving the breeding habitat for distinctly demersal species such as winter flounder.

With the possible exception of windowpane flounder and winter flounder, which accounted for less than 1% of the entrained eggs, less than 2% of the entrained post yolk sac larvae and less than 5% of the entrained juveniles, the EFH species collected at the Charles Poletti Power Project intake were insignificant on a relative percent composition basis. Broken down by life stage, eggs, YSL and PYSL from non-EFH species accounted for more than 97% of the fishes collected in entrainment samples. For juveniles, non-EFH species accounted for more than 93% of the fishes collected.

8.3.2 Seasonal Trends in Entrainment

The overall trend in the temporal distribution of entrainment was more or less similar at each of the three stations with minor variations (see Figures 8-1 through 8-4). A summary of the temporal distribution of entrainment for each lifestage is provided in the sections below.

a. Eggs

The seasonality in the entrainment of eggs is distinct and has followed a similar pattern over five years even with different position along the river. Peak egg entrainment occurs during the late spring and early summer. Comparatively few eggs are entrained from August through January.

Entrainment of eggs at both the Ravenswood and Astoria facilities peaked in April (see Figure 8-1). This month comprised slightly over half of the yearly total of eggs entrained. At Poletti, the peak occurred one month later in May during which 50% of the yearly total of eggs were entrained.

b. Yolk Sac Larvae (YSL)

Entrainment of YSL peaks in the spring with comparatively little entrainment from August through January.

The entrainment of eggs at the Astoria and Poletti facilities exhibited the highest relative percentages over a period from February through May, and comprised more than 40% of the yearly total (see Figure 8-2). At Ravenswood, the relative percentage reached over 50% during the month of April and dropped sharply in May.

Figure 8-1: Relative Monthly Distribution of Entrained Eggs as Recorded at the Poletti, Ravenswood, and Astoria Power Plants.

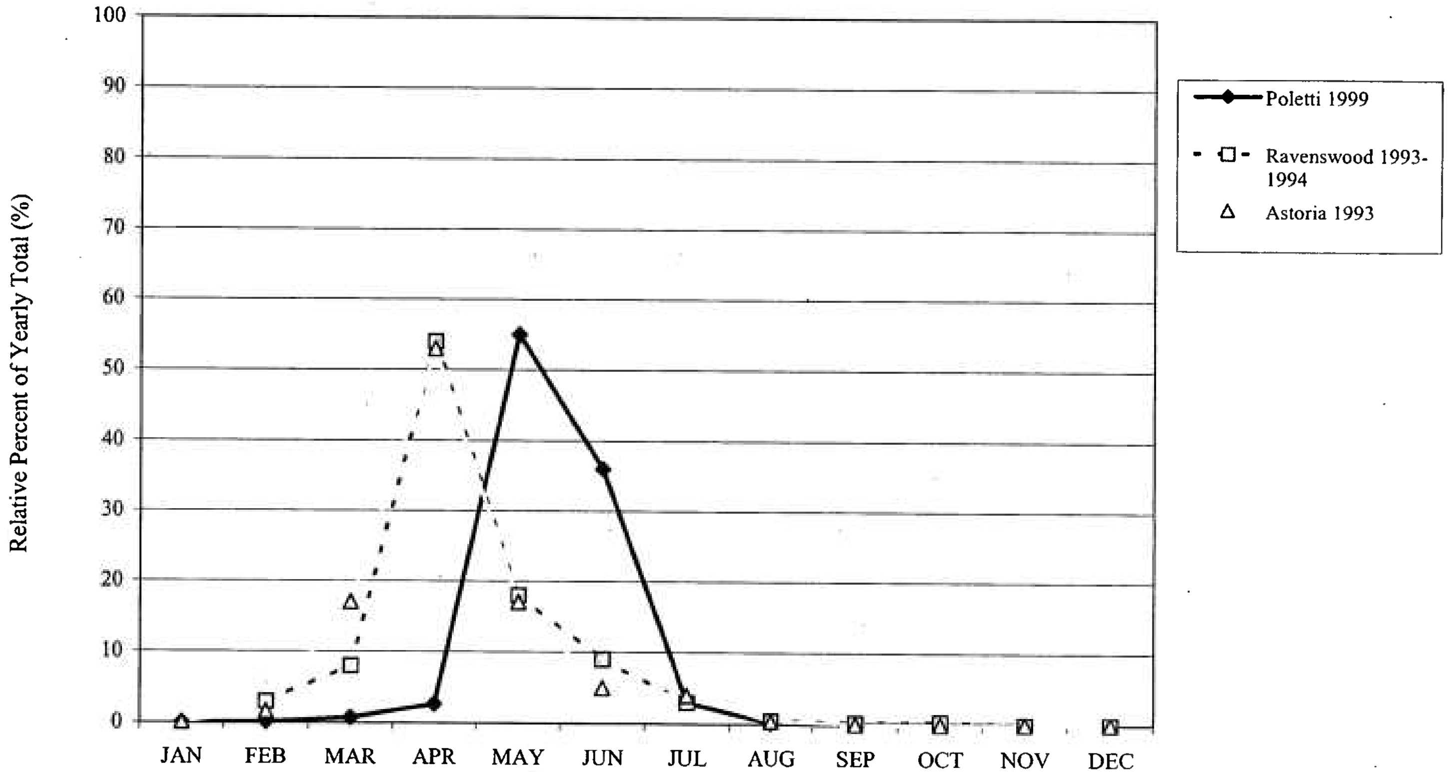
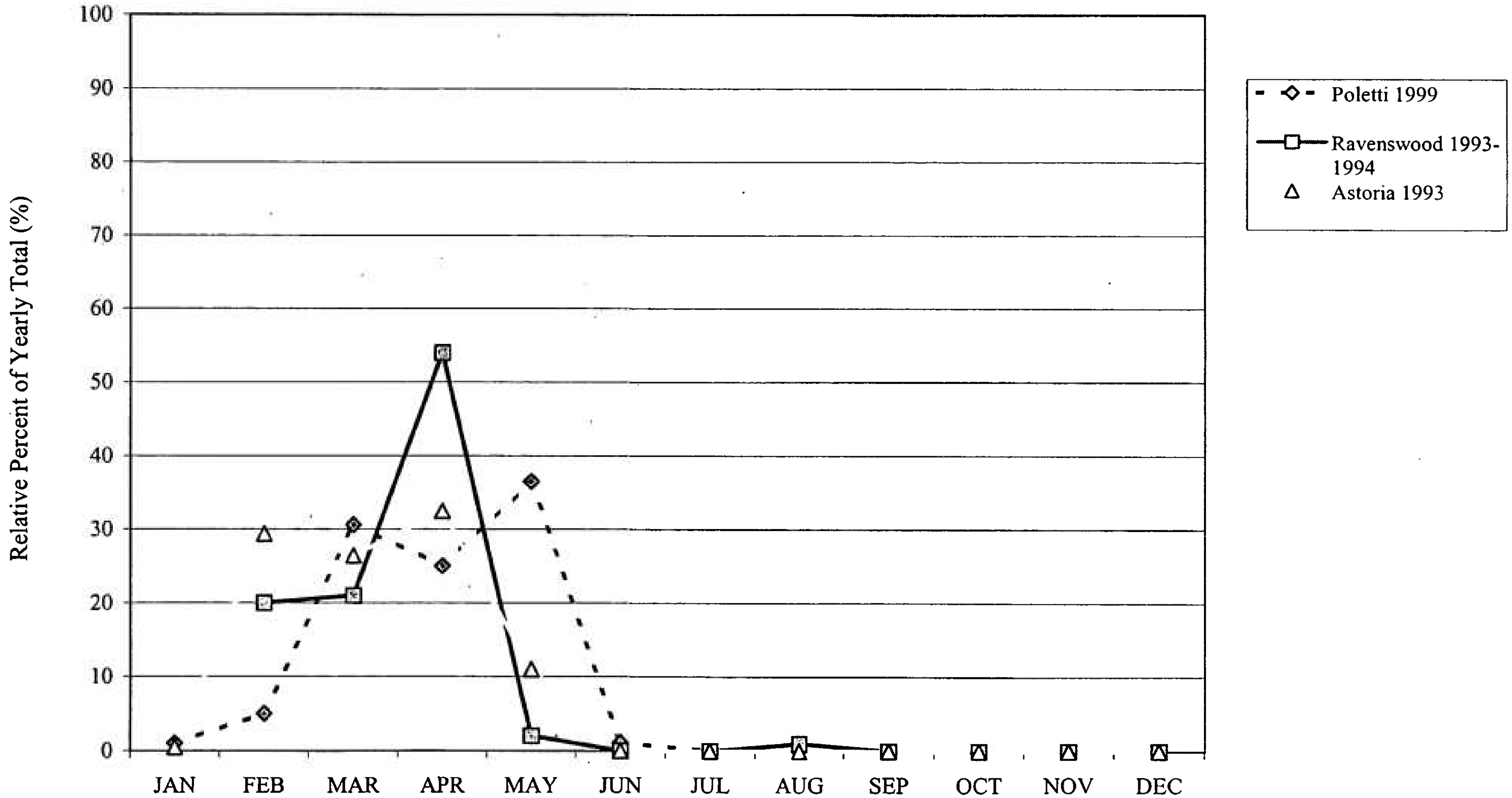


Figure 8-2: Relative Monthly Distribution of Entrained YSL
as Recorded at the
Poletti, Ravenswood, and Astoria Power Plants



c. Post Yolk Sac Larvae (PYSL)

The entrainment of PYSL at the Astoria and Ravenswood facilities was bimodal, with a peak in April (approximately 28%) and a second peak in July-August (approximately 18%) (see Figure 8-3). At the Poletti facility, the relative percentage reached nearly 50% during the month of June. This coincided with the lowest percentages recorded at the Astoria and Ravenswood facilities.

d. Juveniles/Young of year

Entrainment of juveniles and YOY occurred primarily during a period spanning the months from June through October

The entrainment of juveniles/young of year at the Astoria facility was distinctly bimodal with a peak in March (40%) and a peak in July (24%) (see Figure 8-4). The relative contribution to the yearly total of entrained juveniles/YOY at Poletti was highest in July. This peak contributed 65% of the yearly total. At Ravenswood, the relative contribution of entrained juveniles/YOY gradually increased over the summer and reached a peak of over 30% during the month of September.

8.3.3 Diel Variation in Entrainment

Entrainment abundance sampling was conducted over one 24-hour period on a bi-weekly basis from January through March 1999, and on a weekly basis from April through December 1999. Two-hour samples were collected every six hours at two discrete depths in the discharge of the Poletti power plant for a total of 8 samples during each 24-hour sampling event. Samples were collected during the following four diel periods: 0600-1200, 1200-1800, 1800-2400, and 0000-0600.

Given that the numbers of species entrained at a given plant can change quite dramatically throughout a year, entrainment data were lumped into seasonal blocks. For the purposes of this analysis, the four seasonal blocks were defined as follows:

- January-March (Winter);
- April-June (Spring);
- July-September (Summer); and
- October-December (Autumn).

Figure 8-3: Relative Monthly Distribution of Entrained PYSL
as Recorded at the
Poletti, Ravenswood, and Astoria Power Plants.

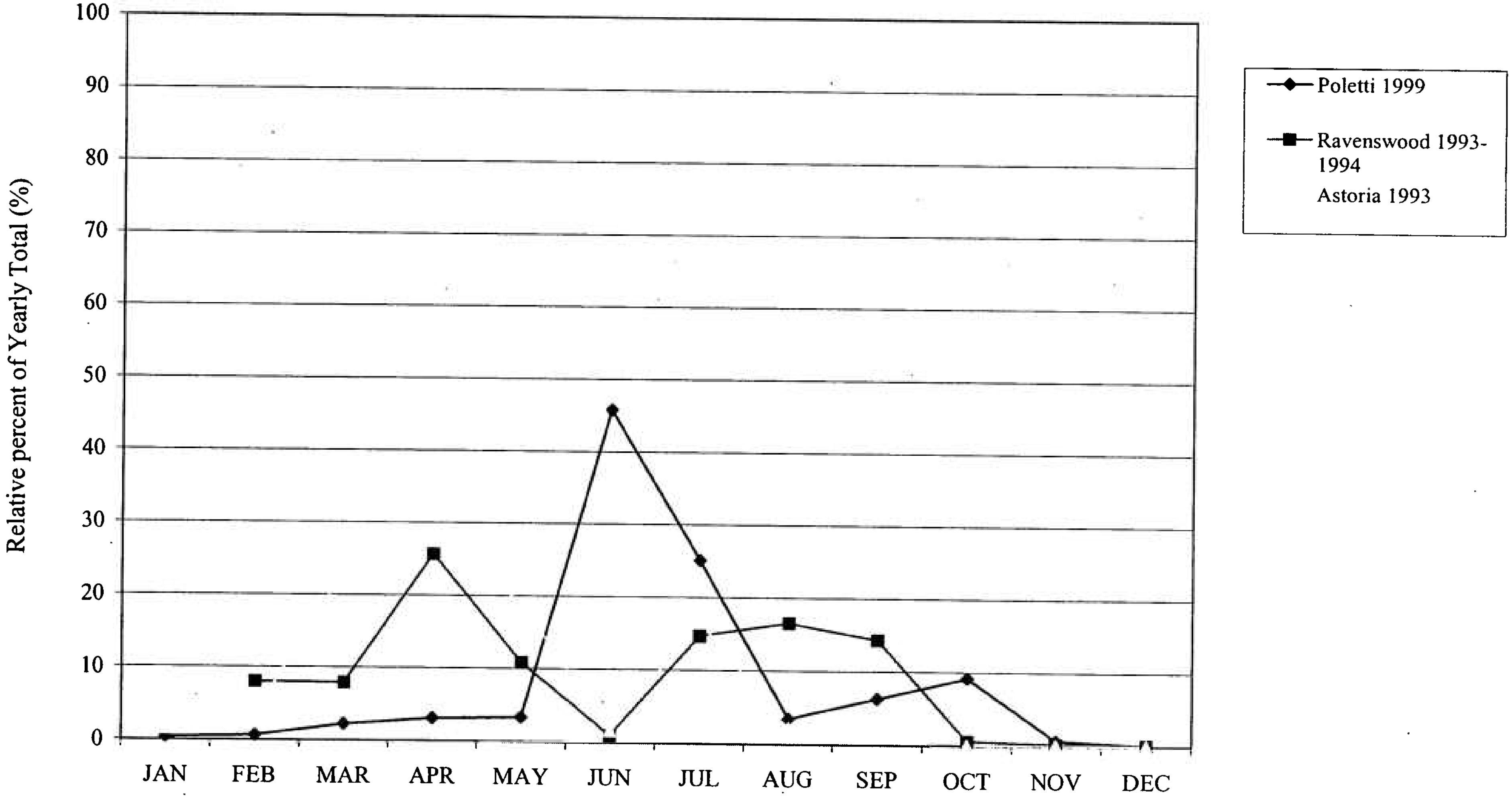
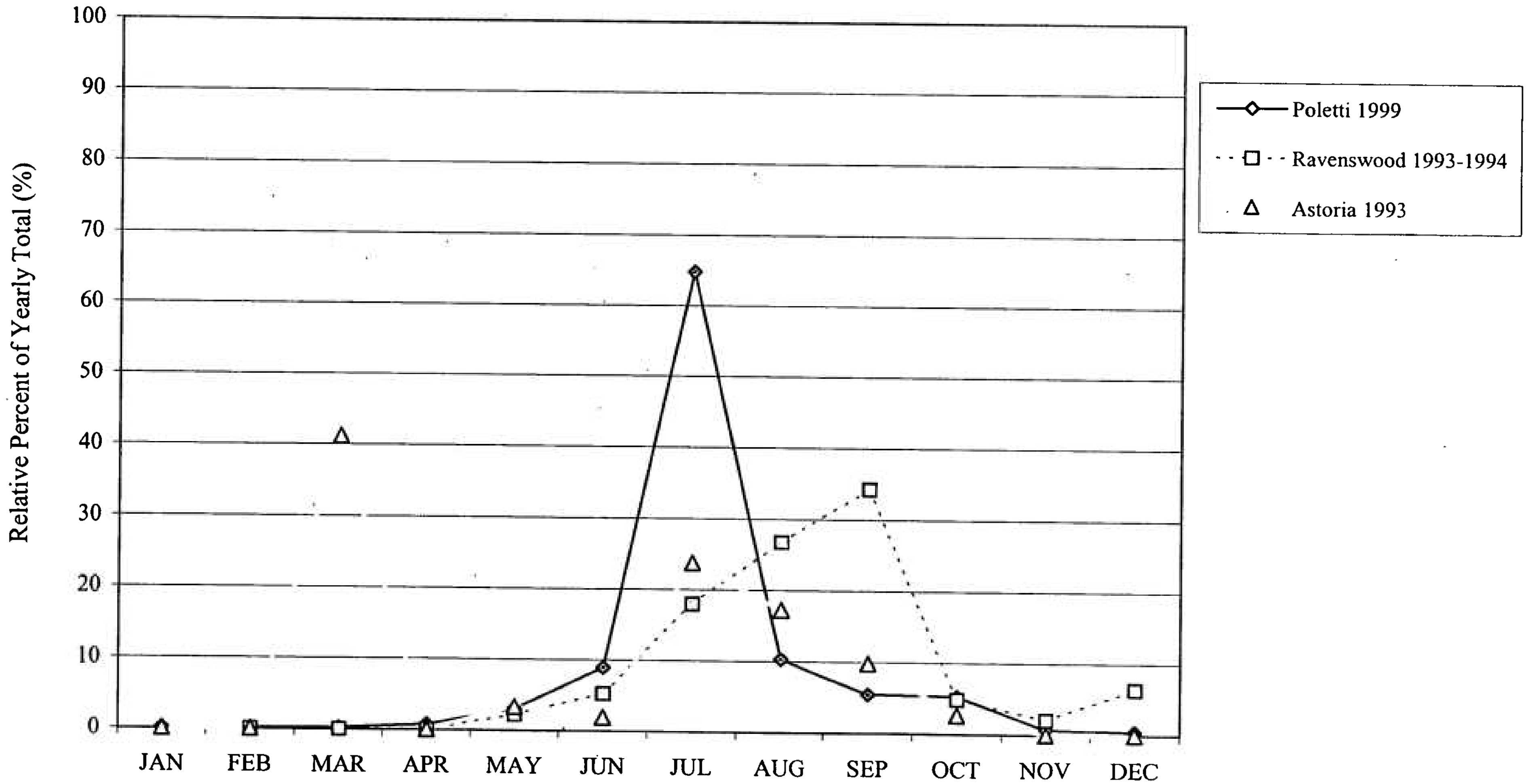


Figure 8-4: Relative Monthly Distribution of Entrained JUV/YOY as Recorded at the Poletti, Ravenswood, and Astoria Power Plants



In order to assess if the different life stages of all species combined during each season exhibited a statistically significant diel entrainment pattern, differences among individual time periods between entrained life stages (EGG, YSL, PYSL, and JUV) were determined with single-factor Analysis of Variance (ANOVA *F* test). The null hypothesis in this case was that there would be no difference in the numbers of individuals entrained during the day i.e., $H_{0:\ :1} = {}_{:2} = {}_{:3} = {}_{:4}$. Conversely, the alternative claim is that there are statistically significant differences in the numbers of individuals within each diel period, i.e., H_a : at least two of the $_{:i}$'s are unequal.

In single factor ANOVA with *I* populations or treatments, and *J* observations from each population the F statistic has an F distribution where v_1 (numerator degrees of freedom or df) = I - 1 and v_2 (denominator df) = I (J - 1). The level ∀ test that supports the rejection of the null hypothesis in favor of the alternative hypothesis is: $F \geq F_{\forall,\ I-1,\ I(J-1)}$. Specifically, statistically significant differences for F∀, *v1, and v2* were reported at the 0.05 ∀ probability level. In instances where P>0.05, the null hypothesis was supported. Where P<0.05, the alternative hypothesis was supported. The following ANOVA matrix summarizes both the F critical values and corresponding alpha probability (P) values for each seasonal block and lifestage.

The ANOVA results do not indicate a statistically significant diel pattern in the entrainment of fish eggs, larvae, or juveniles (see Table 8.5)

Table 8.5: Summary of single-factor ANOVA F-Critical Values (F) and ∀ P-values (P) for Four Life-stages Across Four Seasons

Period	EGGS F/P	YSL F/P	PYSL F/P	JUV F/P
Jan-Mar	3.09/0.66 NS	3.09/0.76 NS	3.09/0.25 NS	3.09/0.87 NS
Apr-Jun	2.81/0.18 NS	2.81/0.87 NS	2.81/0.78 NS	2.81/0.54 NS
Jul-Sep	2.86/0.40 NS	*N/A*	2.86/0.26 NS	2.86/0.61 NS
Oct-Dec	2.79/0.45 NS	*N/A*	2.79/0.31 NS	2.79/0.50 NS

N/A- No YSL were collected during this seasonal block.
NS - Not Statistically Significant.

In an examination of the relative percent diel contribution of entrained ichthyoplankton, the non-significant nature of diel distribution at the Poletti facility is illustrated further (see Table 8.6). Specifically, for each lifestage, the relative percent composition is more or less evenly distributed throughout each of the diel periods.

Table 8.6 - Relative Percentage Distribution of Entrained Eggs

Period	Diel Period			
	0000 - 0600	0600 - 1200	1200 - 1800	1800 - 2400
EGGS				
Jan - Mar	29.69	13.96	45.33	11
April - June	22.78	23.3	21.9	27
July - Sept	13.11	54.92	26.33	5.63
Oct - Dec	6.97	53.44	20.2	18.76
Yolk Sac Larvae (YSL)				
Jan - Mar	21.46	39.66	25.1	13.7
April - June	24.83	11.7	28.22	35.23
July - Sept	0	0	0	0
Oct - Dec	0	0	0	0
Post Yolk Sac Larvae (PYSL)				
Jan - Mar	18.71	7.57	25.18	48.52
April - June	13.84	20.62	31.1	34.3
July - Sept	21.18	25.14	20.9	32.7
Oct - Dec	22.43	7.34	53.1	17.07
Juveniles (JUV)				
Jan - Mar	15.61	19.09	18.08	47.2
April - June	13.65	31.1	34.6	20.56
July - Sept	11.72	32.6	11.66	43.9
Oct - Dec	20.54	16	42.39	21.05

8.3.4 Conclusions Regarding Entrainment Impacts

The general conclusions that can be drawn from review of recent entrainment sampling results are as follows:

- Resident species appear to be depositing eggs within the influence zone of all three stations and, therefore, dominate entrainment sampling results on a relative percent composition basis.
- Resident species also dominate entrainment sampling results for YSL, PYSL and juveniles.
- The most abundant species entrained at the existing East River generating stations included four beard rockling, grubby, bay anchovy, northern pipefish, Atlantic menhaden, and cunner, none of which are identified as EFH species for the East River.
- On a relative percent composition basis, entrainment sampling results were similar at the Ravenswood, Astoria and Poletti Stations.
- Seasonal Distribution was similar at the three Power Generating Stations.
- There is no significant diel trend in the entrainment of ichthyoplankton.

Given the natural variability of the East River fish community, changes in both relative density /relative abundance of species can be expected on a year-to-year basis. Although every community has it's own unique range of natural variability within which it operates, continued improvements in water quality may expand both the relative abundance and composition of certain species in the future.

8.4 Impingement

To keep condensers from clogging with debris and to protect downstream pumping equipment, power plants generally use a combination of stationary bars to keep larger debris out of the intake and vertically traveling screens to exclude smaller materials. Aquatic organisms can become trapped on the screens, a process called impingement. Some impinged fish survive and others do not because of exhaustion resulting from attempts to swim away from the screens and injury due to contact with the screens (Normandeau Associates, 1999).

8.4.1 Relative Species Composition

The numbers of different species impinged at Poletti (39) was lower than those species entrained at Ravenswood (58) but higher than those impinged at Astoria (14).

Table 8.7 provides a detailed breakdown of the impingement contribution of EFH fishes at the Poletti Generating Station. Te relative percent impinged (Adjusted for collection efficiency) is provided. Blue crab is also included in the table.

Table 8.7: Relative Percent Contribution of Designated EFH Species to Total Numbers Impinged (Adjusted for Collection Efficiency) (Poletti).

EFH SPECIES		LIFESTAGE JUV/YOY/Year+ (%)
Gadus morhua (Atlantic cod)		ND
Melanogrammus aeglefinus (haddock)		ND
Pollachius virens (pollock)	X	ND
Merluccius bilinearis (whiting)		ND
Merluccius albidus (offshore hake)		ND
Urophycis chuss (red hake)	X	**0.07%**
Urophycis tenuis (white hake)		ND
Sebastes fasciatus (redfish)		ND
Glyptocephalus cynoglossus (witch flounder)		ND
Pleuronectes americanus (winter flounder)	X	**29.1%**
Pleuronectes ferruginea (yellowtail flounder)		ND
Scophthalamus aquosus (windowpane flounder)	X	**1.62%**
Hippoglossoides platessoides (American plaice)		ND
Macrozoarces americanus (ocean pout)		ND
Hippoglossus hippoglossus (Atlantic halibut)		ND
Placopecten magellanicus (Atlantic sea scallop)		ND
Clupea harengus (Atlantic sea herring)	X	**0.02%**
Lophius americanus (monkfish)		ND
Pomatomus saltatrix (bluefish)	X	**0.01%**
Loligo pealei (long finned squid)		ND
Illex illecebrosus (short finned squid)		ND
Peprilus tricanthus (butterfish)	X	**0.3%**
Scomber scombrus (Atlantic mackerel)	X	ND
Paralichthys dentatus (summer flounder)	X	ND
Stenotomus chrysops (scup)	X	ND
Centropristus striata (black sea bass)	X	**13.5%**
Spisula solidissima (surf clam)		ND
Artica islandica (ocean quahog)		ND
Squalus acanthias (spiny dogfish)		ND
Lopholatilus chamaeleonticeps (tilefish)		ND
Scomberomus cavalla (king mackerel)	X	ND
Scomberomus maculatus (Spanish mackerel)	X	ND
Rachycentron canadum (cobia)	X	ND
Odontaspis taurus (sand tiger shark)		ND
Charcharinus obscurus (dusky shark)		ND
Charcharinus plumbeus (sandbar shark		ND
NON-EFH FISHES	**17.13%**	
***Callinectes sapidus* (blue crab)**	**38.2%**	

ND = Not Detected (in sample); X = EFH Designation; NA = Not Applicable

As is indicated in Table 8.7, winter flounder and black sea bass dominate the EFH fishes impinged while blue crab dominates the non-EFH impingement samples. Based upon the Poletti data set, the bulk of impinged fishes were in the JUV/YOY class.

8.4.2 Seasonal Distribution of Impingement

The impingement of YOY fishes at all three stations occurs during the months of May through December (see Figure 8-5). The relative distribution of impinged YOY fishes at the Poletti and Astoria facilities is more or less uniform during this period. In contrast, the relative contribution of impinged fishes climbed steadily at Ravenswood, peaking in December.

The relative monthly impingement of Year+ fishes exhibited slightly different trends than those displayed by YOY fishes (see Figure 8-6). The most apparent difference relative to YOY is that the impingement events of Year+ fishes is more or less episodic. Specifically, both Ravenswood and Astoria exhibited peaks during the month of April. Relative contribution to total impingement during this month was 50% and nearly 70% respectively. The Poletti station exhibited a similar, episodic pattern as the other two facilities with the exception that the peak occurred during the month of January.

8.4.3 Conclusions Regarding Impingement Impacts

For the proposed project, the comparatively small volume of makeup water required from the Lower East River enables the use of a "fish friendly" passive screening device (Johnson wedge wire screen). Based on operational experience in the Hudson River, passive intake systems, when specifically sized to reduce the potential for impingement, virtually eliminate impingement of aquatic organisms.

8.5 Species Potentially Subject to Entrainment/Impingement

In a review of East River trawl surveys and generating station entrainment/impingement studies, it appears that the following fishes might be expected to occur within the vicinity of the Charles Poletti Power Project:

1.	cunner	*Tautogolabrus adspersus*
2.	Atlantic menhaden	*Brevoortia tyrannus*
3.	tautog	*Tautoga onitis*
4.	windowpane flounder	*Scophthalamus aquosus* (EFH)
5.	bay anchovy	*Anchoa mitchilli*
6.	winter flounder	*Pseudopleuronectes americanus* (EFH)
7.	four-bearded rockling	*Enchelyopus cimbrius*

Figure 8-5: Relative Monthly Distribution of Impinged YOY as Recorded at the Poletti, Ravenswood, and Astoria Power Plants

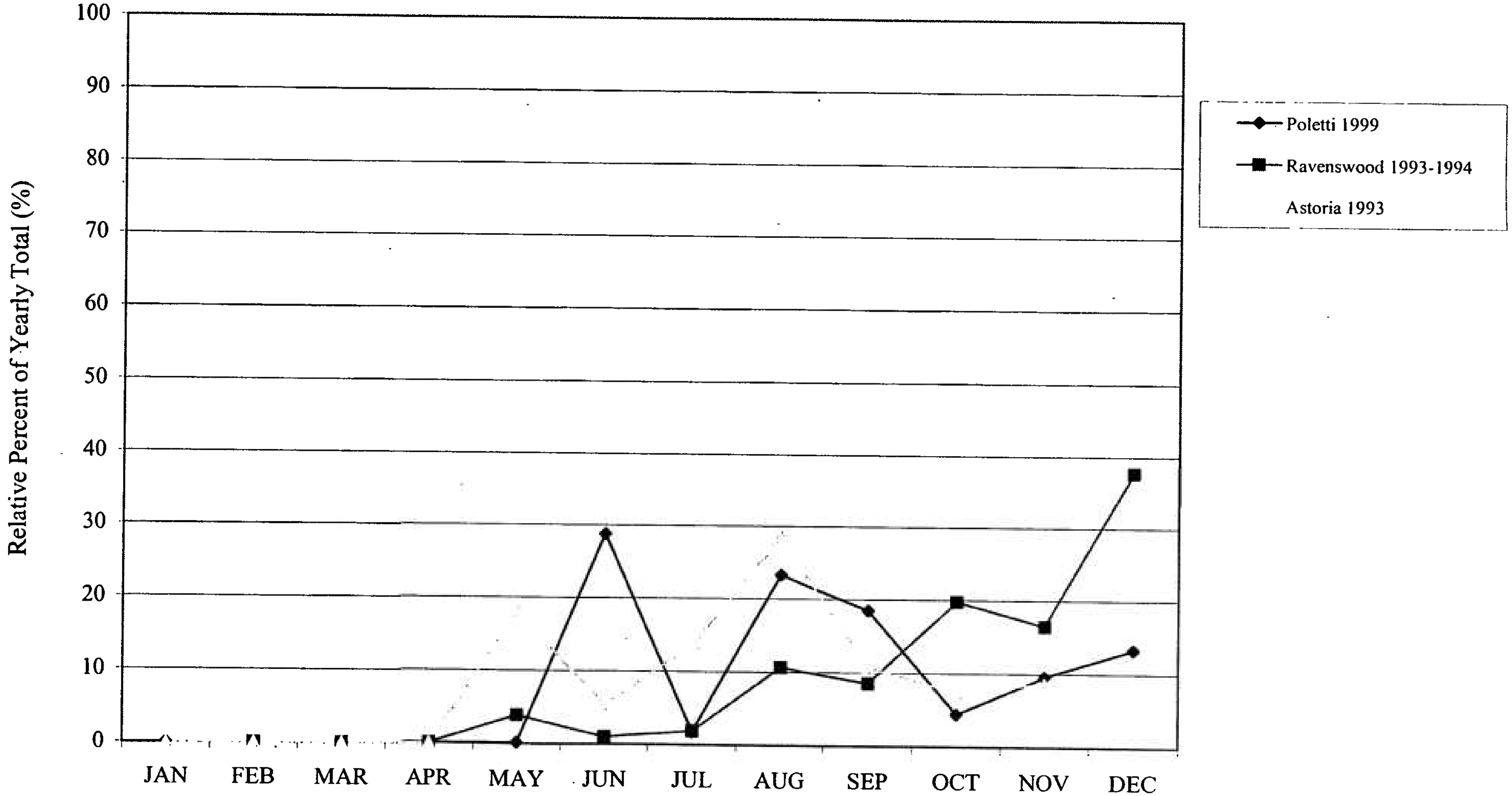
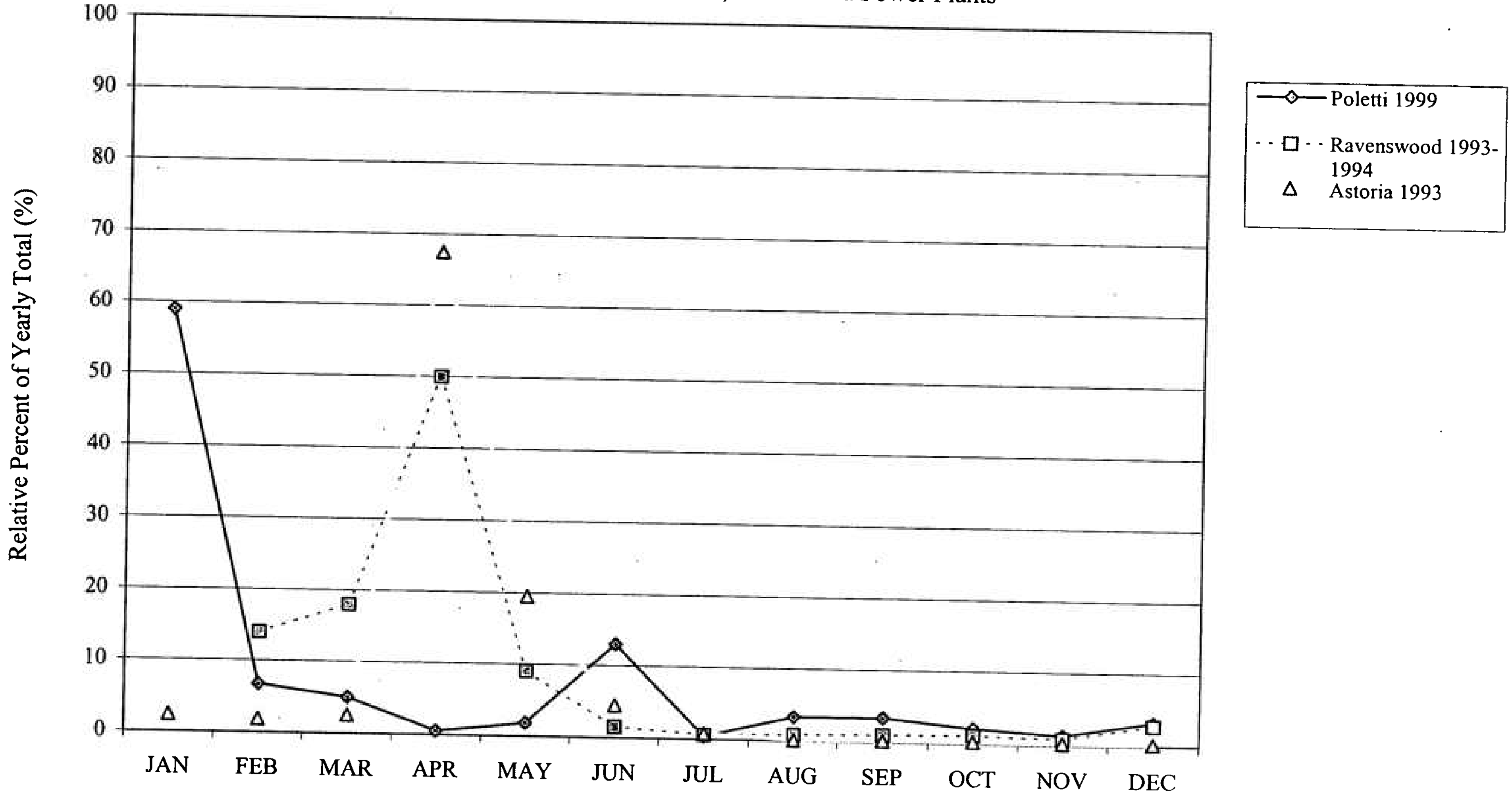


Figure 8-6: Relative Monthly Distribution of Impinged Year+
as Recorded at the
Poletti, Ravenswood, and Astoria Power Plants



8.	grubby	*Myoxocephalus aeneus*	
9.	striped bass	*Morone saxatilis*	
10	hite perch	*Morone americana*	
11.	northern pipefish	*Sygnathus fuscus*	
12.	black sea bass	*Centropristus striata*	(EFH)
13.	butterfish	*Peprilus tricanthus*	(EFH)
14.	blue crab	*Callinectes sapidus*	

Taken together, these species comprised over 95% of the entrainment samples collected at the East River generating stations during entrainment sampling programs executed from 1991 through 1999.

The following sections focus on the early developmental biology and the temporal and spatial distribution of the 13 target fishes and EFH species that are potentially present in the vicinity of the intake during early life stages (i.e., potentially subject to entrainment or impingement). Each subsection presented below contains information organized around the early developmental stages of fishes and where applicable, pertinent transitional stages and subdivisions. Each of the primary developmental stages, including transitions and subdivisions, are recognizable in the field and are referred to specifically within the narrative where the available data support such a distinction.

8.6 Life History Information

8.6.1 Reproductive Biology

With a few exceptions, the fishes of the New York Harbor area are oviparous and generally produce numerous, small eggs (Osse, van den Boogart, 1995). Marine fishes, often with small, pelagic eggs, may produce more than a million eggs during spawning while freshwater fishes mostly have fewer, but larger eggs (Bond, 1996). In general, fecundity (i.e., the number of eggs produced by an individual) is inversely related to egg size and increases linearly with body size (Harper, Begon & Townsend, 1996).

Fish eggs are subject to extraordinarily high levels of predation and mortality of the eggs can reach levels of 99% or more (Osse, van den Boogaart, 1995). Consequently, the massive production of eggs by both marine and freshwater fishes is viewed as an adaptation to an environment subject to a number of stochastic events, and that is a reproductive strategy formally referred to as *r*-selection (MacArthur & Wilson, 1967). Of the New York Harbor fishes presented in this study, fecundity estimates ranged from a minimum of 100 eggs per female to a maximum of 1,400,000 eggs per female for spottail shiner and bluefish, respectively (DEIS, 1999).

8.6.2 Early Life History

Presented below are summaries of life history characteristics of each of the 13 target fishes (Bigelow & Schroeder, 1953), the EFH species that are potentially present in the vicinity of the intake during early life stages (Bigelow & Schroeder, 1953), and blue crab (Barnes, 1991). For the purposes of this discussion and subsequent analysis the following definitions have been adopted:

Egg	refers to the developing embryo;
Yolk sac larva (YSL)	refers to the initial transitional larval stage to the preflexion larval stage;
Post yolk sac larva (PYSL)	is used to refer to the period after yolk sac absorption and includes the preflexion, flexion, postflexion, and transformational subdivisions, which collectively trace the development of the notochord flexion;
Juvenile	refers to those individuals that display a morphological departure from the larval stage (i.e., fin ray development), the completion of ossification, and loss of larval characteristics (Kendall, Ahlstrom & Moser, 1984).

a. Cunner (*Tautogolabrus adspersus*)

The cunner occurs farther north than any other member of the family labridae in the western Atlantic. The range of the cunner spans along the Atlantic coast and offshore banks, from Conception Bay, the east coast of Newfoundland, and the western and southern parts of the Gulf of St. Lawrence, southward to New Jersey and occasionally as far as the mouth of Chesapeake Bay. They are year-round, coastal residents and live near cover such as rocks, pilings, and macrophytes (Bigelow and Schroeder 1953; Olla et al. 1979). Adult cunner are typically 6-10 inches in length weighing under one-half pound but have been reported to reach 16 inches in length and a weight over two pounds (Johansen 1925; Bigelow and Schroeder 1953).

Fecundity has been estimated to be approximately 100,000 eggs (Williams et al. 1973) and from 1,192 eggs for a 76 mm TL fish to 84,403 eggs for a 171 mm TL fish (Nitschke 1998). Spawning occurs in late afternoon and evening (Ferraro 1980) from May to August depending on latitude (Johansen 1925). Cunner eggs are buoyant, transparent, range in diameter from 0.75 to 0.85 millimeters (mm) and do not posses an oil globule. Incubation occurs over a 40-hour period at temperatures of 70 – 72 °F. This period lengthens to 72 hours at water temperatures of 55 – 65 °F. At the time of hatching, larvae are approximately 2.0 mm in total length (TL) and at a TL of 15mm transitional larvae resemble the adult form.

Cunner are of little commercial value, but they do provide some recreation because of their affinity for piers and wharves and their susceptibility to hook and line.

b. Atlantic menhaden (*Bevoortia tyrannus*)

The Atlantic menhaden ranges along coastal waters from Nova Scotia to eastern Florida. The Gulf of Maine is the northerly limit of the menhaden. Based on average U.S. Commercial Landings of selected fish groups taken from 1988-1991 data, menhaden landings amounted to a little over 2 billion pounds (USDA, 1992).

The Atlantic menhaden spawn chiefly at sea, but closer to the shore in northern parts of the range. Eggs have been reported from lower Chesapeake Bay and the Patuxent River north to Benedict. Adults spawn every month in some parts of the range with fall and spring peaks occurring in the Chesapeake Bay region. Preferable water temperatures range from 4.4-23.6° C, with peak activity at 15-18° C.

Menhaden eggs are buoyant and are relatively large, ranging from 1.5 – 1.8 mm in diameter, with a broad perivitelline space and small oil globule (0.15-0.17 mm). Incubation is rapid, generally occurring in less than 48 hours. The newly hatched larvae are 4.5 mm TL growing to 5.7 mm TL after four days. The dorsal and caudal fins first become visible at a length of 9 mm; at 23 mm all of the fins are well developed; scales are present at 33 mm and at 41 mm the juveniles show most of the characters of the adult (Bigelow & Schroeder, 1953).

Larvae probably spend one month in water over the continental shelf, entering estuarine waters at approximately 10 mm TL or larger. Movement of larvae within the Chesapeake Bay tributaries occurs from late May to late June and in November. During the post larval stage, menhaden tend to accumulate at the fresh/saltwater interface in the upper Chesapeake Bay region. Juveniles from the upper bay region begin to emigrate from the interface to the mesohaline portions of the estuary. The juveniles are pelagic with the smallest size classes upriver. Migration to the sea occurs after the first summer, generally in late August in northern estuaries and as late as January in southern waters. Juveniles may overwinter in all major estuaries from Chesapeake Bay to Florida. Eggs and small larvae have been observed in Long Island Sound, Narragansett Bay, and Chesapeake Bay, but it is suggested that spawning in these areas made minor contributions to total population numbers.

c. Tautog *(Tautoga oniti)*

The tautog ranges along the Atlantic coast from Nova Scotia to South Carolina, chiefly south of Cape Ann and is most abundant between Cape Cod and the Delaware Capes, restricted to the immediate vicinity of the coast.

Tautog range farther offshore and in deeper waters than cunner. In near-shore waters, tautog will follow the flood tide up above the low water level around ledges to prey upon blue mussels (*Mytilus edulis*) in the intertidal zone, dropping back into deeper water during the ebb tide. Tautog prefer habitats that possess steep rocky shores; breakwaters; off lying ledges and submerged wrecks; boulder strewn bottoms; and mussel beds (Bigelow & Schroeder, 1953). Generally, tautog won't migrate with the seasons (Bigelow & Schroeder, 1953). However, they will occupy deeper waters in the autumn and over winter in eelgrass (*Zostera marina*) beds.

The eggs are buoyant, without an oil globule and range in size from 0.9-1.0 mm in diameter. At a temperature of 68 to 72° F, incubation occurs over a 42 to 45 hour period. This period may be extended by 10-12 hours in cooler waters (Bigelow & Schroeder, 1953). At the time of hatching, larvae are approximately 2.2 mm TL. When four days old, post yolk sac larval tautog have reached a length of 3 mm. Transitional larvae, as indicated by the differentiation of the dorsal and anal fins, are 10 mm TL. Juveniles are approximately 30 mm TL and have gained adult characteristics.

d. Windowpane flounder *(Scophthalamus aquosus)*

The general range of the windowpane includes coastal waters of eastern North America, from the Gulf of Lawrence to South Carolina; most abundant west and south of Cape Cod (Bigelow & Schroeder, 1953). Southern New England and Middle Atlantic populations are considered to be overexploited and at a low biomass level.

Spawning occurs from February through November in coastal, inner continental shelf waters, peaking in the mid-Atlantic Bight during the month of May (Able & Fahay, 1998; in LMS Article X, 2000). Some spawning may occur in the high salinity portions of estuaries in the mid-Atlantic bight, including Sandy Hook bay. Windowpane spawn in the evening on or near the bottom.

Eggs are found in the polyhaline portion of estuaries in the spring. Larval windowpane are most common in May, when they were collected in all Harbor areas except Red Hook. Densities were highest in the upper Harbor. Juveniles were not collected in intertidal zones but occurred frequently along sub-tidal and a variety of deeper habitats. Bottom trawl data indicate that larvae were most abundant in deeper channel during winter and summer.

Windowpane eggs are spherical, transparent, buoyant, 1.0-2.0 mm in diameter, with a single colorless or pale lemon oil globule with a diameter of 0.15-0.28 mm. Windowpane larval development TL ranges from 5.5 – 8 mm and is completed while smaller than both yellow tail (10.3-14 mm) and the witch flounder (5.6 – 42 mm). Larvae assume a demersal habit.

The windowpane is of limited commercial value because it is very thin-bodied and does not grow particularly large. According to Lange and Lux (1978), an average of 1,936 metric tons of windowpane were landed in New England between 1975 and 1977, mostly from Georges Bank. Annual commercial landings from 1975-1988 averaged 2.03 million kg with a peak in 1985 at 4.21 million kg (ICNAF 1977-85; NAFO 1982-91).

e. **Bay anchovy** ***(Anchoa mitchill)***

The bay anchovy is a small, slender fish, from 38.1 mm to 101.6 mm in length with greenish blue coloring above the lateral line and pale silver below. The bay anchovy ranges widely from temperate to subtropical waters along the Atlantic and Gulf coasts, between Main and the Yucatan peninsula, Mexico. Bay anchovy occur in clear and turbid waters and over all types of substrates. Bay anchovy are also tolerant to a wide range in salinity.

Within the New York area, the bay anchovy ranges along the coast of Long Island and in the lower reaches of the Hudson Estuary, including the East River. Trawl data from the National Marine Fisheries Service (NMFS) indicate that bay anchovy move southward out of coastal estuaries of New York and New Jersey during the winter months, when water temperatures drop below 41°F. This migration leads them to warmer over-wintering areas ranging from Cape Hatteras to Delaware Bay. Onshore-offshore movements of bay anchovies within estuaries have also been documented. For example (MacGregor (1994) reported significantly higher abundance of eggs and recently hatched larvae offshore in Chesapeake Bay, indicating that adults moved offshore to spawn. Similar movements were reported for the Hudson River Estuary where adults remained near shore until early June when they moved offshore to spawn.

The Bay anchovy enters the lower Hudson River in April as adults. The bay anchovy adults are present in the lower estuary in high numbers in the summer and are absent from the estuary in the winter. Egg collections suggest that spawning occurs in the lowest regions of the Hudson River and possibly out into coastal waters.

Bay anchovy spawn throughout the Hudson-Raritan bay complex, including Raritan and Newark bays, Arthur Kill, Kill van Kull, and the Upper and Lower New York bays as well as Long Island sound. Additionally, studies have shown that spawning takes place in the estuary where salinity is greater than 5 ppt (Bassista & Hartmann, 1998). These investigators also found a latitudinal difference in bay anchovy spawning behavior (Bassista & Hartmann, 1998) where bay anchovy in the Chesapeake Bay were primarily age-1 spawners while Hudson River spawners were age 2.

Individual females may spawn more than 50 times per year, with daily batch fecundities ranging from 429 to 2,026 eggs per female. Typically, egg diameter at the time of hatching is 1.57 mm. Initially, eggs are buoyant but become demersal within 12-16 hours. There is enormous spatial and temporal heterogeneity with regard to the growth rate of bay anchovy. Based on simple linear regression, 1995 growth rates ranged from 0.39 mm/day to 0.88 mm/day, while the 1996 growth rates ranged from 0.41 mm/day to 0.77 mm/day. Significant differences in growth rates were observed as little as 15 km apart, and were found to vary weekly. Presumably, the spatial and temporal variation in growth rates can be attributed to a combination of biological, chemical, and physical factors. Newly hatched yolk sac larva range from 1.57 mm to 3.17 mm in length and drift along the bottom with tidal currents. Early phase juveniles (i.e., pelagic juveniles) measure 12.7 mm in length.

The distribution of young anchovy shifts up the Hudson River estuary as development progresses through the summer months (Everly & Boreman, 1996). PYSL metamorphose in August and September (Woodhead, 1992). Juvenile bay anchovy immigrate to the sea in the fall; few remain in the estuary after November (Woodhead, 1992).

f. Winter flounder *(Pseudopleuronectes americanus)*

The general range of the winter flounder includes the coastal and offshore fishing banks from the Strait of Belle Isle to Chesapeake Bay, although extreme northern and southern records have been noted (Bigelow & Schroeder, 1953).

Individual females produce an average of about 500,000 eggs annually, and extremes of nearly 1,500,000 have been reported from larger individuals. This species is peculiar among flatfishes in that its eggs are not buoyant and sink to the bottom, where they stick together in clusters (Bigelow & Schroeder, 1953). Typically eggs are 0.74 to 0.85 mm in diameter and newly shed eggs have no oil globule.
The optimal salinity for egg survival is 15 to 35 ppt. Many embryos become inviable or abnormal at temperatures below freezing and temperatures above 10° C. The optimum water temperature range for survival is 0-10° C

At a water temperature of 3.9° C, the larvae were about 5 mm TL, and the yolk sac was absorbed in 12 to 14 days. At a temperature of 5° C the metamorphosis took 80 days, with the larvae reaching 8-9 mm TL. At a temperature of 8° C the metamorphosis took 49 days with the larvae reaching 8-9 mm TL as well. No metamorphosis was evident at 2° C. In aquaria, winter flounder larvae engage in upward swimming bouts and then sink to the bottom where they remain for short periods. Winter flounder larvae are continuous, visual, daylight feeders that cease feeding at night.

Larvae are non-buoyant and have a strong benthic orientation. Since the early life stages of this species are nondispersive, spawning grounds and nursery grounds overlap. Howell et al. (1992) indicates that the nursery habitat for larvae and juveniles includes littoral and sublittoral saltwater coves, coastal salt ponds, estuaries, and protected embayments.

After metamorphosis, winter flounder are benthic and seldom lose contact with the substrate. Most juveniles spend much of their first 2 years in or near shallow natal waters, where they move in response to extreme heat or cold. After metamorphosis, the juveniles prefer a substrate of sand or sand and silt. Older juveniles in estuaries gradually move seaward as they grow larger. Temperature is a less important factor in the distribution of juveniles, which tolerate higher temperatures than adults.

In river estuaries and harbors, winter flounder are most abundant in channel areas from July through December, while shallow water abundance is highest from May through July. Overall abundance is higher in deep water channel areas (NMFS, 1994). Data from recent sampling programs indicates two periods of winter flounder abundance in the New York/New Jersey area, the first occurring during early spring to early summer and the second occurring during late-fall to early winter (USACE-NYD, 1999). Although the winter flounder is a resident of the New York Harbor, it moves throughout the estuary in response to the annual cycle (Woodhead, 1992).

Predation is the major cause of mortality in larval and juvenile winter flounder. The larvae were heavily preyed upon by the small hydromedusa *Saria tubulosa*, great cormorant, the great blue heron, and the osprey. The estimated natural mortality rates of winter flounder ranged from 50% to 54% and the total annual mortality (natural and fishing) ranged from 72-78%. South of Cape Cod, Massachusetts, instantaneous mortality rates of 0.11 (natural) and 0.24 (fishing) were reported.

g. Four-bearded rockling *(Enchelyopus cimbriu)*

The Fourbeard rockling can be found inshore from the northern part of the Gulf of St. Lawrence to Long Island Sound and in deeper waters from the northeast coast of Newfoundland to as far south as North Carolina. Rocklings are widely distributed around the margins of the North Atlantic where they occur at depths ranging from 1 – 650 m. They are more abundant in depths of 46 – 55 m but can move to shallower waters in the winter. Rocklings have been caught as far north in the Hudson River estuary as Indian Point (Bigelow & Schroeder, 1953). They are year-round residents wherever they are found although there may be local inshore-offshore seasonal movements in some areas (Bigelow and Schroeder 1953).

The four-bearded rockling is a nocturnal, demersal species that prefers soft, smooth mud or sand substrates. The eggs are buoyant, described as ranging between 0.66 to 0.98 mm in diameter. Newly hatched larvae are a little more than 2 mm long. The yolk sac is absorbed at a length of 3.6 mm. Post yolk sac larvae and later larval stages range up to 10 mm in length.

The rockling is neither large enough nor plentiful enough to be of importance commercially.

h. Grubby *(Myoxocephalus aenaeus)*

Grubbies are found in coastal waters of North America from New Jersey to Newfoundland (Bigelow and Schroeder 1953). In the New England area they are commonly found year-round in eelgrass habitat, whereas in Newfoundland they are found in shallow protected areas on mud, sand and gravel bottoms (Ennis 1969). The grubby is the smallest of the common sculpins with few reaching total lengths of more than 12.5-15 cm, with an upper limit of 20 cm.

The grubby is found over all types of substrates, although favoring *Zostera marina* beds. It is the only sculpin that summers in shoal water near New York harbor (Bigelow & Schroeder, 1953). The known distribution of the grubby in summer indicates that it favors water temperatures of 69° F yet can tolerate waters as cold as 32° F in winter.

Grubbies exhibit sexual dimorphism in color and adult size (females larger than males). The spawning season lasts throughout the winter in New England and until June in Newfoundland, with some females reaching sexual maturity during their first year (Lazzari et al. 1989). Eggs are 1 mm in diameter, and can be green or rose-colored depending on what type of seaweed or algae they have attached to (Lazzari et al. 1989; Bigelow and Schroeder 1953).

The grubby is small and therefore is of little commercial value, however it does serve as a source of food for larger commercially important fishes. In the Hudson River, commercial fishermen occasionally take it in Haverstraw Bay and a few have been collected at Indian Point. Grubbies are quite common in the upper part of New York harbor where they spawn in late winter.

i. Striped bass (*Morone saxatilis*)

The striped bass is an anadromous member of the *Percichthyidae* family. An anadromous member spends most of their lives in the sea and migrates to the fresh water to breed. They are native to North America and range along the Atlantic coast from the St. Lawrence River to the northeastern portion of the Gulf of Mexico. Principal spawning populations along the eastern seaboard of the United States include: the Hudson River; Delaware Bay and the Delaware River; Chesapeake Bay; Albermarl sound, the Roanoke and Chowan Rivers; the Santee River and the St. Johns River.

Adult striped bass generally feed in near shore waters from summer through late winter. As summer progresses they migrate northward along the coast, but return to nearshore waters of their natal rivers during the autumn. Once water temperatures rise in the spring, spawning adults begin moving up river to freshwater spawning areas.

Depending on their age and size, females produce up to several million semi-buoyant eggs, which are deposited and suspended within the water column. The eggs are relatively large and average 3.1 mm in diameter although egg size will vary with the size of the female.

The spatial and temporal distributions of striped bass are strongly influenced by both water temperature and salinity. At the time of hatching, total larval length (viewed laterally) is typically 3.1 mm. Peak striped bass egg abundance occurs from Hyde Park (RKM 124) to Saugerties (RKM 151) with a peak at Kingston during mid-late May. Striped bass yolk sac larva are most abundant from West Point (RKM 75.6) to Poughkeepsie (RKM 99.7) from late May to early June. Post yolk sac larvae are most abundant in the middle estuary from Indian Point (RKM 58) to Poughkeepsie (RKM 99.7) from late May to mid-June.

Juvenile striped bass are distributed over much of the Hudson River from July through September where they inhabit deep river channels. The abundance of striped bass peaked from Tappan Zee (RKM 38.6) to Croton-Haverstraw (RKM 54.7) from late June until about the middle of August. By the end of their first summer, many of the juvenile striped bass have moved to the southern extreme of the Hudson River estuary and are found in New York Harbor, western Long Island Sound, and along the south shore of Long Island (NYSDEC, 1992).

j. White perch *(Morone americana)*

The natural range of this species extends along the Atlantic coast of North America from the southern Maritime Provinces of Canada and the St. Lawrence River to South Carolina in brackish and freshwater areas near the coast. Within the Hudson River, the white perch is an abundant, year round resident between New York City and the Troy Dam near Albany.

Spawning activity in the Hudson River occurs north of Croton Bay in shallow water and tributary streams starting in late April. After spawning, adults move downstream. Estimates of white perch fecundity (i.e., the number of eggs in the first stage of the life cycle produced by an individual) range from 20,000 to 321,000 eggs per female, which varies with the age and size of the female. White perch egg masses sink to the bottom, are extremely adhesive, and are quite small. This latter feature may be attributable to the absence of the oil globule. Typically, egg diameter at the time of hatching measures 1.58 mm.

Newly hatched larvae (yolk sac larva) range from approximately 1.58 mm to 3.17 mm in length and are exclusively demersal. The transition from the yolk sac larva to preflexion larva, which is marked by the complete absorption of the yolk sac, occurs at a length of 3.17 mm. Transformation larva (i.e., stage between postflexion larva and juveniles) measure 25.4 mm in length.

In the Hudson River, peak abundance of white perch eggs appears to occur in the upper estuary during mid-late May spanning from Kingston (RKM 138.3) to Albany (RKM 201). White perch yolk sac larvae are most abundant in the upper estuary, but downriver of where the eggs were most abundant, from Poughkeepsie (RKM 99.7) to Catskill (RKM 172.1). Post yolk sac larvae are most abundant in the upper estuary, but were found to co-occur with striped bass post yolk sac larvae from Poughkeepsie (RKM 99.7) to Catskill (RKM 172.1). Temporally, these peaks are most pronounced during mid-May for yolk sac larvae and mid-June for individuals within the post yolk sac larval stages). In the Hudson River, juveniles were found to occur from Tappan Zee (RKM 38.6) to Catskill (RKM 172.1) with three distinct peaks from Tappan Zee (RKM 38.6) to Croton-Haverstraw (RKM 54.7); Cornwall (RKM 90) to Poughkeepsie (RKM 99.7); and from Saugerties (151.2) to Catskill (172.1) during mid August.

k. Northern pipefish *(Syngnathus fuscus)*

The northern pipefish is disproportionately long relative to its width. Specifically, Bigelow & Schroeder (1953) report that in males, this is particularly pronounced, being 35 times as long as they are deep. The snout is tube like, blunt ended, with the small, toothless mouth at the tip. The body is hexagonal in cross section in front of the vent but is four sided behind the dorsal fin. The dorsal fin covers four to five of the bony rings in front of the vent and as many behind it. The caudal fin is rounded; its middle rays the longest. The anal fin is very small, close behind the vent; the pectorals are of moderate size; there are no ventral fins (Bigelow & Schroeder, 1953). This species ranges along the eastern seaboard in salt and brackish water, from the southern side of the Gulf of St. Lawrence and outer Nova Scotia at Halifax, to South Carolina (Bigelow & Schroeder, 1953).

The northern pipefish prefers dense stands of Zostera marina (eelgrass), both in salt marshes, harbors, and river mouths, where it often goes up into brackish water, and on more open shores as well. Pipefish do not exhibit tremendous migratory movements and are generally considered over-wintering residents wherever they are found. Northern pipefish feed primarily on copepods and amphipods, fish eggs, early phase fish larvae.

The northern pipefish is not considered a commercially significant species (Bigelow & Schroeder, 1953).

l. Black sea bass *(Centropristes striatus)*

Juvenile black sea bass occur in saline waters of estuaries and in offshore areas. Within estuaries, juveniles are found around jetties, piers, wrecks, and shell bottom such as oyster reefs. Black sea bass have been collected year-round in North Carolina estuaries at salinities of 1 to 36 ppt and temperatures of 6 to 29° C. Adult black sea bass are found in offshore areas in depths of 10 to 120 m; however, most are within the 20-60 m depth range.

Little is known of the early life history of black sea bass. Black sea bass eggs are pelagic, are 0.9-1.0 mm in diameter and hatch in about 75 hours at 16° C. Eggs from artificially spawned gulf black sea bass hatched in 38 hours after fertilization at 23° C under an 11-hour photoperiod. Larvae collected from tows from the surface to a depth of 33 meters, 4 to 82 kilometers from shore where water depths ranged from 15 to 51 m. Larvae longer than 13 mm standard length (SL) were not collected, presumably because they become demersal or estuarine near that size.

It is not known what part of the population remains at sea, nor are the routes and mechanisms of larval transport known. What little is known indicates that black sea bass are migratory in the northern part of their range, whereas south of Cape Hatteras, North Carolina, they are apparently residents in given areas year round. In the Middle Atlantic Bight, black sea bass move inshore and northward in spring and offshore and south in the fall, probably due to changes in temperature.

m. Butterfish *(Peprilus tricanthus)*

The Atlantic butterfish occurs along the coast of North America from South Carolina to Nova Scotia and southward to Florida (Bigelow and Schroeder 1953). They prefer deep water and are most abundant between southern New England and Cape Hatteras (Hildebrand and Schroeder 1928). Butterfish are found over the entire mid-Atlantic shelf in summer and autumn, but in response to seasonal cooling they aggregate along the edge of the continental shelf where water temperatures remain relatively warm (Waring and Murawski 1982). The butterfish often comes inshore, into sheltered bays and estuaries and seems to prefer sandy bottoms to muddy or rocky substrates. Schools of butterfish can be observed at the surface when along the coast where the flats are covered by only four to five feet of water.

The eggs are buoyant, transparent and spherical and range in diameter from 0.7 - 0.8 mm, usually with a single oil globule of about 0.17 - 0.2 mm (Bigelow & Schroeder, 1953). The larvae are 2 mm long at the time of hatching. The dorsal, anal, and caudal fin rays are visible in larvae at a length of 6 mm. It is at this point that larval forms start to assume adult characteristics. At a length of 15 mm all of the larval characteristics are lost, the caudal fin is deeply forked, the dorsal and anal fins are formed, and the fish completely resembles the adult form (Bigelow & Schroeder, 1953).

Spawning takes place chiefly during the summer in inshore waters, generally at depths less than 98 feet (Bigelow and Schroeder 1953). The minimum spawning temperature is approximately 15° C (Colton 1972). Peak egg production occurs in Chesapeake Bay in June and July (Hildebrand and Schroeder 1928) and in Massachusetts Bay from June to August (Bigelow and Schroeder 1953). Butterfish eggs are found in the Gulf of Maine on Georges Bank, but generally the larvae are relatively scarce east and north of Nantucket Shoals (Bigelow and Schroeder 1953). Some butterfish are sexually mature at age one, but all are mature by age two (DuPaul and McEachran 1969).

The largest butterfish weigh 1.25 pounds and are 12 inches long, but their usual length is 6 to 9 inches. The commercial catch is made mostly with pound nets, floating traps, purse seines, and otter trawls. They will sometimes bite a very small hook baited with a clam or sea worm (Bigelow and Schroeder 1953). They have been landed by fishermen since the 1800's. From 1920 to 1962 the annual domestic harvest averaged 3500 metric tons (Overholtz 1998b). From 1965 to 1976, when foreign fleets began to exploit butterfish, landings increased to an average of 10,000 metric tons per year. From 1977 to 1980 when foreign fishing was phased out, butterfish landings averaged 6300 metric tons; in 1987 to 1995, 3000 metric tons; and in 1996, 3600 metric tons.

n. Bluefish *(Pomatomus saltatrix)*

Bluefish is a migratory, pelagic species generally found in temperate and semi-tropical inshore and offshore waters. In North America, bluefish range from Nova Scotia to Florida and also occur in the Gulf of Mexico from Florida to Texas. In the New York Bight bluefish is a common inshore inhabitant that arrives in May and usually departs by November. Most of the bluefish population in the New York Bight probably originates from spring-spawned eggs (McBride & Conover, 1991).

Bigelow & Schroeder (1953) report that females with large ova approaching ripeness have been taken off the coast of North Carolina in spring and off various parts of the coast farther north in summer. Bigelow & Schroeder (1953) report further that bluefish have never actually been reported spawning, but based on the distribution of juveniles and late phase larvae, spawning may take place offshore.

Estimates of bluefish fecundity range from 600,000 to 1,400,000 eggs per female (Pottern et al. 1989). Bluefish egg masses are buoyant, pelagic and hatch in about two days. Typically, egg diameter ranges from 0.9 mm to 1.2 mm.

The yolk sac larvae are 2.0-2.4 mm TL at hatching and within four days the yolk sac is almost fully absorbed. Transition to the juvenile stage occurs at 13 to 14 mm TL at which time they begin to migrate south or toward estuarine nursery areas (Pottern et al., 1989).
Bigelow & Schroeder (1953) indicate that juveniles and late phase larvae occur inshore within Chesapeake Bay. Those juveniles spawned during the spring in the South Atlantic arrive in the Hudson River estuary during June and early July when they are 25.4 mm to 50.8 mm in total length (LMS, 1998). Those spawned during the summer in the mid-Atlantic Bight arrive in September and are much larger. In the Hudson River the peak abundance of early juveniles occurs in the lower estuary from Tappan Zee (RKM 38.6) to Croton-Haverstraw (RKM 54.7) from late July to early August. Later juveniles are also most abundant at Tappan Zee (RKM 38.6), with a peak from late June to mid-July.
The recreational component of the fishery constitutes 80-90% of the total catch, most of which is taken in waters from New York to Virginia. As one of the most important recreational species, bluefish are caught by fishermen in the bays and sounds, on ocean beaches, and over the continental shelf whether by trolling, live-baiting, casting, jigging, or chumming (Grosslein and Azarovitz 1982).

o. Atlantic herring *(Clupea harengus harengus)*

This species ranges north to the edge of the polar ice in Greenland and as far south as Cape Hatteras (Anthony 1982). Adult's school offshore in deeper waters and some populations move shoreward during the spawning season and frequently undertake vertical migrations, rising at night and sinking by day. Movements are typically local and probably short range. Feeding adults prefer salinity concentrations that hover around 35 ppt. The larvae form discrete swarms, but are ultimately dispersed by the current at lengths of 18-25 mm. Juveniles drift with the current.
Atlantic herring spawn in fjords, bays, straights and estuaries in addition to oceanic banks. The greatest spawning activity takes place over rock, pebble, or gravel bottoms, and sometimes over clay, although never over soft mud either with or without macrophyte stands. The salinity is typically around 35 ppt and not below 2.8 ppt. These fishes will not spawn below 31.99 ppt or above 33 ppt.

These fishes are found at depths ranging between 0.3-240 meters and are often found within the 50-meter contour. Fall spawners may breed farther offshore than the spring spawners. Fecundity ranges from 3,000 to 261,000 eggs per female. Summer-fall spawners in some areas have higher production than spring spawners. The eggs are demersal and adhesive and sometimes deposited on algae, anchor ropes, and free-living animals such as crabs. However, they are most often deposited in large sheets on the substrate.

Incubation of eggs takes 4.3-56 days with the length of incubation period depending primarily upon temperature, although this time can be lengthened by the increase in suspended particulates and decreased salinity. Incubation takes 174 hours at 17-24° Celsius.

p. Pollock ***(Pollachius virens)***

The pollock is an active fish, living at any level between bottom and surface, which is dictated by the food supply and on the season, and often exhibit schooling behavior. In the Gulf of Maine system pollock typically are found at depths ranging from the surface to 600 feet. Pollock feed chiefly on small fish (i.e., herring, lance, young cod, young haddock, young hake, and on pelagic crustaceans (i.e., pelagic shrimp-like euphausids)).

The pollock is a late autumn and early winter spawner. The brevity of the spawning season, i.e. January through April, coupled with the fact that the vertical temperature gradient covers a range of no greater than 3-5° F, makes it somewhat easy to establish the physical criteria for proper egg production. Peak spawning activity takes place in high salinity waters.
The number of eggs produced by the female averages about 225,000, but exceptional cases of more than 4 million eggs per female have been reported. The eggs are buoyant, does not possess an oil globule, an average about 1.15 mm. in diameter. The larvae are about 3.4 to 3.8 mm. long at hatching. Caudal fins appear at a length of 9mm, ventral fin rays at a length of 15mm. At a length of 25-30mm, juveniles have adopted many of the adult characteristics.

The pollock is a cool water fish. Larger fish have rarely been observed at the surface when water temperatures were higher than 52° F. This behavior is also exhibited by the smaller "harbor pollock" which will not frequent waters where the temperature exceeds 60° F. The pollock's preference for warmer waters may relate to the egg incubation process and to the development of the reproductive organs. These factors determine the northerly boundary of a resident population.

q. Summer flounder ***(Paralichthys dentatus)***

The summer flounder is demersal. Although fluke come close inshore during the warmer half of the year, a bulk of the population lie farther offshore in depths of 50 to 60 feet or more. Summer flounder spend most of their lives on the bottom. During their stay in shoal water they prefer sandy or mud bottoms, *Zostera marina* stands, or among the piling of docks. The little that is known of the breeding behavior of this species indicates that it breeds offshore. Furthermore, it seems probable that the eggs themselves may be buoyant.

At a length of 16mm, the right eye has nearly completed its migration, and the outlines of young fry 26mm long approach those of the adult. Adult Summer flounders ordinarily grow to a maximum weight of 15 pounds and to a length of three feet.

r. Red hake *(Urophycis chuss)*

The red hake is exclusively American, occurring in continental waters from the Gulf of St. Lawrence southward to the Mid-Atlantic States. The red hake has not been reported farther south than Virginia (Bigelow and Schroeder 1953). Historically hakes were found in the south channel (gulf) and on the northwestern slope of Georges Bank with heaviest concentrations from the southwestern area of Georges Bank to Hudson Shelf Valley (Anderson1982). The red hake spend their first months drifting at or near the surface, and fry of ½ to four inches are often taken in summer in *Zostera marina* beds.

The New York Bight appears to be an important spawning and nursery area for red hake (Anderson 1982). Eggs are pelagic and average 0.74 mm in diameter (Hildebrand and Cable 1938). At hatching, larvae measure an average of 2.04 mm (Miller and Marak 1959) and become demersal when they are between 35 and 40 mm long (Anderson 1982). Little is known of the growth rate of the larval phase of this species. The red hake rarely reaches a length of greater than 30 inches or a weight greater than 6 to 7 pounds. Bigelow & Schroeder (1953) comment that a weight greater than 5 pounds is exceptional. Females are larger than males of the same age.

Bigelow and Schroeder (1953) report that the distribution of the larval phases indicates variation with respect to duration. Furthermore, the authors have observed fry at a length of four inches on the surface although others seek the bottom while they are at a length of 2 inches. Once the red hake has assumed a benthic orientation, it does so for the remainder of its life, rising to the surface only for food. When hake take to the bottom, they do so in very shallow water among *Zostera marina* beds.

Fry can be observed in water temperatures of 68 – 70° F, while the great majority of older hake occupy deeper waters at temperatures ranging between 45-50° F. Limited stomach content analyses indicate that shrimps, amphipods, and other small crustacea, small fish (alewives, butterfish, cunners, eels, flatfishes, tautogs, herring, mackerel, menhaden, lance, silversides), are all consumed by red hake.

The hakes are not very important commercially although they are sold in fish markets, if large enough, and smaller fish have been used for poultry feed. They are usually sold in the form of fresh and frozen fillets and are commonly used in fish cakes.

s. Blue crab (Callinectes sapidus)

The blue crab is found in marine and brackish waters from Nova Scotia southward to the northern part of Argentina. In the United States, it is abundant from Massachusetts to southern Texas, where it supports major commercial and recreational fisheries. Blue Crabs mate from May through October, while they are in the soft-shell state, following their last pubertal molt.

Most crabs cannot swim, but members of the Portunidae, which includes the brachyuran common blue crab *Callinectes sapidus*, are the most powerful and agile swimmers of all crustaceans. Portunids can swim sideways, backwards, and sometimes forward with great rapidity. However, they are benthic animals, like other crabs, and only swim intermittently (Barnes, 1987).

Spawning occurs in the relatively low-salinity waters of the upper estuary and lower portion of the estuary (Eoifanio et al., 1984). After mating in freshwater portions of the estuary, they move into sounds and near-shore areas where they over winter. Recent studies in the Chesapeake Bay have found females carrying 3 to nearly 8 million eggs (Prager et al., 1990).

Post embryonic development amongst the Brachyura is metamorphic and includes both zoea larva and megalopa postlarva. After a seven to fourteen day period, the eggs hatch into the swimming zoea. In the lower Delaware estuary, zoeal abundance peaks in early August and again in early September. These larvae molt seven to eight times in 35 days, during optimum (high salinity) conditions before reaching the megalopa stage. The timing of the transition to the megalopa stage occurs as a function of salinity. This postlarval stage lasts from one to two weeks.

In the Hudson River, juvenile blue crabs are most abundant in August through October, depending on location. Peak abundance occurs in August at the farthest downriver sites such as Liberty State Park and Croton Bay. At upriver sites such as Iona Marsh and Moodna Creek-peak abundance did not occur until September. Evidently, preferable habitat for juvenile blue crabs includes a high standing crop of both *Vallisneria sp.* (celery) and Potamogeton sp. (pondweeds).

8.7 Threatened or Endangered Species

Correspondence was submitted to the National Marine Fisheries Service (NMFS) requesting information regarding the potential for encountering any federally listed threatened or endangered species in the East River. A response was received dated July 18, 2000 indicating that several species of sea turtles occur in the general project area; a copy of the response letter from the NMFS is provided in Appendix 8A of this Application.

Sea turtles are southern species that occur rarely in the New York and southern New England region. When they do occur, it is generally only during the summer and fall. Sea turtles may occur in greater numbers during periods of warm water temperature, but at no time are they common in the area. In fact, it has been difficult to verify their presence at all in the New York area. Several studies that might have expected to encounter them, have not. Individuals that have been found in New York waters are typically moribund adults. It is thought that the adults disperse during the spring and follow the warming water northward. In the fall, individuals failing to move south to warmer water may succumb to hypothermia in the rapidly declining water temperatures.

Due to their southerly range, warm temperature requirements, low abundance and preference for oceanic waters it is unlikely that sea turtles would ever occur in the East River or the vicinity of the proposed Project. Even if this did occur, however, it is unlikely that the Combined Cycle Project would be detrimental to them. Healthy adult sea turtles are too large to be entrained or impinged. Additionally, because of the rapid dilution and the resulting small area of detectable thermal gradients, coupled with the strong tidal current of the East River, the turtles would have difficulty locating and staying in the thermal discharge plume. Thus, no thermal effects are expected.

Nevertheless, the NMFS has indicated that because these species may be present, further consultation pursuant to Section 7 of the Endangered Species Act will be necessary for all federal authorizations related to this project. NYPA will undertake that consultation in conjunction with any required permit from the U.S. Army Corps of Engineers.

8.8 Measures to Protect the Aquatic Community during Plant Operation

Based on the proposed location for the project, the existing infrastructure, as well as the environmental impacts of other cooling water intakes structures, it has been determined that recycle/reuse of low volume waste streams coupled with installation of a wedge wire screen intake adjacent to the existing Charles Poletti Power Project intake, constitutes BTA for operation at this site. The mechanical draft hybrid (wet/dry) cooling tower with plume abatement has been determined to best balance the range of technical, environmental, visual and economical criteria examined. The key factors contributing to this determination are discussed in the sections below.

8.8.1 Intake Location

The new intake for the Poletti combined-cycle project will be located adjacent to the intake structure of the existing Poletti project. The new intake pipe will extend 60 to 80 feet inland from the East River and continue approximately 230 feet underground to a new pumphouse.

The design requirements, standards, and constraints used to site this structure are provided below:

- Cooling water supply pipeline routes which required minimal disturbance;
- Addition of a screen filter to remove organisms drawn near the intake to minimize the impingement of marine aquatic life when drawing water from the East River;
- Intake screen located on the River to take advantage of currents to minimize fish schooling in front of the intake screen;
- Intake velocity design of a maximum 0.5 fps across the screen to minimize impingement and entrainment of aquatic fauna;
- Intake located below the existing service platform to avoid marine shipping, recreational boating, commercial fishing, and the use and maintenance of the channel; and.
- Intake pipe and screen located far enough into the river to maximize the amount of available water intake.

The proposed intake location avoids important spawning areas, fish migration paths, shellfish beds and other areas where aquatic life may be concentrated and minimizes the potential impact on navigation in the East River (Figure 3-2).

8.8.2 Intake Design

The new cooling water intake structure will include a 2 mm cylindrical vee-wire screens (Johnson wedge-wire), or equivalent, composed of a stainless steel. Two screens will be installed using a tee configuration at the end of the intake pipe. Each screen measures approximately 1.4 m in length and 1.4 m in diameter to maximize surface area, thereby minimizing through-slot velocity at the maximum expected intake flow rate of 6.5 mgd.
One pair of screens will be mounted approximately 5 feet below mean low water.

Johnson wedge-wire screening systems are designed to provide sufficient surface area to accommodate the required flow volumes at through-slot velocities of 0.5 fps or less. Since the velocity of the water approaching the slots declines rapidly with increasing distance from the screen, it becomes negligible at several inches from the surface of the screen. These low approach velocities make it easier for fishes to swim at velocities sufficient to escape the water intake point. Other design features, which influence the effectiveness of these particular systems are the size of the slots, the orientation of the screens, and the through-slot velocity relative to that of the ambient current. Each of the features of the Johnson screen (i.e. its simple passive design, low intake velocity, vee-wire construction, smooth surfaces and *in situ* cleaning) are specifically designed to reduce both the entrainment and impingement of fish and invertebrate species.

The Johnson Screen uses no moving parts, which simplifies installation, operation, and maintenance. The intake screen utilizes an internal flow modifier, which creates a uniform low velocity flow of 0.5 fps or less over the entire screen surface. This feature allows the intake screen to eliminate high intake velocities, which have the potential to cause environmental as well as maintenance concerns. The uniform velocity also permits the intake screen to handle a higher hydraulic capacity with low head loss.

The Johnson Screen also provides a positive remote cleaning system, or "Hydroburst Backwash". This system is designed to handle high concentrations of debris. The Hydroburst Backwash system releases a measured burst of air inside the screen that forces accumulated debris away from the screen by back flowing air out through the screen. The system can be automatically operated using a timed sequence or activated when screen headloss exceeds a preset value. Either of these systems provides manual overrides as an emergency option. The intake screen requires minimal maintenance due to its stainless steel construction, and can be easily replaced if required, with no environmental disturbances.

Each of the features of the Johnson screen (i.e., simple passive design, low intake velocity, vee-wire construction, smooth surfaces and *in situ* cleaning) are specifically designed to reduce the entrainment and impingement of fish and invertebrate species. For example, the low approach velocities of less than 0.5 fps make it easier for fishes to swim at velocities sufficient to escape the water intake point.

Based on operational experience in the Hudson River estuary, the following has been documented concerning Johnson wedge wire screens:

- impingement related losses associated with use of an appropriately sized/designed Johnson wedge wire screen having 2 mm openings and a through-slot velocity less than 0.5 fps are negligible; and

- a 2 mm wedge wire screen having a through-slot velocity less than 0.5 fps will effectively limit potential entrainment-related impacts to organisms having a total length greater than 15 mm.

8.8.3 Intake Capacity

Projected capacity factors indicate that water withdrawal from the East River and air emissions will likely be reduced if the proposed Combined Cycle Project is constructed. The proposed Combined Cycle Project will be a base load facility and is expected to offset operation of less efficient generation capacity available along the East River.

Table 8.8 summarizes projected water use for alternative cooling technologies. As demonstrated in Table 8.8, when compared with a 500 MW Rankine cycle facility using once through cooling (i.e., boiler with steam turbine), the cooling water requirements of the mechanical draft hybrid (wet/dry) cooling tower are reduced by 98% at peak load. When compared with the use of once through cooling at a comparably sized combined cycle facility, the water requirements of the mechanical draft hybrid (wet/dry) cooling tower are reduced by almost 82%. Although the use of an Air Cooled Condenser (ACC) could further reduce and even eliminate the need for cooling water makeup, the Air Cooled Condenser was found to be operationally less efficient and more visually intrusive than a mechanical draft hybrid (wet/dry) cooling tower with plume abatement.

This Application had previously identified the intake and discharge structures of existing (see Table 7.10) and proposed (see Table 7.11) electric generating facilities located on the East River and their overall efficiency of water use relative to the plant output. It is important to point out that the proposed Combined Cycle Project is one of the most efficient (i.e., requires only a small volume of water per MW of electricity produced) when compared to both existing and recently proposed East River electric generating stations. The only proposed facility that has a lower discharge per megawatt is the Astoria Energy Project, which has proposed the use of dry cooling. As indicated above, dry cooling was considered but was found to be less efficient and more visually intrusive than a mechanical draft hybrid (wet/dry) cooling tower with plume abatement.

Table 8.8: Comparison of East River Water Use Estimates for Various Plant Configurations and Cooling Alternatives

Plant/Cooling Technology	Projected Average Summer Cooling Water Use (gpm/MW output)	Notes
500 MW Rankine Cycle Plant using once through cooling	440	
500 MW Combined Cycle Project using once through cooling	160	
500 MW Combined Cycle Project using Mechanical Draft Wet Cooling Tower	9.0	Assumes cooling tower makeup requirement of 6.5 mgd. Process makeup from municipal distribution system.
500 MW Combined Cycle Project using Mechanical Draft Hybrid (Wet/Dry) Cooling Tower	8.8	Assumes cooling tower makeup requirement of 6.3 mgd. Process makeup from municipal distribution system.
500 MW Combined Cycle Project using Dry Cooling (Air Cooled Condenser)	0.0	Process makeup from municipal distribution system.

8.8.4 Construction

The proposed location will have minimal construction related impacts. Positioning the wedge wire intake pipe and screen adjacent to the existing structure effectively minimizes loss of potential habitat associated with the intake structure; limits the potential for increased turbidity levels due to erosion of unprotected slopes, precludes the need for major dredging operations (i.e., dredging will be limited to the bank area for the intake pipe, the pipe itself will be supported on existing pilings) and minimizes fill of aquatic areas associated with construction activities. A silt curtain will be installed during construction activities.

The construction sequence and proposed mitigation measures to be taken during the intake pipe construction are discussed in the sections below.

8.8.5 Construction Sequence

Construction of the intake pipe will be performed in a chronologically managed sequence of activities such that disturbance of the surrounding environment will be minimized. Construction activities will be scheduled to minimize impact on recreational and marine activities. The Coast Guard will be notified prior to construction.

The construction sequence is expected to last four to six months and is anticipated to be carried out as follows:

- Construction equipment and materials will be mobilized to the site.
- Log booms and silt curtains will be installed around the proposed area of river construction activities. Log booms and silt curtains will be located outside (into the river) of the proposed temporary sheet pile area. The log booms and silt curtains will begin at the existing intake structure and continue around to the shoreline adjacent to the existing sheetpiling at the discharge canal. Marine warning light buoys will be installed as necessary to serve as navigation warnings. In addition to the offshore construction, a cut and fill operation will be underway to install the land portion of the 24-inch pipe, from a new pump house to a tie-in point near the shoreline. The pipe will be placed approximately 5 feet below grade.
- Upon completion of the log boom and silt curtain installation, temporary sheet piling will be driven within the curtain area extending from the existing intake structure to the existing adjacent shoreline near the discharge canal.
- The sheet pile enclosed area will then be dewatered to a water level low enough to provide access to excavate the shoreline and work on the existing intake pump pile

structure. The water removed from this area will be discharged over the sheet pile wall within the silt curtain.

- Once the area has been adequately dewatered, a portion of the cantilevered concrete pier of the existing intake structure will be demolished for access to install the new intake piping.
- A temporary trench will be excavated from the shoreline in-land to the previously installed underground piping from the new pump house.
- New steel beam pipe supports will be welded to the existing steel piles to support the offshore portion of the intake pipe.
- The offshore portion of the intake pipe will be installed from the tie-in point out into the water, where the Johnson Screen will be attached.
- A concrete support collar or headwall will be constructed at the grade/water transition area. The temporary trench will be backfilled up to the headwall and riprap will be placed along the shoreline.
- The concrete service deck will be reconstructed to include an access hatch to allow future maintenance.
- Prior to completion, water will be allowed to fill in the sheetpile-enclosed area until it reaches equilibrium with the river.
- At the completion of construction, the temporary sheet piling will be removed.
- The silt curtain will be removed once the suspended sediment has settled to the bottom of the river, followed by the log booms, and warning light buoys.
- The construction equipment and all other materials brought to the site will be demobilized and removed from the site.

An environmental engineer will be present during all phases of construction to monitor construction activities to minimize environmental disturbance.

8.9 Measures to Protect the Aquatic Community During Construction

The mitigative measures to protect the aquatic community during construction are discussed in the following sections.

8.9.1 Impacts to Essential Fish Habitat (EFH)

Direct impacts to EFH would involve changes to those characteristics essential for the maintenance of a healthy population of fishes. For the purposes of interpreting the definition of essential fish habitat the following components are addressed:

(1) *"Waters* include aquatic areas and their associated physical, chemical, and biological properties (i.e., that are used by fish) and may include areas historically used by fish where appropriate".

Water quality impacts related to the proposed project are limited to short term and localized changes in temperature and near-field increases in salinity (i.e., within the existing mixing zone for the diffuser) when the new facility is operated alone. When viewed within the context of the much larger East River system, the impacts associated with the discharge of cooling water or cooling tower blowdown are considered minimal.

(2) *"Substrate* is a term used to refer to sediment, hard bottom, structures underlying the waters, and associated biological communities."

(3) *"Necessary* means the habitat required to support a sustainable fishery and healthy ecosystem".

As shown in Figure 3-13, the proposed project will result in a minimal loss of substrate during construction of the new intake pipe adjacent to the existing intake. Following this temporary disturbance, the project is not expected to convert existing substrate types to less desirable substrates. The most significant substrate type for many of these fishes involves those quiescent zones where *Zostera marina* (eelgrass) beds can develop. Given the flow regime, and highly disturbed nature of the East River channel in the vicinity of the Combined Cycle Project, eelgrass beds would not develop within the influence zone of the proposed project.

8.9.2 Mitigation Measures

The potential environmental impacts resulting from the installation of the intake pipe in the water will be minimal due to the mitigation measures implemented (i.e. sheet pile containment of the construction area) during construction.

The mitigation measures to be implemented during construction are as follows:

- Log booms will delineate the work area, while the silt curtains will completely enclose the area of proposed disturbance from any silt migration;
- Disturbance to the riverbed will remain within the sheetpile enclosure and will be altered only to satisfy the structural and shoring protection requirements for the intake pipe; and
- Alterations to the riverbed will consist of additional riprap as required for armor and protection.

Due to the protective enclosure surrounding the work area as discussed above, the impacts to water quality in the East River will be minimal (if any). In addition, adverse effects on navigation and water dependent commercial activity will be minimal because the sheetpiling will be constructed within an existing pier line and the log booms and buoys will provide sufficient warning to mariners as well as protection from any floating debris

8.10 References

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Section 9

Section 9

9.0 VEGETATION AND WILDLIFE

9.1 Introduction

This section discusses vegetation, wetlands, wildlife, and threatened and endangered species issues related to NYPA's proposed Combined Cycle Project. The proposed Project site has a long history of industrial use that has converted the natural habitat to an urban, industrial landscape. As part of this historical use, the natural habitat has been cleared and converted from much of the proposed Project site and surrounding lands. This section examines the past and existing natural environment of the site.

A field reconnaissance survey and a review of maps and literature was used to gather information on vegetation, wetlands, and wildlife. Because natural habitats present on the site have been altered by development, reconnaissance level field surveys were conducted.

9.2 Existing Conditions

The proposed Project site is located in a coastal area at the western end of Long Island. Long Island is approximately 112 miles long (from east to west) and approximately 25 miles wide at its widest point. The island is bordered by the Long Island Sound to the north and the Atlantic Ocean to the south. Although surrounded by water, the island comes within approximately 0.25 miles to 0.6 miles of the North American Continent at the East River, which separates Queens from Manhattan.

Glacial activity had a major role in the creation of the landscapes on Long Island. About 21,000 years ago, the Laurentide Ice Sheet covered most of New York (Alden et al. 1999). These glaciers pushed sediment that created Long Island's morraines and outwash plains. Since the retreat of glaciers, the site may have been alternately submerged and above water because of changing sea levels and landforms.

The proposed Project site is relatively flat at an elevation of approximately 15 feet above mean sea level (msl). Most of the adjacent area in Astoria is also relatively level with elevations ranging up to 50 feet above msl. The Project site has been greatly modified by man during its history. Many areas have been filled with earth to create additional land for industrial development.

The proposed Project site is located along the Upper East River Reach (Reach 11), which stretches from Orion's Astoria power plant to the Flushing River, east of LaGuardia Airport (see Figure 9-1). The curving shoreline of the reach borders Steinway Creek, Bowery Bay, and the western side of Flushing Bay and the Flushing River. Fill for waterfront developments such as the Astoria Generating Station and LaGuardia Airport, have altered the shoreline of Reach 11. Despite this alteration, some original and re-emerging natural areas occur along Flushing Bay and the Flushing River. The West Queens Reach (Reach 12) extends along the East River from the Astoria Con Edison power plant at 20th Avenue south to Newtown Creek and the border of Brooklyn (see Figure 9-2). As with Reach 11, the West Queens Reach was created by fill and, with the exception of the East River itself, no important natural areas or wildlife habitats remain.

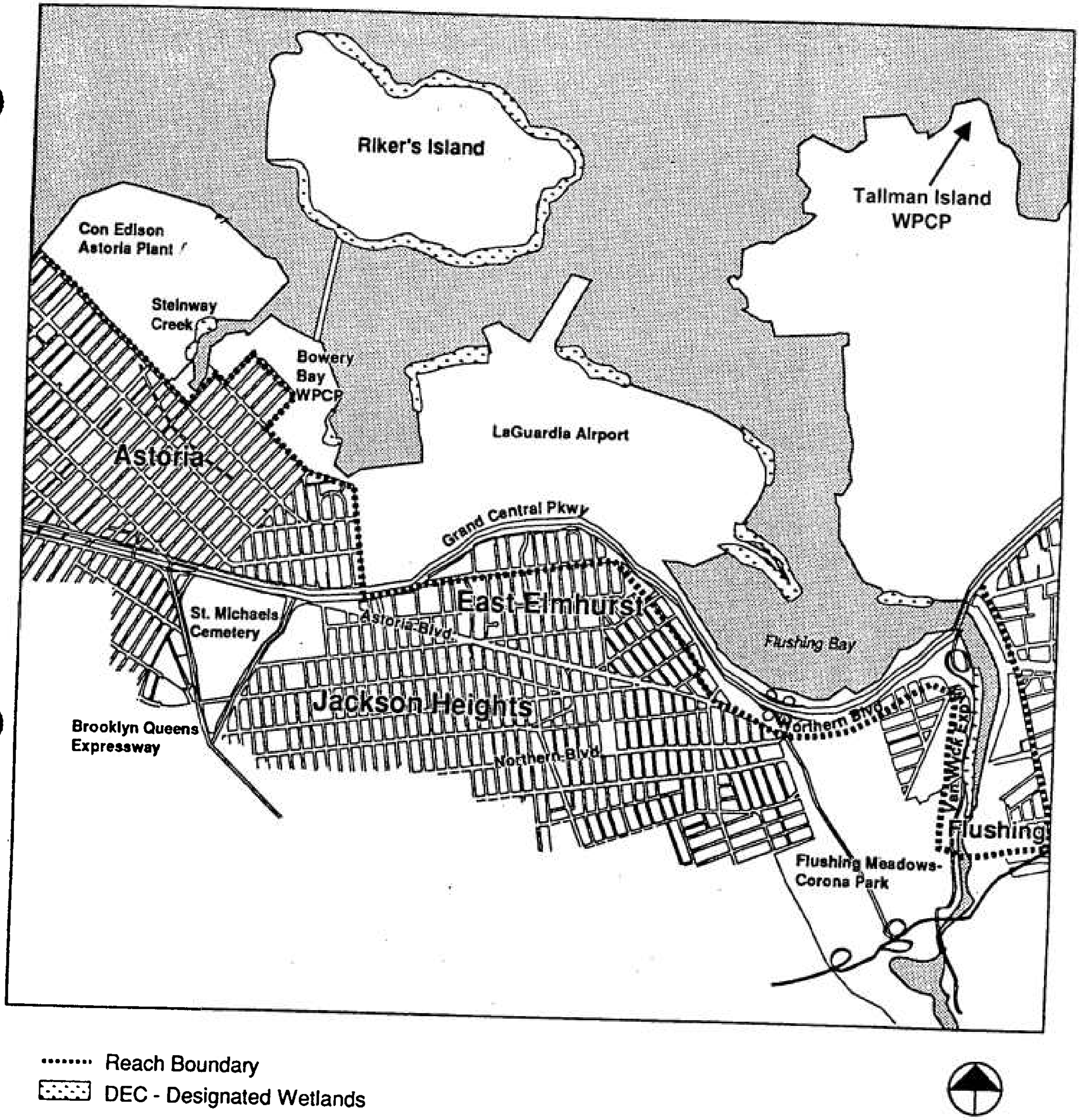
The East River located just north of the Project site influences the natural environment of the proposed Project site. The East River is a tidal straight that connects New York to Long Island Sound. The New York Harbor (Upper Bay) entrance is between the Battery and Governors Island while the sound entrance is between Throgs Neck and Willets Point. The East River's width varies from approximately 0.25 miles to 0.6 miles and acts as a physical barrier separating the western portion of Long Island and Queens from Manhattan. Tributaries to the East River include the Harlem, Bronx, and Flushing Rivers.

9.2.1 Vegetation

The Mid-Atlantic region, which includes New York City, contains a variety of forest and coastal habitats. One forest type found in coastal areas such as Long Island and the New Jersey Pine Barrens is the Northern Pine-Oak Forest or pine barren (Alden et al. 1999). Under natural conditions, this habitat is subject to regular fires and dominated by fire resistant pine species such as pitch pine (*Pinus rigida*) and Virginia pine (*Pinus virginiana*). Coastal areas include habitats such as sandy beaches and dunes, salt marsh, shallow bays, and tidal flats (Alden et al. 1999; Benyus 1989).

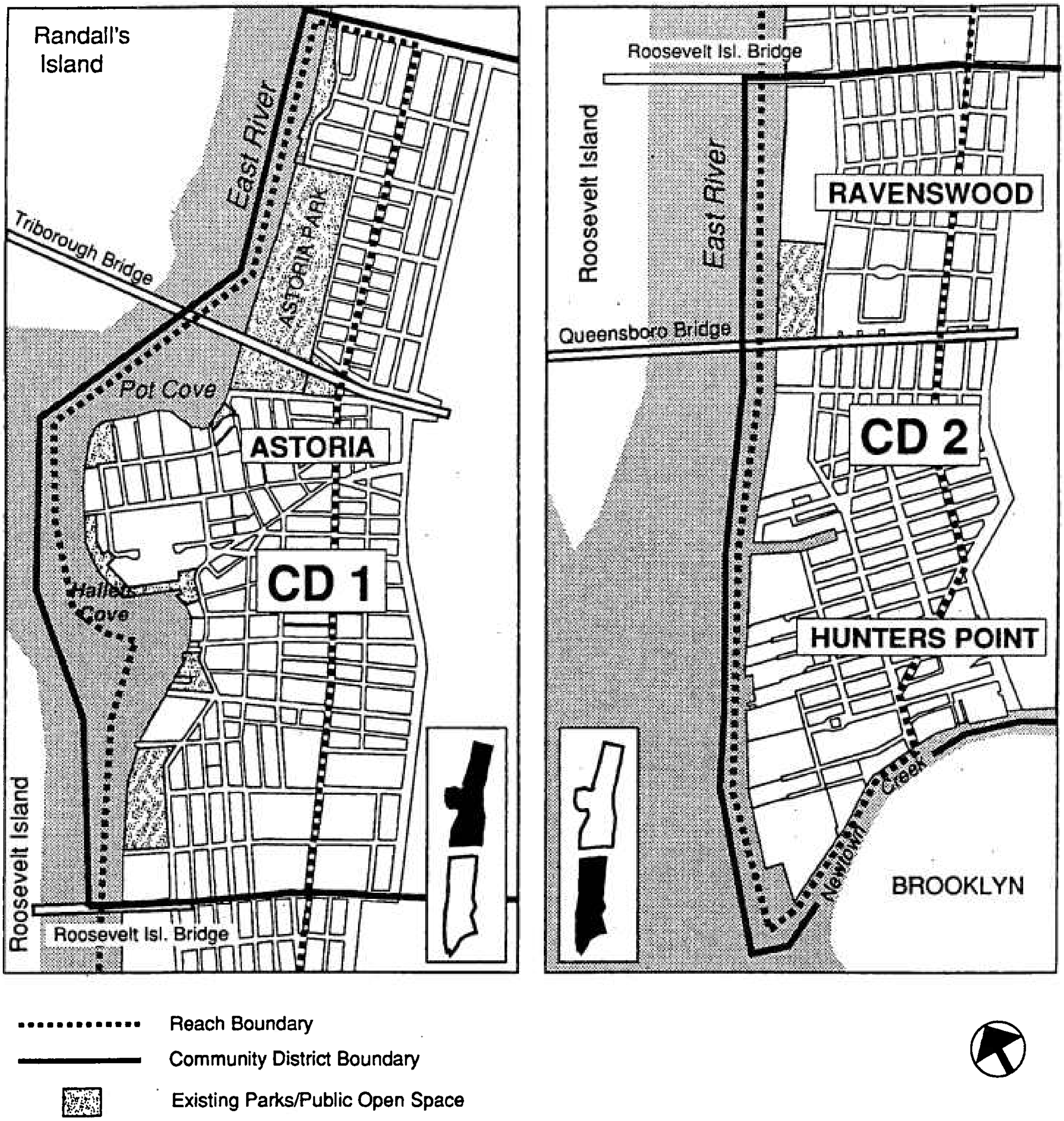
Much of the New York City area was covered with hardwood forest, of which, only small portions remain (Bull 1964). Existing forested areas are secondary growth of oaks, beech, maple, and hickory in upland areas. In sandy areas of coastal plains such as on Long Island, pitch pine and several species of scrub oak occur. A prairie-like region, known as the Hempstead Plains, occurred on western Long Island. Natural coastal habitats are found at Jamaica Bay National Wildlife Refuge along the south shoreline in Queens.

The proposed Project site has been extensively altered by prior electric generating station development and activities and, as such, is characterized by a total absence of natural habitat. Currently, the proposed Project site is paved and is used for outdoor storage of miscellaneous equipment and materials. The site was previously used for contractor parking. On-site vegetation is limited to landscaped areas primarily consisting of lawn interspersed with various ornamental trees.



TRC

New York Power Authority **Combined Cycle Project** **Astoria, Queens, NY**
Figure 9-1. Reach 11: Upper East River
Source: New York City Department of Planning, Comprehensive Waterfront Plan



New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 9-2. Reach 12: West Queens

Source: New York City Department of Planning, Comprehensive Waterfront Plan

TRC

9.2.2 Wetlands

Wetlands regulated under the New York State Freshwater and Tidal Wetlands Act have been mapped and classified by the New York State Department of Environmental Conservation NYSDEC. No state-regulated wetlands are present on the proposed Project site based on the NYSDEC map of the area (NYSDEC, 1995). The potential for tidal wetlands on site is precluded by existing bulkheads and rip-rap along the shoreline in the vicinity of the Project site. However, tidal wetland resources associated with the East River and Steinway Creek are located approximately 3,000 feet southeast of the proposed Project site, as shown on the NYSDEC Tidal Wetland Map. The East River and Steinway Creek are identified as Littoral Zone. An area of salt marsh is identified along the western shore of Steinway Creek.

A wetland reconnaissance survey was conducted during Spring 1999 to confirm the absence of wetlands as defined by the U.S. Army Corps of Engineers (1987). NYSDEC (1995) has also prepared a manual for freshwater wetland delineation. The U.S. Army Corps of Engineers regulates the discharge of dredged or fill material into wetlands under Section 404 of the Clean Water Act. To qualify as wetland, an area must demonstrate the presence of hydric vegetation, soil, and hydrology as defined in the U.S. Army Corps of Engineers (1987). The site survey determined that areas proposed for construction activity and disturbance do not contain wetlands.

9.2.3 Wildlife

Terrestrial wildlife is limited to urban-adapted species and a few bird species that wander across the site from the East River. The landscaped vegetation on the proposed Project site is less desirable as wildlife habitat than native vegetation, but turf grass, ornamental trees, and the close proximity of open water will attract various wildlife species, especially birds. Bird species that can occur at the site include the typical urban species, such as European starling (*Sturnus vulgaris*), rock dove (*Columba liva*), and house sparrow (*Passer domesticus*), and species wandering on to the site from neighboring areas (National Geographic Society 1987). The close proximity of open water results in water-associated bird species such as herring gull and great black-backed gulls occasionally flying across the site. During the site reconnaissance survey in the Spring of 1999, several broods of Canada geese were observed in the area around the sintering building, indicating the presence of nesting habitat near or on the proposed Project site. Trees in the Project vicinity will provide habitat for thrushes, warblers, and other perching birds. A list of bird species known to occur in the New York City area is provided in Table 9.1.

Mammal species in the area will be limited but can include eastern gray squirrel (*Sciurus carloinensis*), house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), and black rat (*Rattus rattus*) (Alden et al. 1999). Suitable habitat for frogs, toads, and snakes occurs in wetland areas along Steinway Creek to the east of the Project site.

9.2.4 Threatened and Endangered Species

Correspondence was received from the NYSDEC Natural Heritage Program and the U.S. Fish and Wildlife Service (USFWS) concerning the potential presence of state-listed or federally listed threatened and/or endangered species or potential habitat on the proposed Project site or in the vicinity of the site. Copies of the correspondence that has been received from NYSDEC and USFWS are included in Appendix 9A of the Application. Correspondence was also received from the National Marine Fisheries Service (NMFS) regarding aquatic resources identified as threatened or endangered. These resources are discussed in Section 8 of this Application.

The correspondence from the NYSDEC, dated September 21, 1999, indicated that NYSDEC has no records of rare or state-listed animals and plants, significant natural communities, or other significant habitats, on or in the immediate vicinity of the proposed Project site. The correspondence from the USFWS, dated October 4, 1999, stated that except for transient individuals, no Federally listed or proposed endangered or threatened species occur in the Project impact area. A Biological Assessment or further consultation under the Endangered Species Act will not be required.

9.2.5 Areas of Ecological Significance

The City's *Comprehensive Waterfront Plan* indicates that the nearest areas proposed for designation as significant coastal fish and wildlife habitat areas are North Brother and South Brother Islands and the Lower Hudson River along the west side of Manhattan (New York City, Department of City Planning 1992). The two islands are located approximately 4,000 feet northeast of the proposed Project site. Together these islands comprise one of the largest waterbird rookeries in the region.

North Brother Island is a 15-acre island with a mix of buildings and deciduous woods. Birds commonly found on the island include snowy egret, black-crowned night herons (*Nycticorax nycticorax*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), and Canada geese (*Branta canadensis*).

South Brother Island is a 10-acre island with rocky and wooded areas. This island is a principal nesting site for herring and great biack-backed gulls. Other birds found on the island include black-crowned night-herons, great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*) cattle egrets (*Bubulcus ibis*), double-crested cormorants (*Phalacrocorax auritus*), and Canada geese.

9.3 Assessment of Impacts and Proposed Development

Because of the absence of natural vegetation, wetlands, and undisturbed wildlife habitat, the proposed development will have no impact to vegetation, wetlands, and wildlife. Considering the distance between the proposed Project site and North Brother Island, South Brother Island, and the Hudson River, no impacts to these areas are anticipated and no further studies are proposed. Construction management will ensure that the construction activities stay out of mapped wetland areas.

9.4 References

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Table 9.1 Common Bird Species List

Species from New York City Area Including Jamaica Bay National Wildlife Refuge	
Horned Grebe	*Podiceps auritus*
Pied-billed Grebe	*Podilymbus podiceps*
Double-crested Cormorant	*Phalacrocorax auritus*
Snow Goose	*Chen caerulescens*
Canada Goose	*Branta canadensis*
Mallard	*Anas platyrhnynchos*
American Black Duck	*Anas rubripes*
Blue-winged Teal	*Anas discors*
Wood Duck	*Aix sponsa*
Gadwall	*Anas strepera*
Pintail	*Anas acuta*
Northern Shoveler	*Anas clypeata*
Redhead	*Aythya americana*
Canvasback	*Aythya valisineria*
Common Goldeneye	*Bucephala clangula*
Oldsquaw	*Clangula hyemalis*
Ruddy Duck	*Oxyura jamaicensis*
Cattle Egret	*Bubulcus ibis*
Snowy Egret	*Egretta thula*
Great Egret	*Casemerodius albus*
Great Blue Heron	*Ardea herodias*
Black-crowned Night Heron	*Nycticorax nycticorax*
Green-backed Heron	*Butorides striatus*
Tricolored Heron	*Butorides striatus*
American Bittern	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Glossy Ibis	*Plegadis falcinellus*
Clapper Rail	*Rallus longirostris*
Cooper's Hawk	*Accipiter cooperii*
Sharp-shinned Hawk	*Accipiter striatus*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Osprey	*Pandion haliaetus*
American Kestrel	*Falco sparverius*
Northern Harrier	*Circus cyaneus*
Ruffed Grouse	*Bonasa umbellus*
Northern Bobwhite	*Colinus virginianus*
American Oystercatcher	*Haematopus palliatus*
Piping Plover	*Charadrius melodus*
Killdeer	*Charadrius vociferus*
Lesser Golden Plover	*Pluvialis dominica*
American Woodcock	*Scolopax minor*
Ruddy Turnstone	*Arenaria interpres*
Whimbrel	*Numenis americanus*
Willet	*Cataptrophorus semipalmatus*
Upland Sandpiper	*Bartramia longicauda*
Spotted-Sandpiper	*Actitis macularia*
White-rumped Sandpiper	*Calidris fuscicollis*

Table 9.1 (cont'd) Common Bird Species List

Species from New York City Area Including Jamaica Bay National Wildlife Refuge	
Stilt Sandpiper	*Calidris himantopus*
Wilson's Phalarope	*Phalaropus tricolor*
Herring Gull	*Larus argentatus*
Laughing Gull	*Larus atricilla*
Great Black-backed Gull	*Larus marinus*
Common Tern	*Sterna hirundo*
Least Tern	*Sterna antillarum*
Forester's Tern	*Sterna foresteri*
Black Skimmer	*Rynchops niger*
Mourning Dove	*Zenaida macroura*
Rock Dove	*Columba livia*
Yellow-billed Cuckoo	*Coccyzus minor*
Black-billed Cuckoo	*Coccyzus americanus*
Eastern Screech Owl	*Otus asio*
Great Horned Owl	*Bubo virginianus*
Short-eared Owl	*Asio flammeus*
Whip-poor-will	*Caprimulgus vociferus*
Common Nighthawk	*Chordeiles minor*
Chimney Swift	*Chaetura pelagica*
Rugy-throated Hummingbird	*Archilochus colubris*
Belted Kingfisher	*Ceryle alcyon*
Northern Flicker	*Colaptes auratus*
Hairy Woodpecker	*Picoides villosus*
Downy Woodpecker	*Picoides pubescens*
Eastern Kingbird	*Tyrannus tyrannus*
Great Crested Flycatcher	*Myriachus crinitus*
Eastern Phoebe	*Sayornis phoebe*
Eastern Wood Pewee	*Contopus virens*
Least Flycatcher	*Empidonax minimus*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Bank Swallow	*Riparia riparia*
Barn Swallow	*Hirundo rustica*
Blue Jay	*Cyancocitta cristata*
American Crow	*Corvus brachyrhynchos*
Fish Crow	*Corvus ossifragus*
White-breasted Nuthatch	*Sitta carolinensis*
Red-breasted Nuthatch	*Sitta canadensis*
Marsh Wren	*Cistothorus palustris*
Sedge Wren	*Cistothorus platensis*
Gray Catbird	*Dumetella carolinensis*
Brown Thrasher	*Toxostoma rufum*
American Robin	*Turdus migratorius*
Wood Thrush	*Hylocichla mustelina*
Hermit Thrush	*Catharus guttatus*
Eastern Bluebird	*Sialia sialis*
Blue-gray Gnatcatcher	*Pilioptila caerulea*
Cedar Waxwing	*Bombycilla cedrorum*

Table 9.1 (cont'd) Common Bird Species List

Species from New York City Area Including Jamaica Bay National Wildlife Refuge	
European Starling	*Sturnus vulgaris*
Yellow-throated Vireo	*Vireo flavifrons*
Red-eyed Vireo	*Vireo olivaceus*
Philadelphia Vireo	*Vireo philadelphicus*
Black and White Warbler	*Mniotitla varia*
Black-throated Green Warbler	*Dendroica viens*
Pine Warbler	*Dendroica pinus*
Prairie Warbler	*Dendroica discolor*
Blue-winged Warbler	*Vermivora pinus*
Nashville Warbler	*Vemivora ruficapilla*
Northern Parula	*Parula americana*
Yellow Warbler	*Dendroica petechia*
Hooded Warbler	*Wilsonia citrina*
Black-throated Blue Warbler	*Dendroica caerulescens*
Bay-breasted Warbler	*Dendroica castanea*
Wilson's Warbler	*Wilsonia pusilla*
Louisiana Waterthrush	*Seiurus motacilla*
Yellow-brested Chat	*Icteria virens*
Ovenbird	*Seiurus aurocapillus*
Common Yellowthroat	*Geothlypis trichas*
American Redstart	*Setophaga ruticilla*
Eastern Meadowlark	*Sturnella magna*
Red-winged Blackbird	*Agelaius phoeniceus*
Northern Oriole	*Icterus galbula*
Orchard Oriole	*Icterus spurius*
Common Grackle	*Qusicalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Scarlet Tanager	*Piranga olivacea*
House Sparrow	*Passer Domesticus*
Indigo Bunting	*Passerina cyanea*
American Goldfinch	*Carduelis tristis*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Pine Siskin	*Carduelis pinus*
Grasshopper Sparrow	*Ammodramus savannarum*
Sharp-tailed Sparrow	*Ammodramus caudacutus*
Seaside Sparrow	*Ammodramus maritimus*
Chipping Sparrow	*Spizella passerina*
Field Sparrow	*Pizella pusilla*
Vesper Sparrow	*Pooecetes gramineus*
Song Sparrow	*Melospiza melodia*
Dark-eyed Junco	*Junco hyemalis*
Lapland Longspur	*Calcarius lapponicus*
Snow Bunting	*Plectrophenax nivalis*

Sources: Bull (1964); Geffen (1979); National Geographic Society (1987)

Section 10

Section 10

10.1.2 Visual Resources

An inventory of aesthetic resources of statewide significance was conducted for the study area surrounding the Facility site to identify resources that would warrant specific consideration in terms of potential visual or aesthetic impacts. No state parks, urban cultural parks, State Nature and Historic Preserve or Scenic Areas of Statewide Significance are located within the study area. Similarly, no State Forest Preserve, National Wildlife Refuges or wild, scenic or recreational rivers are located in the study area. Other national resources including National Natural Landmarks and properties included in the National Park System are also absent from the area surrounding the Facility site.

An inventory of properties listed in the National or State Register of Historic Places and designated New York City Landmarks is presented in Section 11 of this Application. These resources as well as local parks and other visual resources within the study area are discussed and evaluated in the following sections.

a. Queens

Important visual resources in the Queens portion of the study area include Astoria Park and Ralph DeMarco Park along the East River waterfront. These parks provide primarily passive open space along the East River with paved paths and benches serving the local community. Astoria Park is spanned by both the Triborough Bridge and the elevated rail tracks. From these waterfront areas, park users have views of the Hell Gate area of the East River and Wards Island to the west and the nearby bridges spanning the East River (see Figure 10-1a). Shore Boulevard also provides two-way vehicular access along the East River waterfront.

The stacks of the Orion Astoria Generating Station are visible from only a few areas of the nearby Queens neighborhood due to the density of the development and the relative height of the stacks. Other facilities surrounding the Project site, such as the oil storage tanks, have even less visibility. The Orion Astoria Generating Station is clearly visible from Ralph DeMarco Park, as shown in Figure 10-2a, Photos 1 and 2 although the primary view corridors from the park are to the west. From this vantage point, the Charles Poletti Power Project is viewed in conjunction with the Orion facility and not as a separate feature. The Orion Astoria Generating Station and the Charles Poletti Power Project are not visible from Astoria Park due to the four-story residential buildings opposite the north end of the park along Ditmars Boulevard.

The Lawrence Family Cemetery at 20th Road and 35th Street (NYC Landmark) and the Steinway House at 18-22, 1st Street (State and National Registers of Historic Places and NYC Landmark) are the only designated historic sites within the study area. Figure 10-2b, Photo 3 shows the view of the Orion Astoria Generating Station and the Charles Poletti Power Project from the Lawrence

Family Cemetery, indicating a typical view of the existing generating station in the context of the Astoria neighborhood. The cemetery is secured behind a chain link fence and not readily accessible to the general public (see Figure 10-2b, Photo 4). Views from the Steinway House toward the Project site were obscured by dense vegetation. Photo locations are shown in Figure 10-3

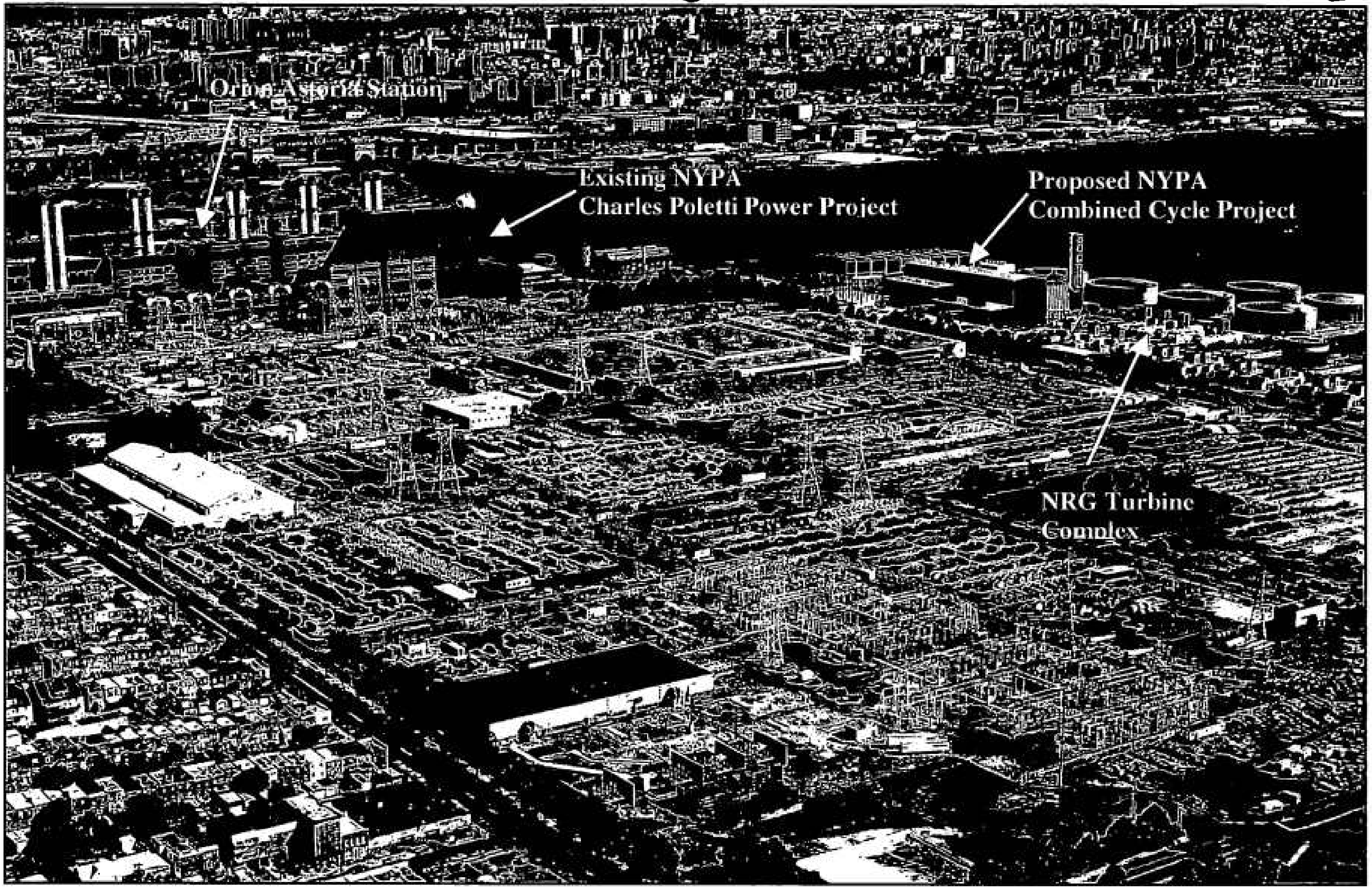
b. Wards Island

The only significant visual resource on Wards Island with a view of the proposed Project site is the park area opposite the existing Orion Astoria Generating Station and the Charles Poletti Power Project. This open waterfront area is occupied by nine ball fields and circular, vehicular roadways. The waterfront is secured with rip rap and is accessible to pedestrians, but the area lacks pedestrian-oriented improvements (i.e., developed promenade, sitting areas, etc.). Access to the park areas and ball fields is essentially limited to individuals with automobiles or the M-35 bus from Manhattan. The view of the proposed Project site from Wards Island is shown on Figure 10-2c, Photo 5. From this vantage point, the Project site is visible between the existing oil storage tanks and the sintering building (the original 1905 powerhouse). Figure 10-2c, Photo 6 shows the view of the Charles Poletti Power Project and the Orion Astoria Generating Station from the waterfront area of Wards Island.

c. Bronx Waterfront

The Bronx waterfront within the study area is totally occupied by industrial land uses and offers no public access or viewing locations. Similarly, the industrial neighborhood beyond the waterfront is without important visual resources. However, a public pier is located on the Bronx waterfront near the Hunt's Point industrial area to the northeast of the Project site. Even though this pier is located beyond the study area limit, this area was included in the visual assessment field survey.

The Tiffany Street Pier is located at the end of Tiffany Street on the Bronx waterfront, to the west of the Hunt's Point Water Pollution Control Plant. The surrounding neighborhood is industrial. The pier extends approximately 400 feet from the shoreline and provides pedestrian access to the waterfront. The pier has numerous benches and a covered area, with large openings to maximize opportunities for fishing in the waters below. From the pier, the industrial Bronx waterfront is prominent to the east and west with middleground views of Rikers Island and North Brother Island toward the south. The Charles Poletti Power Project and the Project site is visible behind South Brother Island. In the distance, the Hell Gate Railroad Bridge and the Citibank Building in Long Island City are visible. The view from the Tiffany Street Pier toward the Project site is shown in figure 10-2d, Photo 7, and the pier is shown in Photo 8.



New York Power Authority
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Figure 10-4. Artist Rendering
(Revised January 2001)

Source: Burns and Roe Enterprises, Inc., January, 2001

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10.2 Visual Impact Assessment

10.2.1 Future No Action Conditions

As shown in the photos provided as Figure 10-2a through 10-2d, the existing Charles Poletti Power Project and the adjacent Orion Astoria Generating Station (or at least a portion of the stacks) is visible from selected locations in the nearby Queens neighborhood and Wards Island. Only distant views of the existing facilities are available from the Bronx waterfront. Without the proposed project, these views are expected to remain the same. No other changes are expected to occur to the urban design and visual resource characteristics of the study area in the absence of the proposed Project.

10.2.2 Urban Design Considerations with the Proposed Project

a. Description of the Proposed Combined Cycle Project

The NYPA Combined Cycle Project will be constructed on a seven-acre site adjacent to the oil storage tanks at the Charles Poletti Power Project. The new facility will be housed in a metal-clad building approximately 100 feet in height, painted in dark earth tones similar to the existing Poletti Project. The adjacent air-cooled condenser located to the west of the new turbine building will be similar in height and scale. The most visually prominent feature will be the new 250-foot-tall collocated stacks. To the west of the oil storage tanks, the 42-foot-tall demineralization water storage tank will also provide a new visual feature along the East River shoreline but will be essentially invisible from the Bronx waterfront. The two new jet kerosene storage tanks will be constructed within two of the existing oil storage tanks and will not exceed the height (48 feet) of the existing tanks.

The proposed gas interconnection will be underground and will not provide any visible elements except for the new meter station to be located south of the Astoria West 138 kV substation; the new meter station will require minimal aboveground facilities and will be effectively screened by the surrounding facilities. The electrical interconnection to the Astoria West 138 kV substation will be via an underground, 138 kV cable. The proposed Combined Cycle Project will also be connected to the Astoria East 138 kV substation via a double-circuit, overhead, 138 kV transmission line on single-shaft, 67-foot-tall steel pole structures. The anticipated appearance of the Combined Cycle Project is illustrated in the artist rendering shown as Figure 10-4.

Outdoor lighting provided for the Combined Cycle Project will be similar to and consistent with the existing lighting at the Poletti Project. Area and task lighting will be shielded, directional and focused at the ground or specific work areas as required to eliminate impacts from fugitive light.

Wide area lighting will not be required, and maintenance lighting will not be provided for the new switchyard and other outdoor equipment because, normally, these areas are unoccupied. Portable lighting will be used if maintenance work is required in these areas during non-daylight hours. Lighting for the new stack will be in conformance with standard FAA requirements and will be similar to the lighting of the existing stacks. A detailed lighting plan will be provided as part of a post-certificate Compliance Filing.

b. Relationship of Proposed Project to Existing Urban Design Elements

In terms of height and bulk, the new turbine building will be larger than the other nearby facilities such as the NRG gas turbine complex, the existing oil storage tanks, and the various warehouse buildings. However, the new building will be smaller than the existing Charles Poletti Power Project and the Orion Astoria Generating Station. Similarly, the new 250-foot-tall collocated stacks will be taller than the surrounding facilities, but will be comparable to the existing stacks. The air-cooled condenser, with an open network of steel support beams to a height of approximately 65 feet above grade, will provide a new visual element in contrast to the solid-walled buildings but similar to the open substations and lattice transmission structures located at the NYPA complex. In terms of urban design, the proposed Combined Cycle Project is compatible with the existing electric generating facilities near the Project site.

The proposed Project will not affect other existing urban design elements in the nearby Queens neighborhood including the local street pattern, the existing streetscape along 20th Avenue, or the existing street hierarchy.

10.2.3 Visual Resource Considerations with the Proposed Project

Recreational and historic sites and the potential visual impact of the proposed Combined Cycle Project on these resources are summarized in Table 10.1. Photosimulations created using "Microstation Masterpiece," a component of the Intergraph CAD system, are also included to depict potential visibility of the proposed Project. Local schools, although listed as visually sensitive resources in the Pre-Application Report for the Combined Cycle Project, will not be adversely impacted by the proposed Project considering the urban setting of these schools and the limited potential visibility of the proposed Project due to intervening buildings.

a. Queens

From the nearby Queens neighborhood, the proposed Combined Cycle Project will be generally unnoticed since there are few opportunities to view the expansive property controlled by Con Edison, Orion, NRG and NYPA. Figure 10-5a shows a photosimulation of the proposed Project from Ralph DeMarco Park (photo location 1) along the East River in Astoria. As shown in this photosimulation, the new facility will be partially visible from this location but will result in an insignificant visual impact considering the visibility and scale of the existing Orion Astoria Generating Station and the magnitude of the incremental change. The primary view corridors from the park, toward the East River to the west, will be unaffected by the proposed Combined Cycle Project.

As shown on Table 10.1, three additional recreational resources to the east of the proposed Project site in Queens have the potential to offer partial views of the proposed Project, resulting in incremental visual impacts. The Woodtree Playground and the Immaculate Conception ballfields are both located on the north side of 20th Avenue, approximately 4,000 feet and 3,500 feet east of the proposed Project site, respectively. These sites currently have limited view corridors and provide partial views of the existing stacks at the Orion Astoria Generating Station and the Charles Poletti Power Project. In addition, the Bowery Bay Yacht Club may also provide partial views of the taller features of the Combined Cycle Project; however, the primary view corridor from the yacht club is to the northeast toward the open water and Rikers Island, away from the proposed Project. Considering the industrial setting of these recreational resources, the incremental visibility of the proposed Combined Cycle Project will not result in adverse visual impacts.

None of the four historic sites in Queens will provide a view of the proposed Project due to the distance and the intervening buildings or vegetation. Figure 10-2b, photo 3 shows the view from the Lawrence Family Graveyard toward the Project site and the limited potential views of the proposed Project.

Table 10.1: Recreational and Historic Sites and Potential Visual Impacts

Site No. [1]	Site Name	Distance from Project Site	Remarks	Potential Project Visibility
1	Woodtree Playground	4,000 feet	1.03 acre playground, swings	Partial; Incremental change
2	Astoria Park	4,200 feet	61.24 acre park with ballfields, 14 tennis courts, pool, playgrounds, summer concerts, track	Project not visible due to intervening buildings
3	Immaculate Conception Ballfields	3,500 feet	Ballfields provided by Con Edison to school.	Partial; Incremental Change
4	Ralph DeMarco Park	2,500 feet	6.2 acre park	Partial; Incremental change
5	Columbus Square	6,500 feet.	0.1 acre sitting area	Project not visible due to distance and intervening buildings
6	Ditmars Park	5,000 feet	.92 acre park, sitting area and basketball	Project not visible due to intervening buildings
7	Hoyt Playground	6,500 feet	2.2 acre playground	Project not visible due to distance and intervening buildings
8	Peter Chappetto Memorial Sq.	6,000 feet	1.23 acre park	Project not visible due to distance and intervening buildings
9	Sitting area	6,000 feet	1.16 acre sitting area	Project not visible due to distance and intervening buildings
10	Steinway Playground	6,000 feet.	1.31 acre playground	Project not visible due to distance and intervening buildings
11	Triborough Bridge Playground A	6,500 feet	4.54 acre recreation area	Project not visible due to distance and intervening buildings
12	Triborough Bridge Playground B	6,500 feet	1.3 acre playground	Project not visible due to distance and intervening buildings

Site No. [1]	Site Name	Distance from Project Site	Remarks	Potential Project Visibility
13	Triborough Bridge Playground C	6,500 feet	.46 acre playground	Project not visible due to distance and intervening buildings
14	Triborough Bridge Playground D	6,500 feet	.46 acre recreation area	Project not visible due to distance and intervening buildings
15	Triborough Bridge Playground E	6,500 feet	.46 acre recreation area	Project not visible due to distance and intervening buildings
16	Bowery Bay Yacht Club	4,000 feet	Marina and floating docks	Partial; Incremental change
17	Randalls and Wards Island Parks	2,500 feet	395-acres of ballfields, picnic areas, tennis, riding academy and rodeo school.	Partial; Incremental change
18	Downing Stadium	5,000 feet	Athletic stadium	Project not visible
1	Lent Homestead and Cemetery	6,500 feet	National and State Registers of Historic Places, NYC Landmark	Project not visible due to distance and intervening buildings
2	Marine Air Terminal	7,500 feet	National and State Registers of Historic Places, NYC Landmark	Project not visible due to distance and intervening buildings
3	Steinway House	4,500 feet	National and State Registers of Historic Places, NYC Landmark	Project not visible due to intervening vegetation
4	Lawrence Family Graveyard	4,000 feet	NYC Landmark	Project not visible due to distance and intervening buildings

[1]Recreation sites shown on Figure 4-5; historic sites shown on Figure 11-1.

Source: http://www.ci.nyc.us/html/dpr/html/yourparks.html

b. Wards Island

The eastern shoreline of Wards Island will offer clear, unobstructed views across the East River toward the proposed Combined Cycle Project. Figure 10-5b shows a photosimulation of the proposed Project from Wards Island (photo location 5). As shown in this photosimulation, the new facility will be plainly visible between the existing oil storage tanks and the sintering building. From this location, the new turbine building and collocated stacks will stand in contrast to the surrounding facilities in terms of height and bulk. In particular, the air-cooled condenser with the open support structure and visible ductwork will contrast with the brick facade of the nearby sintering building. Considering the visual prominence of the Poletti Project and the adjacent Orion Astoria Generating Station (not visible in Figure 10-5b but shown in Photo 6, Figure 10-2c), the Combined Cycle Project will result in an incremental visual change and an insignificant visual impact from the vantage point of Wards Island.

c. Bronx Waterfront

The Bronx shoreline is almost completely industrial and offers few public vantage points. The Tiffany Street Pier near the Hunts Point area provides one of the few public access areas along the Bronx waterfront. The Tiffany Street Pier offers clear, unobstructed views across the East River toward Rikers Island and the NYPA property. Figure 10-5c shows a photosimulation of the proposed Project from the Tiffany Street Pier (photo location 1). As shown in this photosimulation, the new facility will be visible behind the existing oil storage tanks. From this location, the new turbine building and collocated stacks will provide a new visual element, but will be similar to the surrounding facilities in terms of height and bulk The new demineralized water storage tank will also be visible along the shoreline but will not be readily seen from the Bronx waterfront. From this vantage point, the proposed Combined Cycle Project will partially block the existing view of the Citibank Building in Long Island City. Because the proposed Project will be similar to the Poletti Project in terms of scale, form and color, the visual impact of the proposed Project is minimized and will not result in a significant visual impact, particularly as viewed from this distance (greater than one mile) along the Bronx waterfront.

Photosimulation of Proposed Combined Cycle Project. (Photo location 1)

View of Proposed Project Site from Ralph DeMarco Park, Astoria, Queens.

New York Power Authority
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Astoria, Queens, NY

Figure 10-5a: Photosimulation of Proposed Combined Cycle Project from Ralph Demarco Park

Source: Burns and Roe Enterprises, January 2001

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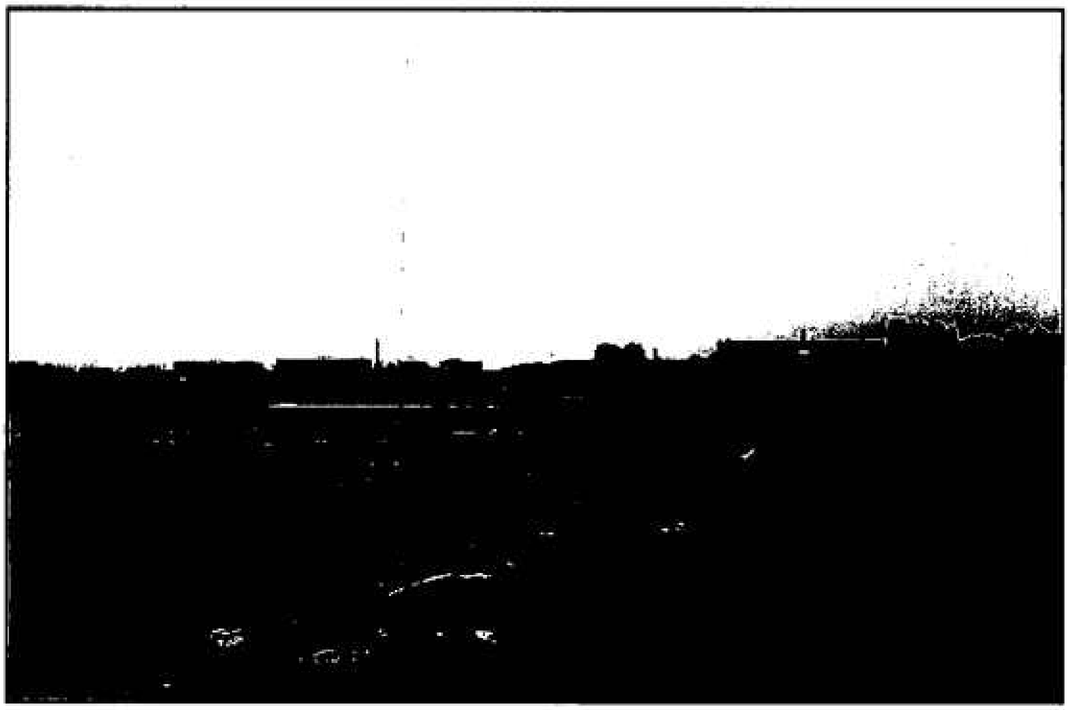
Photosimulation of Proposed Combined Cycle Project. (Photo location 5)



View of Proposed Combined Cycle Project from Wards Island.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-5b: Photosimulation of Proposed Combined Cycle Project from Wards Island

Source: Burns and Roe Enterprises, January 2001

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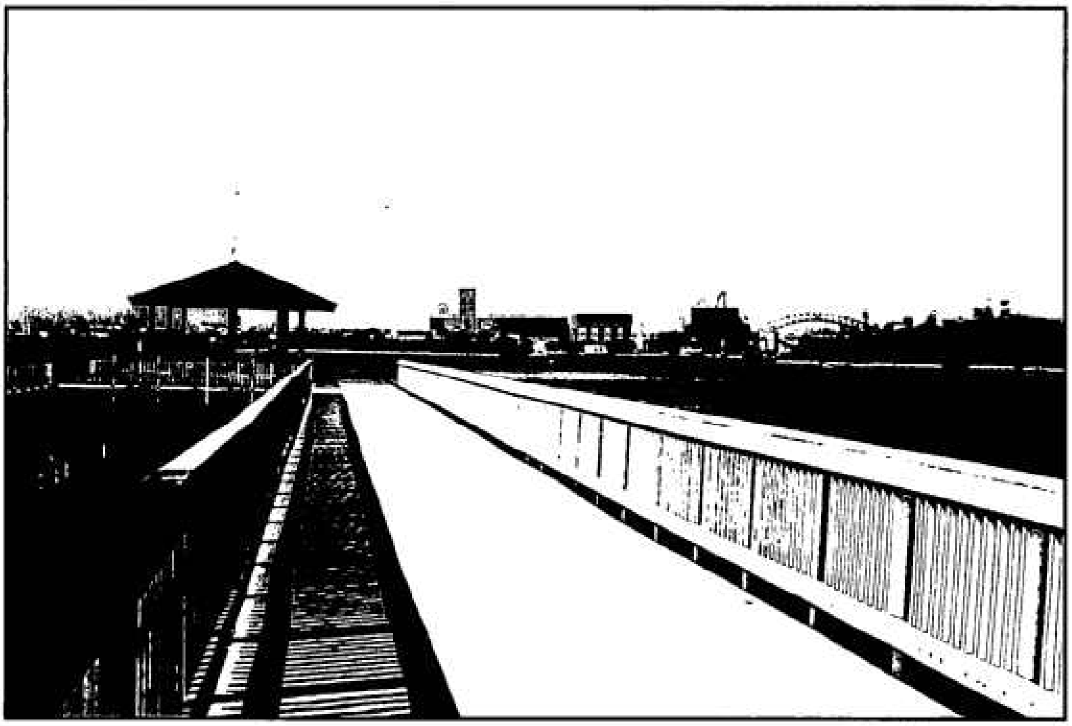
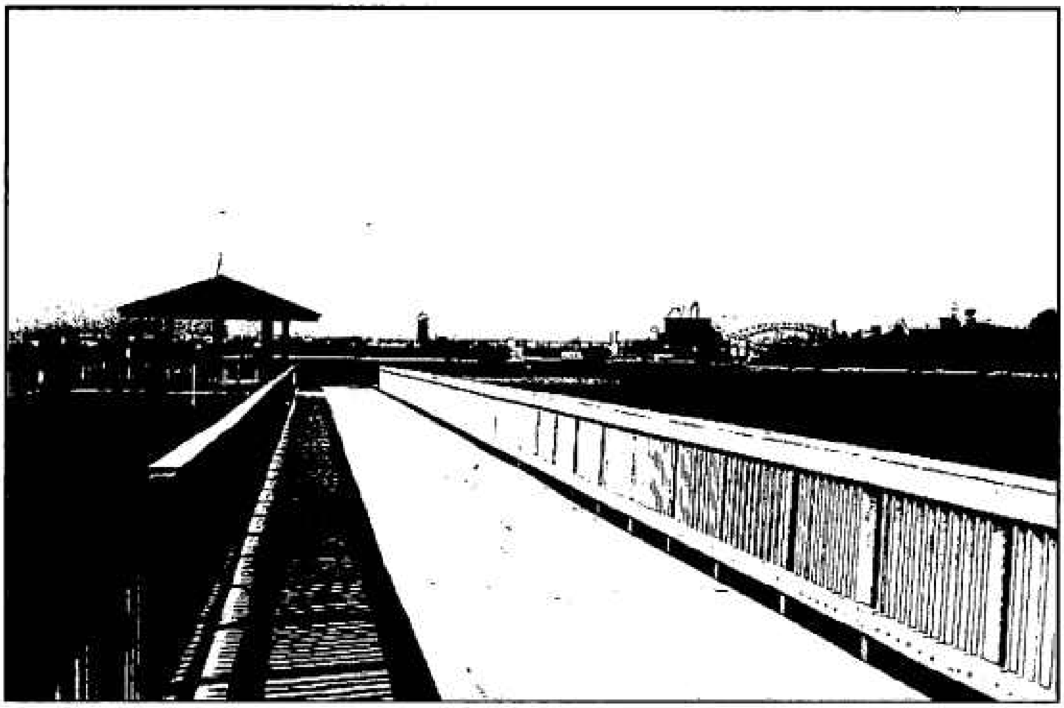


Photosimulation of Proposed Combined Cycle Project. (Photo location 8)



View of the Proposed Project site from the Tiffany Street Pier, Bronx, New York.

TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-5c: Photosimulation of Proposed Combined Cycle Project from the Tiffany Street Pier

Source: Burns and Roe Enterprises, January 2001

10.3 Visible Plume Analysis

A major exhaust by-product of the combined cycle turbine combustion process will be water vapor. With each pound of natural gas fired, over two pounds of water vapor are formed and emitted from the plant stack. The exhaust gas during kerosene firing will contain a somewhat higher percentage of water vapor due to the steam injected into the combustion for NO_x control. When hot humid exhaust gas is vented to a cooler humid atmosphere, the plume may be cooled to the temperature at which the vapor will condense and a visible plume forms. Because the exhaust gas contains more water vapor than the ambient air, an analysis was performed to determine if the exhaust plume would condense and become visible under normal atmospheric conditions. The plume visibility analysis is presented in detail in Appendix 10A of this Application.

The plume visibility analysis concluded that a visible plume would occur approximately 620 hours per year, or approximately 7 percent of the time a plume could be observed during normal operation while firing natural gas. Similarly, an average of only 34 hours per year (0.4%) would have a visible vapor plume, while firing kerosene. Further analysis indicated that combustion plume formation is only a cool weather phenomenon, with approximately 75 percent of the plumes occurring during the months of December, January and February. The plumes will likely occur during the morning hours, and will be light and wispy in character. In general, the maximum extent of a visible plume would be only several hundred feet downwind and would not be expected to be visually intrusive.

10.4 Cumulative Visual Impacts

The Combined Cycle Project is one of several power projects proposed in New York City. To date, Article X Applications have been filed for the East River Repowering Project (Con Edison Case 99-F-1314), the Astoria Energy Project (SCS Energy, Case 99-F-1191) and the Ravenswood Cogeneration Facility (KeySpan Energy, Case 99-F-1625) in New York City. The East River Repowering Project is located on the Lower East Side of Manhattan, more than 5 miles from the proposed Combined Cycle Project site. The Ravenswood Cogeneration Facility is located approximately 2.8 miles southwest of the proposed Project site. Neither of these two other proposed projects will be viewed in conjunction with the Combined Cycle Project due to the distance between these projects, the intervening development in Queens, and the presence of various elevated roadways, bridges and railroads (i.e., Triborough Bridge, New York Connecting Railroad). Accordingly, no cumulative visual impacts are expected in conjunction with these other two proposed projects.

The Astoria Energy Project site is located approximately 3,500 feet southeast of the Combined Cycle Project site in Astoria, Queens. Due to the extent of the property controlled by Con Edison, Orion and NYPA, and the density of development in the nearby Queens neighborhood, there will be few opportunities to simultaneously view both the Combined Cycle Project and the Astoria Energy Project. Based on this assessment, no aesthetic resources will be adversely impacted by the proposed NYPA Combined Cycle Project.

10.5 References

Benas, R., 1998. *Environmental Aesthetics (Draft)*. New York State Department of Environmental Conservation.

New York City Department of City Planning, 1993. *City Environmental Quality Review Technical Manual.*

10.0 URBAN DESIGN AND VISUAL RESOURCES

This section provides an assessment of the potential effect of the proposed project on the area's urban design and visual resources. This assessment methodology is based on the New York City Environmental Quality Review (CEQR) Technical Manual (New York City Department of City Planning, 1993) This assessment provides a description of the area's existing visual character and consideration of future conditions with and without the proposed project. The assessment of potential impacts is based, in part, on photosimulations depicting the appearance of the proposed Combined Cycle Project. In general, the study area includes the area within a one-mile radius of the proposed project.

10.1 Existing Visual Character

The description of the area's visual character is based on a review of aerial photographs, zoning and land use maps, and a comprehensive field survey conducted in the nearby Queens neighborhood, Wards Island and the Bronx waterfront near Hunt's Point.

10.1.1 Urban Design Characteristics

a. Queens

The Charles Poletti Power Project and the proposed Project site are part of a 291-acre complex of electric generating and ancillary facilities, including an extensive Con Edison storage yard. Located at Lawrence Point in northwestern Queens, this complex is relatively isolated from the adjacent Astoria neighborhood, with a common boundary along 20th Avenue. The complex is buffered to the west and north by the East River and to the east by Steinway Creek. The Orion Astoria Generating Station (formerly owned by Con Edison) and the adjacent Charles Poletti Power Project are the most visually prominent features of the extensive complex. Together, these facilities have five pairs of collocated, 300-foot-tall stacks, and their consistent height and spacing create a distinctive design feature. Along 20th Avenue, the common boundary with the Astoria neighborhood, the industrial facilities to the north are secured behind a chain link fence and intermittently screened by mature vegetation.

The adjacent Astoria neighborhood is predominantly residential with a mix of single-family townhouses and mid-rise apartment buildings. Curbside trees throughout the neighborhood soften the urban appearance while at the same time, the standard block pattern with the streets oriented parallel and perpendicular to the East River provide order to this urban area. Many of the apartment buildings and townhouses were built as complexes, resulting in a uniform appearance and streetscape along many of the blocks. The primary commercial streets, Ditmars

Boulevard and 31st Street, exhibit a typical urban streetscape with varied facades and building design. Major design elements in the Astoria neighborhood include the Triborough Bridge and two separate, elevated rail tracks. The Triborough Bridge spans the East River between Wards Island and Queens, providing a visual element as well as a physical division of the Astoria community. The New York Connecting Railroad traverses Wards Island and Astoria on an elevated track. The Hell Gate Bridge of the New York Connecting Railroad is a distinctive steel arch suspension bridge across the East River that has been determined eligible for the State and National Registers of Historic Places. The elevated N train of the New York City Subway runs down the center of 31st Street, ending just south of Ditmars Boulevard.

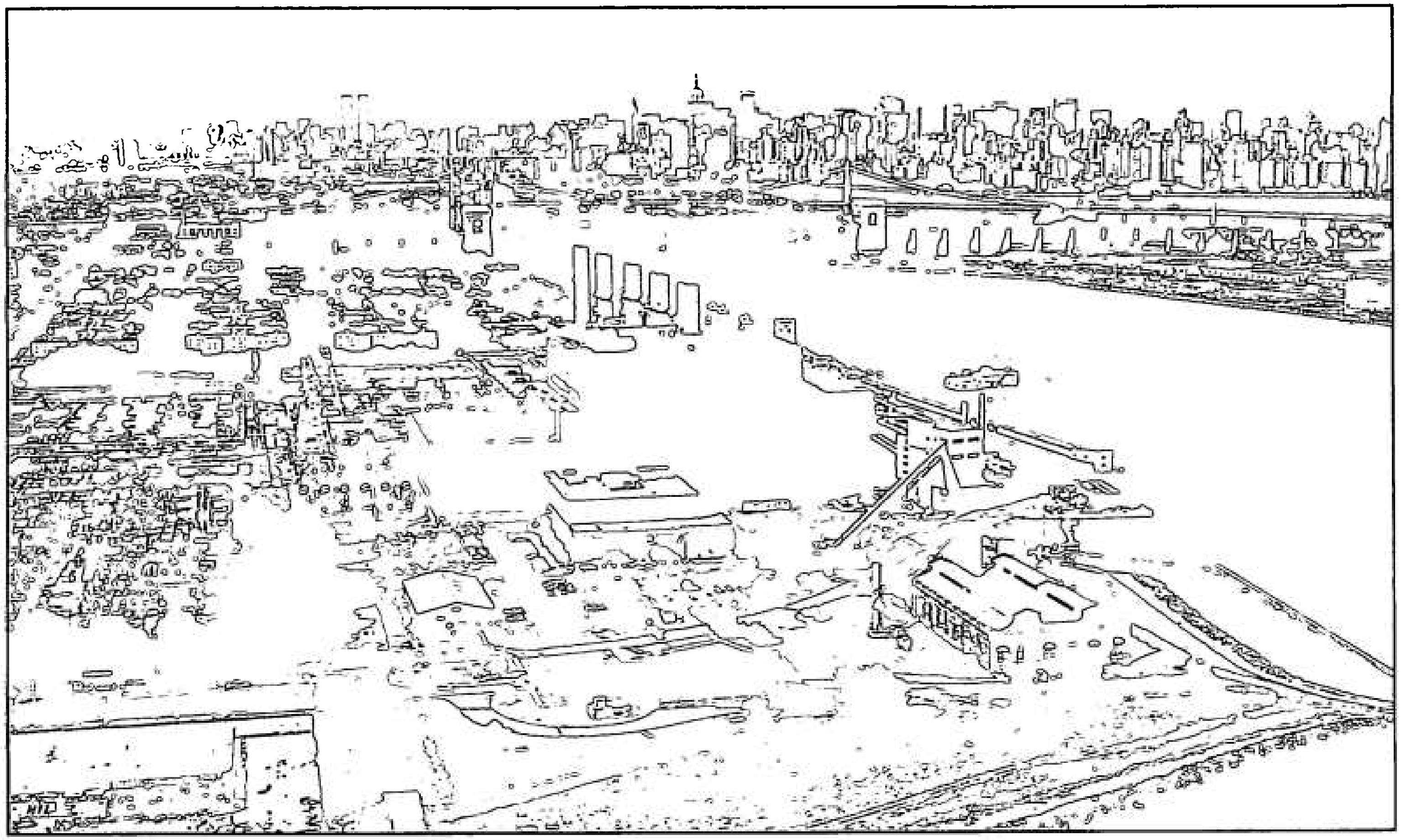
These urban design elements are shown in the oblique aerial photographs provided as Figures 10-1a through 10-1c.

b. Wards Island

Wards Island is located directly across the East River from the Charles Poletti Power Project and the proposed project site. Wards Island is occupied by various municipal facilities including the Wards Island Water Pollution Control Plant, the Manhattan Psychiatric Center, Downing Stadium, Wards Island Park and the Triborough Bridge. Wards Island is dominated by the elevated roadways and toll plaza associated with the Triborough Bridge and the elevated rail tracks of the New York Connecting Railroad. Open park areas are primarily occupied by ball fields.

c. Bronx Waterfront

The study area includes the Port Morris section of the south Bronx and the Bronx waterfront along the Bronx Kill and the East River. The portion of the Bronx within the study area is dominated by industrial land uses and the Hell Gate rail yard. Other dominant design and land use features in this portion of the Bronx include Interstate 278 and Interstate 87 and the Bronx leg of the Triborough Bridge.



New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-1a: Urban Design Context

Source: New York Power Authority

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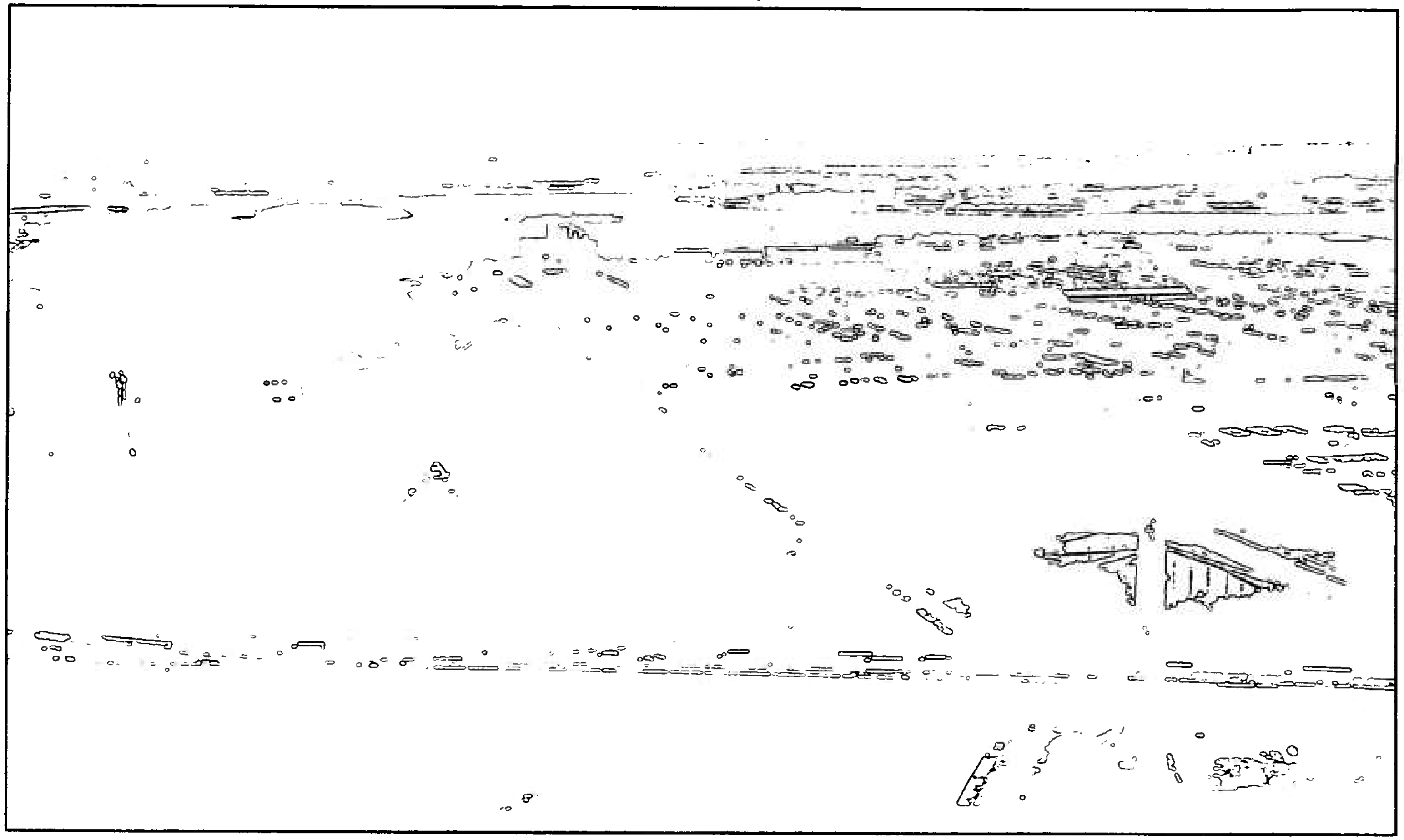
New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-1b: Urban Design Context

Source: New York Power Authority

TRC



New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-1c: Urban Design Context

Source: New York Power Authority

TRC

10.1.2 Visual Resources

a. Queens

Important visual resources in the Queens portion of the study area include Astoria Park and Ralph DeMarco Park along the East River waterfront. These parks provide primarily passive open space along the East River with paved paths and benches serving the local community. Astoria Park is spanned by both the Triborough Bridge and the elevated rail tracks. From these waterfront areas, park users have views of the Hell Gate area of the East River and Wards Island to the west and the nearby bridges spanning the East River (see Figure 10-1a). Shore Boulevard also provides two-way vehicular access along the East River waterfront.

The stacks of the Orion Astoria Generating Station are visible from only a few areas of the nearby Queens neighborhood due to the density of the development and the relative height of the stacks. Other facilities surrounding the Project site, such as the oil storage tanks, have even less visibility. The Orion Astoria Generating Station is clearly visible from Ralph DeMarco Park, as shown in Figure 10-2a, Photos 1 and 2 although the primary view corridors from the park are to the west. From this vantage point, the Charles Poletti Power Project is viewed in conjunction with the Orion facility and not as a separate feature. The Orion Astoria Generating Station and the Charles Poletti Power Project are not visible from Astoria Park due to the four-story residential buildings opposite the north end of the park along Ditmars Boulevard.

The Lawrence Family Cemetery at 20th Road and 35th Street (NYC Landmark) and the Steinway House at 18-22, 1st Street (State and National Registers of Historic Places and NYC Landmark) are the only designated historic sites within the study area. Figure 10-2b, Photo 3 shows the view of the Orion Astoria Generating Station and the Charles Poletti Power Project from the Lawrence Family Cemetery, indicating a typical view of the existing generating station in the context of the Astoria neighborhood. The cemetery is secured behind a chain link fence and not readily accessible to the general public (see Figure 10-2b, Photo 4). Views from the Steinway House toward the Project site were obscured by dense vegetation. Photo locations are shown in Figure 10-3

b. Wards Island

The only significant visual resource on Wards Island with a view of the proposed Project site is the park area opposite the existing Orion Astoria Generating Station and the Charles Poletti Power Project. This open waterfront area is occupied by nine ball fields and circular, vehicular roadways. The waterfront is secured with rip rap and is accessible to pedestrians, but the area lacks pedestrian-oriented improvements (i.e., developed promenade, sitting areas, etc.). Access to

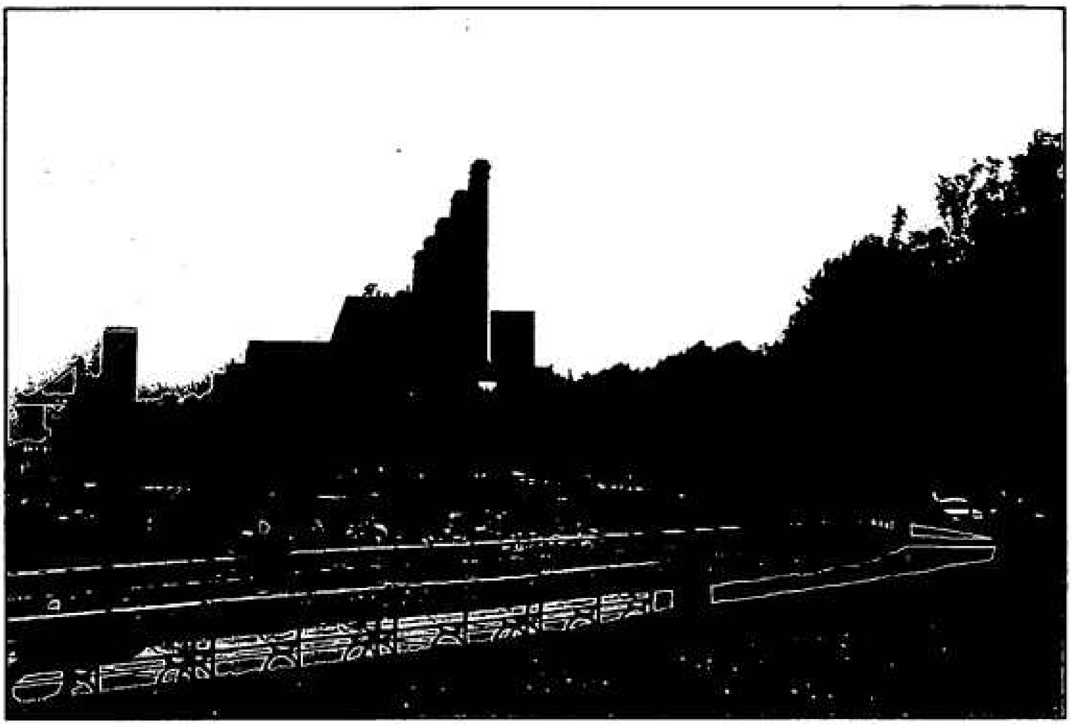


Photo 1: View from Ralph DeMarco Park, Astoria, Queens.

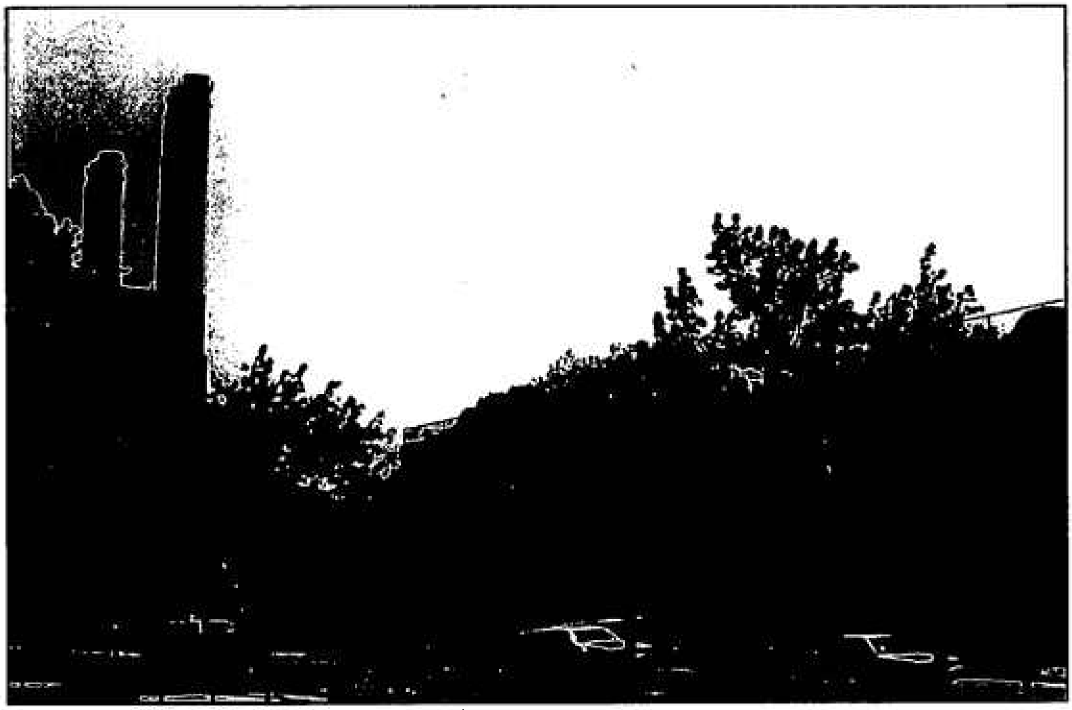


Photo 2: View from Ralph DeMarco Park, Astoria, Queens.

TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-2a: Representative Views

Source: New York Power Authority

Photo 3: View of Orion Astoria Project from Lawrence Family Cemetery (NYC Landmark) Astoria, Queens

Photo 4: Lawrence Family Cemetery, Astoria Queens.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-2b: Representative Views

Source: New York Power Authority

TRC

Photo 5: View of Proposed Project Site from Wards Island.

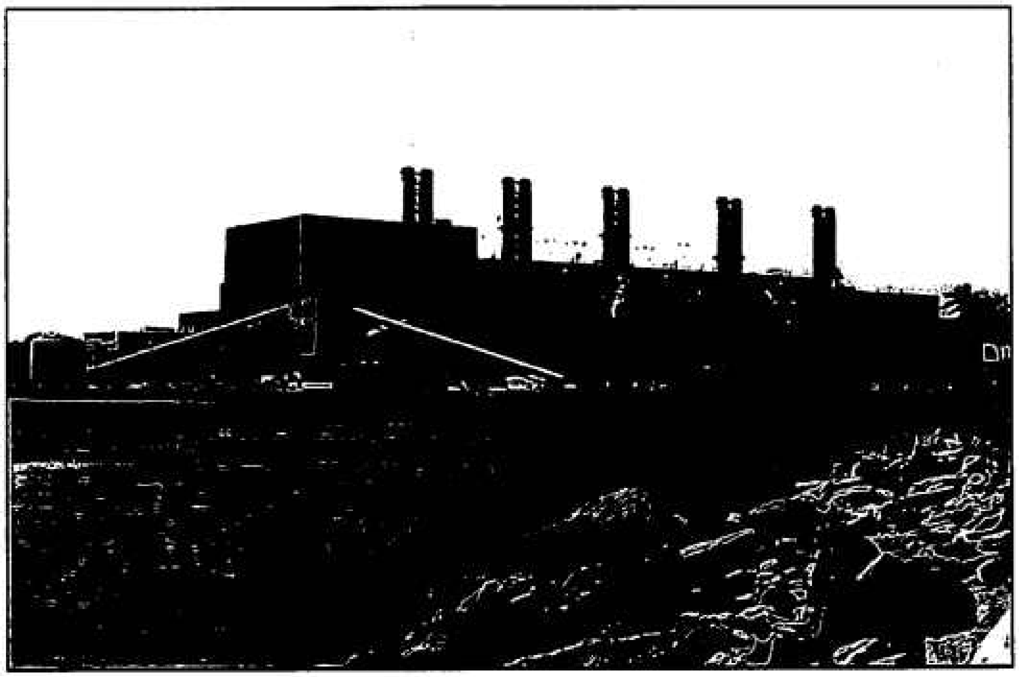


Photo 6: View of Poletti Project and Orion Astoria Project from Wards Island.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-2c: Representative Views

Source: New York Power Authority

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Photo 7: View of the Poletti Project and Proposed Project Site from the Tiffany Street Pier, Bronx.

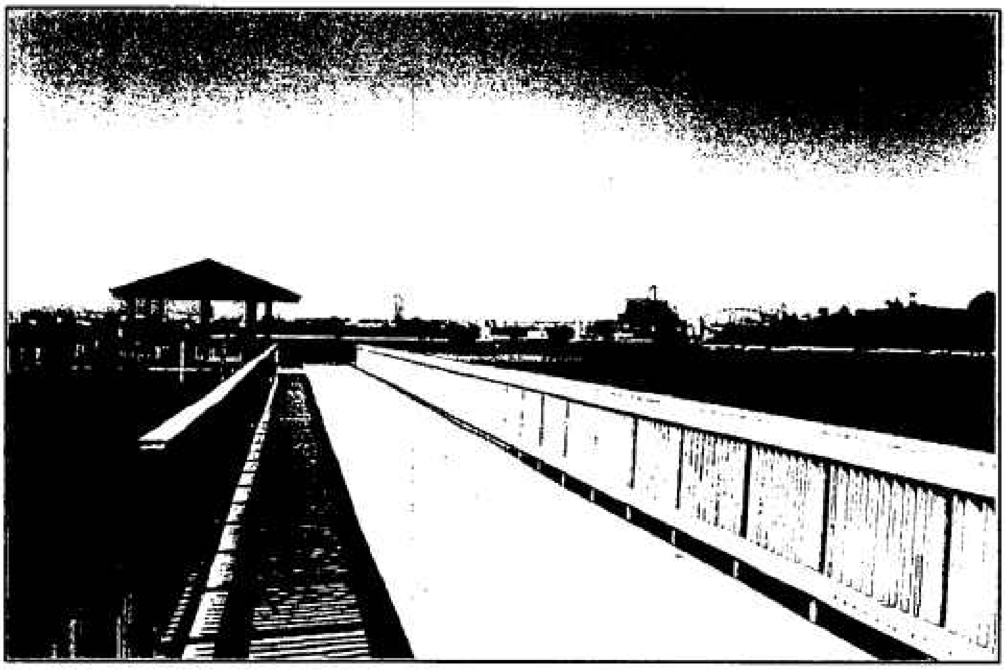

Photo 8: View of the Poletti Project and the Tiffany Street Pier.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-2d: Representative Views

Source: New York Power Authority

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(1) - Photograph Number

- Views

TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-3: Photo Locations
Approx. Scale: 1": 2,000'

Source: NYC Dept of Planning Sectional Maps,
TRC Environmental, June 2000

the park areas and ball fields is essentially limited to individuals with automobiles or the M-35 bus from Manhattan. The view of the proposed Project site from Wards Island is shown on Figure 10-2c, Photo 5. From this vantage point, the Project site is visible between the existing oil storage tanks and the sintering building (the original 1905 powerhouse). Figure 10-2c, Photo 6 shows the view of the Charles Poletti Power Project and the Orion Astoria Generating Station from the waterfront area of Wards Island.

c. Bronx Waterfront

The Bronx waterfront within the study area is totally occupied by industrial land uses and offers no public access or viewing locations. Similarly, the industrial neighborhood beyond the waterfront is without important visual resources. However, a public pier is located on the Bronx waterfront near the Hunt's Point industrial area to the northeast of the Project site. Even though this pier is located beyond the study area limit, this area was included in the visual assessment field survey.

The Tiffany Street Pier is located at the end of Tiffany Street on the Bronx waterfront, to the west of the Hunt's Point Water Pollution Control Plant. The surrounding neighborhood is industrial. The pier extends approximately 400 feet from the shoreline and provides pedestrian access to the waterfront. The pier has numerous benches and a covered area, with large openings to maximize opportunities for fishing in the waters below. From the pier, the industrial Bronx waterfront is prominent to the east and west with middleground views of Rikers Island and North Brother Island toward the south. The Charles Poletti Power Project and the Project site is visible behind South Brother Island. In the distance, the Hell Gate Railroad Bridge and the Citibank Building in Long Island City are visible. The view from the Tiffany Street Pier toward the Project site is shown in figure 10-2d, Photo 7, and the pier is shown in Photo 8.

10.2 Visual Impact Assessment

10.2.1 Future No Action Conditions

As shown in the photos provided as Figure 10-2a through 10-2d, the existing Charles Poletti Power Project and the adjacent Orion Astoria Generating Station (or at least a portion of the stacks) is visible from selected locations in the nearby Queens neighborhood and Wards Island. Only distant views of the existing facilities are available from the Bronx waterfront. Without the proposed project, these views are expected to remain the same. No other changes are expected to occur to the urban design and visual resource characteristics of the study area in the absence of the proposed Project.

10.2.2 Urban Design Considerations with the Proposed Project

a. Description of the Proposed Combined Cycle Project

The NYPA Combined Cycle Project will be constructed on a 4-acre site adjacent to the oil storage tanks at the Charles Poletti Power Project. The new facility will be housed in a metal-clad building approximately 100 feet in height, painted in dark earth tones similar to the existing Poletti Project. The most visually prominent feature will be the new 250-foot-tall collocated stacks. At the eastern end of the 48-foot-tall oil storage tanks, the new 65-foot- tall hybrid cooling tower structure will also present a new visual feature. To the west of the oil storage tanks, the 42-foot-tall demineralization water storage tank will also provide a new visual feature along the East River shoreline. The two new jet kerosene storage tanks will be constructed within two of the existing oil storage tanks and will not exceed the height (48 feet) of the existing tanks.

The proposed gas interconnection will be underground and will not provide any visible elements except for the new meter station to be located south of the Astoria West 138 kV substation; the new meter station will require minimal aboveground facilities and will be effectively screened by the surrounding facilities. The electrical interconnection to the Astoria West 138 kV substation will be via an underground, 138 kV cable. The proposed Combined Cycle Project will also be connected to the Astoria East 138 kV substation via a double-circuit, overhead, 138 kV transmission line on single-shaft, 67-foot-tall steel pole structures. The anticipated appearance of the Combined Cycle Project is illustrated in the artist rendering shown as Figure 10-4.

Outdoor lighting provided for the Combined Cycle Project will be similar to and consistent with the existing lighting at the Poletti Project. Area and task lighting will be shielded, directional and focused at the ground or specific work areas as required. Wide area lighting will not be required, and maintenance lighting will not be provided for the new switchyard and other outdoor equipment because, normally, these areas are unoccupied. Portable lighting will be used if maintenance work is required in these areas during non-daylight hours. Lighting for the new stack will be in conformance with standard FAA requirements and will be similar to the lighting of the existing stacks. A detailed lighting plan will be provided as part of a post-certificate Compliance Filing.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-4: Artist Rendering

Source: Burns and Roe Enterprises, Inc., August 2000

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b. Relationship of Proposed Project to Existing Urban Design Elements

In terms of height and bulk, the new turbine building will be larger than the other nearby facilities such as the NRG gas turbine complex, the existing oil storage tanks, and the various warehouse buildings. However, the new building will be smaller than the existing Charles Poletti Power Project and the Orion Astoria Generating Station. Similarly, the new 250-foot-tall collocated stacks will be taller than the surrounding facilities, but will be comparable to the existing stacks. In terms of urban design, the proposed Combined Cycle Project is compatible with the existing electric generating facilities near the Project site.

The proposed Project will not affect other existing urban design elements in the nearby Queens neighborhood including the local street pattern, the existing streetscape along 20th Avenue, or the existing street hierarchy.

10.2.3 Visual Resource Considerations with the Proposed Project

a. Queens

From the nearby Queens neighborhood, the proposed Combined Cycle Project will be generally unnoticed since there are few opportunities to view the expansive property controlled by Con Edison, Orion, NRG and NYPA. Photo 1, Figure 10-5a shows a photosimulation of the proposed Project from Ralph DeMarco Park along the East River in Astoria. As shown in this photosimulation, the new facility will be partially visible from this location but will result in an insignificant visual impact considering the visibility and scale of the existing Orion Astoria Generating Station and the magnitude of the incremental change. The primary view corridors from the park, toward the East River to the west, will be unaffected by the proposed Combined Cycle Project.

b. Wards Island

The eastern shoreline of Wards Island will offer clear, unobstructed views across the East River toward the proposed Combined Cycle Project. Photo 3, Figure 10-5b shows a photosimulation of the proposed Project from Wards Island. As shown in this photosimulation, the new facility will be plainly visible between the existing oil storage tanks and the sintering building. From this location, the new turbine building and collocated stacks will stand in contrast to the surrounding facilities in terms of height and bulk The cooling towers (65 feet tall) will be slightly taller than the existing oil storage tanks (48 feet tall) and will only be marginally visible from the vantage point of Wards Island. Considering the visual prominence of the Poletti Project and the adjacent Orion Astoria Generating Station (not visible in Figure 10-5b but shown in Photo 6, Figure 10-

2c), the Combined Cycle Project will result in an incremental visual change and an insignificant visual impact from the vantage point of Wards Island.

c. Bronx Waterfront

The Bronx shoreline is almost completely industrial and offers few public vantage points. The Tiffany Street Pier near the Hunts Point area provides one of the few public access areas along the Bronx waterfront. The Tiffany Street Pier offers clear, unobstructed views across the East River toward Rikers Island and the NYPA property. Photo 5, Figure 10-5c shows a photosimulation of the proposed Project from the Tiffany Street Pier. As shown in this photosimulation, the new facility will be visible behind the existing oil storage tanks. From this location, the new turbine building and collocated stacks will provide a new visual element, but will be similar to the surrounding facilities in terms of height and bulk The new demineralized water storage tank will also be visible along the shoreline. From this vantage point, the proposed Combined Cycle Project will partially block the existing view of the Citibank Building in Long Island City. Because the proposed Project will be similar to the Poletti Project in terms of scale, form and color, the visual impact of the proposed Project is minimized and will not result in a significant visual impact, particularly as viewed from this distance (greater than one mile) along the Bronx waterfront.

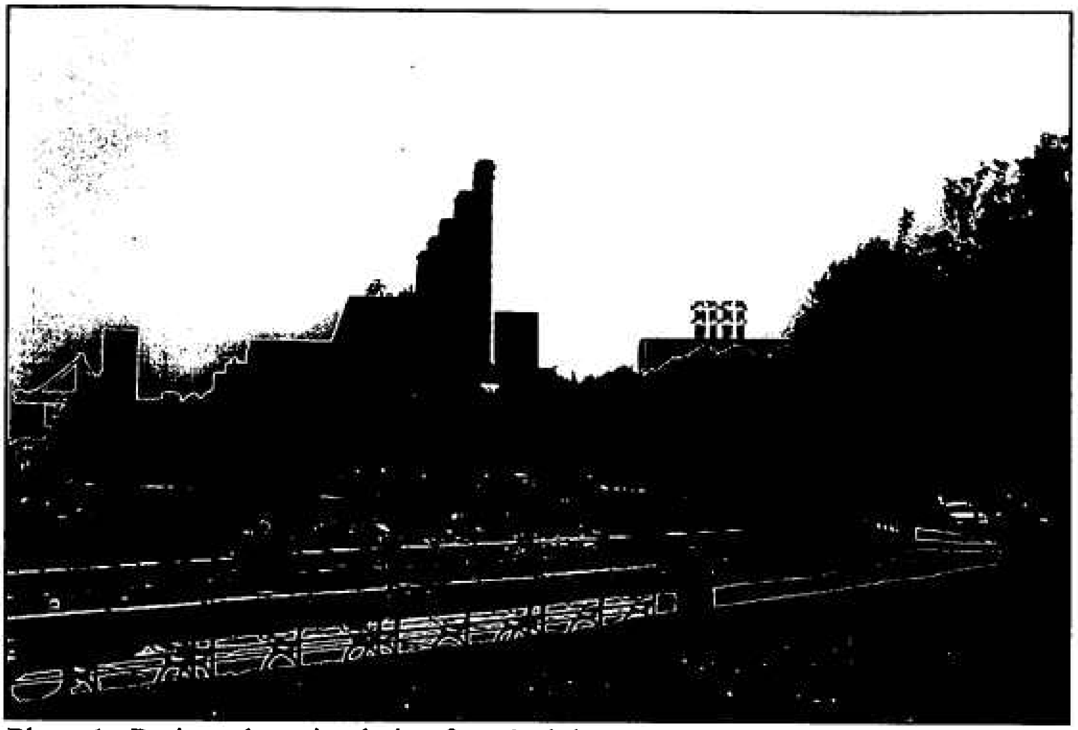

Photo 1: Project photosimulation from Ralph DeMarco Park, Astoria, Queens.

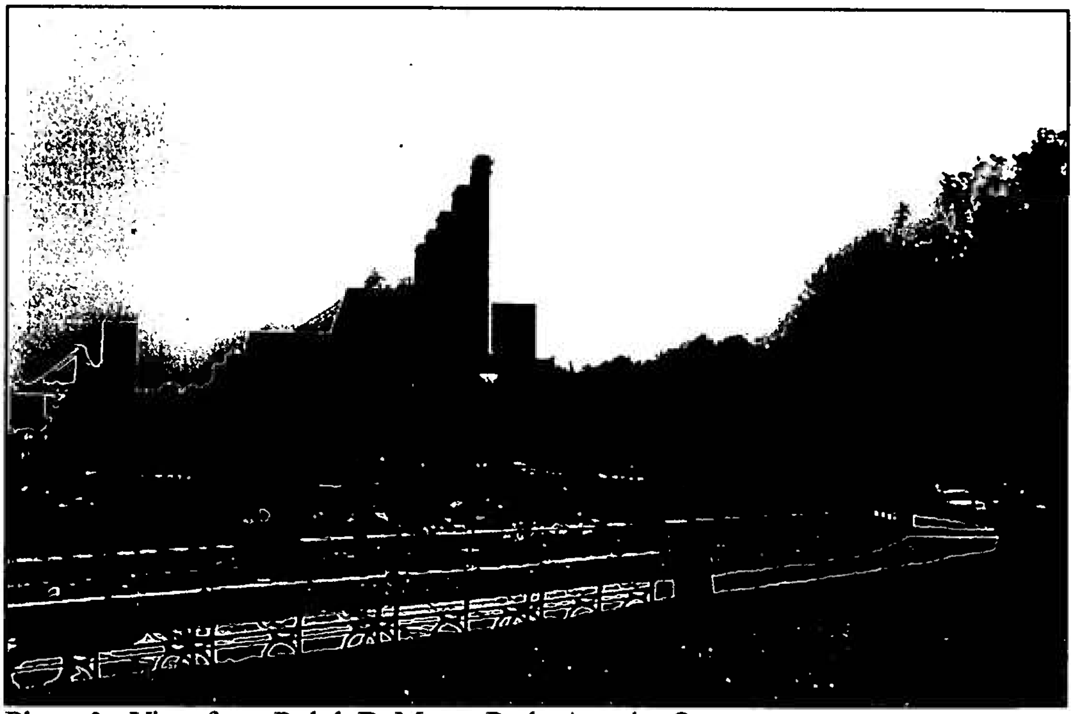

Photo 2: View from Ralph DeMarco Park, Astoria, Queens.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-5a: Photosimulation of Proposed Combined Cycle Project from Ralph Demarco Park

Source: New York Power Authority

TRC

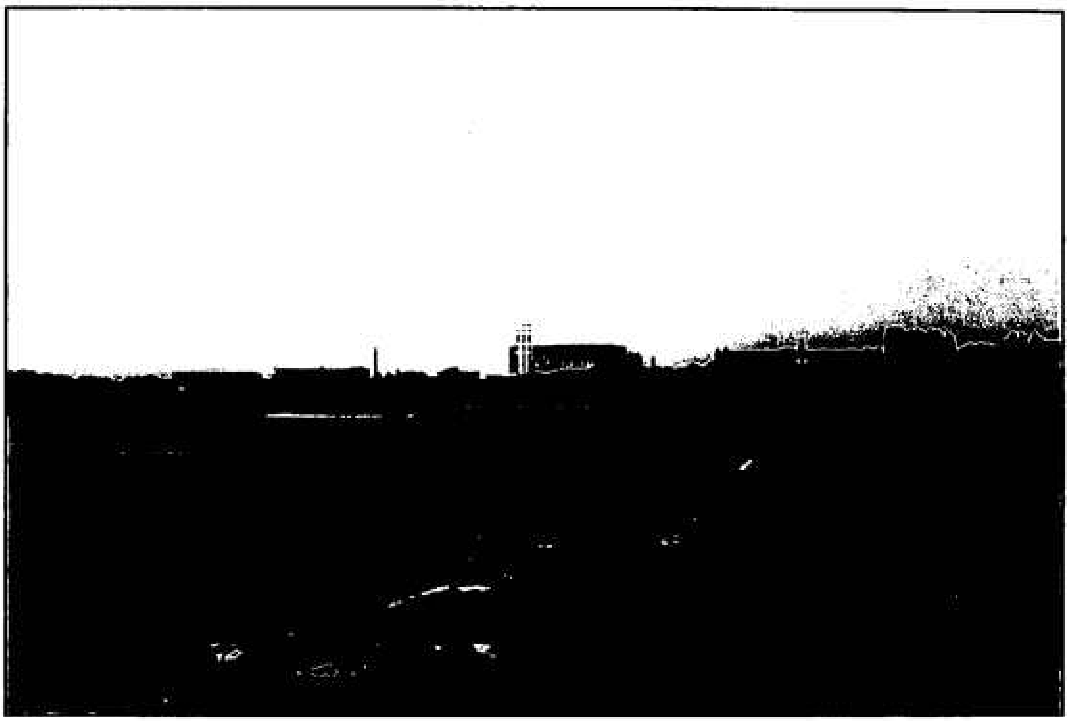

Photo 3: Photosimulation view of Proposed Project Site from Wards Island

Photo 4: View of Proposed Project Site from Wards Island.

TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-5b: Photosimulation of Proposed Combined Cycle Project from Wards Island

Source: New York Power Authority

Photo 5: Photosimulation view of the proposed Poletti Project from the Tiffany Street Pier, Bronx, New York.

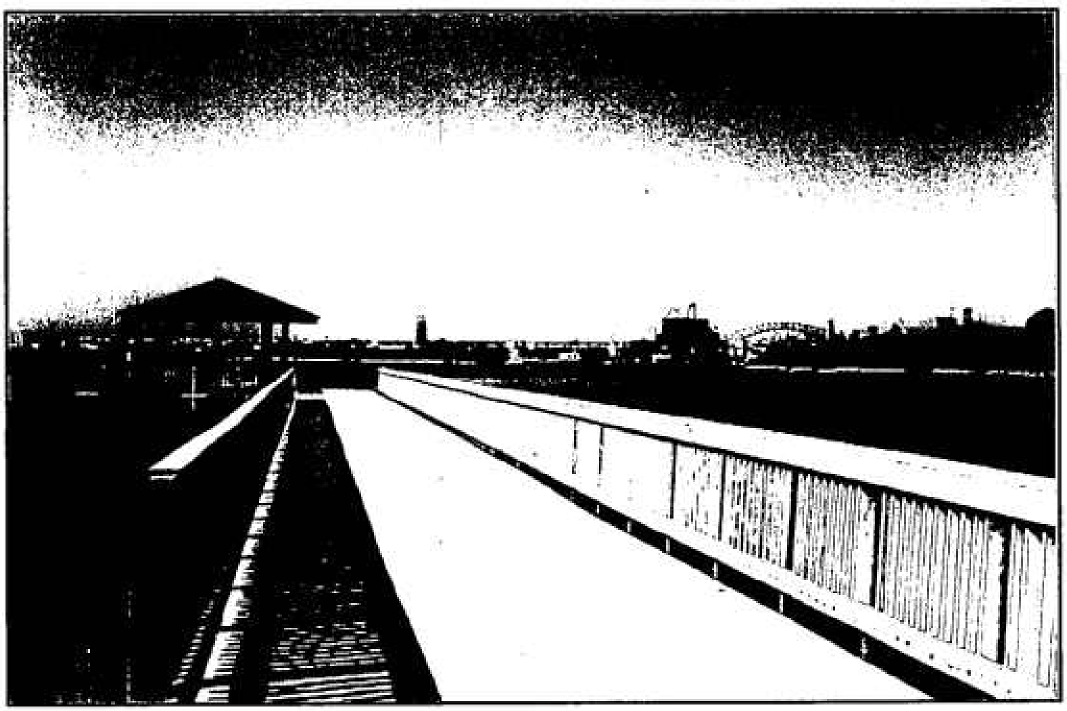

Photo 6: View of the Poletti Project from the Tiffany Street Pier, Bronx, NewYork.

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 10-5c: Photosimulation of Proposed Combined Cycle Project from the Tiffany Street Pier

Source: New York Power Authority

TRC

10.3 Visible Plume Analysis

10.3.1 Stack Plume Visibility Analysis

A major exhaust by-product of the combined cycle turbine combustion process will be water vapor. With each pound of natural gas fired, over two pounds of water vapor are formed and emitted from the plant stack. The exhaust gas during kerosene firing will contain a somewhat higher percentage of water vapor due to the steam injected into the combustion for NO_x control. When hot humid exhaust gas is vented to a cooler humid atmosphere, the plume may be cooled to the temperature at which the vapor will condense and a visible plume forms. Because the exhaust gas contains more water vapor than the ambient air, an analysis was performed to determine if the exhaust plume would condense and become visible under normal atmospheric conditions. The plume visibility analysis is presented in detail in Appendix 10A of this Application.

The plume visibility analysis concluded that a visible plume would occur approximately 620 hours per year, or approximately 7 percent of the time a plume could be observed during normal operation while firing natural gas. Similarly, an average of only 34 hours per year (0.4%) would have a visible vapor plume, while firing kerosene. Further analysis indicated that combustion plume formation is only a cool weather phenomenon, with approximately 75 percent of the plumes occurring during the months of December, January and February. The plumes will likely occur during the morning hours, and will be light and wispy in character. In general, the maximum extent of a visible plume would be only several hundred feet downwind and would not be expected to be visually intrusive.

10.3.2 Cooling Tower Plume Analysis

Potential visual impacts typically associated with cooling tower plumes occur because of water (both droplets and vapor) contained in the plume. Visible plumes occur when small water droplets produce an opaque cloud.

A cooling tower analysis was performed using the Electric Power Research Institute (EPRI) Seasonal and Annual Cooling Tower Impact (SACTI) cooling tower model. The model is widely recognized as being the most comprehensive and validated cooling tower plume model available for modeling power plant cooling tower plumes. The SACTI model employs sophisticated atmospheric dispersion equations, which include plume rise and thermodynamics of the emitted water vapor plumes. Additionally, the model uses a database of hourly meteorological conditions to develop a statistical frequency distribution of plume heights, lengths, and occurrence of ground fog and icing conditions, and salt deposition conditions. Meteorological data was obtained from La Guardia Airport for the period 1990-1996. This was the same period used to assess the visible plumes resulting from the combustion water vapor emissions. A detailed discussion of the SACTI model and the results of this analysis are included in Appendix 10A of this Application.

By definition, a hybrid cooling tower is a modification to a wet evaporative tower, with a certain portion of the hot circulating water passed through a dry section – usually in the top of the tower (although some designs have the dry sections on the sides of the air inlets). The dry section is essentially a large radiator, similar in operation to the radiator in an automobile. The dry section provides for cooling of the circulating water, and also adds heat to the cool saturated flow from the wet section of the tower. The additional heat added to the outlet flow serves to increase the dew point depressions, and help minimize a condensed plume formation. The dry section can be engineered to provide plume abatement to a design dry bulb and wet bulb temperature combinations. The design data for a hybrid tower assessed for the proposed Combined Cycle Project assumed all condensed vapor plumes would be eliminated at temperatures above 24° F.

The SACTI model was also used to define the frequency of occurrence of maximum and average height and length of plumes. The SACTI model uses a meteorological preprocessor to examine the tower conditions and identify plume categories that will result in both possible ground fog events and elevated plumes. The plume categories identified by the model are tabulated by their frequency of occurrence in the meteorological database. The SACTI met processor calculates plume heights and lengths for each category, and for each representative tower equivalent approach angle. The maximum plume height and length for each equivalent angle were identified, and were sorted by increasing length and height. Based on the results of this modeling, the hybrid cooling tower will create visible plumes for a total of less than 300 hours per year, and approximately 50% of the time the cooling tower plume will be less than 356 meters (approximately 1,168 feet) in length, and less than 57 meters (approximately 188 feet) in height. This frequency of visible cooling tower plumes is considered insignificant, particularly considering the extent of the NYPA/Con Edison property and the limited viewing opportunities in the surrounding communities.

10.4 Cumulative Visual Impacts

The Combined Cycle Project is one of several power projects proposed in New York City. To date, Article X Applications have been filed for the East River Repowering Project (Con Edison Case 99-F-1314), the Astoria Energy Project (SCS Energy, Case 99-F-1191) and the Ravenswood Cogeneration Facility (KeySpan Energy, Case 99-F-1625) in New York City. The East River Repowering Project is located on the Lower East Side of Manhattan, more than 5 miles from the proposed Combined Cycle Project site. The Ravenswood Cogeneration Facility is located approximately 2.8 miles southwest of the proposed Project site. Neither of these two other proposed projects will be viewed in conjunction with the Combined Cycle Project due to the distance between these projects, the intervening development in Queens, and the presence of various elevated roadways, bridges and railroads (i.e., Triborough Bridge, New York Connecting Railroad). Accordingly, no cumulative visual impacts are expected in conjunction with these other two proposed projects.

The Astoria Energy Project site is located approximately 3,500 feet southeast of the Combined Cycle Project site in Astoria, Queens. Due to the extent of the property controlled by Con Edison, Orion and NYPA, and the density of development in the nearby Queens neighborhood, there will be few opportunities to simultaneously view both the Combined Cycle Project and the Astoria Energy Project.

10.5 References

Benas, R., 1998. *Environmental Aesthetics (Draft)*. New York State Department of Environmental Conservation.

New York City Department of City Planning, 1993. *City Environmental Quality Review Technical Manual.*

Section 11

Section 11

11.0 CULTURAL RESOURCES

11.1 Introduction

This section provides a brief prehistoric and historic overview of the region; describes historic places, properties and structures identified by local, state and federal agencies within one mile of the proposed project site; and addresses potential impacts to cultural resources from construction and operation of NYPA's proposed Combined Cycle Project.

A Literature Review and Cultural Resource Inventory of the Charles Poletti Power Project was prepared by Hartgen Archeological Associates, Inc. in December 1987 and provided the basis for the prehistoric and historic overview provided in this report; a copy of this report is provided in Appendix 11A of this Application. Historic Sanborn fire Insurance Maps covering the NYPA/Con Edison property were reviewed to determine the potential for unknown historic resources at the proposed project site. The findings and recommendations regarding archeological resources were reviewed with the staff of the Office of Parks, Recreation and Historic Preservation (OPRHP) at a meeting on September 30, 1999.

Historic places, properties and structures within one mile of the project site that are listed on the State and/or National Registers of Historic Places (S/NRHP) were identified through a review of the records on file at the OPRHP. Designated New York City Landmarks within one mile of the project site were identified from the Guide to New York City Landmarks (Dolkart, 1998), published by the Landmarks Preservation Commission. The Commission was requested to identify any additional landmarks designated since 1998; a copy of that correspondence and their reply is provided in Appendix 11A of this Application.

11.2 Regional Prehistoric and Historic Overview

Although the earliest occupation of New York State was probably as early as 12,000 years ago, the earliest dated Paleo-Indian site in New York State is the Dutchess Quarry Cave, located on the west side of the Hudson River in Orange County, dated to approximately 10,580 B.C. (Hartgen, 1987). Subsequent periods of human occupation are defined by tool making and lifestyle characteristics and include the Early, Middle and Late Archaic periods (8000 – 1000 B.C.), Transitional period (1250 – 1000 B.C.), and the Woodland period (ca. 1000 B.C. to A.D. 1600). Archeological evidence indicates that for most of New York State, life in the Woodland period most likely resembled that of the Archaic period. Hunting, fishing, shellfish and plant collecting may have been gradually augmented by the cultivation of food plants (Hartgen, 1987).

The thirteen tribes of Long Island were Eastern Algonkian in language, with those on the western end (in the area of Queens) of Munsee origin. The Rockaway tribe was scattered over the southern part of Hempstead and all of Newtown. Archeological evidence indicates a sharp division between the western and eastern Indians with archeological sites clustered at opposite ends of the island. With an eastward movement of the English population and the subsequent displacement by the Dutch and Iroquois, only a small number of Indians were left by the end of the 17th century, mostly at the eastern end of the island. The same trend continued in the 18th century until they were completely dispersed (Hartgen, 1987).

Dutch settlement on Long Island occurred as early as 1635, and by 1650, Dutch and English settlements were scattered over the island with the Dutch establishing colonies toward the western end and the English toward the eastern end. Dutch rule on Long Island lasted until 1664 with English rule under James Duke of York continuing from 1665 until 1673. Following a brief period of Dutch control in 1673, subsequent peace between the Dutch and English in 1674 ended forever the Dutch rule on Long Island. On Long Island, loyalties during the Revolution were to the British, but during the War of 1812, the inhabitants of Queens County and Long Island came together in opposition to the British. During the early 1800s, extensive railroad construction furthered the growth and development of Long Island, particularly Queens County which became readily accessible and more economically linked to Manhattan.

The village of Astoria, named in honor of John Jacob Astor, was incorporated in 1839. By 1842, steamboats provided access between Astoria and New York City several times a day. Astoria and Ravenswood, the early settlement below Haletts Cove on the East River, continued to expand, as did Hunter's Point and other nearby communities. Long Island City was formed in 1870, consolidating the villages of Astoria, Hunter's Point, Ravenswood and Blissville. At this time, the industrial nature of Astoria and Hunter's Point were well established. By 1872, Astoria was considered a suburb of New York City, noted for the nurseries and floral establishments (Hartgen, 1987). In 1870 and 1871, Steinway and Sons purchased approximately 400 acres in Astoria with approximately one half mile of water frontage on the East River. In 1875 the Steinway piano factory and its attendant company town were developed along Steinway Street; the Steinway mansion remains on the hill north of 19th Avenue, east of Steinway Street.

Completion of the Pennsylvania Railroad tunnel to Manhattan, the IRT Flushing Line, and the BMT Astoria Line between 1910 and 1930 led to greater residential development of Astoria and neighboring communities of East Elmhurst and Jackson Heights. In the 1930s, construction of the Grand Central Parkway provided a limited-access vehicular route across northern Queens. Development of La Guardia Airport, then know as North Beach Airport, began in 1938 in the North Beach resort area (NYC Department of City Planning, 1993).

11.3 Project Site History

According to historical maps, the actual project site was located beyond the natural shoreline prior to 1898. The coastline in this area was modified by construction of a pier and bulkheads in the early 1900s, and the former Berrians Island became obscured by the filling of Berrian's Creek, which connected the island to mainland Astoria.

Shortly after 1900, the Astoria Light, Heat and Power Company located in Astoria at Lawrence Point. This was the first central plant located off Manhattan to supply New York City with gas and later electricity. The original 1905 powerhouse building remains near the proposed project site. According to historical Sanborn maps from 1915, a gas manufacturing plant was developed in the area south of the proposed plant site; this area is currently occupied by the Astoria West 138 kilovolt (kV) substation, an extensive maintenance supply warehouse, and outdoor storage and parking areas. The proposed combined-cycle plant area was used for coal storage for the gas manufacturing plant.

Between 1936 and 1948, portions of the gas plant were demolished. A new coal-fired Astoria generating station was constructed in 1953 along the East River shoreline, west of the area formerly occupied by the gas plant. Additional units were added between 1958 and 1960. Consolidated Edison operated the Astoria generating station. The original 1905 powerhouse was idled in the 1950s, and modifications were undertaken around 1960 to reuse the building as a sintering building. This process used the coal ash by-product from the coal burned at the power plant to manufacture porous cellular nodules for concrete.

In 1975, NYPA acquired the partially built Astoria Plant #6 from Con Edison and formally renamed it the Charles Poletti Power Project. This 825 MW plant remains operational.

11.4 Potential Archeological Resources

The 1987 literature review and cultural resource inventory prepared by Hartgen Archeological Associates, Inc. identified a moderate sensitivity for intact prehistoric cultural resources within the NYPA property. However, historic maps indicate that the area proposed for the 500 MW combined-cycle plant consists of made land that was beyond the natural shoreline prior to 1891. A high sensitivity exists for the presence of historic industrial archeological resources associated with the sintering building.

Since the proposed project site was created by the placement of fill around the turn of the century, the site is considered to have no potential for prehistoric archeological resources. Historic archeological resources are also unlikely to be found at the proposed project site considering the distance from the sintering building and the absence of any documentation in the 1987 report to indicate prior use of the proposed site.

To supplement the 1987 report and verify the absence of any significant historic use of the proposed project site, historic Sanborn Fire Insurance Maps were obtained for the years 1898, 1915, 1936, 1948, 1967, 1976, 1985, and 1990. These maps indicated that extensive development of the NYPA/Con Edison property occurred between 1898 and 1915 with the construction of the sintering building and facilities associated with a manufactured gas plant during that time. The area of the proposed combined-cycle project is clearly shown up through 1948 as being used for coal storage associated with the gas plant. By 1967, most of the facilities associated with the manufactured gas plant had been removed and the present facilities associated with Orion's Astoria project had been constructed. The proposed project site remained unoccupied by any structures throughout this period.

On September 30, 1999, a meeting was held with representatives from the OPRHP to review the information known about the proposed project site and determine the need for any additional archeological investigations. At that meeting, it was agreed that the potential for any significant archeological resources at the project site was unlikely. An Addendum to the 1987 report has been prepared to document the results of the recent geotechnical investigations and to summarize the additional mapped information. The results of map research and geotechnical investigation indicate that no significant cultural resources are present within the proposed project site. The site was partially submerged until early last century and subsequently filled. Any prehistoric sites that have been in the project tract would not have survived the subsequent land filling intact. All evidence indicates that no historical development took place within the project area; thus it has no potential for significant historic-period cultural resources. Consequently, no further archeological work is recommended in the project site (TRC Garrow Associates, 2000).

Copies of the Addendum to the 1987 report were provided to the OPRHP, and in correspondence to NYPA dated July 10, 2000, the OPRHP concurred with the recommendations presented in the Addendum. Consequently, no additional archeological investigations are warranted at the Project site. A copy of the Addendum to the 1987 report and the recent correspondence from the OPRHP are included as Appendix 11A of this Application.

11.5 Historic Architectural Resources

In April 1986, an Appraisal of Significance was prepared for the original Electric Power Station Building of the Astoria Light, Heat and Power Company (circa 1905), leading to a Determination of Eligibility by the State Historic Preservation Officer (SHPO) in August 1986. This building, identified as the sintering building, is located approximately 600 feet west of the proposed plant site. This building is currently in a poor state of repair and is unused.

Additional documentation regarding the sintering building is provided in Appendix 11A of this Application. Photographs showing the exterior of the sintering building and the view from the sintering building toward the proposed Project Site are provided in Figures 11-1a and 11-1b. In particular, the photographs in Figure 11-1b show a portion of the tank farm (the large blue tanks), the adjacent NRG turbines (the multiple gray rectangular stacks), and the LNG tank (the white dome in the background). These photographs demonstrate that the sintering building is located in a dense industrial setting.

With regard to the setting of the sintering building, the eligibility determination for the sintering building (included in the 1987 Cultural Resources Inventory and provided in Appendix 11A of this Application) states the following:

> The Electric Power Station Building (e.g., the Sintering Plant) build ca. 1905 appears to be a significant example of early 20th Century **Industrial Architecture Design**, and the only surviving intact building associated with the former Astoria Gas Plant with its multiple round arched windows, ornate carbelling and decorative parapets. The imposing brick structure appears monumental, reflecting the prominence of this gas plant as the **first central plant located off Manhattan to supply the city's needs**. Despite loss of its generating equipment, the **Power Plant remains architecturally significant**, and is important as the only extant, intact component of the plant. [emphasis added]

Thus, it is clear that the initial setting for the plant was of a highly industrialized nature, and its architecture reflects its industrial intent and its power plant functionality. The sintering building will continue to be in a highly industrialized setting after the completion of the new facility, just as it was upon its initial construction. Therefore, no change in setting is envisioned. Discussions with the OPRHP staff indicate that the construction of the proposed Project will not compromise the eligibility of the sintering building for the National Register of Historic Places. Since the proposed project is not expected to have any effect on the historic sintering building, no mitigation is warranted or proposed.

Records on file at the OPRHP were reviewed in February 2000 to identify the historic architectural resources within one mile of the project site that are listed on the State or National Registers of Historic Places. The Guide to New York City Landmarks (Dolkart, 1998), updated with information provided by the Landmarks Preservation Commission, was used to identify designated New York City Landmarks within one mile of the site. The identified historic architectural resources are listed in Table 11.1 and shown on Figure 11-2.

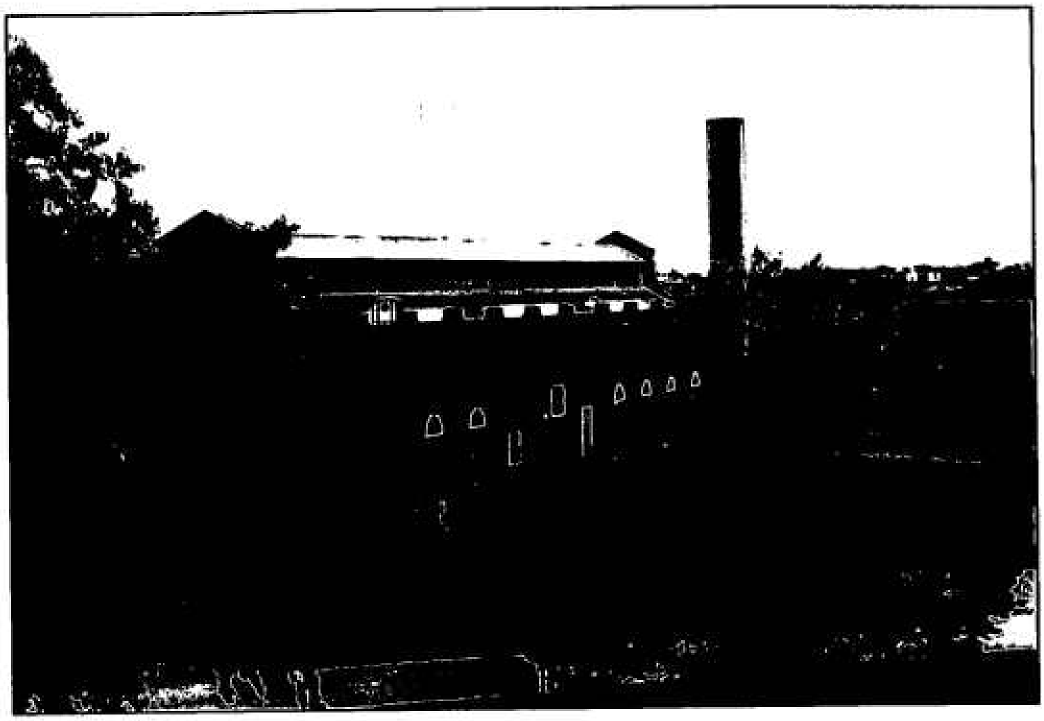

Photo 1: View north of the Sintering Building from the Charles Polletti Power Project Administration Building (May 1999)

Photo 2: View of the Sintering Building (May 1999)

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 11-1a: Views of the Sintering Building and Setting

Source: New York Power Authority

TRC

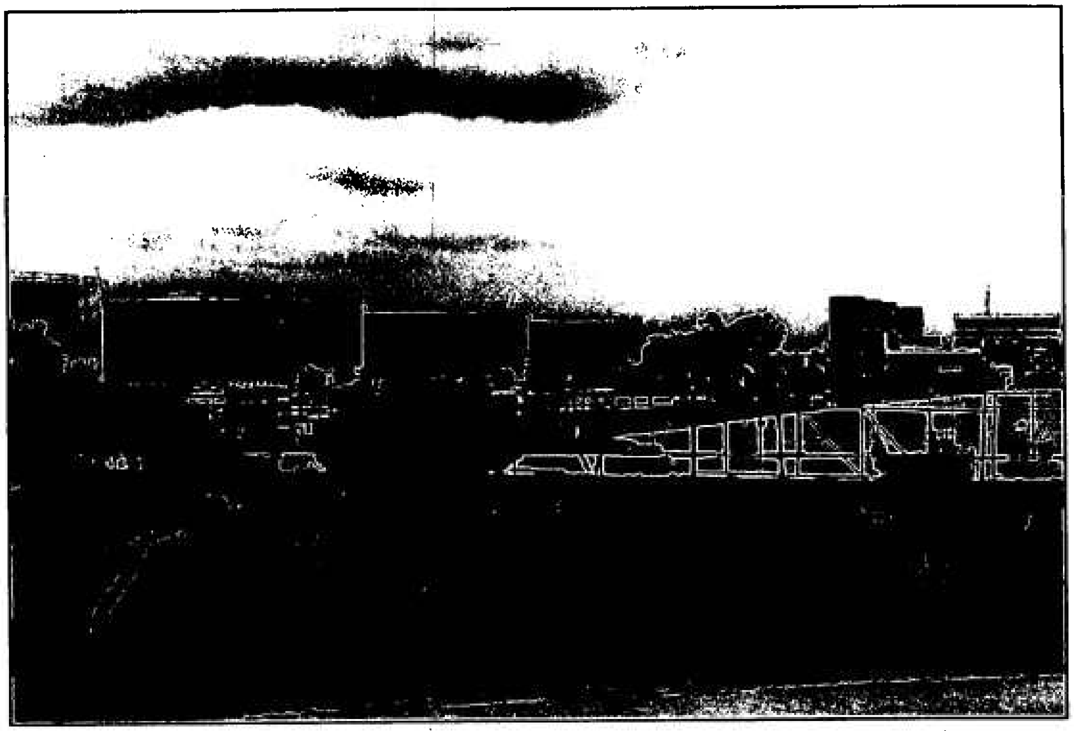

Photo 3: View east from the Sintering Building to the Proposed Project Site

Photo 4: View east from the Sintering Building to the Proposed Project Site

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 11-1b: Views of the Sintering Building and Setting

Source: New York Power Authority

TRC

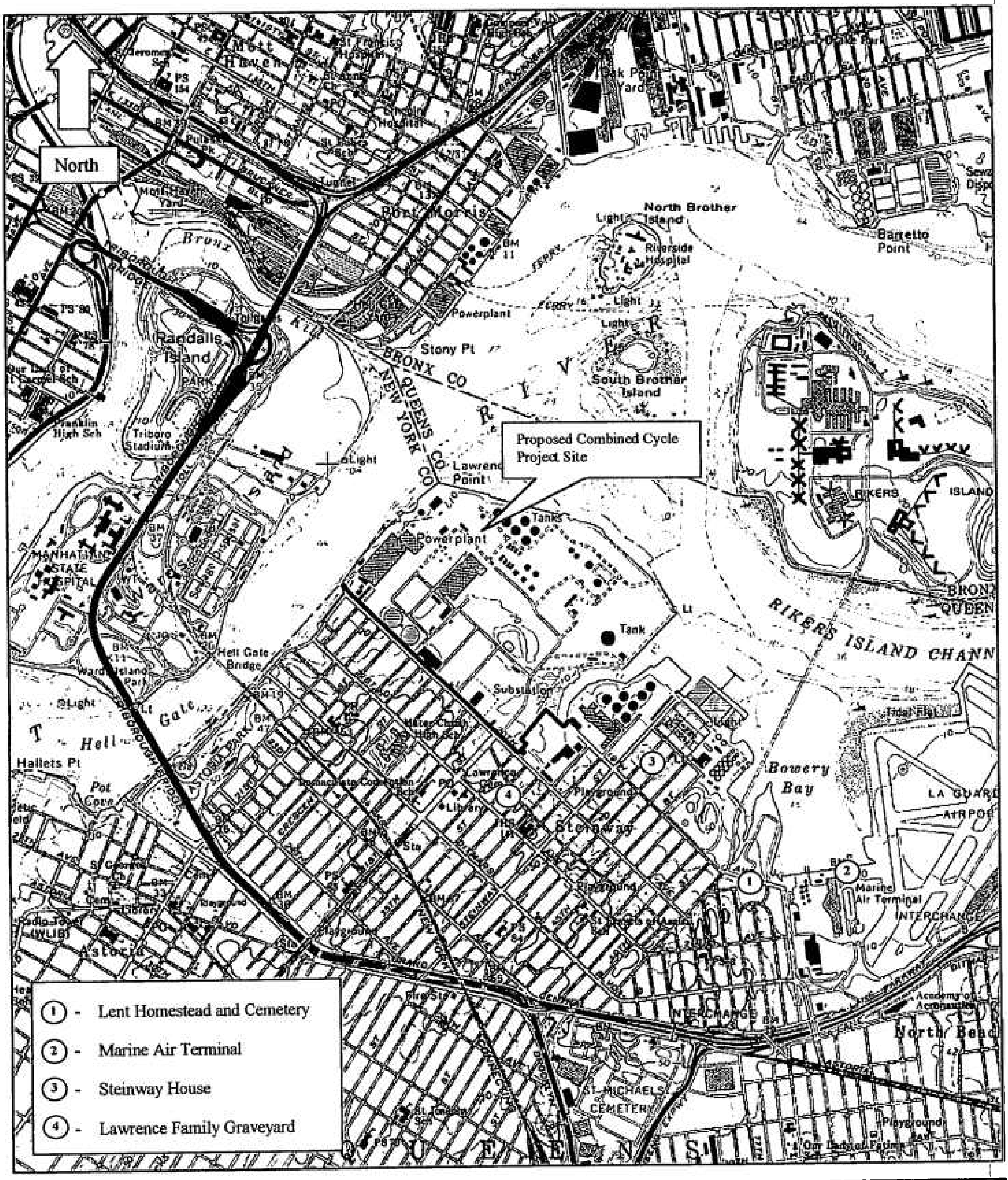

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Figure 11-2. National and State Register Historic Sites and NYC Landmarks w/in One Mile of the Project Site

Map Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

TRC

As shown on Figure 11-2, no structures listed on the State or National Registers or designated NYC Landmarks are located on or in the immediate vicinity of the project site. The closest designated historic structures are located beyond the Con Edison property line, approximately 4,000 feet from the project site. Of the four designated historic structures that were identified, two are located just beyond one mile from the project site.

Considering the distance, the proposed project will not result in any direct adverse impacts to the designated historic resources that have been identified. Potential indirect, visual impacts to these historic resources will be insignificant considering the urban setting that these resources are part of and the anticipated incremental change resulting from the proposed facility. The OPRHP staff at the meeting on September 30, 1999, endorsed this conclusion. Considering the incremental change resulting from the proposed project, the OPRHP staff also determined that there was no need to identify or consider potential impacts to structures potentially eligible for listing on the S/NRHP.

Based on this evaluation, no further investigations or mitigation with regard to historic architectural resources are needed.

Table 11.1: Designated Historic Resources within One Mile of the Project Site

#	Property Name	Address	NRHP (date listed)	NYSRHP (date listed)	NYC Landmark
1	Lent Homestead and Cemetery	78-03 19th Road, Steinway, Queens	2/2/84	12/16/83	Yes
2	Marine Air Terminal	La Guardia Airport	7/9/82	5/12/82	Yes
3	Steinway House	18-22, 1st Street, Steinway, Queens	9/8/83	8/5/83	Yes
4	Lawrence Family Graveyard	SE corner 20th Road and 35th Street, Steinway	Not listed	Not listed	Yes

Source: New York State OPRHP, site files (February 2000); A. Dolkart, 1998. *Guide to New York City Landmarks.*

11.6 Unanticipated Discovery Plan

An Unanticipated Discovery Plan for the NYPA Combined Cycle Project is included as Appendix 11B to this Application. The Plan specifies the potential measures that NYPA will use to avoid or minimize adverse effects to any significant cultural resources, in the event that they are discovered during the construction of the project or the interconnections.

By letter dated November 1, 2000, NYPA requested that the State Historic Preservation Office (SHPO) concur with the appropriateness of the Unanticipated Discovery Plan. In correspondence dated November 17, 2000, the SHPO accepted and approved the Unanticipated Discovery Plan. Copies of this correspondence is included in Appendix 11A of this Application.

11.7 References

Dolkart, Andrew S. 1998. *Guide to New York City Landmarks.*

Hartgen Archeological Associates, Inc. December 1987. *Literature Review and Cultural Resource Inventory of the Charles B. Poletti Power Project*. Prepared for the New York Power Authority.

New York City Department of City Planning. 1993. *Plan for the Queens Waterfront.* NYC DCP 93-43

TRC Garrow Associates. 2000. *Addendum to Literature Review and Cultural Resource Inventory of the Charles B. Poletti Power Project, Astoria, Queens County, New York.* Prepared for the New York Power Authority.

11.0 CULTURAL RESOURCES

11.1 Introduction

This section provides a brief prehistoric and historic overview of the region; describes historic places, properties and structures identified by local, state and federal agencies within one mile of the proposed project site; and addresses potential impacts to cultural resources from construction and operation of NYPA's proposed Combined Cycle Project.

A Literature Review and Cultural Resource Inventory of the Charles Poletti Power Project was prepared by Hartgen Archeological Associates, Inc. in December 1987 and provided the basis for the prehistoric and historic overview provided in this report. Historic Sanborn fire Insurance Maps covering the NYPA/Con Edison property were reviewed to determine the potential for unknown historic resources at the proposed project site. The findings and recommendations regarding archeological resources were reviewed with the staff of the Office of Parks, Recreation and Historic Preservation (OPRHP) at a meeting on September 30, 1999.

Historic places, properties and structures within one mile of the project site that are listed on the State and/or National Registers of Historic Places (S/NRHP) were identified through a review of the records on file at the OPRHP. Designated New York City Landmarks within one mile of the project site were identified from the Guide to New York City Landmarks (Dolkart, 1998), published by the Landmarks Preservation Commission.

11.2 Regional Prehistoric and Historic Overview

Although the earliest occupation of New York State was probably as early as 12,000 years ago, the earliest dated Paleo-Indian site in New York State is the Dutchess Quarry Cave, located on the west side of the Hudson River in Orange County, dated to approximately 10,580 B.C. (Hartgen, 1987). Subsequent periods of human occupation are defined by tool making and lifestyle characteristics and include the Early, Middle and Late Archaic periods (8000 – 1000 B.C.), Transitional period (1250 – 1000 B.C.), and the Woodland period (ca. 1000 B.C. to A.D. 1600). Archeological evidence indicates that for most of New York State, life in the Woodland period most likely resembled that of the Archaic period. Hunting, fishing, shellfish and plant collecting may have been gradually augmented by the cultivation of food plants (Hartgen, 1987).

The thirteen tribes of Long Island were Eastern Algonkian in language, with those on the western end (in the area of Queens) of Munsee origin. The Rockaway tribe was scattered over the southern part of Hempstead and all of Newtown. Archeological evidence indicates a sharp division between the western and eastern Indians with archeological sites clustered at opposite ends of the island. With an eastward movement of the English population and the subsequent displacement by the Dutch and Iroquois, only a small number of Indians were left by the end of the 17th century, mostly at the eastern end of the island. The same trend continued in the 18th century until they were completely dispersed (Hartgen, 1987).

Dutch settlement on Long Island occurred as early as 1635, and by 1650, Dutch and English settlements were scattered over the island with the Dutch establishing colonies toward the western end and the English toward the eastern end. Dutch rule on Long Island lasted until 1664 with English rule under James Duke of York continuing from 1665 until 1673. Following a brief period of Dutch control in 1673, subsequent peace between the Dutch and English in 1674 ended forever the Dutch rule on Long Island. On Long Island, loyalties during the Revolution were to the British, but during the War of 1812, the inhabitants of Queens County and Long Island came together in opposition to the British. During the early 1800s, extensive railroad construction furthered the growth and development of Long Island, particularly Queens County which became readily accessible and more economically linked to Manhattan.

The village of Astoria, named in honor of John Jacob Astor, was incorporated in 1839. By 1842, steamboats provided access between Astoria and New York City several times a day. Astoria and Ravenswood, the early settlement below Haletts Cove on the East River, continued to expand, as did Hunter's Point and other nearby communities. Long Island City was formed in 1870, consolidating the villages of Astoria, Hunter's Point, Ravenswood and Blissville. At this time, the industrial nature of Astoria and Hunter's Point were well established. By 1872, Astoria was considered a suburb of New York City, noted for the nurseries and floral establishments (Hartgen, 1987). In 1870 and 1871, Steinway and Sons purchased approximately 400 acres in Astoria with approximately one half mile of water frontage on the East River. In 1875 the Steinway piano factory and its attendant company town were developed along Steinway Street; the Steinway mansion remains on the hill north of 19th Avenue, east of Steinway Street.

Completion of the Pennsylvania Railroad tunnel to Manhattan, the IRT Flushing Line, and the BMT Astoria Line between 1910 and 1930 led to greater residential development of Astoria and neighboring communities of East Elmhurst and Jackson Heights. In the 1930s, construction of the Grand Central Parkway provided a limited-access vehicular route across northern Queens. Development of La Guardia Airport, then know as North Beach Airport, began in 1938 in the North Beach resort area (NYC Department of City Planning, 1993).

11.3 Project Site History

According to historical maps, the actual project site was located beyond the natural shoreline prior to 1898. The coastline in this area was modified by construction of a pier and bulkheads in the early 1900s, and the former Berrians Island became obscured by the filling of Berrian's Creek, which connected the island to mainland Astoria.

Shortly after 1900, the Astoria Light, Heat and Power Company located in Astoria at Lawrence Point. This was the first central plant located off Manhattan to supply New York City with gas and later electricity. The original 1905 powerhouse building remains near the proposed project site. According to historical Sanborn maps from 1915, a gas manufacturing plant was developed in the area south of the proposed plant site; this area is currently occupied by the Astoria West 138 kilovolt (kV) substation, an extensive maintenance supply warehouse, and outdoor storage and parking areas. The proposed combined-cycle plant area was used for coal storage for the gas manufacturing plant.

Between 1936 and 1948, portions of the gas plant were demolished. A new coal-fired Astoria generating station was constructed in 1953 along the East River shoreline, west of the area formerly occupied by the gas plant. Additional units were added between 1958 and 1960. Consolidated Edison operated the Astoria generating station. The original 1905 powerhouse was idled in the 1950s, and modifications were undertaken around 1960 to reuse the building as a sintering building. This process used the coal ash by-product from the coal burned at the power plant to manufacture porous cellular nodules for concrete.

In 1975, NYPA acquired the partially built Astoria Plant #6 from Con Edison and formally renamed it the Charles Poletti Power Project. This 825 MW plant remains operational.

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Since the proposed project site was created by the placement of fill around the turn of the century, the site is considered to have no potential for prehistoric archeological resources. Historic archeological resources are also unlikely to be found at the proposed project site considering the distance from the sintering building and the absence of any documentation in the 1987 report to indicate prior use of the proposed site.

To supplement the 1987 report and verify the absence of any significant historic use of the proposed project site, historic Sanborn Fire Insurance Maps were obtained for the years 1898, 1915, 1936, 1948, 1967, 1976, 1985, and 1990. These maps indicated that extensive development of the NYPA/Con Edison property occurred between 1898 and 1915 with the construction of the sintering building and facilities associated with a manufactured gas plant during that time. The area of the proposed combined-cycle project is clearly shown up through 1948 as being used for coal storage associated with the gas plant. By 1967, most of the facilities associated with the manufactured gas plant had been removed and the present facilities associated with Orion's Astoria project had been constructed. The proposed project site remained unoccupied by any structures throughout this period.

On September 30, 1999, a meeting was held with representatives from the OPRHP to review the information known about the proposed project site and determine the need for any additional archeological investigations. At that meeting, it was agreed that the potential for any significant archeological resources at the project site was unlikely. An Addendum to the 1987 report has been prepared to document the results of the recent geotechnical investigations and to summarize the additional mapped information. The results of map research and geotechnical investigation indicate that no significant cultural resources are present within the proposed project site. The site was partially submerged until early last century and subsequently filled. Any prehistoric sites that have been in the project tract would not have survived the subsequent land filling intact. All evidence indicates that no historical development took place within the project area; thus it has no potential for significant historic-period cultural resources. Consequently, no further archeological work is recommended in the project site (TRC Garrow Associates, 2000).

Copies of the Addendum to the 1987 report were provided to the OPRHP, and in correspondence to NYPA dated July 10, 2000, the OPRHP concurred with the recommendations presented in the Addendum. Consequently, no additional archeological investigations are warranted at the Project site. A copy of the Addendum to the 1987 report and the recent correspondence from the OPRHP are included as Appendix 11A of this Application.

11.5 Historic Architectural Resources

In April 1986, an Appraisal of Significance was prepared for the original Electric Power Station Building of the Astoria Light, Heat and Power Company (circa 1905), leading to a Determination of Eligibility by the State Historic Preservation Officer (SHPO) in August 1986. This building, identified as the sintering building, is located approximately 600 feet west of the proposed plant site. This building is currently in a poor state of repair and is unused. The proposed project is not expected to have any effect on the historic sintering building; accordingly, no mitigation is warranted or proposed.

Records on file at the OPRHP were reviewed in February 2000 to identify the historic architectural resources within one mile of the project site that are listed on the State or National Registers of Historic Places. The Guide to New York City Landmarks (Dolkart, 1998) was used to identify designated New York City Landmarks within one mile of the site. The identified historic architectural resources are listed in Table 11.1 and shown on Figure 11-1.

As shown on Figure 11-1, no structures listed on the State or National Registers or designated NYC Landmarks are located on or in the immediate vicinity of the project site. The closest designated historic structures are located beyond the Con Edison property line, approximately 4,000 feet from the project site. Of the four designated historic structures that were identified, two are located just beyond one mile from the project site.

Considering the distance, the proposed project will not result in any direct adverse impacts to the designated historic resources that have been identified. Potential indirect, visual impacts to these historic resources will be insignificant considering the urban setting that these resources are part of and the anticipated incremental change resulting from the proposed facility. The OPRHP staff at the meeting on September 30, 1999, endorsed this conclusion. Considering the incremental change resulting from the proposed project, the OPRHP staff also determined that there was no need to identify or consider potential impacts to structures potentially eligible for listing on the S/NRHP.

Based on this evaluation, no further investigations or mitigation with regard to historic architectural resources are needed.

Table 11.1: Designated Historic Resources within One Mile of the Project Site

#	Property Name	Address	NRHP (date listed)	NYSRHP (date listed)	NYC Landmark
1	Lent Homestead and Cemetery	78-03 19th Road, Steinway, Queens	2/2/84	12/16/83	Yes
2	Marine Air Terminal	La Guardia Airport	7/9/82	5/12/82	Yes
3	Steinway House	18-22, 1st Street, Steinway, Queens	9/8/83	8/5/83	Yes
4	Lawrence Family Graveyard	SE corner 20th Road and 35th Street, Steinway	Not listed	Not listed	Yes

Source: New York State OPRHP, site files (February 2000); A. Dolkart, 1998. *Guide to New York City Landmarks.*

11.6 Unanticipated Discovery Plan

An Unanticipated Discovery Plan for the NYPA Combined Cycle Project is included as Appendix 11B to this Application. The Plan specifies the potential measures that NYPA will use to avoid or minimize adverse effects to any significant cultural resources, in the event that they are discovered during the construction of the project or the interconnections.

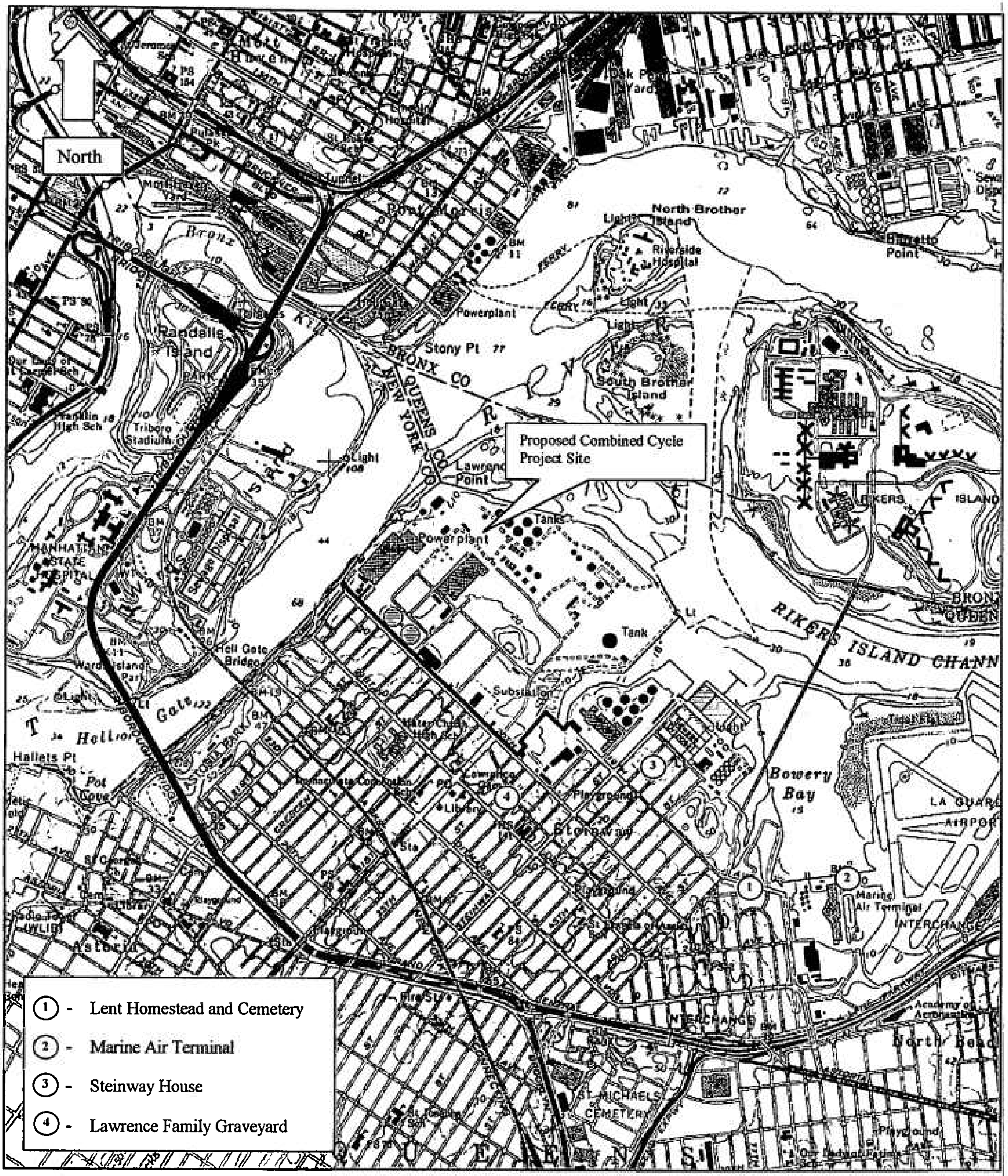

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Figure 11-1. National and State Register Historic Sites and NYC Landmarks w/in One Mile of the Project Site

Map Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

TRC

11.7 References

Dolkart, Andrew S. 1998. *Guide to New York City Landmarks.*

Hartgen Archeological Associates, Inc. December 1987. *Literature Review and Cultural Resource Inventory of the Charles B. Poletti Power Project.* Prepared for the New York Power Authority.

New York City Department of City Planning. 1993. *Plan for the Queens Waterfront.* NYC DCP 93-43

TRC Garrow Associates. 2000. *Addendum to Literature Review and Cultural Resource Inventory of the Charles B. Poletti Power Project, Astoria, Queens County, New York.* Prepared for the New York Power Authority.

Section 12

Section 12

12.0 NOISE

12.1 Introduction

A noise assessment of the proposed NYPA Combined Cycle Project was conducted in accordance with a Noise Modeling Protocol that was submitted to NYSDPS, NYSDEC and NYCDEP. The assessment consisted of two parts: an ambient noise monitoring program in the vicinity of the proposed site to characterize the existing noise environment; and a noise impact evaluation of the proposed new plant. Background ambient noise monitoring was conducted on March 1, 2000. The noise impact evaluation consisted of performing computer noise modeling of the primary noise producing equipment and performing an impact assessment using the modified Composite Noise Rating (CNR) Method as required by the NYSDPS.

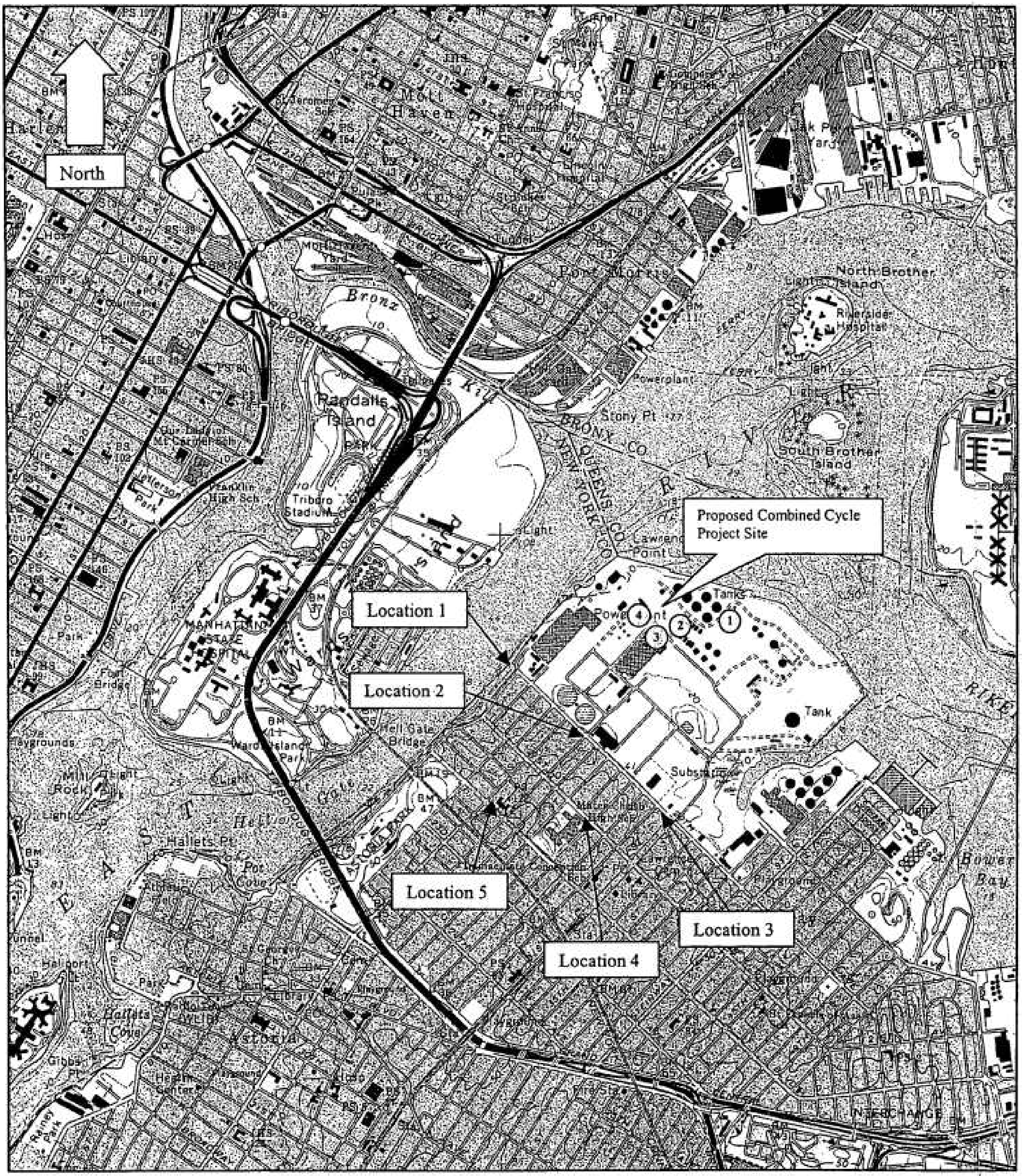
A technical report describing the methodologies used in these analyses is provided in Appendix 12A of this Application.

12.2 Existing Residual Noise Levels

Existing ambient noise levels in the area were quantified through a winter time ambient noise monitoring program conducted on March 1, 2000. Monitoring was conducted during the daytime hours and late at night (1 a.m. to 3 a.m.). Late night monitoring was conducted in order to represent worst case (quietest) background noise levels. Noise levels typically are lowest during the late night hours, when human activity and traffic are at a minimum. Daytime monitoring was conducted in order to determine the variability in ambient noise levels, and to characterize conditions when construction is expected to occur. Monitoring consisted of 20-minute measurements at the nearest noise sensitive areas, which included three residential locations and two schools/residences. The nearest residentially zoned areas are southwest of 20th Avenue. Provided below is a list of the monitoring locations; these locations are shown on Figure 12-1.

- Park on Shore Boulevard and 20th Avenue Corner
- Corner of 20th Avenue and 23rd Street
- 20th Avenue and 31st Street
- Mater School – 21st Avenue and 26th Street
- P.S. 122 at 23rd Street

A Bruel & Kjaer (B&K) Model 2260 precision integrating sound level meter/octave band analyzer with an integral data logger was utilized for this program. Monitoring was conducted during the daytime hours (1 p.m. to 3 p.m.) and late at night (1 a.m. to 3 a.m.). The microphone was fitted with a windscreen to reduce wind generated noise and mounted on a tripod at a height of approximately five feet above the ground. The meter was programmed to measure the 1/3 octave band levels for a continuous period of 20 minutes at each location. The statistical parameters of L_{eq}, L_{90} and L_{10} were calculated by the meter.



(2) - Modeled Property Line Locations (PL-1, PL-2, PL-3 PL-4)

New York Power Authority
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Figure 12-1. Noise Receptor Locations
Scale: 1" = 2000'

Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

TRC

The L_{90} noise level, which is the level exceeded 90 percent of the measurement time, is considered to characterize the residual noise level. The residual noise level is defined to be the sound level that would be present in the absence of intrusive sources, such as barking dogs, intermittent traffic and aircraft overflights. The L_{90} was therefore used to characterize the existing noise environment for this project.

The measured daytime and nighttime residual (L_{90}) noise levels are presented below in Table 12.1. The late night noise levels were used in the noise impact analysis in order to remain conservative.

Table 12.1: Residual (L90) Noise Levels (dBA)

Receptor	Land Use	NYC Zone	Daytime	Late Night
1. Park on Shore Boulevard and 20th Avenue Corner	Residential	R5	60	49
2. Corner of 20th Avenue and 23rd Street	Residential	R5	54	52
3. 20th Avenue and 31st Street		R5	54	52
4. Mater School – 21st Avenue and 26th Street	Residential	R5	51	47
5. P.S. 122 at 23rd Street	Residential	R5	50	46

Source: TRC Environmental, 2000

Measured noise levels were found to be typical for an urban setting. Existing noise sources in the area during the late night consisted of existing power generation facilities, local vehicular traffic, aircraft and natural sounds.

12.3 Applicable Standards/Criteria

Four separate noise standards/criteria are potentially applicable to an electric generating facility located in New York City. These standards/criteria are described further below.

12.3.1 New York City Zoning Resolution

Section 42-21 of the Zoning Resolution limits noise level from any on-site activity to decibel levels according to octave band. Noise is the sound pressure level resulting from any open or enclosed activity. The decibel level limits which may not be exceeded at any point on or beyond the lot line are presented in Table 12.2 below.

Table 12.2: NYC Zoning Resolution Noise Standard (dB)

Octave Band	Limits for M-3 District	Limits for M-3 District Adjoining a Residential District
20 to 75 cycles per second	80	74
75 to 150 cycles per second	75	69
150 to 300 cycles per second	70	64
300 to 600 cycles per second	64	58
600 to 1,200 cycles per second	58	52
1,200 to 2,400 cycles per second	53	47
2,400 to 4,800 cycles per second	49	43
Above 4,800 cycles per second	46	40

Source: New York City, City Planning Commission and City Planning Department (1998, Sections 42-213 and 42-214)

12.3.2 New York City Noise Code

Subchapter 6 of the New York City Administrative Code (the "Code") sets forth noise levels that pertain to the project area. The noise levels are based on "noise quality zones", which are derived from the various land use zones. The project site is located in a manufacturing land use zone (M3-1). The Code sets noise levels for M3 land uses at a maximum of 70 dBA, both day (7 a.m. to 10 p.m.) and night (10 p.m. to 7 a.m.), measured at the adjoining property line.

The Code sets noise levels for high-density residential zones at a maximum of 65 dBA during the day (7 a.m. to 10 p.m.) and 55 dBA at night (10 p.m. to 7 a.m.). The Code sets noise levels for commercial land uses that are the same as manufacturing levels: a maximum of 70 dBA, both day (7 a.m. to 10 p.m.) and night (10 p.m. to 7 a.m.), measured at the adjoining industrial property lines.

The Code does not set overall noise thresholds for construction activities, though noise levels are set for certain types of equipment.

12.3.3 New York City CEQR

With respect to noise, the goal of CEQR is to determine a proposed action's potential effects on sensitive noise receptors, including the effects on interior noise levels of residential, commercial and institutional uses (CEQR Manual Part R). During daytime hours, CEQR sets 65 dBA as an absolute noise level for sensitive receptors that should not be significantly exceeded. An increase of greater than 3 dBA over existing ambient levels would typically be considered significant during nighttime hours (CEQR Manual Section 410).

12.3.4 New York State Department of Public Service

In accordance with NYSDPS requirements, the modified Composite Noise Rating Method (CNR) is used to assess potential noise impacts. This methodology takes into account many factors including the expected sound levels from the plant, the existing sound levels, character of the noise (e.g., tonal, impulsive), duration, time of day and year, and subjective factors such as community attitude and history of previous exposure. The NYSDPS has historically accepted a rating of "D", corresponding to a response of "sporadic complaints", although is currently requesting for new projects that a more stringent rating of "C", corresponding to "no reaction although noise is noticeable" be achieved.

There are no State or Federal noise standards applicable to this project.

12.4 Acoustic Design Goals

In keeping with the requirements and goals of other recent Article X projects, the sound emitted by operation of the proposed plant must, when evaluated through the modified CNR method, result in a ranking of "C" at any residential receptors. A rating of "C" corresponds to "no reaction although noise is generally noticeable".

This rating method utilizes the late night residual octave band levels measured during the noise monitoring program. In order to remain conservative in the analysis, the L_{90} octave band levels measured during the late night hours, when ambient noise sources are typically lowest, were used.

The design goals for the project will differ at each location, and will be a function of the various correction factors required in the modified CNR method. In order to determine the design goals, it was necessary to first calculate the correction factors, and then determine the initial ranking which would be required in order that the final rank result in a rating of "C".

New York City noise code and zoning resolution standards are straight-forward. The City code residential nighttime standard is 55 dBA. To be conservative, the project will be designed for this standard 24 hours a day at residential zones. The Commercial/Manufacturing standard is 70 dBA day and night. The zoning resolution standard limits noise by octave band; the limits were presented in Table 12.2. Four industrial property line receptors were added to the modeling analysis in order to evaluate compliance with these codes.

Finally, the NYC CEQR requirement must also be evaluated. The four design goals are presented in Table 12.3.

Table 12.3: Noise Design Goals

Receptor	NYC Zoning Resolution	NYC Code	CEQR	Modified CNR(3)
1. Park on Shore Boulevard and 20th Avenue Corner	(1)	55	49	C/56
2. Corner of 20th Avenue and 23rd Street	(1)	55	52	C/56
3. 20th Avenue and 31st Street	(1)	55	52	C/56
4. Mater School – 21st Avenue and 26th Street	(1)	55	47	C/56
5. P.S. 122 at 23rd Street	(1)	55	46	C/56
PL-1	(1)	70	N/A (2)	N/A (2)
PL-2	(1)	70	N/A (2)	N/A (2)
PL-3	(1)	70	N/A (2)	N/A (2)

Notes: (1) Octave band limits are presented in Table 12.2.
(2)The CEQR and CNR analysis are designed to determine potential impact at noise sensitive areas (e.g. residential). Therefore, they do not apply to the industrial property line locations.
(3) The dBA level required to achieve a modified CNR rating of "C" is based on the initial ranking required prior to applying the appropriate correction factors.
Source: TRC Environmental, 2001.

12.5 Calculated Impacts and Mitigation

Construction and operation of the proposed project will result in the generation of noise. The potential impact of these noise emissions is a function of the magnitude of the generated noise and the existing residual noise levels. The late night residual noise levels were used in the analysis in order to remain conservative.

The modified CNR method and the City's CEQR guidance were used to estimate potential operational impacts. The noise modeling analysis revealed that mitigation measures will be required in order to achieve these design goals. Incorporating these mitigation measures will reduce operational noise levels such that significant noise impacts are not anticipated in the residentially zoned areas.

Average construction noise levels were calculated to be below daytime ambient levels.

12.5.1 Operational Noise

The NOISECALC computer model, developed by the New York State Department of Public Service, was used to calculate noise levels expected from operation of the proposed facility. The model was developed for predicting noise levels from power plants. NOISECALC is a Hemispherical Free Field (HFF) noise prediction model.

NOISECALC accepts a variety of attenuation factors under varying meteorological conditions. The model was configured to accept hemispherical spreading and atmospheric absorption for this analysis based on values from the *Electric Power Plant Environmental Noise Guide (1984).* Standard conditions of 59° F and 70 percent relative humidity were assumed. Directivity effects for noise from the stacks were also considered. No credit was taken for ground absorption. Modeling receptors were chosen in the same locations as where background monitoring was performed. As noted previously, four industrial property line receptors were added to the modeling analysis in order to evaluate industrial standards.

Several modeling runs were made, with noise control added as required, until the required design goals were achieved. No barriers were added to the analysis. However, the barrier effect that the facility turbine building will have on some sources was considered. As previously noted, noise mitigation measures will be required in order to achieve these goals. These include the following:

- **Tuned HRSG stack silencers** - stack silencers are essentially mufflers which are built into the exhaust stacks. The silencers are designed (tuned) for each specific application. For example, a source which has excessive low frequency noise would have a silencer designed to be more effective against the low frequency noise.

- **Acoustically treated turbine building** - This building will require acoustical insulation on the interior. Additionally, the building will likely need to be designed such that any openings are treated with acoustic louvers, or oriented away from residential areas.

- **Enclosures for the gas compressing stations and chiller system** - Enclosures are simply buildings constructed to minimize the noise from a source.

- **Low noise design air cooled condenser** – Measures such as reducing fan speed, changing blade design, and the number of cells will be required to reduce noise levels over a "standard" design system.

The results of the computer modeling, incorporating the above-mentioned noise mitigation measures, are presented in Table 12.4. The design goals for the proposed project are also presented in this table.

Table 12.4: Calculated Operational Noise Levels Compared to Design Goals (dBA)

Receptor	Calculated Facility (dBA)	NYC Zoning Resolution	NYC Code Goal	Calculated CNR Rank	CNR Goal	CEQR
Park on Shore Boulevard and 20th Avenue Corner	49	(1)	55	C	C	49
Corner of 20th Avenue and 23rd Street	49	(1)	55	C	C	52
20th Avenue and 31st Street	47	(1)	55	B	C	52
Mater School – 21st Avenue and 26th Street	45	(1)	55	B	C	47
P.S. 122 at 23rd Street	44	(1)	55	A	C	46
PL-1	59	(1)	70	N/A	N/A	N/A
PL-2	73	(1),(2)	70	N/A	N/A	N/A
PL-3	74	(1),(2)	70	N/A	N/A	N/A
PL-4	70	(1),(2)	70	N/A	N/A	N/A

(1) The calculated octave band levels are detailed in Table 12.2. See Appendix 12-A for detailed data.

(2) The calculated octave band levels exceed the zoning resolution standards for the industrial M-3 district.

Source: TRC Environmental, 2001

A discussion of the above modeling results and compliance with applicable standards/criteria is presented in Section 12.6

12.5.2 Construction Noise

The construction process for power plant projects generally occurs in the following phases:

- Initial grading and excavation
- Foundation construction/Concrete pouring
- Building assembly
- Siding and machinery installation
- Exterior finish and cleanup

Construction equipment to be used will differ from phase to phase. In general, heavy equipment (bulldozers, dump trucks, cement mixers) will be used during excavation, foundation construction and concrete pouring activities. Noise is generated during construction primarily from two sources:

diesel engines that power the equipment and impact noise from pile drivers and jack hammers. Exhaust noise usually is the predominant source of diesel engine noise, which is the reason that maintaining functional mufflers on all equipment will be a requirement of the Project.

Construction of the Project is anticipated to require approximately 24 months to complete. Construction phases will essentially follow the chronological order listed above, with some overlap occurring.

Estimated octave band noise levels for the expected construction equipment were incorporated into the NOISECALC computer model. Modeling was then performed using the same assumptions and receptors as was performed for the operational noise assessment. Average noise levels were calculated for each construction phase incorporating a usage factor, which is related to the average length of time that a piece of construction equipment is expected to be in use for any given construction phase (Barnes, 1977).

Because the construction sources are not elevated, it is anticipated that the intervening buildings separating some of the residential areas from the facility site will act as effective noise barriers. However, to present a conservative analysis, no credit was taken for this effect.

The calculated construction noise levels were compared to the existing daytime L_{eq} noise levels. The L_{eq} level, which represents a measure of the average of all the noise present, was used rather than the L_{90} because the L_{90} only represents the baseline noise levels, whereas construction noise is a combination of varying noises, more closely represented by the L_{eq}. The calculated average construction noise levels are compared to the existing L_{eq} noise levels in Table 12.5 below.

A review of the data presented in this table reveals that construction noise levels are anticipated to be well below existing ambient daytime noise levels at all residential areas. Therefore, no impacts due to construction activities are anticipated. As such, no mitigation measures are deemed necessary for construction noise. However, as a practical measure, functional mufflers will be maintained on all construction equipment.

Table 12.5: Comparison of Calculated Average Construction Phase Noise Levels to Existing Daytime L_{eq} Noise Levels (dBA)

Construction Phase	1 – Park on Shore Blvd and 20th Ave Corner (2600 ft)	2 – Corner of 20th Ave and 23rd St (2600 ft)	3 – 20th Ave and 31st St (3600 ft)	4 - Mater School – 21st Avenue and 26th Street (3600 ft)	5 – P.S. 122 and 23rd St (4000 ft)
	ACN/ L_{eq}	ACN/L_{eq}	ACN/L_{eq}	ACN/L_{eq}	ACN/L_{eq}
Initial Grading and Excavation	55/65	55/68	51/64	51/62	50/57
Concrete Pouring	52/65	52/68	48/64	48/62	46/57
Building Assembly	51/65	51/68	47/64	47/62	45/57
Siding and Machinery Installation	51/65	51/68	47/64	47/62	45/57
Exterior Finish and Cleanup	52/65	52/68	49/64	49/62	47/57

Notes: ACN = Average Construction Noise level
L_{eq} = Measured daytime L_{eq} level
Source: TRC Environmental, 2000.

12.6 Compliance with Applicable Standards and Criteria

12.6.1 New York City Zoning Resolution

Computer modeling of the major facility sources has revealed that the NYPA Combined Cycle Project can be designed such that operational noise levels will be well below the octave band limits presented in Table 12.2 at any residential zones bordering the site. Accordingly, the proposed project will be in compliance with the New York City Zoning Resolution at all residential locations.

Modeled levels at most of the industrial property line locations (PL-2, PL-3, PL-4), however, are projected to exceed some of the octave band limits. These modeled exceedences occur at the bordering industrial property, which is owned by NRG, Orion and Con Edison and is also used for electric power generation and associated substations and storage yards. These adjacent properties are largely unattended by personnel and include no sensitive noise receptors. A further review of the detailed modeling results (Appendix 12A) reveals that in order to achieve further reductions in noise, extensive, costly control measures would need to be incorporated on many facility sources, including the turbine building, chiller building, transformers, gas compressor and air cooled condenser. Reducing facility noise levels would not provide any benefit to this industrial, largely unoccupied property. Further, reducing noise levels to attempt to achieve the industrial property line standards would not benefit any noise sensitive areas, since the impact analyses conducted (modified CNR, CEQR) show that impacts to sensitive areas have already been minimized through the current design. Accordingly, NYPA will be seeking a waiver of this regulation.

12.6.2 New York City Noise Code

Computer modeling of the major facility sources has revealed that the NYPA Combined Cycle Project can be designed such that operational noise levels will be well below 55 dBA at any residential zones and will therefore be in compliance with the New York City Noise Code for residential areas. Two of the modeled industrial property line locations, however, are projected to exceed the 70 dBA industrial limit. As with the Zoning Resolution discussed above, NYPA will be seeking a waiver of this regulation.

12.6.3 NYSDPS Modified CNR Analysis

a. Operational Noise

The proposed Combined Cycle Project noise levels were input to the modified CNR analysis as required by the NYSDPS. The results of that analysis indicate that the facility can be designed such that the resulting CNR rating at any residential area will be "C" or better, in compliance with the NYSDPS requirement.

b. Construction Noise

The projected construction noise levels, by phase, were also incorporated into the modified CNR analysis. The analysis was conducted in an extremely conservative manner in that the same late night L90 noise levels used in the operational analysis were incorporated, even though construction activities will be limited to the daytime hours. The resulting analysis resulted in CNR ratings of "C" or better at all residential locations.

12.6.4 New York City CEQR

The proposed Combined Cycle Project noise levels were evaluated against the New York City CEQR requirement, which specifies that no impact will occur if increases in late night L_{90} levels are limited to 3 dBA or less. The calculated facility noise levels, when added to the measured existing late night L_{90} levels, resulted in increases of less than 3 dBA at all noise sensitive receptors. Calculated facility levels are therefore in compliance with the CEQR requirement. Provided in Table 12.6 is a summary of the measured background levels, and the project impact.

Table 12.6: CEQR Noise Analysis

Receptor	Calculated Facility Noise Level	Background L90 Day/Night	Background Plus Facility Day/Night	Increase Over Background Day/Night
1-Park on Shore Boulevard and 20th Avenue Corner	48	60/49	60/52	0 / 3
2-Corner of 20th Avenue and 23rd Street	49	54/52	55/54	1 / 2
3-20th Avenue and 31st Street	47	54/52	55/53	1 / 1
4-Mater School-21st Avenue and 26th Street	45	51/47	52/49	1 / 2
5-P.S. 122 and 23rd Street	44	50/46	51/48	1 / 2

Source: TRC Environmental, 2001.

12.7 Assessment of Additional Potential Impacts

- **Hearing Damage** - Hearing damage will not occur at any residential locations as a result of the proposed Project. Noise levels of 70 dBA or lower are recommended in order to prevent hearing damage (EPA, 1974). Facility noise levels at any sensitive receptors will be well below 70 dBA.

- **Sleep Interference** - Studies have shown that there are no subjective effects on sleep at noise levels of 60 dBA when the number of noise events are below eight. A noise event is considered to be a sudden occurrence of a noise level of a given magnitude. Further, sound levels of 45 dBA should not occur more than 10 to 15 times per night in order to avoid sleep interference (Berglund, 1995). Facility operation should not result in sleep interference for the following reasons:
  - facility sound levels are steady in nature
  - facility noise levels are anticipated to be below 45 dBA indoors
  - normal facility operations will not result in "noise events"

- **Indoor and Outdoor Speech Interference** - Relaxed conversation occurs with a voice level of 54-56 dBA at a distance of one meter. When background noise is equal to the speech level, sentence intelligibility is at 95 percent (Berglund, 1995). Ninety five percent sentence intelligibility usually permits reliable communication because of the redundancy in normal conversation (EPA, 1974). Facility noise levels will be well below the relaxed conversation level of 54-56 dBA. Sentence intelligibility will therefore approach 100 percent, and speech interference, indoors or outdoors, is not anticipated due to normal plant operation.

- **Low Frequency Noise Annoyance** - Low frequency noise levels will not be significant due to the nature of combined cycle operation. The majority of low frequency noise generated by the turbine will be effectively attenuated inside the HRSG units.

- **Community Complaint Potential** - The modified CNR analysis was conducted for the purpose of estimating community reaction to facility generated noise. This resulting rating of "C" calculated for the facility results in an expected response of "no reaction". Therefore, no community annoyance is expected due to normal facility operation.

- **Potential for Structural Damage Due to Vibration or Infrasound** - Combustion turbines are highly balanced and do not normally generate ground borne vibration. As noted above, because of the combined cycle nature of operation, low frequency sound will be effectively attenuated by the HRSG units, thereby eliminating the potential for infrasound vibration.

12.8 Cumulative Effects

12.8.1 Cumulative Operational Impacts - Proposed Astoria Energy Station

The cumulative effect of noise generated by the NYPA Combined Cycle Project and the proposed Astoria Energy Project was evaluated. The two facilities share a common residential receptor in their respective noise assessments (20th Avenue and 31st Street). In order to perform this evaluation, the calculated Astoria Energy Project noise level at this receptor was conservatively extrapolated to the other NYPA receptors using only distance as a factor to attenuate the noise level (e.g., atmospheric absorption and building attenuation were not considered). The arrived at extrapolated Astoria Energy Project levels were then added to the calculated NYPA Combined Cycle Project levels as presented in Table 12.4. Provided in Table 12.7 below is a summary of this evaluation.

Table 12.7: Estimated Cumulative Operational Noise Levels (dBA)

Receptor	Calculated NYPA Facility	Extrapolated Astoria Energy Project	Total	Increase over NYPA Facility Alone
1. Park on Shore Boulevard and 20th Avenue Corner	49	41	50	+1
2. Corner of 20th Avenue and 23rd Street	49	43	50	+1
3. 20th Avenue and 31st Street	47	47	50	+3
4. Mater School-21st Avenue and 26th Street	45	43	47	+2
5. P.S. 122 and 23rd Street	44	41	46	+2

A review of the data in this table reveals that the greatest potential for a cumulative effect is at the common residential residential receptor (20th Avenue and 31st Street). Note, however, that the Astoria Energy Project levels are conservative extrapolated noise levels.

The cumulative effect of the two projects would not be anticipated to affect any of the additional potential impact issues discussed in Section 12.7, including hearing damage, sleep interference, low frequency noise annoyance, etc. Noise from both facilities will have similar characteristics, and the combined levels are still well below the levels discussed in Section 6.5.

12.8.2 Cumulative Construction Impacts - Proposed Astoria Energy Project

As was conducted for operational noise, a cumulative assessment of construction noise with the Astoria Energy station was also performed. It was assumed that construction activities, and therefore, noise levels, would be the same for both projects at the same distances. Therefore, the analysis was conducted by extrapolating the estimated noise levels from the Astoria Energy Project based on the distances to the respective NYPA receptors and combining the two levels. Provided in Table 12.8 are the estimated contributions from both projects.

As is the case for operational noise, the greatest potential for a cumulative effect is at the common residential receptor. Little or no differences would be expected at the remaining locations. This analysis assumes, however, that construction schedules would occur at the exact same time, which is unlikely.

Table 12.8: Estimated Cumulative Construction Noise Levels (dBA)

Reception	Grading/Excavation Astor.			Concrete			Steel Assembly			Machinery Installation			Cleanup		
	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined
1-Park on Shore Boulevard and 20th Avenue Corner	55	42	55	52	38	52	51	37	51	51	37	51	52	39	52
2-Corner of 20th Avenue and 23rd Street	55	44	55	52	40	52	51	39	51	51	39	51	52	41	52
3-20th Avenue and 31st Street	51	48	53	48	44	49	47	43	48	47	43	48	49	45	50
4-Mater School-21st Avenue and 26th Street	51	44	52	48	40	49	47	39	48	47	39	48	49	41	50
5-P.S. 122 and 23rd Street	50	42	51	46	38	47	45	37	46	45	37	46	47	39	48

Source: TRC Environmental, 2000.

12.9 Post Construction Compliance Monitoring

An ambient noise monitoring program will be performed following the start of commercial operations to confirm that the calculated noise levels are achieved. Any deficiencies shall be noted, and a schedule to correct them shall be developed. The post construction noise monitoring program will be described in a separate Compliance Filing subsequent to the issuance of the Certificate, and is briefly discussed below.

Prior to conducting the noise monitoring program, a protocol will be developed and submitted for approval. Monitoring will be conducted at the same monitoring locations as presented in this application. The protocol will contain a discussion of which standards and criteria must be achieved, as well as the measurement procedures which must be followed. These are anticipated to include, but not be limited to the following:

- ANSI S1.4-1983 (Specification for Sound Level Meters) or later revisions
- ANSI S1.11-1986 (Specification for Octave, Half-octave, and Third-Octave Band Filter Sets) or later revisions
- ANSI S1.13-1971 (Methods for the Measurement of Sound Pressure Levels) or later revisions
- ANSI S12.9-1993/Part 3 (Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-Term Measurements with an Observer Present) or later revisions.

Two separate sets of measurements will likely be required, one with the facility operating normally at or near full load (80% or higher) to obtain the total noise and one set with the facility offline, in order that background levels can be measured. The measured background levels would then be logarithmically subtracted from the total noise in order that the facility contribution can be determined.

The protocol would also define other measurement parameters, including meteorological conditions, time of day and duration of monitoring.

12.10 References

Barnes, J.D., L. Miller, E. Wood. 1977. *Prediction of Noise from Power Plant Construction.* Prepared for Empire State Electric Energy Research Company.

Berglund, B., and T. Lindvall. 1995. *Community Noise.* Prepared for the World Health Organization. ISSN 1400-2817. ISBN 91-887-8402-9.

Bolt, Beranek and Newman, Inc. 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*.

Miller, L.N., E.W. Wood, R.M. Hoover, A.R. Thompson, and S.L. Patterson. 1984. *Electric Power Plant Environmental Noise Guide*. Prepared for Edison Electric Institute by Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts

United States Environmental Protection Agency, 1978. *Protective Noise Levels*. Office of Noise Abatement & Control. Report Number EPA 550/9-79-100. Washington, D. C. 20460.

12.0 NOISE

12.1 Introduction

A noise assessment of the proposed NYPA Combined Cycle Project was conducted in accordance with a Noise Modeling Protocol that was submitted to NYSDPS, NYSDEC and NYCDEP. The assessment consisted of two parts: an ambient noise monitoring program in the vicinity of the proposed site to characterize the existing noise environment; and a noise impact evaluation of the proposed new plant. Background ambient noise monitoring was conducted on March 1, 2000. The noise impact evaluation consisted of performing computer noise modeling of the primary noise producing equipment and performing an impact assessment using the modified Composite Noise Rating (CNR) Method as required by the NYSDPS.

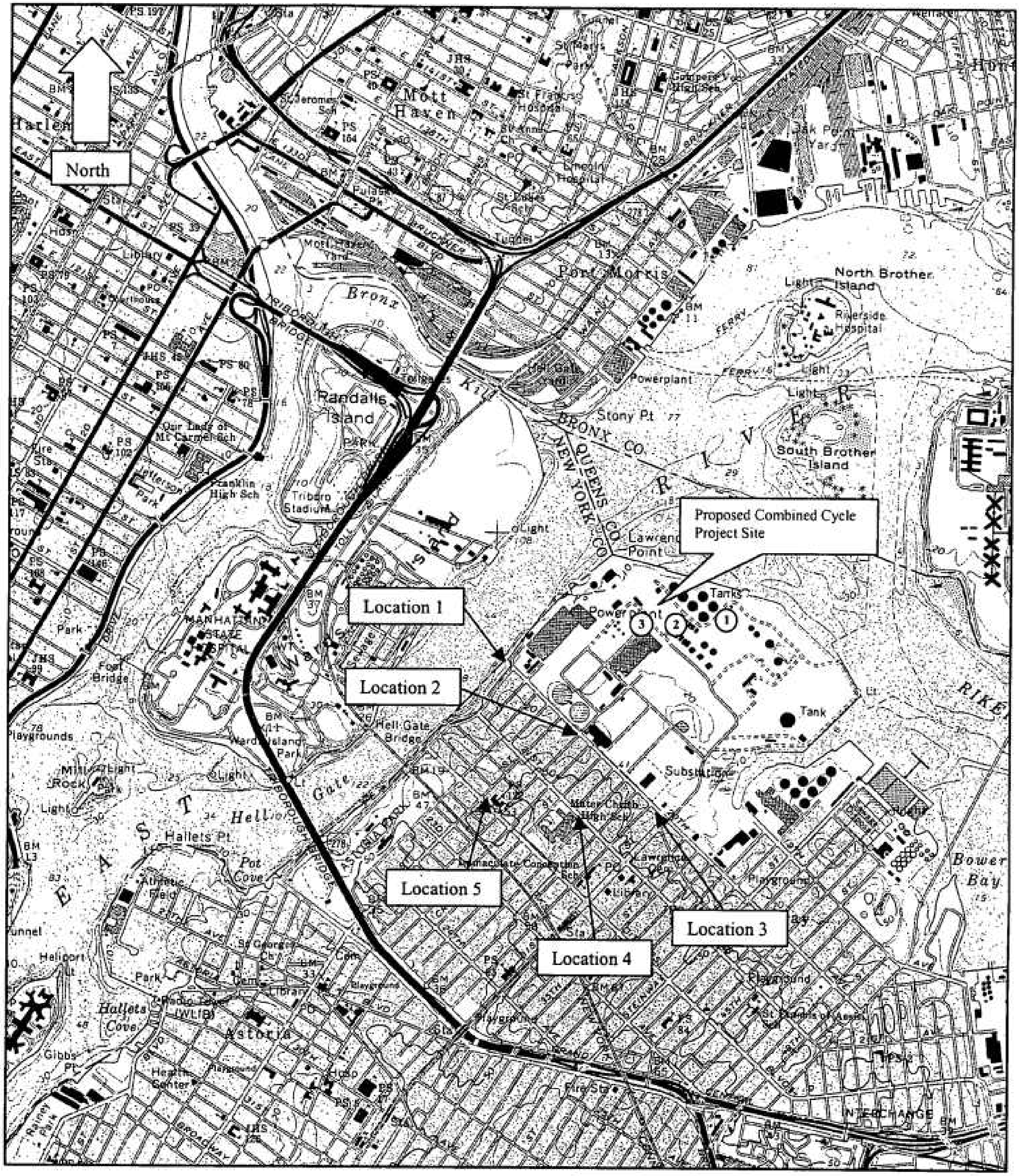
A technical report describing the methodologies used in these analyses is provided in Appendix 12A of this Application.

12.2 Existing Residual Noise Levels

Existing ambient noise levels in the area were quantified through a winter time ambient noise monitoring program conducted on March 1, 2000. Monitoring consisted of 20-minute measurements at the nearest noise sensitive areas, which included three residential locations and two schools/residences. The nearest residentially zoned areas are southwest of 20th Avenue. Provided below is a list of the monitoring locations; these locations are shown on Figure 12-1.

- Park on Shore Boulevard and 20th Avenue Corner
- Corner of 20th Avenue and 23rd Street
- 20th Avenue and 31st Street
- Mater School – 21st Avenue and 26th Street
- P.S. 122 at 23rd Street

A Bruel & Kjaer (B&K) Model 2260 precision integrating sound level meter/octave band analyzer with an integral data logger was utilized for this program. Monitoring was conducted during the daytime hours (1 p.m. to 3 p.m.) and late at night (1 a.m. to 3 a.m.). The microphone was fitted with a windscreen to reduce wind generated noise and mounted on a tripod at a height of approximately five feet above the ground. The meter was programmed to measure the 1/3 octave band levels for a continuous period of 20 minutes at each location. The statistical parameters of L_{eq}, L_{90} and L_{10} were calculated by the meter.



(2) - Modeled Property Line Locations (PL-1, PL-2, PL-3)

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 12-1. Noise Receptor Locations
Scale: 1" = 2000'

Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

TRC

The L_{90} noise level, which is the level exceeded 90 percent of the measurement time, is considered to characterize the residual noise level. The residual noise level is defined to be the sound level that would be present in the absence of intrusive sources, such as barking dogs, intermittent traffic and aircraft overflights. The L_{90} was therefore used to characterize the existing noise environment for this project.

The measured daytime and nighttime residual (L_{90}) noise levels are presented below in Table 12.1. The late night noise levels were used in the noise impact analysis in order to remain conservative.

Table 12.1: Residual (L90) Noise Levels (dBA)

Receptor	Land Use	NYC Zone	Daytime	Late Night
1. Park on Shore Boulevard and 20th Avenue Corner	Residential	R5	60	49
2. Corner of 20th Avenue and 23rd Street	Residential	R5	54	52
3. 20th Avenue and 31st Street		R5	54	52
4. Mater School – 21st Avenue and 26th Street	Residential	R5	51	47
5. P.S. 122 at 23rd Street	Residential	R5	50	46

Source: TRC Environmental, 2000

Measured noise levels were found to be typical for an urban setting. Existing noise sources in the area during the late night consisted of existing power generation facilities, local vehicular traffic, aircraft and natural sounds.

12.3 Applicable Standards/Criteria

Four separate noise standards/criteria are potentially applicable to an electric generating facility located in New York City. These standards/criteria are described further below.

12.3.1 New York City Zoning Resolution

Section 42-21 of the Zoning Resolution limits noise level from any on-site activity to decibel levels according to octave band. Noise is the sound pressure level resulting from any open or enclosed activity. The decibel level limits which may not be exceeded at any point on or beyond the lot line are presented in Table 12.2 below.

Table 12.2: NYC Zoning Resolution Noise Standard (dB)

Octave Band	Limits for M-3 District	Limits for M-3 District Adjoining a Residential District
20 to 75 cycles per second	80	74
75 to 150 cycles per second	75	69
150 to 300 cycles per second	70	64
300 to 600 cycles per second	64	58
600 to 1,200 cycles per second	58	52
1,200 to 2,400 cycles per second	53	47
2,400 to 4,800 cycles per second	49	43
Above 4,800 cycles per second	46	40

Source: New York City, City Planning Commission and City Planning Department (1998, Sections 42-213 and 42-214)

12.3.2 New York City Noise Code

Subchapter 6 of the New York City Administrative Code (the "Code") sets forth noise levels that pertain to the project area. The noise levels are based on "noise quality zones", which are derived from the various land use zones. The project site is located in a manufacturing land use zone (M3-1). The Code sets noise levels for M3 land uses at a maximum of 70 dBA, both day (7 a.m. to 10 p.m.) and night (10 p.m. to 7 a.m.), measured at the adjoining property line.

The Code sets noise levels for high-density residential zones at a maximum of 65 dBA during the day (7 a.m. to 10 p.m.) and 55 dBA at night (10 p.m. to 7 a.m.). The Code sets noise levels for commercial land uses that are the same as manufacturing levels: a maximum of 70 dBA, both day (7 a.m. to 10 p.m.) and night (10 p.m. to 7 a.m.), measured at the adjoining industrial property lines.

The Code does not set overall noise thresholds for construction activities, though noise levels are set for certain types of equipment.

12.3.3 New York City CEQR

With respect to noise, the goal of CEQR is to determine a proposed action's potential effects on sensitive noise receptors, including the effects on interior noise levels of residential, commercial and institutional uses (CEQR Manual Part R). During daytime hours, CEQR sets 65 dBA as an absolute noise level for sensitive receptors that should not be significantly exceeded. An increase of greater than 3 dBA over existing ambient levels would typically be considered significant during nighttime hours (CEQR Manual Section 410).

12.3.4 New York State Department of Public Service

In accordance with NYSDPS requirements, the modified Composite Noise Rating Method (CNR) is used to assess potential noise impacts. This methodology takes into account many factors including the expected sound levels from the plant, the existing sound levels, character of the noise (e.g., tonal, impulsive), duration, time of day and year, and subjective factors such as community attitude and history of previous exposure. The NYSDPS has historically accepted a rating of "D", corresponding to a response of "sporadic complaints", although is currently requesting for new projects that a more stringent rating of "C", corresponding to "no reaction although noise is noticeable" be achieved.

There are no State or Federal noise standards applicable to this project.

12.4 Acoustic Design Goals

In keeping with the requirements and goals of other recent Article X projects, the sound emitted by operation of the proposed plant must, when evaluated through the modified CNR method, result in a ranking of "C" at any residential receptors. A rating of "C" corresponds to "no reaction although noise is generally noticeable".

This rating method utilizes the late night residual octave band levels measured during the noise monitoring program. In order to remain conservative in the analysis, the L_{90} octave band levels measured during the late night hours, when ambient noise sources are typically lowest, were used.

The design goals for the project will differ at each location, and will be a function of the various correction factors required in the modified CNR method. In order to determine the design goals, it was necessary to first calculate the correction factors, and then determine the initial ranking which would be required in order that the final rank result in a rating of "C".

New York City noise code and zoning resolution standards are straight-forward. The City code residential nighttime standard is 55 dBA. To be conservative, the project will be designed for this standard 24 hours a day at residential zones. The Commercial/Manufacturing standard is 70 dBA day and night. The zoning resolution standard limits noise by octave band; the limits were presented in Table 12.2. Three property line receptors were added to the modeling analysis in order to evaluate compliance with these codes.

Finally, the NYC CEQR requirement must also be evaluated. The four design goals are presented in Table 12.3.

Table 12.3: Noise Design Goals

Receptor	NYC Zoning Resolution	NYC Code	CEQR	Modified CNR
1. Park on Shore Boulevard and 20th Avenue Corner	(1)	55	49	C
2. Corner of 20th Avenue and 23rd Street	(1)	55	52	C
3. 20th Avenue and 31st Street	(1)	55	52	C
4. Mater School – 21st Avenue and 26th Street	(1)	55	47	C
5. P.S. 122 at 23rd Street	(1)	55	46	C
PL-1	(1)	70	N/A (2)	N/A (2)
PL-2	(1)	70	N/A (2)	N/A (2)
PL-3	(1)	70	N/A (2)	N/A (2)

Notes:

(1) Octave band limits are presented in Table 12.2.

(2)The CEQR and CNR analysis are designed to determine potential impact at noise sensitive areas (e.g. residential). Therefore, they do not apply to the industrial property line locations.

Source: TRC Environmental, 2000.

12.5 Calculated Impacts and Mitigation

Construction and operation of the proposed project will result in the generation of noise. The potential impact of these noise emissions is a function of the magnitude of the generated noise and the existing residual noise levels. The late night residual noise levels were used in the analysis in order to remain conservative.

The modified CNR method and the City's CEQR guidance were used to estimate potential operational impacts. The noise modeling analysis revealed that mitigation measures will be required in order to achieve these design goals. Incorporating these mitigation measures will reduce operational noise levels such that significant noise impacts are not anticipated in the residentially zoned areas.

Average construction noise levels were calculated to be below daytime ambient levels.

12.5.1 Operational Noise

The NOISECALC computer model, developed by the New York State Department of Public Service, was used to calculate noise levels expected from operation of the proposed facility. The model was developed for predicting noise levels from power plants. NOISECALC is a Hemispherical Free Field (HFF) noise prediction model.

NOISECALC accepts a variety of attenuation factors under varying meteorological conditions. The model was configured to accept hemispherical spreading and atmospheric absorption for this analysis based on values from the *Electric Power Plant Environmental Noise Guide (1984)*. Standard conditions of 59° F and 70 percent relative humidity were assumed. Directivity effects for noise from the stacks were also considered. No credit was taken for ground absorption. Modeling receptors were chosen in the same locations as where background monitoring was performed. As noted previously, three property line receptors were added to the modeling analysis in order to evaluate industrial standards.

Several modeling runs were made, with noise control added as required, until the required design goals were achieved. As previously noted, noise mitigation measures will be required in order to achieve these goals. These include the following:

- **Tuned HRSG stack silencers** - stack silencers are essentially mufflers which are built into the exhaust stacks. The silencers are designed (tuned) for each specific application. For example, a source which has excessive low frequency noise would have a silencer designed to be more effective against the low frequency noise.

- **Acoustically treated turbine building** - This building will require acoustical insulation on the interior. Additionally, the building will likely need to be designed such that any openings are treated with acoustic louvers, or oriented away from residential areas.

- **Enclosures for the gas compressing stations and chiller system** - Enclosures are simply buildings constructed to minimize the noise from a source.

The results of the computer modeling, incorporating the above-mentioned noise mitigation measures, are presented in Table 12.4. The design goals for the proposed project are also presented in this table.

Table 12.4: Calculated Operational Noise Levels Compared to Design Goals (dBA)

Receptor	Calculated Facility (dBA)	NYC Zoning Resolution	NYC Code Goal	Calculated CNR Rank	CNR Goal	CEQR
Park on Shore Boulevard and 20th Avenue Corner	48	(1)	55	C	C	49
Corner of 20th Avenue and 23rd Street	49	(1)	55	C	C	52
20th Avenue and 31st Street	47	(1)	55	B	C	52
Mater School – 21st Avenue and 26th Street	45	(1)	55	B	C	47
P.S. 122 at 23rd Street	44	(1)	55	B	C	46
PL-1	67	(1),(2)	70	N/A	N/A	N/A
PL-2	75	(1),(2)	70	N/A	N/A	N/A
PL-3	75	(1),(2)	70	N/A	N/A	N/A

(1) The calculated octave band levels are detailed in Table 12.2. See Appendix 12-A for detailed data.

(2) The calculated octave band levels exceed the zoning resolution standards for the industrial M-3 district.

Source: TRC Environmental, 2000

A discussion of the above modeling results and compliance with applicable standards/criteria is presented in Section 12.6

12.5.2 Construction Noise

The construction process for power plant projects generally occurs in the following phases:

- Initial grading and excavation
- Foundation construction/Concrete pouring
- Building assembly
- Siding and machinery installation
- Exterior finish and cleanup

Construction equipment to be used will differ from phase to phase. In general, heavy equipment (bulldozers, dump trucks, cement mixers) will be used during excavation, foundation construction and concrete pouring activities.

Estimated octave band noise levels for the expected construction equipment were incorporated into the NOISECALC computer model. Modeling was then performed using the same assumptions and receptors as was performed for the operational noise assessment. Average noise levels were calculated for each construction phase incorporating a usage factor, which is related to the average length of time that a piece of construction equipment is expected to be in use for any given construction phase (Barnes, 1977).

Because the construction sources are not elevated, it is anticipated that the intervening buildings separating some of the residential areas from the facility site will act as effective noise barriers. However, to present a conservative analysis, no credit was taken for this effect.

The calculated construction noise levels were compared to the existing daytime L_{eq} noise levels. The L_{eq} level, which represents a measure of the average of all the noise present, was used rather than the L_{90} because the L_{90} only represents the baseline noise levels, whereas construction noise is a combination of varying noises, more closely represented by the L_{eq}. The calculated average construction noise levels are compared to the existing L_{eq} noise levels in Table 12.5 below.

A review of the data presented in this table reveals that construction noise levels are anticipated to be well below existing ambient daytime noise levels at all residential areas. Therefore, no impacts due to construction activities are anticipated.

Table 12.5: Comparison of Calculated Average Construction Phase Noise Levels to Existing Daytime L_{eq} Noise Levels (dBA)

Construction Phase	1 – Park on Shore Blvd and 20th Ave Corner (2600 ft)	2 – Corner of 20th Ave and 23rd St (2600 ft)	3 – 20th Ave and 31st St (3600 ft)	4 - Mater School – 21st Avenue and 26th Street (3600 ft)	5 – P.S. 122 and 23rd St (4000 ft)
	ACN/ L_{eq}	**ACN/L_{eq}**	**ACN/L_{eq}**	**ACN/L_{eq}**	**ACN/L_{eq}**
Initial Grading and Excavation	55/65	55/68	51/64	51/62	50/57
Concrete Pouring	52/65	52/68	48/64	48/62	46/57
Building Assembly	51/65	51/68	47/64	47/62	45/57
Siding and Machinery Installation	51/65	51/68	47/64	47/62	45/57
Exterior Finish and Cleanup	52/65	52/68	49/64	49/62	47/57

Notes: ACN = Average Construction Noise level

L_{eq} = Measured daytime L_{eq} level

Source: TRC Environmental, 2000.

12.6 Compliance with Applicable Standards and Criteria

12.6.1 New York City Zoning Resolution

Computer modeling of the major facility sources has revealed that the NYPA Combined Cycle Project can be designed such that operational noise levels will be well below the octave band limits presented in Table 12.2 at any residential zones bordering the site. Accordingly, the proposed project will be in compliance with the New York City Zoning Resolution at all residential locations. Modeled levels at the industrial property line locations, however, are projected to exceed some of the octave band limits. Since there are no sensitive receptors at these locations, NYPA will be seeking a waiver of this regulation.

12.6.2 New York City Noise Code

Computer modeling of the major facility sources has revealed that the NYPA Combined Cycle Project can be designed such that operational noise levels will be well below 55 dBA at any residential zones and will therefore be in compliance with the New York City Noise Code for residential areas. Two of the modeled industrial property line locations, however, are projected to exceed the 70 dBA industrial limit. As with the Zoning Resolution discussed above, NYPA will be seeking a waiver of this regulation.

12.6.3 NYSDPS Modified CNR Analysis

a. Operational Noise

The proposed Combined Cycle Project noise levels were input to the modified CNR analysis as required by the NYSDPS. The results of that analysis indicate that the facility can be designed such that the resulting CNR rating at any residential area will be "C" or better, in compliance with the NYSDPS requirement.

b. Construction Noise

The projected construction noise levels, by phase, were also incorporated into the modified CNR analysis. The analysis was conducted in an extremely conservative manner in that the same late night L90 noise levels used in the operational analysis were incorporated, even though construction activities will be limited to the daytime hours. The resulting analysis resulted in CNR ratings of "C" or better at all residential locations.

12.6.4 New York City CEQR

The proposed Combined Cycle Project noise levels were evaluated against the New York City CEQR requirement, which specifies that no impact will occur if increases in late night L_{90} levels are limited to 3 dBA or less. The calculated facility noise levels, when added to the measured existing late night L_{90} levels, resulted in increases of less than 3 dBA at all noise sensitive receptors. Calculated facility levels are therefore in compliance with the CEQR requirement.

12.7 Assessment of Additional Potential Impacts

- **Hearing Damage** - Hearing damage will not occur at any residential locations as a result of the proposed Project. Noise levels of 70 dBA or lower are recommended in order to prevent hearing damage (EPA, 1974). Facility noise levels at any sensitive receptors will be well below 70 dBA.

- **Sleep Interference** - Studies have shown that there are no subjective effects on sleep at noise levels of 60 dBA when the number of noise events are below eight. A noise event is considered to be a sudden occurrence of a noise level of a given magnitude. Further, sound levels of 45 dBA should not occur more than 10 to 15 times per night in order to avoid sleep interference (Berglund, 1995). Facility operation should not result in sleep interference for the following reasons:
  - facility sound levels are steady in nature
  - facility noise levels are anticipated to be below 45 dBA indoors
  - normal facility operations will not result in "noise events"

- **Indoor and Outdoor Speech Interference** - Relaxed conversation occurs with a voice level of 54-56 dBA at a distance of one meter. When background noise is equal to the speech level, sentence intelligibility is at 95 percent (Berglund, 1995). Ninety five percent sentence intelligibility usually permits reliable communication because of the redundancy in normal conversation (EPA, 1974). Facility noise levels will be well below the relaxed conversation level of 54-56 dBA. Sentence intelligibility will therefore approach 100 percent, and speech interference, indoors or outdoors, is not anticipated due to normal plant operation.

- **Low Frequency Noise Annoyance -** Low frequency noise levels will not be significant due to the nature of combined cycle operation. The majority of low frequency noise generated by the turbine will be effectively attenuated inside the HRSG units.

- **Community Complaint Potential -** The modified CNR analysis was conducted for the purpose of estimating community reaction to facility generated noise. This resulting rating of "C" calculated for the facility results in an expected response of "no reaction". Therefore, no community annoyance is expected due to normal facility operation.

- **Potential for Structural Damage Due to Vibration or Infrasound** - Combustion turbines are highly balanced and do not normally generate ground borne vibration. As noted above, because of the combined cycle nature of operation, low frequency sound will be effectively attenuated by the HRSG units, thereby eliminating the potential for infrasound vibration.

12.8 Cumulative Effects

12.8.1 Cumulative Operational Impacts - Proposed Astoria Energy Station

The cumulative effect of noise generated by the NYPA Combined Cycle Project and the proposed Astoria Energy Project was evaluated. The two facilities share a common residential receptor in their respective noise assessments (20th Avenue and 31st Street). In order to perform this evaluation, the calculated Astoria Energy Project noise level at this receptor was conservatively extrapolated to the other NYPA receptors using only distance as a factor to attenuate the noise level (e.g., atmospheric absorption and building attenuation were not considered). The arrived at extrapolated Astoria Energy Project levels were then added to the calculated NYPA Combined Cycle Project levels as presented in Table 12.4. Provided in Table 12.6 below is a summary of this evaluation.

Table 12.6: Estimated Cumulative Operational Noise Levels (dBA)

Receptor	Calculated NYPA Facility	Extrapolated Astoria Energy Project	Total	Increase over NYPA Facility Alone
1. Park on Shore Boulevard and 20th Avenue Corner	48	41	49	+1
2. Corner of 20th Avenue and 23rd Street	49	43	50	+1
3. 20th Avenue and 31st Street	47	47	50	+3
4. Mater School-21st Avenue and 26th Street	45	43	47	+2
5. P.S. 122 and 23rd Street	44	41	46	+2

A review of the data in this table reveals that the greatest potential for a cumulative effect is at the common residential residential receptor (20th Avenue and 31st Street). Note, however, that the Astoria Energy Project levels are conservative extrapolated noise levels.

12.8.2 Cumulative Construction Impacts - Proposed Astoria Energy Project

As was conducted for operational noise, a cumulative assessment of construction noise with the Astoria Energy station was also performed. It was assumed that construction activities, and therefore, noise levels, would be the same for both projects at the same distances. Therefore, the analysis was conducted by extrapolating the estimated noise levels from the Astoria Energy Project based on the distances to the respective NYPA receptors and combining the two levels. Provided in Table 12.7 are the estimated contributions from both projects.

As is the case for operational noise, the greatest potential for a cumulative effect is at the common residential receptor. Little or no differences would be expected at the remaining locations. This analysis assumes, however, that construction schedules would occur at the exact same time, which is unlikely.

Table 12.7: Estimated Cumulative Construction Noise Levels (dBA)

Reception	Grading/Excavation Astor			Concrete			Steel Assembly			Machinery Installation			Cleanup		
	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined	NYPA	Astoria	Combined
1-Park on Shore Boulevard and 20th Avenue Corner	55	42	55	52	38	52	51	37	51	51	37	51	52	39	52
2-Corner of 20th Avenue and 23rd Street	55	44	55	52	40	52	51	39	51	51	39	51	52	41	52
3-20th Avenue and 31st Street	51	48	53	48	44	49	47	43	48	47	43	48	49	45	50
4-Mater School-21st Avenue and 26th Street	51	44	52	48	40	49	47	39	48	47	39	48	49	41	50
5-P.S. 122 and 23rd Street	50	42	51	46	38	47	45	37	46	45	37	46	47	39	48

12.9 Post Construction Compliance Monitoring

An ambient noise monitoring program will be performed following the start of commercial operations to confirm that the calculated noise levels are achieved. Any deficiencies shall be noted, and a schedule to correct them shall be developed. The post construction noise monitoring program will be described in a separate Compliance Filing subsequent to the issuance of the Certificate.

12.10 References

Barnes, J.D., L. Miller, E. Wood. 1977. *Prediction of Noise from Power Plant Construction.* Prepared for Empire State Electric Energy Research Company.

Berglund, B., and T. Lindvall. 1995. *Community Noise.* Prepared for the World Health Organization. ISSN 1400-2817. ISBN 91-887-8402-9.

Bolt, Beranek and Newman, Inc. 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.*

Miller, L.N., E.W. Wood, R.M. Hoover, A.R. Thompson, and S.L. Patterson. 1984. *Electric Power Plant Environmental Noise Guide.* Prepared for Edison Electric Institute by Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts

United States Environmental Protection Agency, 1978. *Protective Noise Levels.* Office of Noise Abatement & Control. Report Number EPA 550/9-79-100. Washington, D. C. 20460.

Section 13

Section 13

13.0 TRAFFIC AND TRANSPORTATION

13.1 Introduction

This section addresses the requirements of 16 NYCRR §§ 1001.1 (a) and 1001.3 and provides a discussion of the traffic data collection program, estimates of future traffic volumes with and without the proposed project, and a calculation of the level of service at selected intersections to determine future traffic conditions. This section discusses the traffic generated by the construction and operation of the proposed NYPA Combined Cycle Project and estimates the potential impacts this traffic may have on the surrounding roadway network in accordance with Stipulation No. 10. This report also addresses potential impacts to other transportation systems resulting from the construction and operation of the proposed facility.

Manual and machine traffic counts, as well as field observations were conducted and detailed analyses were performed to determine the existing base traffic conditions in the vicinity of the existing NYPA Charles Poletti Power Project located along 20th Avenue between Shore Boulevard and Steinway Street (see Figure 13-1, Site Location Map). This traffic data was also used to project future traffic conditions resulting during the construction and operation of the proposed generating facility.

Field observations and manual turning movement traffic counts were conducted on Tuesday, February 15, 2000, from 6:00 AM to 9:30 AM and from 2:00 PM to 6:30 PM at the following key intersections and driveways in the vicinity of the site:

- Location No. 1 – 31st Street/Main Entrance and 20th Avenue
- Location No. 2 – 31st Street and Ditmars Boulevard
- Location No. 3 – Steinway Street and 20th Avenue
- Location No. 4 – 21st Street and 20th Avenue

The manual counts were supplemented with automated traffic recording (ATR) devices located on all approaches at the intersection of 20th Avenue and 31st Street. The automated traffic data was collected from Thursday, February 10, 2000, to Thursday, February 17, 2000. To obtain additional data regarding existing traffic volumes in the project vicinity, TRC Raymond Keyes Associates contacted the New York State and New York City Departments of Transportation.

In addition to the traffic counts, data collected during field observations included roadway geometrics, lane widths, traffic control devices and traffic flow characteristics.

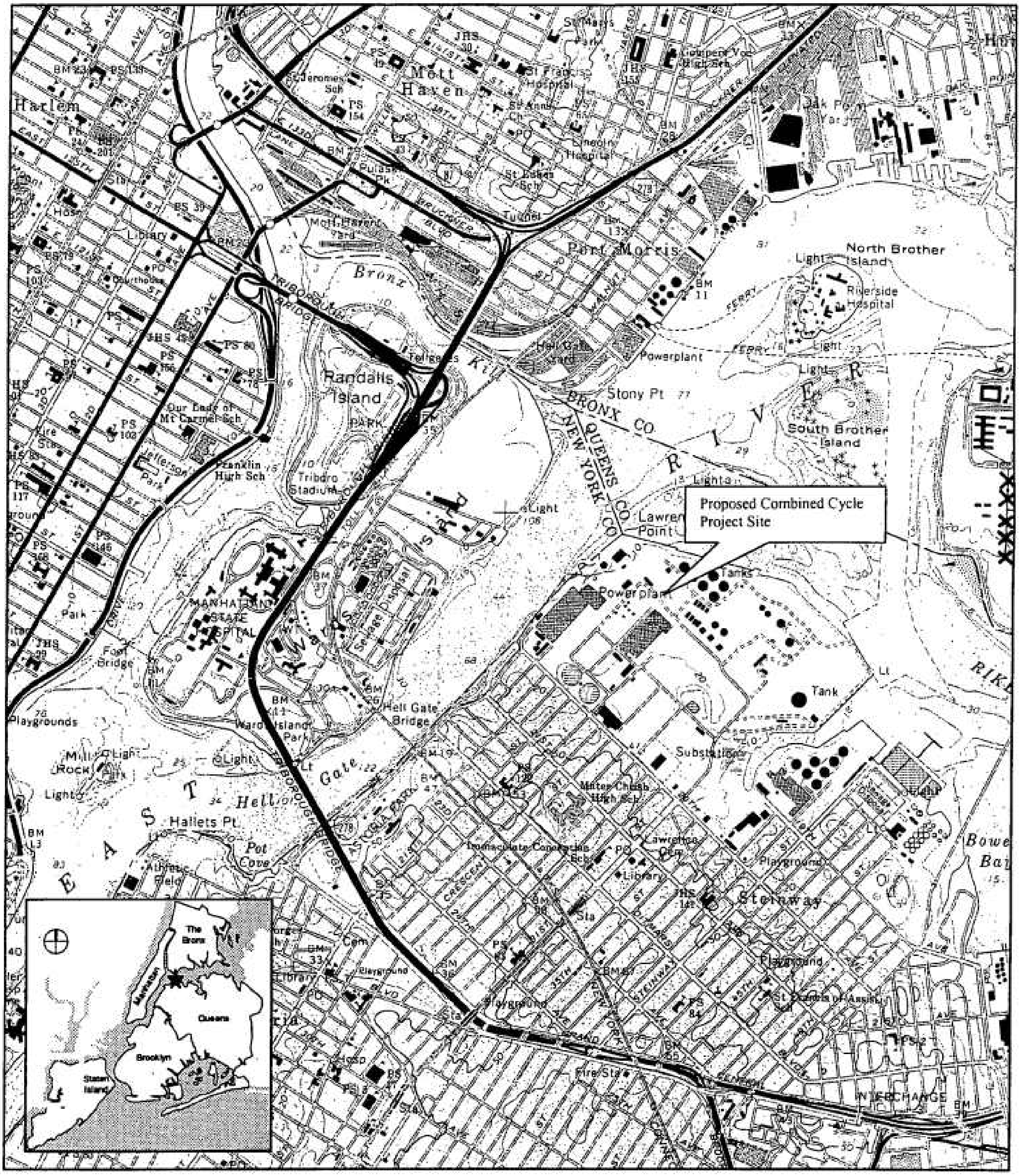


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Figure 13-1. Site Location Map
Scale: 1" = 2000'

Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

Capacity analyses were performed at the key intersections and driveways for existing traffic conditions to determine the existing level of service at each location. Capacity analysis is a method by which traffic volumes are compared to the calculated roadway and intersection capacities to evaluate future conditions. The methodology used is described in the 1994 Update to the 1985 Highway Capacity Manual published by the Transportation Research Board. In general, the term, "Level of Service" is used to provide a "qualitative" evaluation based on certain "quantitative" calculations related to empirical values.

13.2 Existing Traffic Conditions

13.2.1 Roadway Geometry

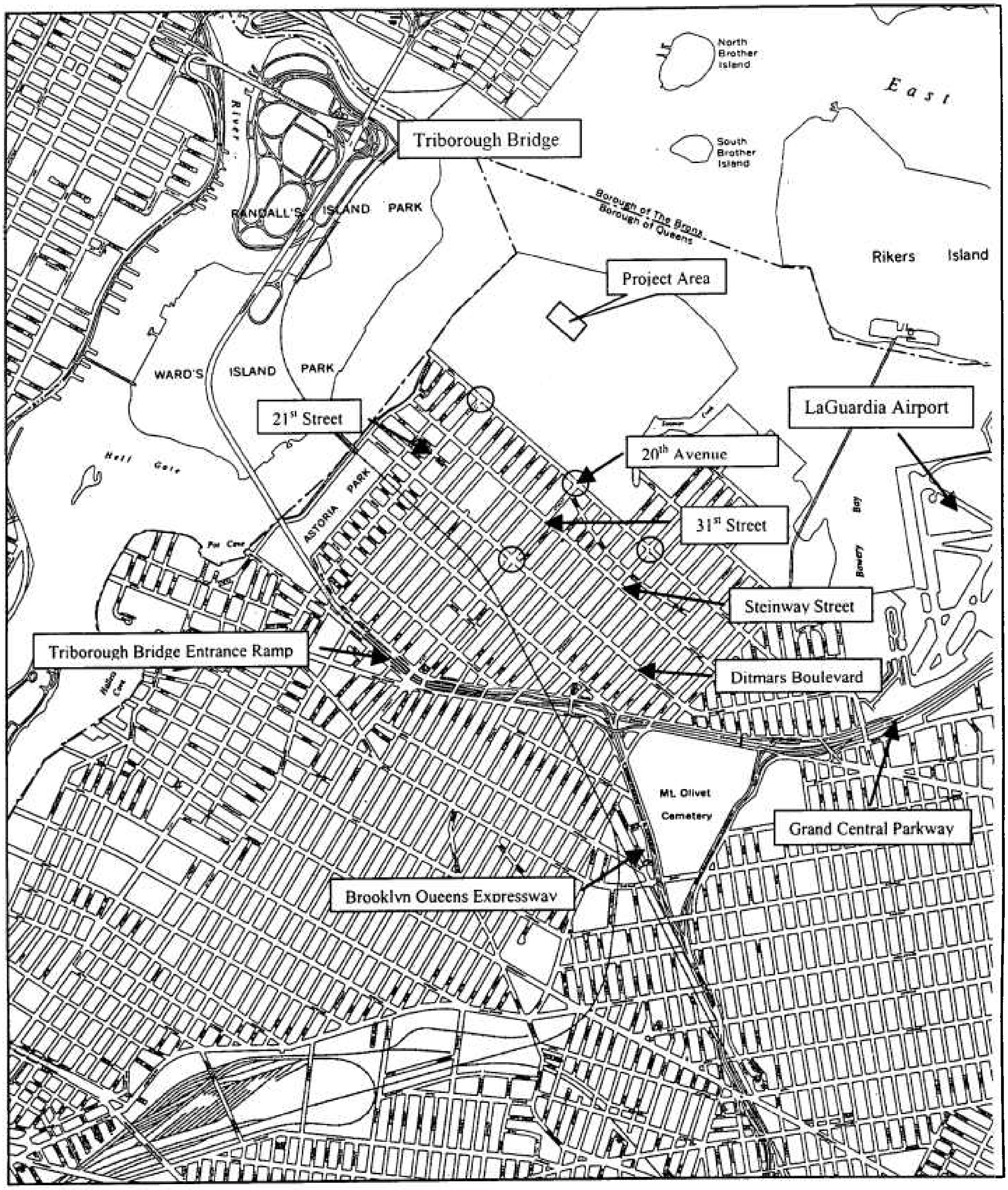
The proposed generating facility will be located approximately one mile north of the intersection of the Queens Ramp to the Triborough Bridge with the Brooklyn Queens Expressway and the Grand Central Parkway, approximately 1.5 miles northwest of La Guardia Airport. Significant roadways within the project area include the Brooklyn Queens Expressway, the Grand Central Parkway, and Astoria Boulevard. Key roadways within the study area include 20th Avenue, 31st Street, Ditmars Boulevard, Steinway Street, and 21st Street. The key roadways within the study area (which all have a posted speed limit of 30 mph) are shown on Figure 13-2 and described below. All of the roadways have appropriate sight distance for urban roadways. Each of the roadways provides sidewalks along both sides of the roadway.

a. Steinway Street

Steinway Street is a two-lane roadway that runs in a general north/south direction serving a variety of commercial and residential developments. Steinway Street extends from Northern Boulevard to Berrian Boulevard and permits parking on both sides of the street. Steinway Street intersects 20th Avenue at a signalized intersection located approximately 0.7 miles from the project site. Steinway Street is under local jurisdiction.

b. Ditmars Boulevard

Ditmars Boulevard is primarily an east/west roadway, one lane per direction with parallel parking permitted on both sides of the street. Ditmars Boulevard extends from Shore Boulevard to 82nd Street. Ditmars Boulevard intersects 31st Street at a signalized intersection. Ditmars Boulevard is under local jurisdiction.



◯ - Locations of manual turning movement counts

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Figure 13-2. Local Roadway Network

Source: NYC Dept. of Planning Sectional Maps

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c. 20^{th} Avenue

20^{th} Avenue consists of one lane per direction with parking permitted. It is an east/west local roadway extending from Shore Boulevard to 78^{th} Street. 20^{th} Avenue is under local jurisdiction. The Con Edison/NYPA/Orion property is bounded along the south by 20^{th} Avenue, and the main entrance to the property and the proposed project site is located at the intersection of 20^{th} Avenue with 31^{st} Street. 20^{th} Avenue intersects 31^{st} Street at a signalized intersection, and it intersects 21^{st} Street at an unsignalized intersection.

d. 21^{st} and 31^{st} Streets

21^{st} and 31^{st} Streets are one lane per direction (with parking) local roadways extending essentially from 20^{th} Avenue to 50^{th} Avenue and Northern Boulevard, respectively. 31^{st} Street intersects 20^{th} Avenue and Ditmars Boulevard at signalized intersections. The main entrance to the Charles Poletti Power Project is located opposite 31^{st} Street at the intersection of 31^{st} Street and 20^{th} Avenue. 21^{st} Street intersects 20^{th} Avenue at an unsignalized intersection. Both streets are under local jurisdiction.

13.2.2 Site Access

One access point currently serves the Poletti Project site, and will serve the proposed generating facility. The access point to the facility is through a gated entry drive located along 20^{th} Avenue at the signalized intersection with 31^{st} Street.

13.2.3 Existing Traffic Volumes

A review of the traffic counts at the driveways and external study locations on the adjacent roadways identified the following representative peak roadway hours:

- Peak AM Roadway Hour – 7:45 to 8:45 AM
- Peak PM Roadway Hour – 2:45 to 3:45 PM

The existing peak hour traffic volumes entering and exiting the site are shown on Figure 13-3. The turning movement counts data sheets are contained in Appendix 13A.

In addition, the manual counts were supplemented with automated traffic recording (ATR) devices located on all approaches at the intersection of 20^{th} Avenue and 31^{st} Street. The automated traffic data was collected from Thursday, February 10, 2000 to Thursday, February 17, 2000. Copies of the ATR traffic counts are included in Appendix 13B.

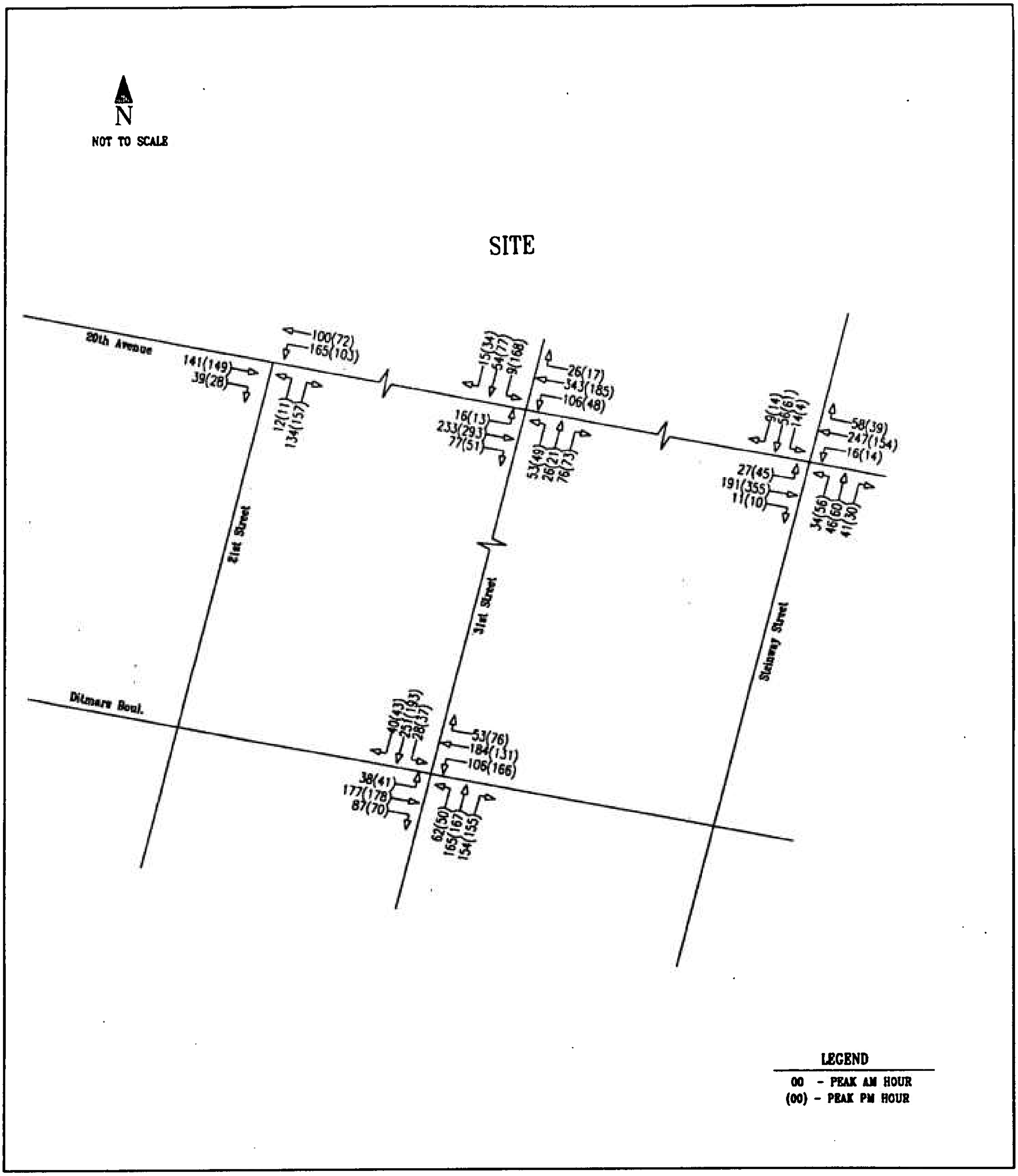

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Figure 13-3. 2000 Existing Traffic Volumes: Peak Hour
Source: TRC Raymond Keyes, May 2000

Since the majority of construction workers will be arriving at the site prior to 7:00 AM and the Peak AM Roadway Hour, the hour of 6:30 to 7:30 AM was analyzed. The 2000 existing traffic volumes during the hour of 6:30 to 7:30 AM are illustrated in Figure 13- 4.

13.2.4 Existing Levels of Service

The definitions of Level of Service as contained in the 1994 Update to the 1985 Highway Capacity Manual appear in Appendix 13C.

In general, Level of Service A represents the best traffic operating condition. Levels of Service for signalized and unsignalized intersections are defined in terms of average delay. Delay is used as a measure of driver discomfort, frustration, efficiency, etc. Table 13.1 summarizes the Level of Service and associated delays for signalized and unsignalized intersections:

Table 13.1: Level of Service and Associated Average Delay

Level of Service	Average Delay per Vehicle (Seconds)	
	Signalized	Unsignalized
A	5.0 or less	5.0 or less
B	5.1 to 15.0	5.1 to 10.0
C	15,1 to 25.0	10.1 to 20.0
D	25.1 to 40.0	20.1 to 30.0
E	40.1 to 60.0	30.1 to 45.0
F	60.1 or greater	45.1 or greater

Source: Highway Research Board 1994 Update to the 1985 Highway Capacity Manual.

Capacity analyses were performed for the key locations with the existing traffic volumes utilizing Highway Capacity Software developed by the Federal Highway Administration (FHWA). Copies of the capacity analysis worksheets are provided as Appendix 13D.

Table 13.2 summarizes the results of the capacity analyses for the Existing Traffic conditions during the AM and PM peak periods. Table 13.3 summarizes the results of capacity analyses performed for the existing traffic conditions during the 6:30 AM to 7:30 AM periods, which is representative of the time period when project generated traffic is anticipated to arrive at the project site. Signalized intersections are indicated in uppercase letters and unsignalized intersections are represented in lowercase. As shown in Tables 13.2 and 13.3, all intersections currently operate at acceptable levels of service (A-D).

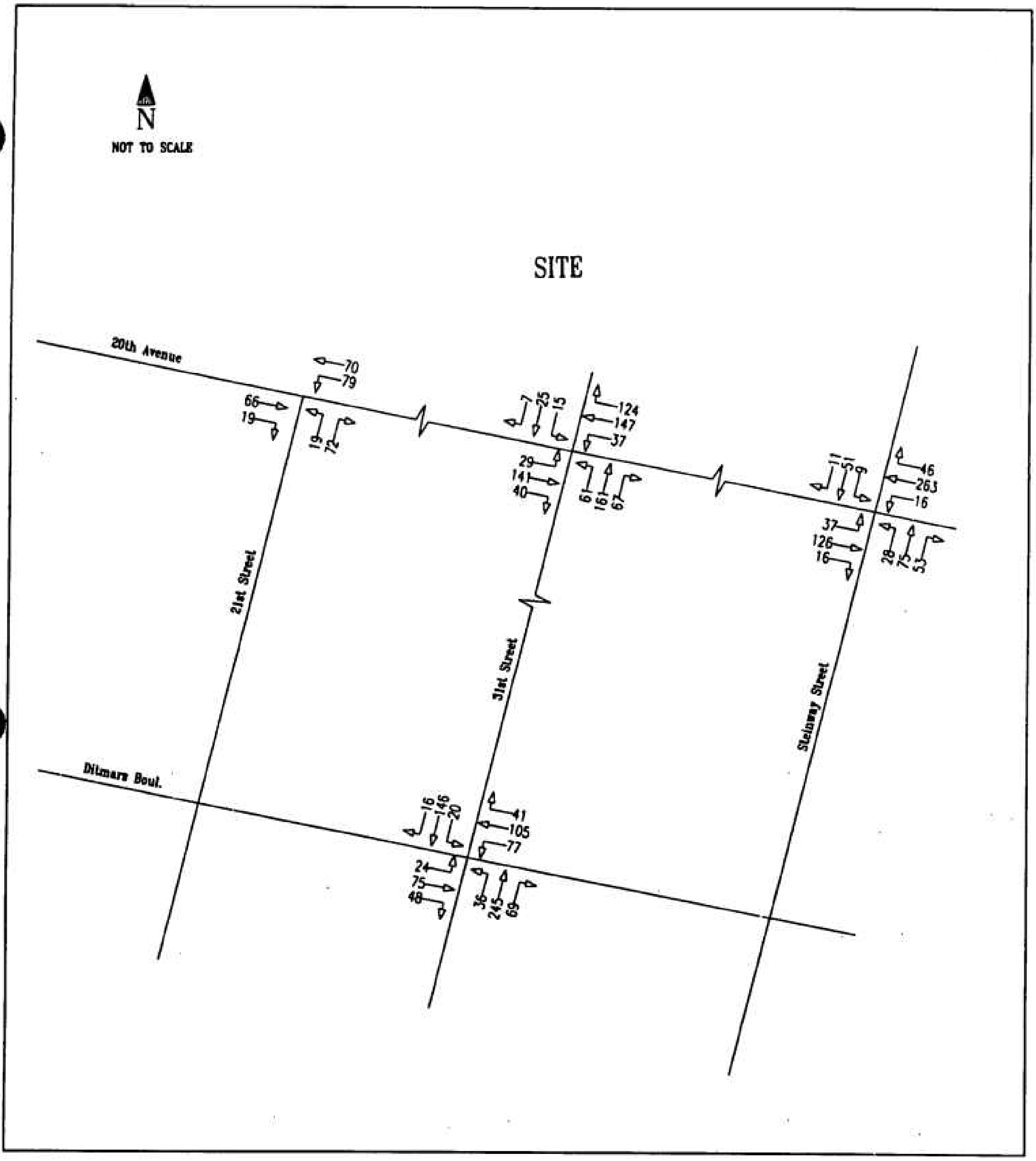

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Figure 13-4. 2000 Existing Traffic Volumes: 6:30 to 7:30 AM

Source: TRC Raymond Keyes, May 2000

Table 13.2: Level of Service Summary –Peak Hour Existing Conditions

Intersection	Approach	AM			PM		
		LOS	DELAY	V/C	LOS	DELAY	V/C
31st Street @ Ditmars Boulevard	Eastbound	C	15.3	0.641	B	14.5	0.602
	Westbound	D	36.2	0.927	C	16.2	0.665
	Northbound	C	16.1	0.654	C	15.2	0.608
	Southbound	B	13.4	0.486	B	13.1	0.446
	Overall	C	20.4	0.794	B	14.8	0.637
Steinway Street @ 20th Avenue	Eastbound	B	9.4	0.384	B	12.3	0.660
	Westbound	B	10.4	0.511	B	9.2	0.351
	Northbound	B	6.7	0.198	B	6.9	0.242
	Southbound	B	6.6	0.148	B	6.5	0.143
	Overall	B	9.1	0.343	B	10.1	0.435
21st Street @ 20th Avenue	Northbound L	b	7.8	-	b	6.3	-
	Northbound R	a	3.7	-	a	3.9	-
	Northbound Overall	a	4.1	-	a	4.0	-
	Westbound L	a	3.1	-	a	2.9	-
	Westbound Overall	a	1.9		a	1.7	
	Overall	a	1.9	-	a	1.9	-
31st Street/Main Entrance @ 20th Ave.	Eastbound	B	7.1	0.485	B	7.1	0.490
	Westbound	C	18.4	0.870	B	6.7	0.429
	Northbound	B	10.2	0.259	B	10.3	0.282
	Southbound	B	9.6	0.117	B	12.6	0.565
	Overall	B	12.9	0.621	B	8.9	0.521

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

Table 13.3: Level of Service Summary - Existing Conditions
(During the Hour of 6:30 to 7:30 AM)

Intersection	Approach	AM		
		LOS	DELAY	V/C
31st Street @ Ditmars Blvd.	Eastbound	B	11.0	0.299
	Westbound	B	13.0	0.506
	Northbound	B	13.7	0.508
	Southbound	B	11.6	0.273
	Overall	B	12.7	0.507
Steinway Street @ 20th Avenue	Eastbound	B	9.1	0.332
	Westbound	B	10.4	0.510
	Northbound	B	6.9	0.245
	Southbound	B	6.5	0.132
	Overall	B	9.0	0.368
21st Street @ 20th Ave.	Northbound L	b	5.2	-
	Northbound R	a	3.1	-
	Northbound Overall	a	3.5	-
	Westbound L	a	2.5	-
	Westbound Overall	a	1.3	-
	Overall	a	1.6	-
31st Street/Main Entrance @ 20th Avenue	Eastbound	B	6.1	0.322
	Westbound	B	7.1	0.480
	Northbound	B	11.2	0.437
	Southbound	B	9.4	0.084
	Overall	B	8.4	0.463

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

13.2.5 Emergency Vehicle and School Bus Routes

Based upon discussions with representatives of the Fire and Police Departments, it was determined that emergency vehicles have no set routes in the area. In the event of an emergency, all emergency vehicles travel to the emergency site by means of the quickest and shortest route possible, dependent upon roadway conditions, time of day and location. Accordingly, the project will not have an impact on emergency vehicle routes.

The Applicant has contacted the Office of Pupil Transportation for the New York City Board of Education in an effort to obtain information regarding school bus routes in the project area. Despite numerous inquiries, no information has been provided to the Applicant by the Board of Education (TRC Raymond Keyes, 2000).

13.2.6 Accident Data

The New York State Department of Transportation (NYSDOT), the New York City Department of Transportation and County of Queens were contacted to obtain recent accident data. The NYSDOT - Safety Information Management System data on the section of 20th Avenue from 21st Street to Steinway Street and 31st Street from Ditmars Boulevard to 20th Avenue (from April 1996 to March 1999) was reviewed and analyzed. The accidents are summarized into categories including year of the accident, probable cause, and number of injuries (see Appendix 13E).

During the analyzed three-year period, a total of 596 accidents occurred. Of the total accidents, 390 (65.4%) were non-reportable. The NYSDOT definition of a non-reportable accident is when there is no personal injury along with no motorist report being filed, no dollar value of vehicular damage was entered on the accident report or the amount of damages did not exceed $1,000. The accidents were generally due to human error rather than problems with the roadway or traffic control. Only two accidents resulted in fatalities.

13.3 Future Traffic Conditions

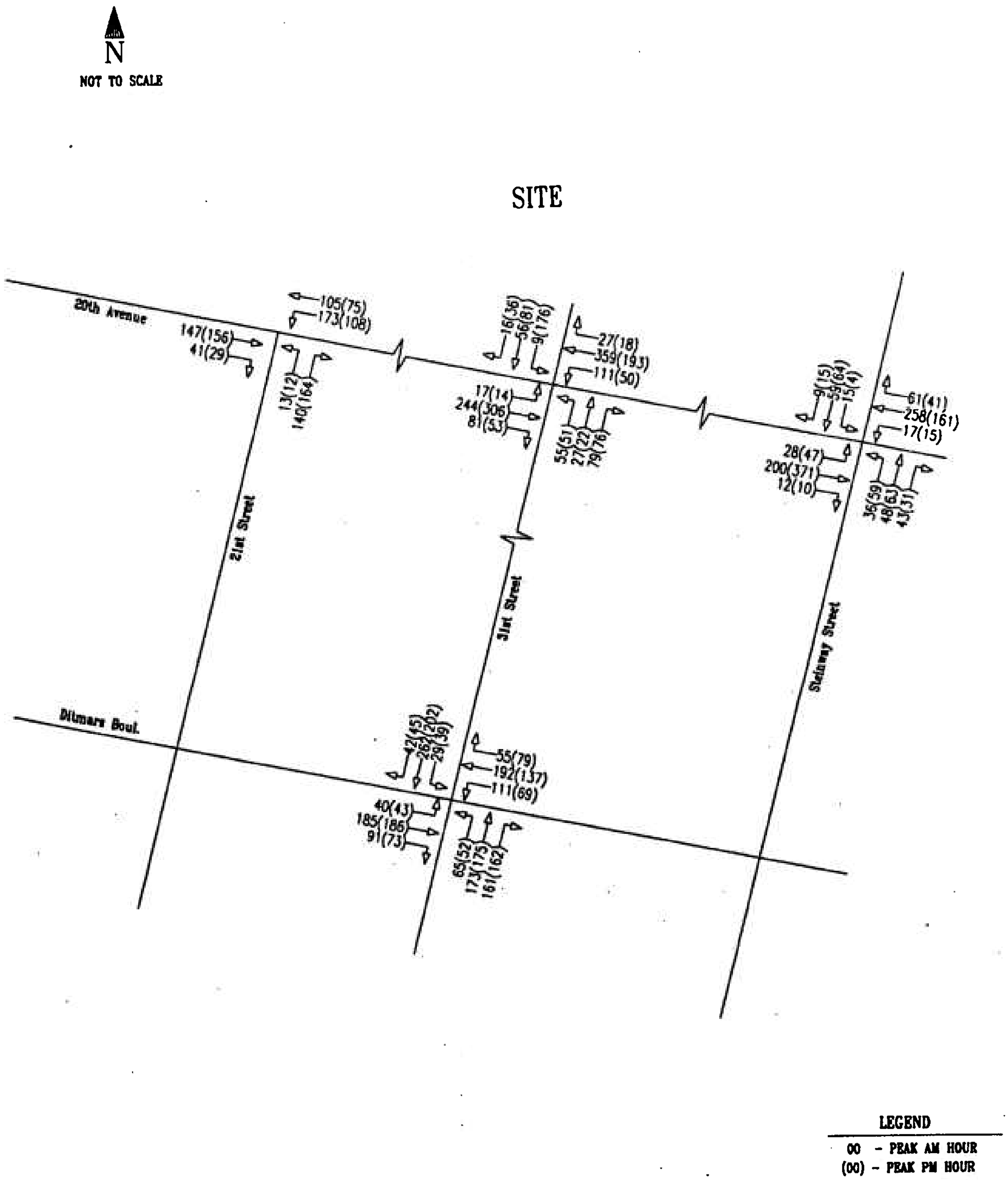
The ability of the local roadway network to accommodate the anticipated traffic volumes generated by the proposed facility is measured by comparing the peak hour traffic volumes to roadway capacities. Thus, it is essential to determine the hourly traffic volumes to be generated by the proposed project and add those volumes to the existing traffic volumes for each peak hour. For this analysis, two types of impacts will be addressed: 1) construction impacts, which reflect the addition of vehicle trips generated by the peak construction workforce as well as delivery of equipment and material to the project site (Peak Construction Condition); and 2) impacts resulting from the operation of the proposed facility (Condition With Project). Because the proposed project will not increase employment levels at the Charles Poletti Power Project, the proposed facility will not generate a significant amount of additional traffic during operation. Therefore, the future traffic conditions during the proposed facility's operation were conservatively determined based on background growth projections for the area.

13.3.1 2003 Background Traffic Volumes and Level of Service Analysis

To project the existing traffic volumes to 2003, the anticipated period of peak construction, a background growth factor was applied to the existing roadway volumes. Incorporated in this growth is any traffic potentially generated by approved future developments within the project area. Discussions with representatives of the Borough of Queens indicated two potential developments in the area: the SCS Astoria Energy Project located near the Poletti Project on the opposite side of Steinway Creek and the extension of the "N" Train which currently terminates at 31st Street and Ditmars Boulevard. The proposed "N" train extension would extend in a northeasterly direction toward La Guardia Airport. Neither of these two projects would significantly impact the traffic operating conditions in the vicinity of the site.

To ensure an adequate assessment of potential impacts and adjacent development site-generated traffic, a conservative compounded growth rate of 1.5% per year was projected for the existing traffic volumes to form the Year 2003 background traffic volumes. Thus, the existing traffic volumes were conservatively projected to the Peak Construction Year 2003 by applying a total growth factor of more than 4.5%. The resulting 2003 background traffic volumes, for both the peak hours and the 6:30 AM to 7:30 AM hour, are illustrated on Figures 13-5 and 13-6.

Using the 2003 background traffic volumes described above and illustrated on Figures 13-13-5 and 6, capacity analyses were conducted for the projected 2003 background conditions for the key intersections and driveways for both the morning and evening peak periods as well as the 6:30 to 7:30 AM hour. The 6:30 to 7:30 AM period was also evaluated as it is anticipated that a significant majority of the construction workers associated with the proposed facility will arrive during this period, rather than the traditional AM peak. The results of the capacity analyses are summarized in Tables 13.4 and 13.5. As illustrated in Tables 13.4 and 13.5, all intersections will operate at acceptable Levels of Service (A – D). However, the westbound movement at the intersection of 31st Street and Ditmars Boulevard will operate at a Level of Service "E" during the Peak AM Hour.



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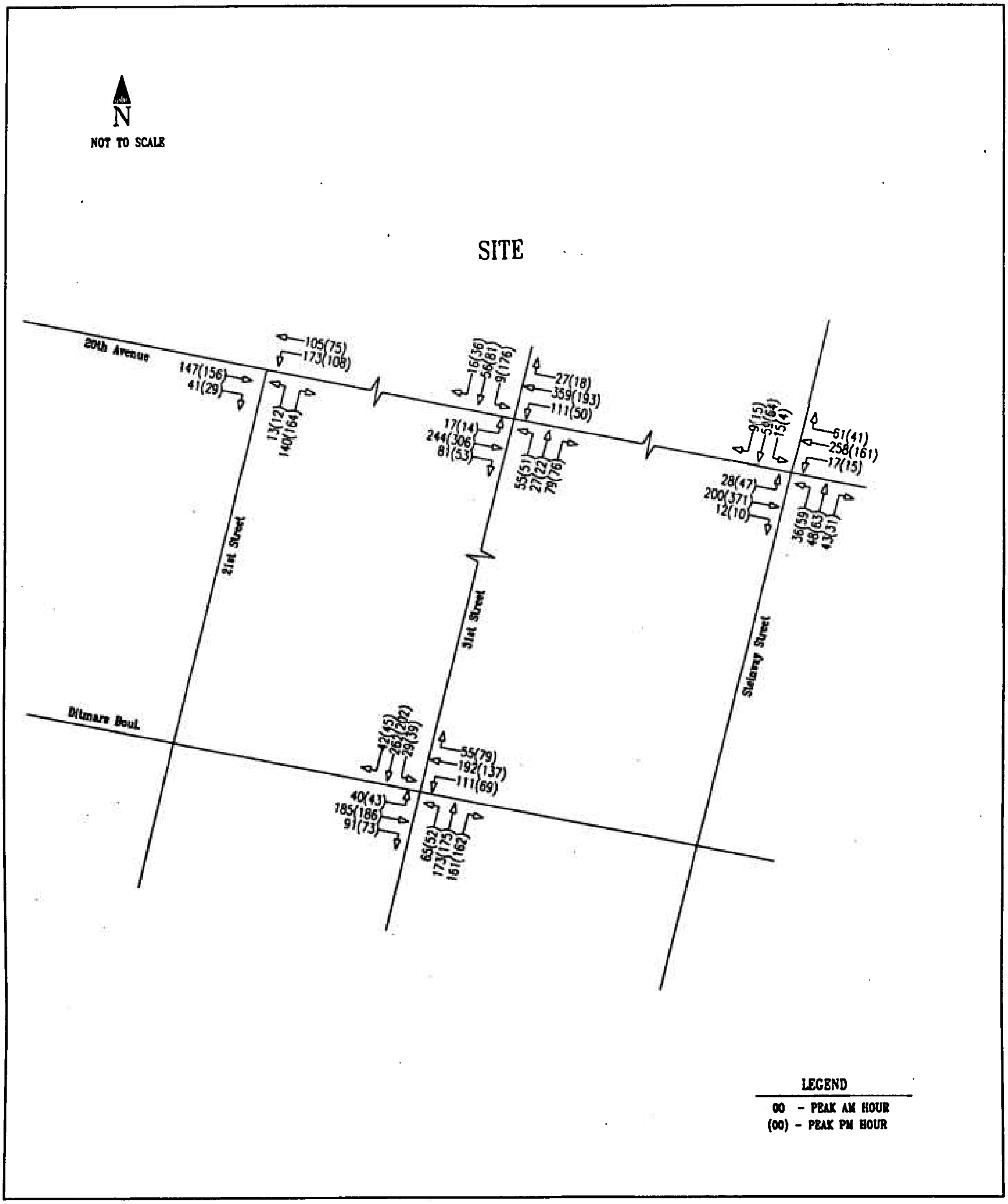
Combined Cycle Project
Astoria, Queens, NY

Figure 13-5. 2003 No-Build Traffic Volumes: Peak Hour

Source: TRC Raymond Keyes, May 2000

TRC



TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 13-6. 2003 No-Build Traffic Volumes: 6:30 to 7:30 AM

Source: TRC Raymond Keyes, May 2000

Table 13.4: Level of Service Summary – 2003 Projected Background Conditions

		AM			PM		
	Approach	LOS	DELAY	V/C	LOS	DELAY	V/C
31st Street @ Ditmars Blvd.	Eastbound	C	16.2	0.676	C	15.1	0.634
	Westbound	E	49.5	0.989	C	17.4	0.703
	Northbound	C	17.1	0.693	C	15.8	0.640
	Southbound	B	13.8	0.515	B	13.3	0.474
	Overall	C	24.3	0.844	C	15.4	0.672
Steinway Street @ 20th Avenue	Eastbound	B	9.6	0.404	B	13.0	0.693
	Westbound	B	10.7	0.538	B	9.4	0.373
	Northbound	B	6.8	0.208	B	7.0	0.256
	Southbound	B	6.6	0.157	B	6.6	0.150
	Overall	B	9.3	0.361	B	10.5	0.458
21st Street @ 20th Avenue	Northbound L	b	8.2	-	b	6.5	-
	Northbound R	a	3.8	-	a	4.0	-
	Northbound Overall	a	4.2	-	a	4.1	-
	Westbound L	a	3.1	-	a	2.9	-
	Westbound Overall	a	1.9	-	a	1.7	-
	Overall	a	1.9	-	a	1.9	-
31st Street/Main Entrance @ 20th Ave.	Eastbound	B	7.3	0.513	B	7.3	0.515
	Westbound	C	23.3	0.917	B	7.0	0.460
	Northbound	B	10.2	0.271	B	10.4	0.298
	Southbound	B	9.6	0.121	B	13.1	0.605
	Overall	C	15.3	0.654	B	9.2	0.551

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections

Source: TRC Raymond Keyes Associates, 2000.

Table 13.5: Level of Service Summary – 2003 Projected Background Conditions

(During the Hour of 6:30 to 7:30 AM)

Intersection	Approach	AM		
		LOS	DELAY	V/C
31st Street @ Ditmars Blvd.	Eastbound	B	11.1	0.315
	Westbound	B	13.4	0.535
	Northbound	B	14.0	0.533
	Southbound	B	11.7	0.289
	Overall	B	12.9	0.534
Steinway Street @ 20th Avenue	Eastbound	B	9.3	0.354
	Westbound	B	10.6	0.535
	Northbound	B	7.0	0.255
	Southbound	B	6.5	0.137
	Overall	B	9.1	0.385
21st Street @ 20th Ave.	Northbound L	b	5.4	-
	Northbound R	a	3.1	-
	Northbound Overall	a	3.6	-
	Westbound L	a	2.5	-
	Westbound Overall	a	1.3	-
	Overall	a	1.6	-
31st Street/Main Entrance @ 20th Avenue	Eastbound	B	6.2	0.338
	Westbound	B	7.3	0.506
	Northbound	B	11.3	0.459
	Southbound	B	9.5	0.088
	Overall	B	8.5	0.486

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

13.3.2 2003 Construction Generated Traffic Volumes and Level of Service Analysis

The peak construction period for the proposed project is anticipated to occur for several months during the Year 2003. Construction is anticipated to be completed within a 24-month time frame, and during the majority of the construction period, construction traffic volumes will be significantly less than during the peak period. The peak construction period, however, is considered for this analysis to present a worst-case construction impact scenario.

There are two types of vehicular trips associated with the construction activity. The first type is construction worker trips. The peak number of required construction workers will occur approximately mid-way through the construction schedule, and will continue for a few months. Before and after this peak, fewer construction workers will be required at the facility and construction-related vehicular trips would correspondingly be less. Construction activity will be performed over the course of one shift, assumed to be during the day from 7:00 AM to 3:00 PM. Peak construction personnel is anticipated to reach 350 employees.

The second category of traffic associated with construction of the proposed project involves trips by trucks delivering construction materials, equipment, and supplies. It is anticipated that there will be up to a maximum of approximately 25 construction trucks per day. This includes trucks needed for fill activities. Delivery of large equipment is planned by barge. However, occasional truck delivery of large equipment might be required. In such event, these deliveries will be made during off-peak times and will be coordinated with local officials and NYSDOT. Therefore, traffic from the trucks will not have an impact upon the peak roadway hours. The majority of delivery trucks will arrive/depart during non-peak periods when traffic on the adjacent roadways is generally lower. Therefore, the trucks will not have a significant impact on traffic operating conditions in the area. Nevertheless, this analysis assumes that a conservative number of trucks will arrive and depart the site during peak morning and evening periods.

The transportation of any vehicles carrying hazardous materials will be instructed to use the most appropriate routes to/from the site, thus generally travelling from 20th Avenue along Steinway Street. The number of these trucks will be limited.

Three assumptions were considered in determining the number of vehicular trips associated with construction workers traveling to and from the site. First, to be conservative it was assumed that no construction workers would utilize mass transit to get to/from the site. Second, it was conservatively assumed that twenty-five percent of the construction workers would be arriving during the Peak AM Roadway Hour. This is extremely conservative, since the Peak AM Roadway Hour (7:45 to 8:45 AM) does not begin until forty-five minutes after the construction workers will begin work (7:00 AM). One hundred percent of construction workers were assumed to be departing during the Peak PM Roadway Hour. Finally, an average vehicle occupancy of 1.2 persons per vehicle was applied to the total amount of construction workers traveling to and from the site by their own means of transportation, although this number tends to be higher for construction workers. Considering these assumptions, Table 13.6 lists the amount of traffic due to construction workers and truck traffic, traveling to and from the site during morning and evening peak periods.

Table 13.6: Construction Generated Traffic Volumes During Peak Construction Period

	PEAK AM		PEAK PM	
	Enter	**Exit**	**Enter**	**Exit**
Construction Worker Trips	73	0	0	292
Truck Trips	10	5	5	10
Totals	**83**	**5**	**5**	**302**

Since the Peak AM Roadway Hour (7:45 to 8:45 AM) does not begin until forty-five minutes after the construction workers will begin work (7:00 AM) the hour of 6:30 to 7:30 AM was analyzed. To ensure an adequate assessment of impacts, a worst case scenario was addressed which assumed that one-hundred percent of the construction workers would be arriving at the site during this hour and that they would be arriving at an average vehicle occupancy of 1.2 persons per vehicle, Table 13.7 lists the amount of traffic due to construction during the hour of 6:30 to 7:30 AM.

Table 13.7: Construction Generated Traffic Volumes During Peak Construction Period (6:30 AM to 7:30 AM)

	6:30 to 7:30 AM	
	Enter	**Exit**
Construction Worker Trips	292	0
Truck Trips	10	5
Total	**302**	**5**

The arrival/departure patterns for the traffic to be generated during construction of the proposed facility were determined based upon review of the existing roadway traffic network and patterns in the vicinity of the site. These patterns are illustrated in Figures 13-7 and 13-8. Construction-generated traffic volumes during the Peak Construction Period and the 6:30 AM and 7:30 AM hour were distributed to the roadway with the assumption that heavy vehicles will be travelling to/from the site along 20th Avenue. The resultant construction-generated traffic volumes are illustrated in Figures 13-9 and 13-10. The Construction-generated traffic volumes were then added to the 2003 projected background traffic volumes to determine the 2003 peak construction traffic volumes as shown in Figures 13-11 and 13-12.

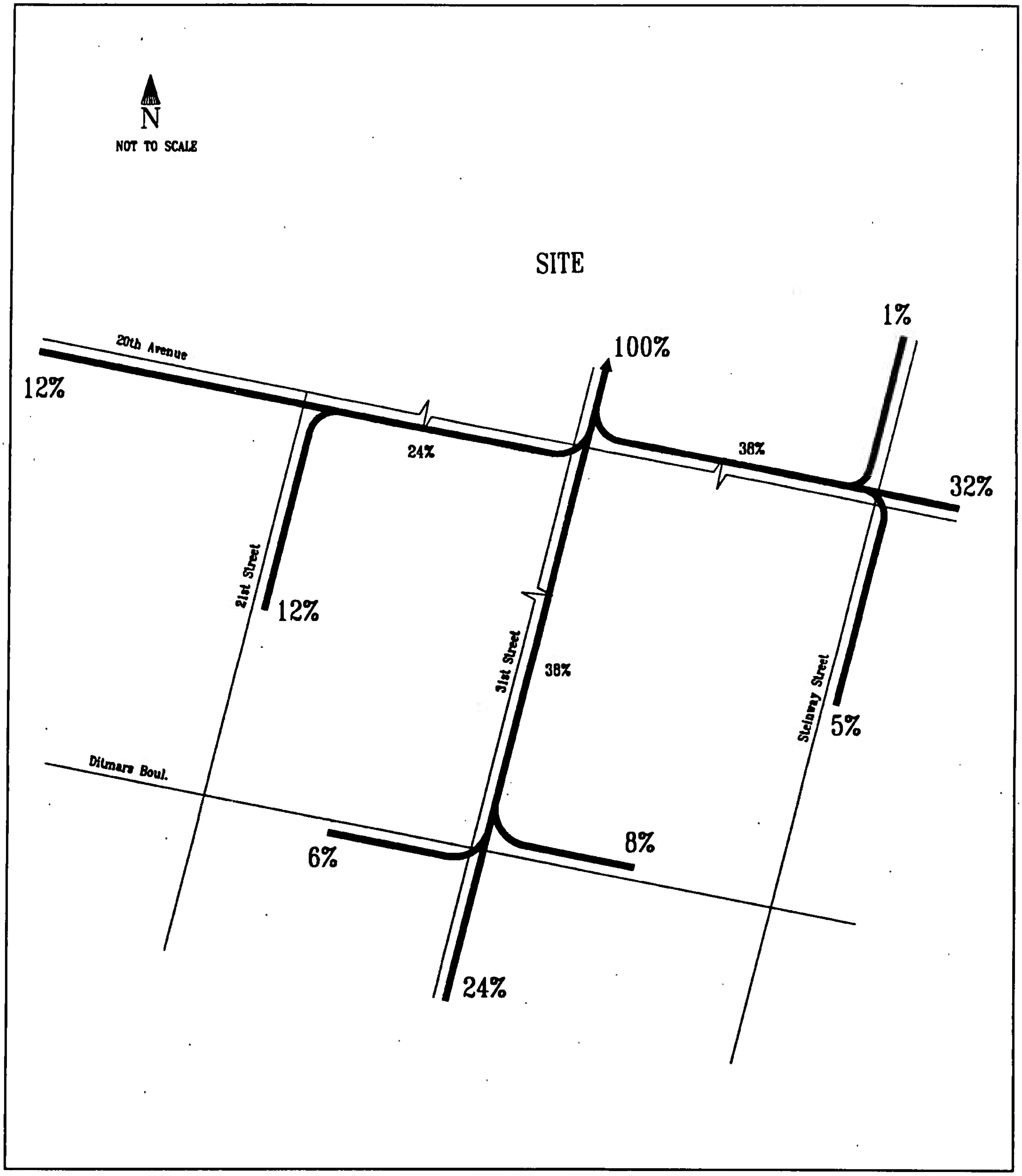


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Figure 13-7. Construction Arrival Distribution

Source: TRC Raymond Keyes, May 2000

TRC

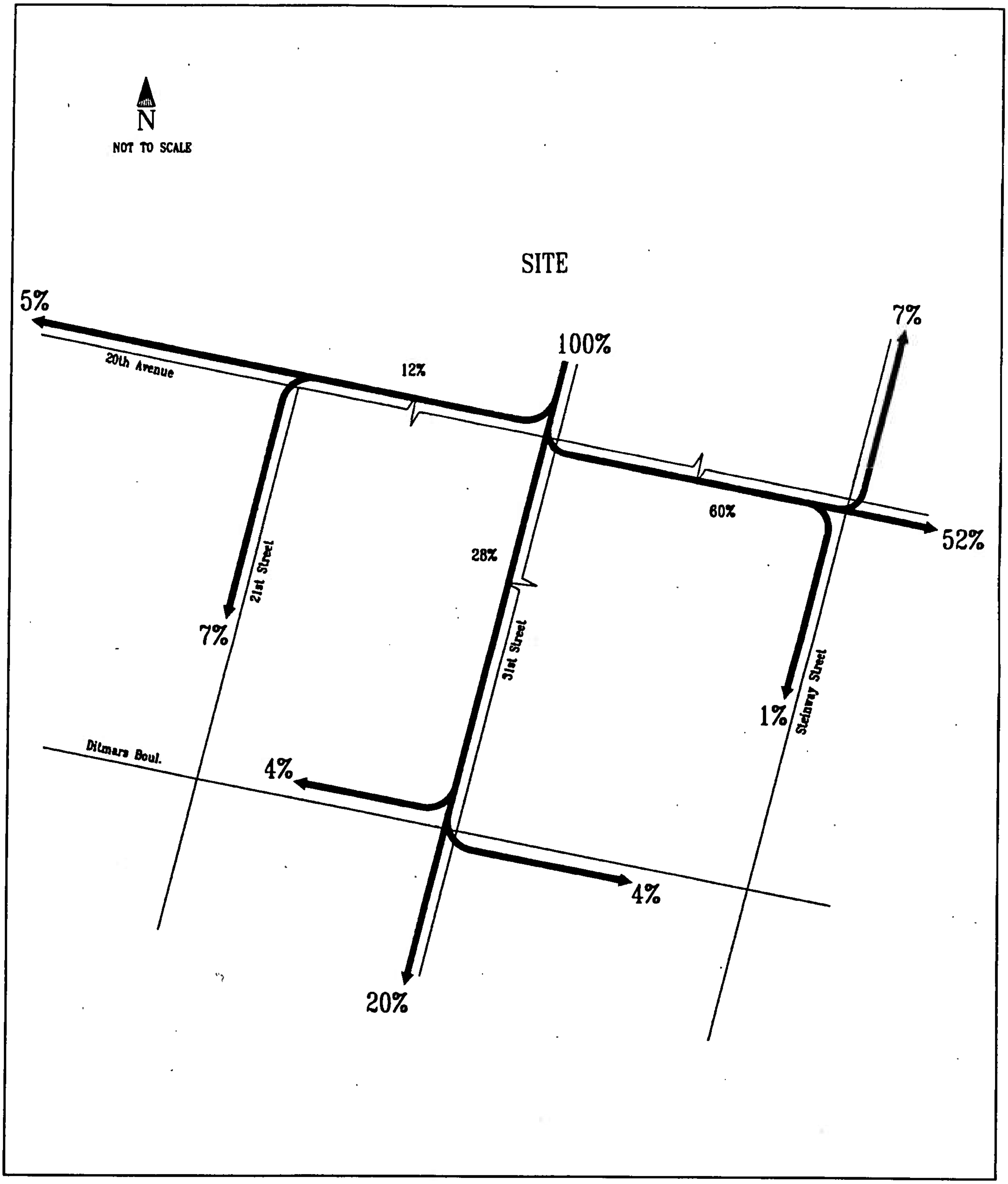

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Figure 13-8. Construction Departure Distribution

Source: TRC Raymond Keyes, May 2000

TRC

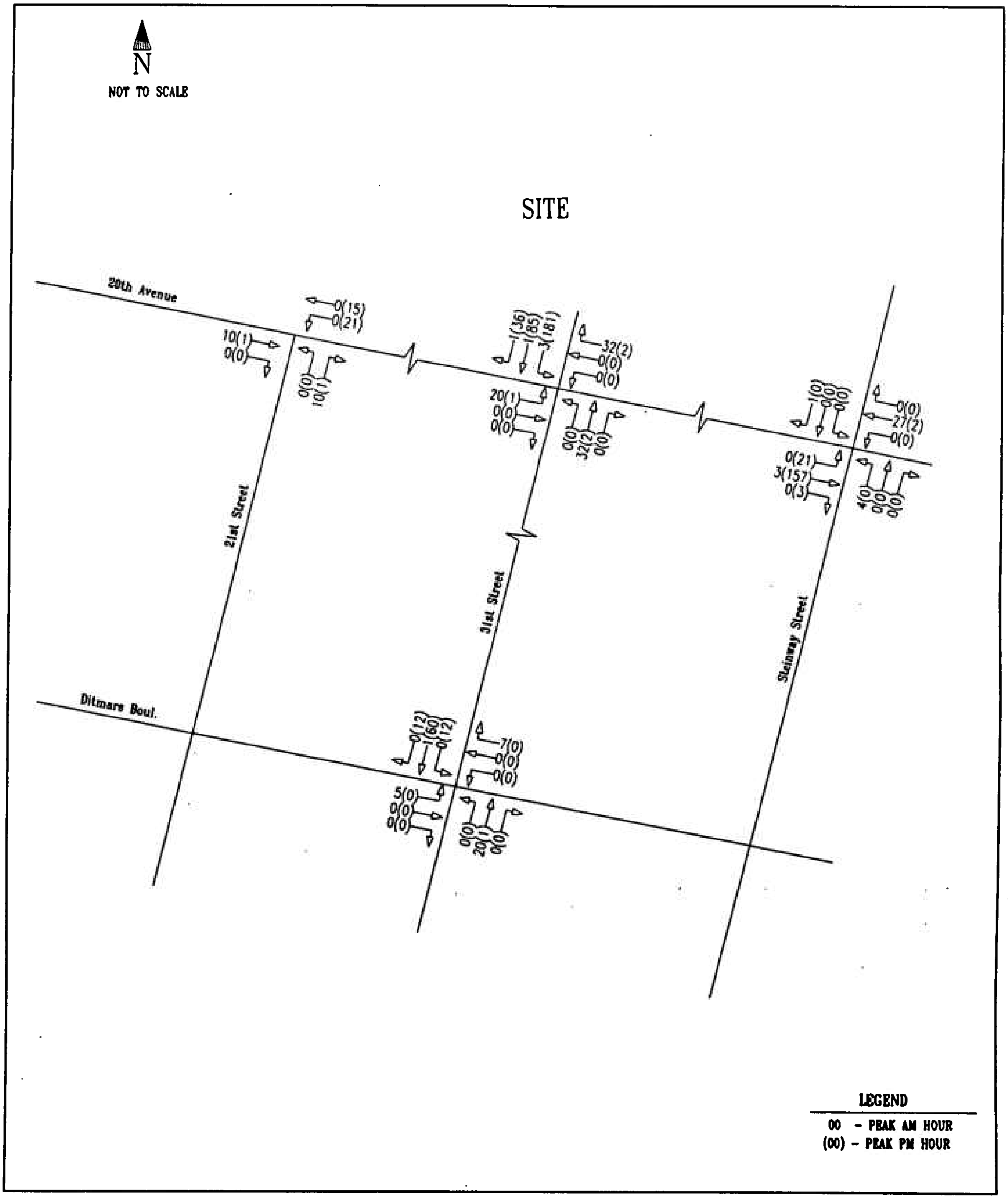

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Figure 13-9. Construction Generated Traffic Volumes: Peak Hour

Source: TRC Raymond Keyes, May 2000

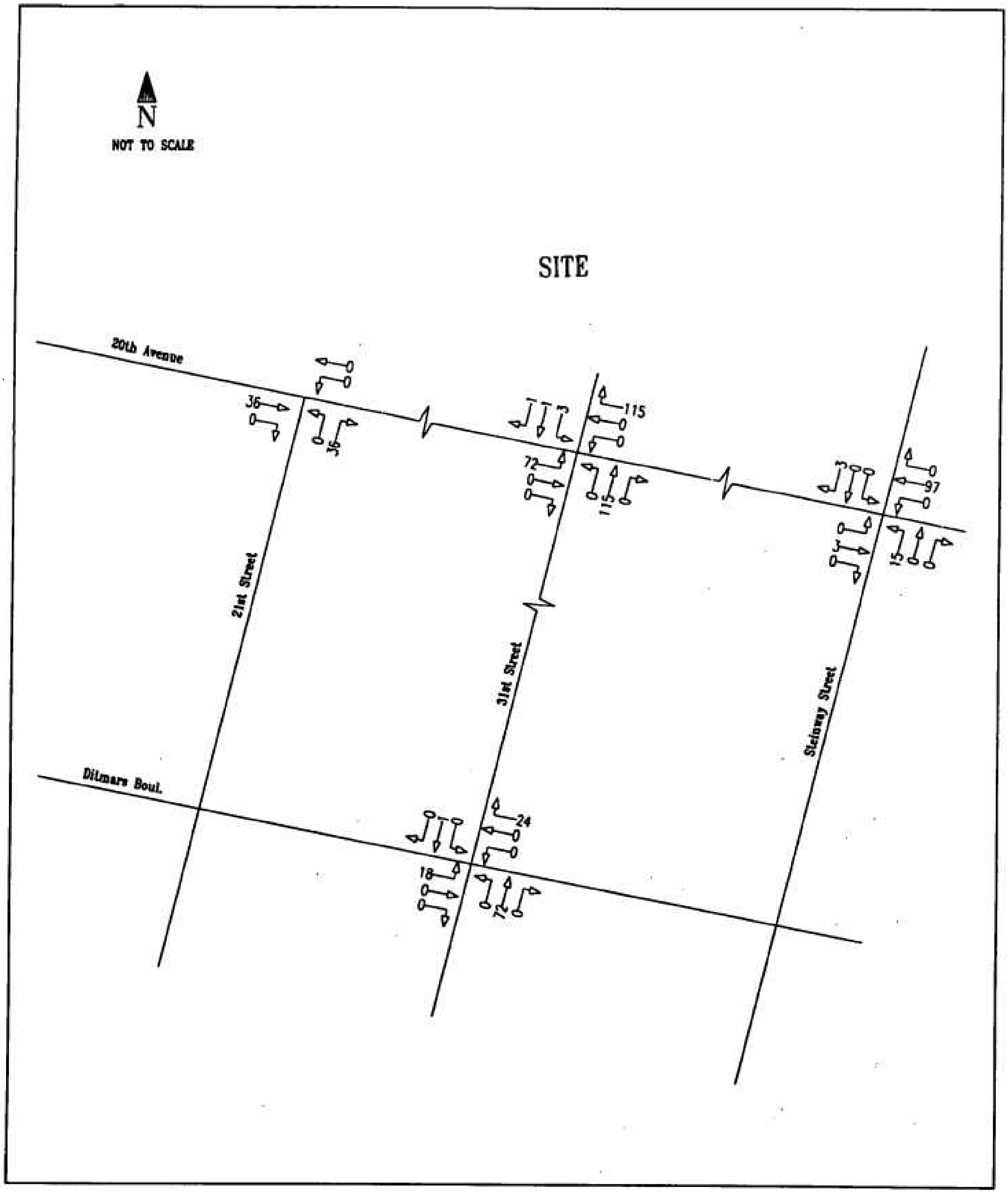

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Figure 13-10. Construction Generated Traffic Volumes: 6:30 to 7:30 AM

Source: TRC Raymond Keyes, May 2000

TRC

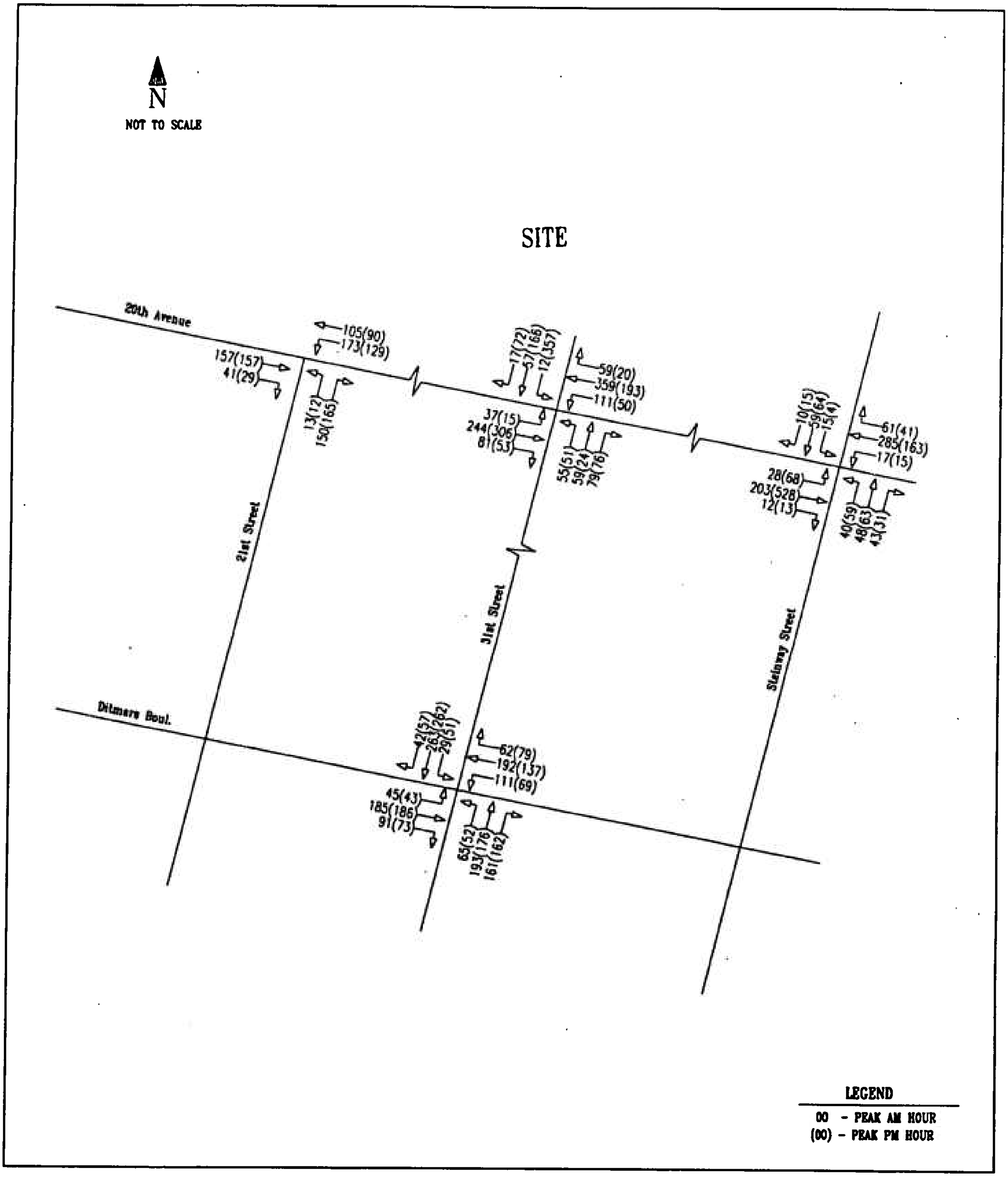

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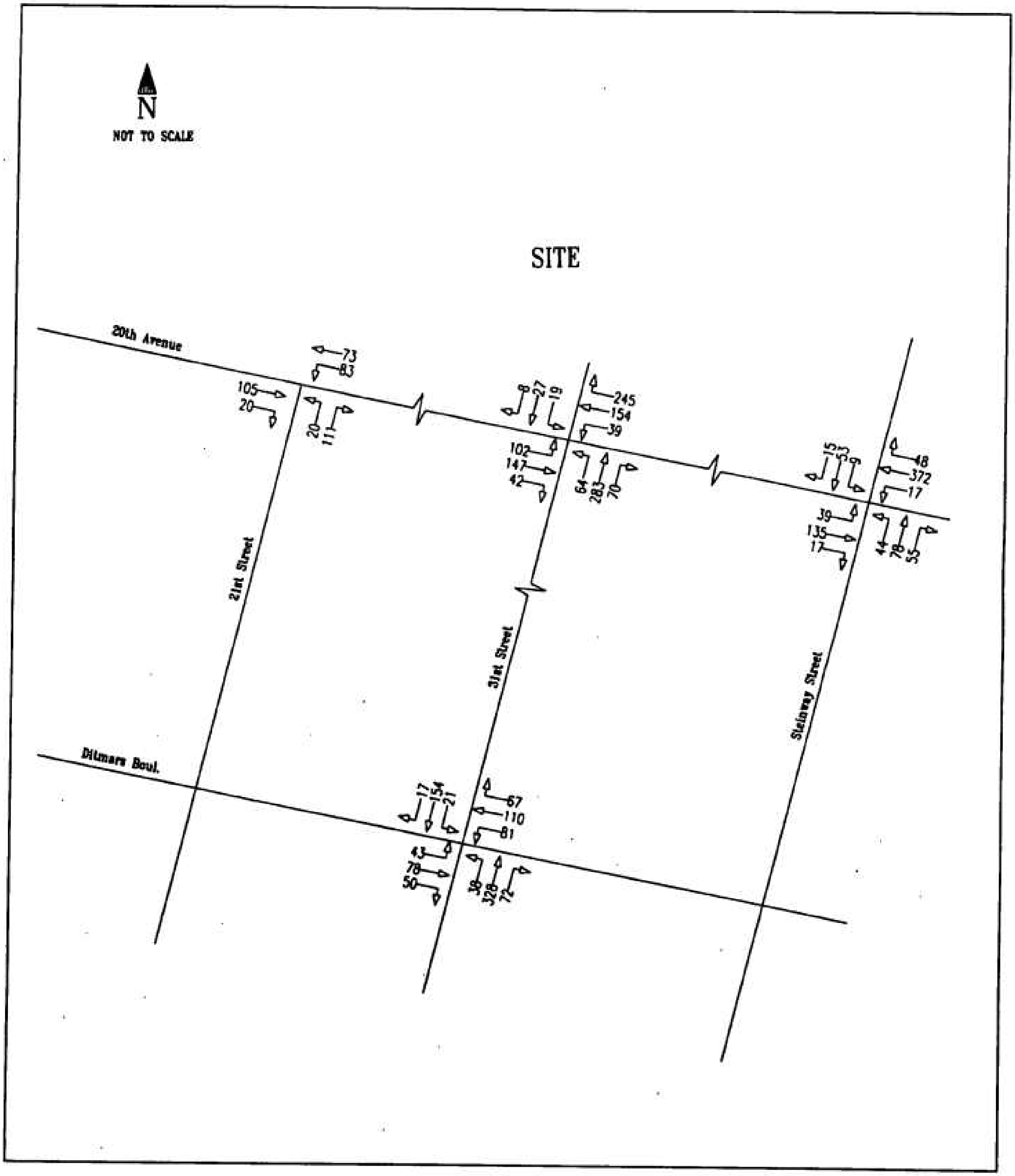
Figure 13-11. 2003 Construction Traffic Volumes: Peak Hour

Source: TRC Raymond Keyes, May 2000

TRC



TRC

New York Power Authority
Combined Cycle Project
Astoria, Queens, NY

Figure 13-12. 2003 Peak Construction Traffic Volumes: 6:30 to 7:30 AM

Source: TRC Raymond Keyes, May 2000

Capacity analyses were conducted for all the key study locations for the 2003 peak construction condition. To ensure an adequate assessment of potential impacts, both the morning and evening peak periods as well as the 6:30 to 7:30 AM hour were evaluated. As indicated in Tables 13.8 through Table 13.10, all of the intersections will continue to operate at acceptable Levels of Service (A – D) for all time periods. In order to obtain these acceptable Levels of Service, signal timing modifications need to be made at the intersections of Steinway Street and 20th Avenue, and 31st Street/Main Site Entrance and 20th Avenue during the Peak PM Hour. These signal timing modifications would only be a temporary adjustment, since the Peak Construction Period is only anticipated to occur for a few months. However, the westbound approach at the intersection of 31st Street and Ditmars Boulevard continues to operate at Level of Service "E" during the morning and evening peak hours. It should be noted that this approach would operate at Level of Service "E" both with and without the project construction during these periods. The approach would operate at LOS B during the 6:30 to 7:30 AM hour.

Table 13.8: Level of Service Summary – 2003 AM Peak Construction Period

Intersection	Approach	No-Build			Build		
		LOS	Delay	V/C	LOS	Delay	V/C
31st Street @ Ditmars Blvd.	Eastbound	C	16.2	0.676	C	17.3	0.709
	Westbound	E	49.5	0.989	E	55.6	1.012
	Northbound	C	17.1	0.693	C	17.8	0.719
	Southbound	B	13.8	0.515	B	13.9	0.523
	Overall	C	24.3	0.844	D	26.3	0.869
Steinway Street @ 20th Avenue	Eastbound	B	9.6	0.404	B	9.6	0.414
	Westbound	B	10.7	0.538	B	11.1	0.579
	Northbound	B	6.8	0.208	B	6.8	0.215
	Southbound	B	6.6	0.157	B	6.6	0.159
	Overall	B	9.3	0.361	B	9.5	0.383
21st Street @ 20th Ave.	Northbound L	b	8.2	-	b	8.3	-
	Northbound R	a	3.8	-	a	3.9	-
	Northbound Overall	a	4.2	-	a	4.3	-
	Westbound L	a	3.1	-	a	3.2	-
	Westbound Overall	a	1.9	-	a	2.0	-
	Overall	a	1.9	-	a	1.9	-
31st Street/Main Entrance @ 20th Avenue	Eastbound	B	7.3	0.513	B	8.9	0.628
	Westbound	C	23.3	0.917	D	35.0	0.983
	Northbound	B	10.2	0.271	B	10.4	0.317
	Southbound	B	9.6	0.121	B	9.6	0.131
	Overall	C	15.3	0.654	C	21.0	0.712

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

Table 13.9: Level of Service Summary - 2003 PM Peak Construction Condition

Intersection	Approach	NO-BUILD			BUILD		
		LOS	DELAY	V/C	LOS	DELAY	V/C
31st Street @ Ditmars Blvd.	Eastbound	C	15.1	0.634	C	15.1	0.634
	Westbound	C	17.4	0.703	C	17.4	0.703
	Northbound	C	15.8	0.640	C	16.4	0.666
	Southbound	B	13.3	0.474	C	15.5	0.622
	Overall	C	15.4	0.672	C	16.1	0.685
Steinway Street @ 20th Avenue (1)	Eastbound	B	13.0	0.693	C	17.2	0.860
	Westbound	B	9.4	0.373	B	7.5	0.358
	Northbound	B	7.0	0.256	B	8.9	0.298
	Southbound	B	6.6	0.150	B	8.4	0.174
	Overall	B	10.5	0.458	B	13.3	0.600
21st Street @ 20th Ave.	Northbound L	b	6.5	-	b	7.1	-
	Northbound R	a	4.0	-	a	4.0	-
	Northbound Overall	a	4.1	-	a	4.2	-
	Westbound L	a	2.9	-	a	3.0	-
	Westbound Overall	a	1.7	-	a	1.8	-
	Overall	a	1.9	-	a	1.9	-
31st Street/Main Entrance @ 20th Avenue (1)	Eastbound	B	7.3	0.515	B	13.7	0.691
	Westbound	B	7.0	0.460	B	12.4	0.604
	Northbound	B	10.4	0.298	B	6.8	0.306
	Southbound	B	13.1	0.605	C	20.9	0.904
	Overall	B	9.2	0.551	C	15.8	0.810

(1) Build condition reflects temporary adjusted timings.

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

Table 13.10: Level of Service Summary - 2003 AM Peak Construction Condition (During the Hour of 6:30 to 7:30 AM)

Intersection	Approach	NO-BUILD			BUILD		
		LOS	DELAY	V/C	LOS	DELAY	V/C
31st Street @ Ditmars Blvd.	Eastbound	B	11.1	0.315	B	11.7	0.390
	Westbound	B	13.4	0.535	B	14.5	0.596
	Northbound	B	14.0	0.533	C	15.4	0.629
	Southbound	B	11.7	0.289	B	11.9	0.306
	Overall	B	12.9	0.534	B	13.9	0.612
Steinway Street @ 20th Avenue	Eastbound	B	9.3	0.354	B	9.4	0.379
	Westbound	B	10.6	0.535	B	12.7	0.680
	Northbound	B	7.0	0.255	B	7.1	0.286
	Southbound	B	6.5	0.137	B	6.6	0.145
	Overall	B	9.1	0.385	B	10.3	0.469
21st Street @ 20th Ave.	Northbound L	b	5.4	-	b	5.7	-
	Northbound R	a	3.1	-	a	3.4	-
	Northbound Overall	a	3.6	-	a	3.7	-
	Westbound L	a	2.5	-	a	2.6	-
	Westbound Overall	a	1.3	-	a	1.4	-
	Overall	a	1.6	-	a	1.7	-
31st Street/Main Entrance @ 20th Avenue	Eastbound	B	6.2	0.338	B	10.7	0.686
	Westbound	B	7.3	0.506	B	10.3	0.706
	Northbound	B	11.3	0.459	B	13.0	0.619
	Southbound	B	9.5	0.088	B	9.5	0.103
	Overall	B	8.5	0.486	B	11.3	0.670

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

13.3.3 2004 Traffic Volumes and Level of Service Analysis

A conservative compounded growth rate of 1.5% per year was projected for the existing traffic volumes to form the Year 2004 traffic volumes. Thus, the existing traffic volumes were conservatively projected to the final Build Year 2004 by applying a total growth factor of more than 6%. The resulting 2004 projected traffic volumes are illustrated on Figure 13-13. The trip generation for the proposed facility is not anticipated to increase significantly. Since there will be no increase in site traffic due to the operation of the proposed facility, the 2004 projected traffic volumes represent the 2004 No-Build and 2004 Build conditions.

Capacity analyses for the 2004 projected traffic volumes were conducted for all key study locations. The results of these analyses are presented in Table 13.11.

13.3.4 Comparison of Analyses

To illustrate that the project will not have significant impacts with regard to traffic operations, Table 13.12 compares the 2000 Existing Condition, 2003 Projected Background Condition, 2003 Projected Peak Construction Condition, and 2004 Condition With or Without Project analyses. As illustrated in Table 13.12, no Level of Service (LOS) changes are anticipated between any of the conditions at the intersections of Steinway Street & 20th Avenue, and 21st Street & 20th Avenue.

The intersection of 31st Street/Main Entrance and 20th Avenue experiences Level of Service changes during the Peak AM Hour, between the 2000 Existing Condition and the 2003 Condition Without Project Construction, and during the Peak PM Hour, between 2003 Condition Without Project Construction and the 2003 Peak Construction condition. The Level of Service change during the Peak AM Hour will occur with or without the proposed project in place. The deterioration in Level of Service during the Peak PM Hour is due to construction worker traffic and will only be temporary. The overall Level of Service at this intersection is always at an overall acceptable Level of Service (A – C), and therefore, no mitigation is recommended.

The intersection of 31st Street and Ditmars Boulevard experiences Level of Service changes during the Peak AM Hour between the 2003 Condition Without Project Construction, and the 2003 Peak Construction Condition, and during the Peak PM hour between the 2000 Existing Condition and the 2003 Condition Without Project Construction. The Level of Service change during the Peak AM Hour is from Level of Service "C" to Level of Service "D". This is still an acceptable Level of Service, and the intersection is projected to experience an overall Level of Service "D" under the 2004 condition with or without the proposed project. The Level of Service change during the Peak PM Hour is simply due to background traffic from the 2000 Existing Condition to the 2003 No-Build

Condition and therefore, would occur with or without the proposed project. Accordingly, no mitigation is recommended.

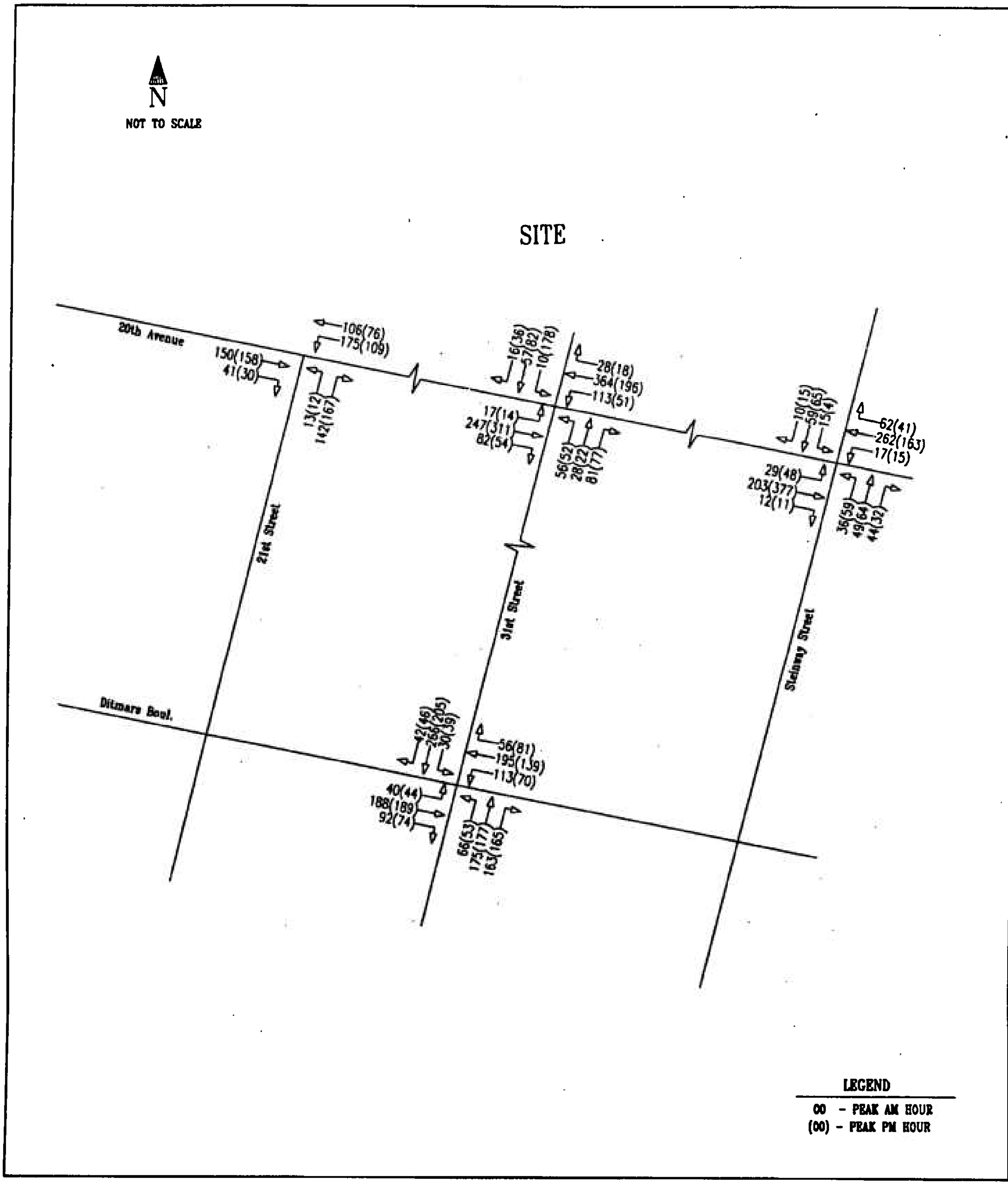
13.3.5 Cumulative Traffic Impacts

Considering the proximity of the proposed Combined Cycle Project and the proposed Astoria Energy Project located at the existing Castle Oil Facility in the Steinway section of Queens, a qualitative cumulative impacts assessment was conducted, accounting for the possibility if both projects' peak construction periods would occur simultaneously.

The construction of the proposed Astoria Energy Project is currently planned to peak in the year 2002 while NYPA's Combined Cycle Project is proposed to have its peak construction period in the year 2003. Even if the two peak construction periods overlap, there would be a limited number of locations where a portion of the traffic from both projects would exist simultaneously, mainly only the intersection of Steinway Street and 20th Avenue. This potential overlap is accounted for in the conservative assumptions that were used to develop background traffic volume projections for the capacity analysis, including a conservative compounded growth rate of 1.5% per year for the three-year period (i.e., 2000 to 2003).

In addition, it is envisioned that construction workers for the proposed Astoria Energy Project will be bused to the work site from an off-site location, thereby minimizing any traffic impacts that would occur at any of the locations, including the intersection of Steinway Street and 20th Avenue. It should also be noted that the existing Castle Oil Facility's site traffic utilizing the intersection of Steinway Street and 20th Avenue would no longer be doing so, once construction commenced. However, to be conservative, this traffic was not removed from the roadway network when developing future background traffic volumes.

In conclusion, the conservative assumptions used in developing future background traffic volumes account for the possible overlap of construction associated with the proposed Combined Cycle Project and the nearby Astoria Energy Project, and no significant cumulative traffic impacts are anticipated.



New York Power Authority
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Figure 13-13. 2004 No-Build/Build Traffic Volumes

Source: TRC Raymond Keyes, May 2000

TRC

Table 13.11: Level of Service Summary – 2004 Projected Traffic Volumes

Intersection	Approach	AM			PM		
		LOS	Delay	V/C	LOS	Delay	V/C
31st Street @ Ditmars Blvd.	Eastbound	C	16.5	0.687	C	15.4	0.646
	Westbound	E	58.1	1.020	C	17.9	0.717
	Northbound	C	17.4	0.704	C	16.0	0.652
	Southbound	B	13.9	0.526	B	13.4	0.483
	Overall	D	26.8	0.866	C	15.7	0.685
Steinway Street @ 20th Avenue	Eastbound	B	9.6	0.414	B	13.3	0.707
	Westbound	B	10.7	0.545	B	9.4	0.377
	Northbound	B	6.8	0.211	B	7.0	0.260
	Southbound	B	6.6	0.159	B	6.6	0.151
	Overall	B	9.3	0.366	B	10.6	0.467
21st Street @ 20th Ave.	Northbound L	b	8.3	-	b	6.6	-
	Northbound R	a	3.8	-	a	4.0	-
	Northbound Overall	a	4.2	-	a	4.2	-
	Westbound L	a	3.1	-	a	2.9	-
	Westbound Overall	a	2.0	-	a	1.7	-
	Overall	a	1.9	-	a	1.9	-
31st Street/Main Entrance @ 20th Ave.	Eastbound	B	7.4	0.519	B	7.4	0.523
	Westbound	D	26.0	0.936	B	7.1	0.472
	Northbound	B	10.2	0.277	B	10.4	0.304
	Southbound	B	9.6	0.124	B	13.3	0.615
	Overall	C	16.6	0.668	B	9.3	0.561

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

Table 13.12: Overall Level of Service Comparison

Intersection	LOS (Delay) 2000 Existing Condition AM	PM	2003 Condition without Project Construction AM	PM	2003 Peak Construction Condition AM	PM	2004 Condition with or Without Project AM	PM
31st Street/Main Entrance @ 20th Ave.	B 12.9	B 8.9	C 15.3	B 9.2	C 21.0	C (1) 16.9	C 16.6	B 9.3
31st Street @ Ditmars Blvd.	C 20.4	B 14.8	C 24.3	C 15.4	D 26.3	C 15.7	D 26.8	C 15.7
Steinway Street @20th Avenue	B 9.1	B 10.1	B 9.3	B 10.5	B 9.5	B (1) 14.0	B 9.3	B 10.6
21st Street @ 20th Avenue	a 1.9	a 1.9	a 1.9	a 1.9	a 1.9	a 1.9	a 1.9	a 1.9

(1) Reflects temporary signal timing adjustment.

NOTE: Upper case letters indicate signalized intersections.
Lower case letters indicate unsignalized intersections.

Source: TRC Raymond Keyes Associates, 2000.

13.4 Other Transportation Considerations

13.4.1 Barge Deliveries

Major equipment is intended to be shipped by barge to minimize impacts on the surrounding community due to transportation of heavy machinery. A typical barge for handling equipment such as generator or turbine will be 200 feet long by 40 feet wide with 10-foot draft or 200 feet long by 48 feet wide with 12-foot draft. Both types of barges would be equipped with a 50 to 60 foot long ramp. The barges will be docked west of the Foam Pump House at the site and the ramp lowered to establish a bridge to the shore. Land based crane will be used to unload the equipment off the barge.

Barge traffic is common on the East River in the site area. The U.S. Coast Guard regulates barge traffic and safety on the East River. The Coast Guard has indicated that three additional barges a day would have little effect on the East River Harbor activities. As a result, use of barges for the project construction will have no adverse effect on navigation in the East River.

13.4.2 La Guardia Airport

La Guardia Airport is located in the Borough of Queens approximately 1.5 miles southeast of the proposed project site. La Guardia Airport has been operated by the Port Authority of New York and New Jersey under a lease with New York City since June 1, 1947. The airport consists of 680 acres and 72 aircraft gates. There are two main runways (4-22 and 13-31) each measuring 7,000 feet long by 150 feet wide. Five hangars are located at La Guardia with space for the following airlines: Delta, United, TWA, Northwest and American. La Guardia Airport is one of three major airports in the New York metropolitan region, serving more than 22 million air travelers annually.

Considering the height and location of the proposed Project stack, a Notification of Construction or Alteration was submitted on April 11, 2000 for review and approval by the Federal Aviation Administration (FAA). The FAA conducted an aeronautical study and on June 1, 2000, issued initial findings that indicated the Project as originally proposed (i.e., stack height of 287.5 feet) would exceed obstruction standards. These initial findings were reviewed with the FAA at a meeting on July 14, 2000, and the stack height was subsequently reduced to 250 feet. The FAA will issue a Public Circular to solicit comments from the aviation community regarding the proposed Project and will issue a final determination following review of the public comments. Copies of the various documents and correspondence regarding the FAA are included in Appendix 13F of this Application.

13.4.3 Mass Transit

There are a number of mass transit opportunities within the project area. A station for the Metropolitan Transit Authority (MTA) New York City Subway "N – Broadway Local" line is located at Ditmars Boulevard and 31st street approximately one mile south of the project site. The subway line originates at Ditmars Boulevard and serves the Astoria and Long Island City sections of Queens, southern Manhattan and Brooklyn, terminating at Stillwell Avenue, Coney Island. Numerous opportunities for bus and rail transfers exist along the line.

MTA Bus service within the project area includes the M60 line, which runs along Astoria Boulevard and provides service between Manhattan's Upper West Side and La Guardia Airport, and the 19A line, which runs along Ditmars Boulevard and provides service between Queensboro Plaza subway station and Astoria Boulevard at 82nd Street. No bus service operates along 20th Avenue serving the proposed project site.

No significant impacts to the operation of mass transit systems are anticipated as a result of the proposed facility.

13.5 References

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Section 14

Section 14

14.0 SOCIOECONOMICS

14.1 Introduction and Methodology

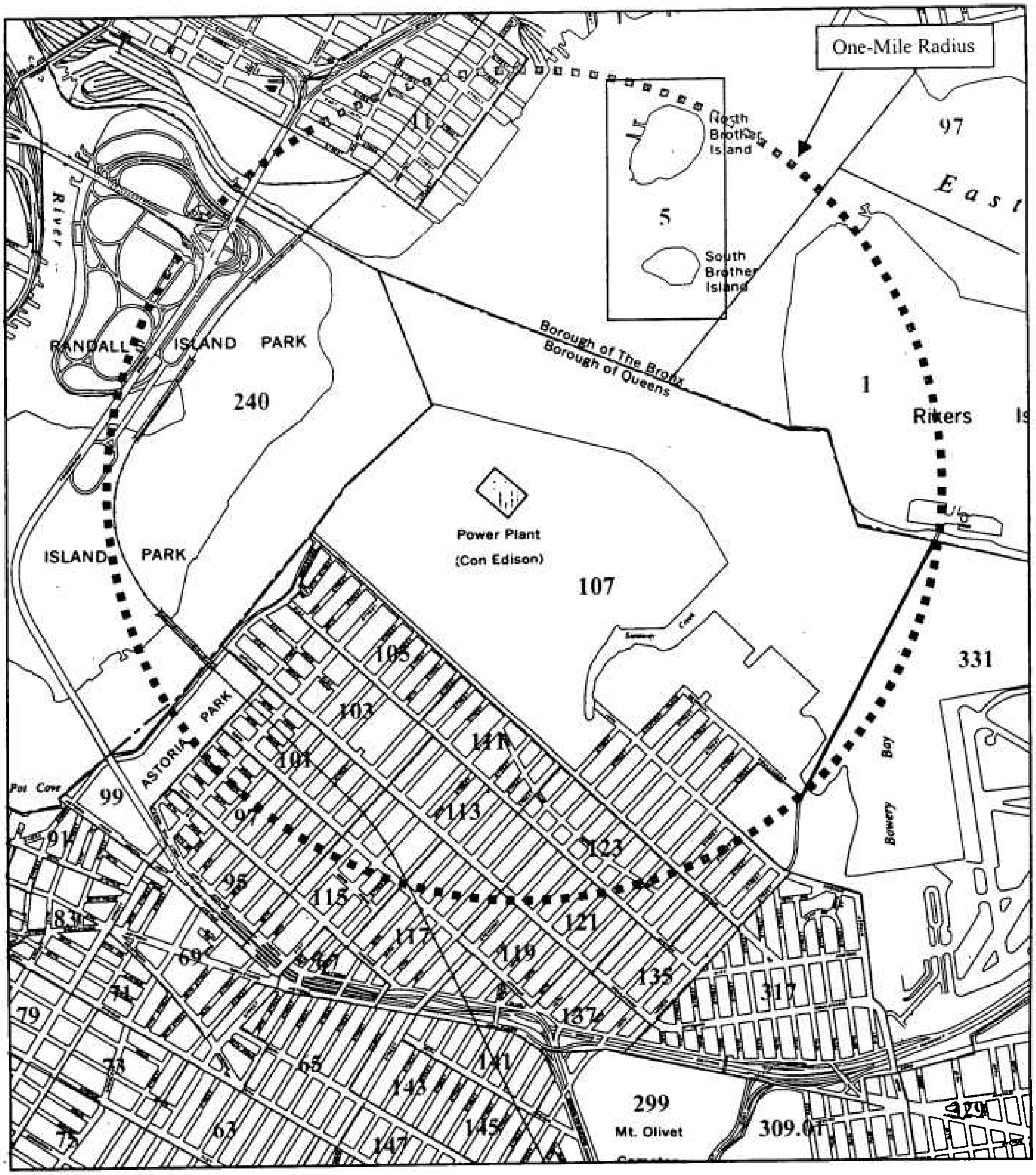
This section addresses the socioeconomic environment and socioeconomic impacts of construction and operation of the NYPA 500 MW Combined-Cycle Project. Demographics, employment, industries, and community services are addressed. Environmental justice issues were also considered and evaluated. Data was obtained from New York City agencies, New York State agencies, Department of City Planning, and the U.S. Bureau of the Census. The socioeconomic analysis area included portions of Bronx, New York, and Queens Counties within 1.0 mile of the proposed Project site. For the evaluation of environmental justice, 1989 and 1990 Bureau of the Census data was used because this is the best source of data on minority populations, income levels, and poverty status. When applicable, mitigation measures are proposed to reduce potential impacts.

Census tract data was analyzed at two levels: (1) Census tract 107, which includes the proposed Project site and surrounding lands; and (2) 17 census tracts within 1.0 mile of the proposed Project site (see Figure 2.1). For comparison purposes data was collected at regional geographic levels for New York state, the New York / New Jersey Metropolitan Statistical Area, Bronx County, Queens County, and New York County.

14.2 Existing Demographic and Economic Characteristics

The proposed Project site occurs within the boundaries of Community District 1 in the Borough of Queens, New York City. The demographic trends in Community District 1 are similar to those in the remainder of Queens and those in the city as a whole (see Table 14.1). Queens Community District 1 and the City of New York lost population during the 1970-80 decade and gained population during the 1980-90 decade. Most of the analysis area within 1.0 mile of the Project site occurs in Queens Community District 1. Other districts within 1.0 mile of the proposed Project site include Bronx Community District 1 and Manhattan Community District 11. Racial and income characteristics of the analysis area are presented in Section 14.3 under environmental justice.

Non-farm employment in 1997 included 608,532 jobs in Queens (Bureau of Economic Analysis, 1999). The largest employing economic sectors in the county are services (36.3%), retail trade (14.5%), and transportation/public utilities (14.0%). As of April 2000, the unemployment rate for New York City was 5.5% (New York Department of Labor, 2000a). Private sector jobs increased by 10% from July 1993 through July 1998 (New York City, Office of Operations, 1998). Approximately 44% of New York state's private sector employment occurs in New York City (New York City, Office of Management and Budget, 2000a).



New York Power Authority
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Figure 14-1. Census Tracts
Scale: 1" = 2000'

Source: NYC Dept. of Planning Sectional Maps

TRC

Table 14.1: Community District, Borough and New York City Population Trends

Location	1970	Percent Change 1970-80	1980	Percent Change 1980-90	1990
New York City	7,895,900	-10.4%	7,071,639	3.5%	7,322,564
Bronx	1,471,700	-20.6%	1,168,972	3.0%	1,203,789
Bronx Community District 1	138,600	-43.4%	78,441	-1.6%	77,214
Manhattan	1,532,200	- 6.8%	1,428,285	4.1%	1,487,536
Manhattan Community District 11	154,700	-25.9%	114,569	-3.5%	110,508
Queens	1,986,500	-4.8%	1,891,325	3.2%	1,951,598
Queens Community District 1	194,500	-4.8%	185,198	1.8%	188,549

Source: New York City, Department of City Planning (1998a, 1998b, 1998c)

Employment opportunities near the proposed Project site are primarily in the transportation/public utilities, industrial economic, and local government sectors. Major employers include the Con Edison Astoria Plant, Bowery Bay Water Pollution Control Plant, Steinway Piano Factory, Castle Astoria Terminal, and Riker's Island correctional facility (New York City, Department of City Planning, 1993). The Con Edison Astoria Plant's property surrounds the proposed Project site and includes the Orion Astoria Station and a docking facility to receive oil shipments. Con Edison, Orion and NYPA employ approximately 1,300 people at this location. The Castle Astoria Terminal, located approximately 0.6 miles southeast of the proposed Project site, is a petroleum storage facility that employs 19 people. The Steinway Piano Factory, on the northwest corner of 19th Avenue and 38th street, employs 450 people. Riker's Island correctional facility houses approximately 16,000 prisoners and has a staff of 6,000-7,000 to operate the facility.

Other employment centers occur on Randalls Island, approximately 0.6 miles west of the Project site. The New York City Fire Department Training Academy, Ward's Island Sewage Treatment Plant, and J.J. Downing Memorial Stadium are located on the island within 1.0 mile of the proposed Project site.

14.3 Environmental Justice

Executive Order 12898 requires federal agencies to consider disproportionate adverse human health and environmental impacts on minority and low-income populations as part of National Environmental Policy Act analysis. A review of environmental justice concerns has been incorporated into this socioeconomic analysis. Public participation is also considered a key process for incorporating environmental justice concerns (Environmental Protection Agency, 1998).

14.3.1 Minority and Income Status

New York State, New York County, and Queens County have a white majority, with large African-American and Hispanic populations (see Table 14.2). The Project site is located within census tract 107, which is sparsely populated. No residences occur adjacent to or with 0.2 miles of the proposed Project site. The census tracts within 1.0 mile have minority representation similar to Queens County with a somewhat higher African-American (24.1%) and Hispanic (24.8%) representation than the county as a whole.

Incomes tend to be lower in the 17 census tracts closest to the proposed Project site, but the poverty rates are similar, 10.8% for Queens County and 9.7% for the 17 census tracts (see Table 14.3).

14.3.2 Public Involvement

In connection with environmental justice, meetings were held with the public. Issues identified by the public included the following:

- Concerns about air quality and burning natural gas;
- The proposed Project ability to meet increased electricity demand;
- Concerns about health effects, especially asthma and emphysema;
- Large number of existing plants in the area and limitations on building new plants;
- Consideration of expanding energy efficiency programs;
- Visual resource concerns related to facility stacks;
- Circumstances when oil will be burned;
- Questions about water quality and discharges, including impacts to fish;
- Potential for waterfront access;
- Influence of NYPA on other power producers in Queens;
- Affect on property taxes.

These issues have been addressed elsewhere in the Article X Application. Mitigation measures for air quality (Chapter 5), surface water resources (Chapter 7), visual resources (Chapter 10), noise (Chapter 12), and traffic and transportation (Chapter 13) were developed to respond to issues identified by the public.

Table 14.2: 1990 Population, Race, and Hispanic Origin

Location	Total Persons	Racial and Hispanic Origin Representation					
		White	African-American	Native American	Asian/ Pacific Islander	Other Race	Hispanic Origin, Any Race
New York State	17,990,455	74.5%	15.9%	0.3%	3.8%	5.5%	12.0%
New York / New Jersey Metropolitan Statistical Area	11,463,705	64.7%	21.5%	0.3%	5.4%	8.1%	17.6%
Bronx County	1,203,789	35.8%	37.5%	0.4%	2.8%	23.4%	42.3%
New York County	1,487,536	58.4%	22.0%	0.3%	7.4%	11.9%	25.6%
Queens County	1,951,598	57.9%	21.7%	0.3%	12.2%	7.9%	19.0%
Census Tract 107 at Proposed Project Site	83	100.0%	0.0%	0.0%	0.0%	0.0%	12.0%
17 Census Tracts Within 1.0 Mile of Proposed Project Site	50,766	59.5%	24.1%	0.4%	4.9%	11.1%	24.8%

Source: Bureau of the Census (1990)

Table 14.3: 1989 Income and Poverty Status

Location	Median Family Income	Per Capita Income	Percent Population in Poverty
New York State	$ 39,741	$16,501	12.7%
New York / New Jersey Metropolitan Statistical Area	$ 42,434	$ 18,131	13.9%
Bronx County	$25,479	$10,535	27.8%
New York County	$ 36,831	$ 27,862	20.0%
Queens County	$ 40,426	$ 15,348	10.8 %
Census Tract 107 at Proposed Project Site	$39,167	$9,718	14.5%
17 Census Tracts Within 1.0 Mile of Proposed Project Site	$ 25,473	$10,885	9.7%

Source: Bureau of the Census (1990)

14.4 Community Services and Facilities

14.4.1 Local Government

The proposed Project site occurs within the Borough of Queens, City of New York. The site is in Queens Community District 1 and Queen City Council District 22. Portions of Bronx Community District 1 and Manhattan Community District 11 occur within 1.0 mile of the proposed Project site. Services provided locally, which may be directly affected by the Project, include transportation, water, police, fire, emergency services, and solid waste. In addition, a wide range of services are provided in areas within 1.0 mile of the proposed Project site including education, parks and recreation, housing, and social services.

The City of New York spent $36,108 million during fiscal year 1999, and the forecasted expenditure for fiscal year 2000 is $38,390 million (New York City, Office of Management and Budget, 2000b). Project principal sources of Fiscal Year 2000 revenue for the city include $7,771 million in property taxes, $13,819 million in non-property taxes and other sources such as taxes on sales, personal income, and corporations (New York City, Office of Management and Budget, 2000b). For real property taxes, real property is divided into four tax classes:

- Tax Class 1 – residential one, two, and three family homes;
- Tax Class 2 – residential cooperatives, rental buildings, and rental condominiums;
- Tax Class 3 – utility corporations and special franchises properties;
- Tax Class 4 – stores, warehouses, hotels, and vacant lands (New York City, Department of Finance, n.d.).

Since fiscal year 1994, the average tax rate has been $10.366 per $100 assessed value, and the growth in the New York City's tax levy and revenue has come from a growth in tax base, instead of an increase in the tax rate. Tax Classes 1 and 2 have received increasing shares of the tax levy while Tax Class 4 has received a decreasing share. Tax Class 3 has experienced large fluctuations (New York City, Department of Finance, 2000). Since the Project is operated by NYPA, a state agency, the Project will not pay taxes under an exemption set forth in Section 1012 of the Public Authorities Law.

14.4.2 Police, Fire, and Emergency Services

The proposed Project site is located within the New York Police Department's 114th Precinct's jurisdiction, which serves Queens and Roosevelt Island. The 114th Precinct is headquartered at 34-16 Astoria Boulevard. The site is also located within Fire Engine Company No. 312's district. Area hospitals include Astoria General Hospital located on 30th Avenue and Crescent Street or Elmhurst Hospital located on Broadway and Baxter Avenue.

14.4.3 Solid Waste

Options for disposing of solid waste in New York City are limited. The Fresh Kills landfill in Staten Island is proposed for closure, and incinerators are no longer considered a viable option for solid waste disposal. Solid waste efforts are now focused on increased recycling, waste prevention, and waste export. The Final Scoping Document for the Comprehensive Solid Waste Management Plan, states that all waste generated by the City's commercial businesses and industries is currently managed through existing private transfer facilities and by direct hauls in collection vehicles (New York City, Department of Sanitation, 1999).

14.4.4 Educational Facilities

Only a few schools occur within 1.0 mile of the Project site (see Table 14.4). No schools occur within 0.5 miles of the proposed Project site.

Table 14.4: Principal Educational Facilities within 1.0 Mile of the Proposed Project Area

School	Type	Grades[1]	Location	Enrollment
P.S. 122, Mamie Fay	Public	K-08	21-21 Ditmars Boulevard	1,087
J.H.S. 141, Steinway	Public	6-8	37-11 21st Avenue	1,148
Mater Church High School	Private		21st Avenue and 26th Street	
Immaculate Conception	Private		30th Street and Ditmars Boulevard	

[1]P=preschool, K – Kindergarten, number = grade level

Source of public school data: New York City Board of Education (2000)

14.5 Socioeconomic Impact Assessment

Projects similar to the proposed Project typically create a social and economic impact to an area during construction as well as during operation of the Project. Socioeconomic impacts are evaluated in terms of construction, operation, local government services, and environmental justice. The proposed Project will not have any direct impact on population levels, and the proposed Project will not result in any displacements.

14.5.1 Direct Construction Impacts

Construction of the proposed Project is expected to last approximately 18 months. During construction, 100 to 350 local construction jobs will be created, and the local economy will receive secondary benefits from the purchase of construction materials and other supplies (see Table 14.5). The Project intends to obtain construction labor through only the local labor union hiring halls in the region. The estimated annual construction payroll is $13,468,000 for year 1 and $3,616,200 for year 2 (see Table 14.6).

With the current low unemployment rates, the availability of workers will be tight. New York City's April 2000 unemployment rate was 5.5%, the lowest since 1988 (New York Department of Labor, 2000a). The low unemployment rates in the New York City area and nationwide create a high demand for skilled workers.

Table 14.5: Construction Work Force by Quarter

Quarter	Construction Force
Year 1 – First Quarter	100
Year 1 – Second Quarter	350
Year 1 – Third Quarter	350
Year 1 – Fourth Quarter	350
Year 2 – First Quarter	350
Year 2 – Second Quarter	100

Table 14.6: Annual Construction Payroll Estimates

Period	Average Number of Employees	Number of Months	Average Monthly Wage Per Employee	Total Annual Construction Payroll Estimate
Year 1	288	12	$3,897	$13,468,000
Year 2	225	4	$4,018	$3,616,200

Source: New York Department of Labor (2000b). Wages escalated at 3.1% based on Consumer Price Index for Urban Wager Earners and Clerical Workers, May 1999-May 2000 (Bureau of Labor Statistics, 2000).

In the New York metropolitan area, 123,762 workers were employed in the construction industry in 1998 (New York Department of Labor, 2000b), (see Table 14.7). The growth rate of construction employment may be declining. During the first quarter of 2000, 700 construction jobs were created in New York City. This figure is less than the 1,800 jobs created during the first quarter of 1999 (New York City Office of Management and Budget, 2000c). A construction force of 100 to 350 employees will be needed for the Project (see Table 14.5). The Project can expect a tight construction labor market, but good salaries will make the Project attractive to prospective employees.

Table 14.7: Available Construction Workers

Specialty	Number of Workers
Building Construction	26,073
Non-Building Construction	9,769
Special Trade Contractors	87,920
Total	123,762

Source: New York Department of Labor (2000b)

Construction will provide a small benefit to the Queens and New York City economies. Because of the large size of the economy, with 608,532 jobs in Queens County and 2,562,446 jobs in New York County (Manhattan Borough), the addition of an average of 250 jobs represents a small proportion of employment available in the area (see Table 14.6). As of 1997, 41,097 persons were employed in the construction sector in Queens County (Bureau of Economic Analysis, 1999).

Construction activity is expected to create 185 secondary jobs in New York City (see Table 14.8). In addition, jobs and purchases during construction are expected to create approximately $82 million in economic activity. Multipliers are taken from the Minnesota Inplan Group (1996) model used to estimate the benefits of economic activity in New York State. Multipliers are specific to geographic area and job category.

14.5.2 Operational Impacts

No additional personnel will be employed by the Project during operations. The Project will utilize engineering, technical, administrative, and maintenance personnel currently employed by NYPA. Purchases required for Project operations are expected to create approximately $3.5 million in economic activity (see Table 14.8). These purchases will be beneficial but represent only a small portion of total economic activity in New York City.

Table 14.8 Secondary Employment and Economic Activity

Category	Project	Secondary Multiplier	Secondary Benefit
Construction Jobs	250 jobs	0.74	185 jobs
Construction Economic Activity	Salaries: $17,000,000 Purchases: $91,000,000	0.76	$82,080,000
Annual Operation Economic Activity	Purchases: $ 12,000,000	0.29	$3,480,000

Source of multipliers: Minnesota Inplan Group (1996)

NYPA does not pay taxes on the Poletti Project. New York State Law concerning NYPA's tax exempt status is set forth in Section 1012 of the Public Authorities Law. This section of the law establishes that NYPA Projects are exempt from real property taxes.

The populations of Bronx County, Queens County, New York County, or New York City are not expected to grow as a result of the Project. The proposed Project will provide service to customers in the New York City region.

The Project will improve the economic efficiency of electric services by allowing electricity to be marketed in the electric grid based on the demand for electric services. Deregulation of the electric utility industry by the New York State Public Service Commission has benefited electric consumers. The average New York City's consumer's annual electric bill was reduced by $41 from April 1996 to April 1998 (New York City, Office of Operations, 1998). Additional utility bill savings are available through New York City's Energy Cost Savings Program (ESCP) for industrial and commercial firms relocating from designated areas within New York City, or renovated or expanding anywhere in the city. The ESCP program provides utility bill credits up to 30 percent, and during 1998, 109 companies were approved to receive ECSP credits.

Government customers obtain savings through NYPA's energy-efficiency programs. NYPA supplies economical electricity that saves government customers, and taxpayers, an estimated $250 million per year. NYPA also provides economic development power that helps protect 144,000 jobs in New York City, including more than 23,500 jobs in Queens.

In addition, by using waste heat from the combustion turbine to produce steam and generate additional electricity, the plant would operate with a higher thermal efficiency than other types of generating facilities. These efficiencies will result in an efficient operation with reduced costs, and offer the potential to reduce electric rates.

a. Local Government

The Project will not require major increases in government services. Water use and discharges are discussed in Chapter 7 of the Article X Application, and transportation is discussed in Chapter 13. Other services are discussed below.

b. Police, Fire, and Emergency Services

The Project will not create additional major demands on the existing police forces. No population increases within 1.0 mile of the proposed Project site are Projected that will affect police services.

Police services may be needed to assist with traffic control during deliveries of large equipment. Prior to construction activities, NYPA will meet with the New York Police Department to discuss plant security, construction scheduling, and traffic. NYPA will employ on-site security staff. The proposed Project site will include security equipment such as on-site lighting, alarm system, and controlled site and facility access. No New York Police Department services will be required for normal operations.

The fire protection system at the facility will include sensors, alarm systems, extinguishers, fires suppression systems, and other fire protection equipment. During a fire emergency, the New York City Fire Department and local officials will implement any community emergency plans. The Project design will incorporates advanced fire protection systems, including dedicated water storage, fire pumps, hoses, and special fire fighting equipment for internal areas such as the control room and turbine building/enclosures. NYPA employees will be selected and trained to assist the fire department and maintain fire protection equipment.

NYPA will meet with the New York City Fire Department representatives to review the Project plans and design. NYPA and the New York City Fire Department will develop a list of required equipment, develop training programs, and establish emergency procedures. The New York City Fire Department will periodically tour the Project to allow the fire department to understand the site layout and unique Project characteristics. NYPA will provide copies of its emergency response plan to the fire department for review. The proposed emergency response plan will be similar to the existing facility response Plan. First aid and emergency response training will be provided to supervisory employees.

NYPA will develop a Spill Prevention Control and Countermeasure (SPCC) Plan and Storm Water Pollution Prevention Plan (SWPPP) to determine response procedures and responsibilities during a spill or release of a hazardous substance on the site. The New York City Fire Department will receive copies of these documents.

NYPA will work with the Mayor's Office of Emergency Procedures for off-site caused emergencies. The Mayor's Office of Emergency Procedures (2000) develops plans, organizes task forces, and facilitates communication to respond to emergencies such as severe summer and winter weather, flooding, hurricanes, transportation disasters, terrorism, and utility disruption.

The proposed Project will not increase the demand for police, fire and emergency services. NYPA will develop safety and emergency planning procedures that minimize the need for such services.

c. Solid Waste

Any waste generated by the proposed Project be collected by a private trash hauler and transported to a transfer station as required by the Comprehensive Solid Waste Management Plan (New York City, Department of Sanitation, 1999).

The proposed Project will be integrated into NYPA's recycling programs for selected wastes such as paper, plastic, and aluminum cans in order to minimize the amount of solid waste generated. When feasible, NYPA will consider participating in Department of Sanitation sponsored programs such as WasteMatch, which provides brokering service for industrial scrap, packaging and other potentially reusable items that do not have defined recycling markets. Since all solid wastes generated at the proposed Project will be handled and disposed of in accordance with applicable laws and regulations, no specific mitigation is warranted or proposed.

d. Educational Facilities

Direct impacts to educational facilities, such as limiting access or creating additional demand, will not occur during construction or operation of the Project. Noise monitoring was performed at Mater Scholl, at 21st Avenue and 26th Street, and P.S. 122.

Construction or operation of the proposed Project will not stimulate in-migration, and the Project's impact on student population and capacity utilization of the schools will be negligible. No schools are located within 0.5 miles of the Project site, and few schools occur within 1.0 mile of the proposed Project site (see Table 14.4). Accordingly, no direct or indirect impacts on area schools are expected from the proposed Project.

14.5.3 Environmental Justice Impacts

Environmental justice impacts are defined as disproportionately high and adverse environmental effects on minority or low income populations. Environmental justice impacts were reviewed for the 17 census tracts within 1.0 mile of the proposed Project site.

This area has a long history of industrial use. Shortly after 1900, the Astoria Light, Heat, and Power Company located in Astoria at Lawrence Point. This was the first central plant located off Manhattan to supply New York City with gas and later electricity. The site has continued to be used for electric power generation since that time. During the 1970's, NYPA acquired the power facilities and currently operates the 825 MW plant on the site. Other industrial sites include the Castle Oil Terminal and Bower Bay WPCP. Such uses continue to define an industrial character for the area. The proposed Project will continue the historical industrial land use of the proposed Project site. In addition, the proposed Project will reduce air emissions on an annual basis (see Chapter 5), which will benefit minority and low-income residents in the 17 census tracts closest to the proposed Project site and other areas of Queens and New York City.

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Section 15

Section 15

15.0 ALTERNATIVES

A detailed description of the proposed NYPA Combined Cycle Project has been presented in Section 3.0 of this Application. This section provides a discussion of alternatives to the proposed Project. Alternatives addressed include a "No Action" alternative as well as alternative project locations, designs and cooling systems.

15.1 "No-Action" Alternative

16 NYCRR § 1001.2(c) requires the applicant to address a "no-action" alternative to the Project. The no-action alternative assumes that NYPA would not construct the proposed Project. This would be detrimental to the development of a competitive electric market. The strategy of the 1998 State Energy Plan is to:

> Encourage the New York Power Authority's role in a restructured elect5ricity industry to enhance economic development, provide low-cost power to municipalities, promote energy efficiency and development of environmentally clean energy sources, and assist in maintaining a reliable and integrated bulk power system in New York.[1]

The "no-action" alternative would be inconsistent with the objectives of the NYSPSC and the 1998 State Energy Plan.. Failure to build the Project would result in higher capacity operation of older, higher emitting generating units. Under the "no-action" alternative, existing units in the region will continue to operate at current, and likely higher, capacity levels as energy demands in the region increase. To the extent that the proposed Project could displace the output from older, higher emitting energy generating units, the operation of the proposed Project would reduce regional air emissions, providing environmentally cleaner energy.

Moreover, one of the principal reasons for pursuing the development of the Combined Cycle Project is to enable NYPA to meet the New York Independent System Operator's 80% in-city generation requirements for reliability. On March 2, 1998, Con Edison filed a divestiture plan to auction a portion of its fossil fueled generating capacity in compliance with a New York State Public Service Commission (NYSPSC or Commission) Restructuring Order[2]. The Agreement

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[1] New York State Energy Planning Board, New York State Energy Plan and Final Environmental Impact Statement, November 1998, p.1-16.

[2] Order adopting terms of settlement subject to conditions and understanding (Issued September 23, 1997); Confirming Order (issued October 1, 1997); and Opinion No. 97-16 (issued Novemnber 3, 1997).

and Settlement[3] filed in this proceeding provides that load serving entities in New York City will be required to obtain in-City capacity reserves equal to 80% of their in-City peak load. Since the inception of the New York Independent System Operator in November 1999, it has adopted these same reliability criteria. Selection of the "no-action" alternative would not assist in addressing this requirement.

Finally, the NYPA Combined Cycle Project will assist in providing economical, reliable, efficient and environmentally safe electricity, an essential public service, to government, institutional, and commercial customers in the New York metropolitan area. As described previously in this Application, power demand within the region is rising faster than the ability of the region's power systems to generate and deliver it. Locating an additional source of power on a brownfield site within an existing industrial development is an appropriate and preferable response to the increased demands for power supply in New York and will result in improved system reliability.

The "no-action" alternative is inconsistent with the goals and objectives of the NYSPSC and the 1998 State Energy Plan, could result in adverse air quality impacts, and does not address the need for increased power supply in New York City nor the 80% in-city generation requirements of the New York Independent System Operator. The "no-action" alternative, therefore, is not considered a reasonable alternative to the proposed NYPA Combined Cycle Project.

15.2 Alternate Sites

The New York Power Authority operates 8 major power generating facilities, the majority of which are hydroelectric facilities in upstate New York. NYPA recently sold its nuclear generating stations, the James A. FitzPatrick Nuclear Power Plant on the shore of Lake Ontario, and the Indian Point 3 Nuclear Power Plant on the Hudson River in Westchester County. The only major NYPA generating facility located in New York City is the Charles Poletti Power Project. The power generating sites located outside of New York City are not considered appropriate for the proposed Combined Cycle Project as development of those sites will not address the 80% in-city generation requirement. Therefore, of the sites currently under control of NYPA, only the proposed Project site is considered appropriate for the proposed Combined Cycle Project.

Additionally, the proposed Project site is superior because of its current use as a major electric generating station, thereby eliminating impacts to greenfield areas. The proposed Project location also affords NYPA the ability to optimize the infrastructure attendant to the existing Charles Poletti Power Project, thus minimizing the size of the Project footprint and overall environmental

[3] September 19, 1997.

impacts. Moreover, siting the proposed Project at an existing power facility site minimizes visual impacts to the surrounding area and region. Finally, the proposed Project site also benefits from existing gas and electric transmission facilities at the Charles Polleti Power Project, including Con Edison's Astoria East and Astoria West 138 kV Substations, located approximately 3,000 and 300 feet from the proposed Combined Cycle Project, respectively.

15.3 Alternate Project Designs

NYPA prepared an in-house generation study in January 1998 that identified and evaluated several alternate project designs. These options included the following:

- Repower the existing Poletti facility with three gas turbine/HRSG modules
- Repower the existing Poletti facility with hot windbox technology by using two gas turbines
- Construct two stand-along 252 MW combined-cycle units, each with their own HRSG and steam turbine
- Add three 168 MW simple cycle gas turbines and purchase energy from the spot market or generate as economics dictate

Several assumptions were made in performing the generation study:

- NYPA would continue to supply the existing southeast New York (SENY) load together with its forecasted load growth.
- An in-city generation requirement of 70% would be immediately required of all new load servers until the ISO determines a different requirement. If no requirement is set by the ISO, the default requirement is 80% (as noted above, the 80% requirement has since been adopted by the ISO).
- At an 80% in-city requirement, NYPA is forecasted to be 500 MW short of the requirement in 2004.

To evaluate the cost-effectiveness of the options identified above, production cost simulations for the years 2000 through 2010 were run using General Electric's Multi-Area Production Simulation (MAPS) Program. These model runs provided the annual generation and associated fuel cost for each of the options for the years 2000 through 2010, which were extrapolated through the year 2031.

Captial cost estimates were also developed for each option, including the cost of transmission interconnections. The original estimates for the electrical interconnections were based on 345 kV connections, but the feasibility of a 138 kV interconnection was subsequently confirmed. The 138 kV interconnection would avoid the costs associated with the breaker upgrades or replacement that would be required for the 345 kV interconnection.

An evaluation of the generation planning simulations and the capital cost estimates indicated that the construction of two stand-alone combined-cycle units with a total capacity of approximately 500 MW is the most cost-effective option for meeting the in-city generation requirements.

15.4 Repowering Alternative

In response to public comments advocating the complete shutdown of the existing Charles Poletti Power Project, NYPA evaluated the feasibility of repowering the existing facility with a nominal 750 MW combined cycle facility in conjunction with the new 500 MW Combined Cycle Project. The construction of a nominal 750 MW combined cycle plant would enable NYPA to decommission the existing 825 MW Poletti Project and replace that generating capacity with a newer, state-of-the-art facility. Following a preliminary analysis of several options, it was determined that the optimum configuration would consist of the proposed 500 MW Combined Cycle Project in conjunction with an additional 750 MW facility. This alternative would be developed in two phases with the 500 MW Combined Cycle Project as the initial phase and the 750 MW facility as the second phase. The Poletti Project would continue to operate on a limited basis while the second phase is under construction but would be decommissioned once the 750 MW facility became operational. A decommissioning plan for the Poletti Project would identify the specific facilities that would be removed.

The 750 MW facility would consist of three combustion turbines (GE "F" frame turbines or equivalents), three heat recovery steam generators (HRSGs), and a steam turbine generator. The 750 MW facility would include an air-cooled condenser or a hybrid cooling tower using gray water for Facility cooling. The 750 MW facility would displace the Poletti Project on Con Edison's 345 kV system. Further evaluation is needed to determine the optimum water supply and discharge facilities for the 750 MW facility.

Preliminary air quality modeling for a slightly larger Facility based on two "H" turbines indicated that air quality impacts for this alternative would be below significant impact concentrations for criteria pollutants, but further modeling would be necessary to confirm stack locations, heights and configurations (i.e., three single stacks or collocated stacks).

With regard to potential water quality and aquatic resource impacts, use of an air-cooled condenser or a hybrid cooling tower with this alternative would result in net benefits as compared to the existing once-through cooling system used by the Poletti Project.

A preliminary site plan for this alternative indicates that the sintering building would need to be demolished to provide the necessary land for the 750 MW power block. This building has been determined eligible for the National Register of Historic Places. Further documentation of the sintering building in accordance with Historic American Buildings Survey/Historic American

Engineering Record guidelines may be required prior to its removal. In addition, archeological investigations may be required in the area surrounding the sintering building to address the documented potential for historic archeological resources in this area (Appendix 11A).

With regard to other potential impacts, further analyses would be required, but no significant issues beyond those discussed throughout this Application are anticipated with this alternative. While this alternative remains a viable option for NYPA, the Authority believes that the 500 MW Combined Cycle Project meets environmental and in-city generation goals in a more cost effective and timely manner. Accordingly, the Article X Application pertains solely to the development of the 500 MW Combined Cycle Project. Should the additional 750 MW facility become needed in the future, NYPA will consult with the NYSDPS staff to determine the appropriate requirements for supplemental analyses under Article X.

15.5 Alternate Design Options

During preparation of this Article X Application NYPA identified and evaluated various design options for selected plant components. These included:

- Power Block Alternatives
- Alternate Stack Design
- Alternate Cooling Systems

The results of these alternative design evaluations are described in greater detail below.

15.5.1 Power Block Alternatives

NYPA has selected the power block described in Section 3.0, Project Description. The selection was based on the reliability and economics of the equipment. The reliability information is provided in Section 3.13 of this Application. The performance of the GE Model MS7001 (7FA) unit has been found to be superior to the industry average.

15.5.2 Alternate Stack Design

Initial consideration was given to the use of single stacks for each HRSG, but air quality modeling indicated that potential air quality impacts could be reduced by constructing collocated stacks. Collocated stacks require additional ductwork, resulting in minor penalties in terms of reduced operating efficiency with a corresponding increase in cost. These costs were considered reasonable when compared to the reduced air quality impacts.

15.5.3 Alternate Cooling Systems

Plant cooling system alternatives reviewed by NYPA included the following:

- Once-through cooling system;
- Mechanical draft (wet) cooling tower; and
- Hybrid (wet/dry) cooling tower system.

The evaluation of the alternative cooling system technologies includes system feasibility, environmental considerations and costs. The air-cooled condenser discussed in Section 3.0 (Description of the Proposed Project) was selected by NYPA as the preferred alternative in keeping with NYSDEC's technical standard for new electric generating units.

a. Once-through Cooling System

A once-through cooling system would circulate water drawn from the East River through the condensers. Heat from the condenser would be transferred to the cooler circulating water. The same quantity of water would then be returned directly to the East River. This system is referred to as "once-through" because the cooling water is passed through the condenser one-time before being returned to the East River water source.

The once-through cooling option would provide maximum efficiency and have the least visual impacts on the surrounding landscape. However, NYPA has not selected once-through cooling as a technology because it would require the use of East River water, resulting in potential aquatic impacts due to the entrainment and impingement of aquatic organisms.

b. Mechanical Draft (Wet) Cooling Tower System

A mechanical draft cooling tower uses evaporative cooling to cool the circulating water. Cooling is achieved through evaporation. A supply of makeup water is required to account for evaporation losses. In addition to water lost by evaporation, water also is lost due to drift and blowdown. Drift losses result from water being entrained in the exhaust air stream.. Drift losses are minimized by proper cooling tower design and maintenance. Blowdown is required of wet towers because evaporation concentrates the impurities in the circulating water. Blowing down the circulating water reduces the impurities. Water vapor in the saturated air discharged from the cooling tower will condense upon contact with cooler ambient air creating a plume. The plume has significant visual impacts as well as the potential to cause hazardous icing conditions during winter operation. For these reasons, the mechanical draft wet cooling tower alternative was eliminated from further consideration.

c. Hybrid (Wet/Dry) Cooling Tower System

A hybrid, or wet/dry cooling system, is similar to a wet cooling system, except that the cooling tower would include both dry tube heat exchanger sections and wet evaporative cooling sections. A wet/dry cooling tower works in combination to cool the circulating water. The hot water enters the tower and initially goes through the dry section (finned tube coil), and then through the wet (evaporative section). The dry section acts as a reheater, raising the temperature of the air discharged from the system. This reduces the relative humidity of the air and partially or completely eliminates the visible water vapor plume (Plume Abatement). Moisture in the air discharged from the tower may still condense and form ice if it comes in contact with a cold surface during winter operation. Because the hybrid cooling system incorporates a wet evaporative cooling section, it requires make-up water and generates blowdown in the same way as a wet cooling system.

15.6 Cooling System Technology Evaluation

The cooling system technologies were evaluated with respect to environmental and economic criteria. The Once-Through Cooling System Alternative was rejected because it would result in aquatic impacts greater than the NYSDEC technical standard for new electric generating units. The Mechanical Draft (Wet) Cooling Tower Alternative was rejected because of the increased visual impact and the potential to cause hazardous icing conditions during winter operation. The remaining option, the Hybrid (Wet/Dry) Cooling Tower Alternative, was evaluated with respect to the following factors:

- Cost;
- Visual Impacts and Land Requirements;
- Visible Plume Potential; and
- Aquatic Impacts.

15.6.1 Cost Comparison of Cooling System Alternatives

The cost for the Hybrid (Wet/Dry) Cooling Tower Alternative was compared to the cost of the proposed Air-Cooled (Dry) Condenser System Alternative. The cost differential was found to be on the order of $25 million, with the air-cooled condenser more costly. Costs include engineering, procurement and construction. The differences in cost of the technologies are mainly due to the increase in physical size, electrical equipment (switchgear and transformers), mechanical equipment (fans) and noise abatement equipment required with an air-cooled condenser.

The cost comparison demonstrates the significant cost increase associated with the air-cooled condenser alternative. There are also additional operation and maintenance costs associated with the air-cooled condenser alternative including, but not limited to, electric for fans and corrosion control in addition to efficiency penalties which drive up fuel use/costs and increase air emissions. While the Hybrid (Wet/Dry) Cooling Tower would be less costly than the air-cooled condenser, the closed-cycle cooling system, even with a new East River intake structure, would have difficulty meeting NYSDEC's standard for aquatic impacts for new electric generating units.

15.6.2 Visual Impacts and Land Use Requirements

The proposed air-cooled condenser will result in a new visual element along the East River shoreline, with a structure rising to a height of about 100 feet above grade for a linear distance of approximately 150 feet. The air-cooled condenser will require approximately one acre of land. This additional structure will screen the view of the existing Astoria West substation that is located south of the Project Site. While the air-cooled condenser will increase the visibility of the proposed Project, this incremental visual change will not constitute a significant visual impact. The visual impacts of the proposed Facility, including the air-cooled condenser, are presented in Section 10 of this Application.

A hybrid cooling tower would also result in a new visual element along the East River shoreline, with a structure rising to a height of about 65 feet above grade for a linear distance of approximately 150 feet. A hybrid cooling tower would require approximately 0.9 acre of land. This additional structure would screen the view of the existing NRG simple cycle combustion turbines that are located south of the Project Site. While the hybrid cooling tower would increase the visibility of the proposed Project, this incremental visual change would not constitute a significant visual impact.

A once-through cooling system would not require any above ground structures and would not increase the Project's visibility from the East River or neighboring residential areas. However, this alternative would require additional fender protection beyond the present bulkhead, resulting in a new visual element to the East River shoreline. This new element, extending above mean high water will be marginally noticeable from the East River but would not constitute a significant visual impact.

15.6.3 Visible Plume Analysis

A cooling tower analysis was performed using the Electric Power Research Institute's Seasonal and Annual Cooling Tower Impact (SACTI) cooling tower model. A detailed description of this model and the analysis is presented in Appendix 10A of this Application. Based on this analysis, the impacts associated with a hybrid cooling tower (i.e., fogging, salt deposition, and plume shadowing and visibility) are expected to be minimal. A hybrid tower would result in minimal hours of both plume fogging and rime ice formation, and these impacts will be confined to the NYPA property. Similarly, elevated plumes resulting from the hybrid tower would be few in number and wouldl generally be confined to the NYPA property. Plume shadowing is expected to be negligible with less than 300 hours per year of visible plume formation. In addition, salt deposition is nearly exclusively confined to the NYPA property. In conclusion, a hybrid cooling tower would not result in adverse environmental effects from the emitted water vapor plume.

The air-cooled condenser option will not result in any visible plumes since this technology does not rely on water as a cooling medium.

15.6.4 Aquatic Impacts

The proposed air-cooled condenser would not require the use of East River water for facility cooling and, therefore, would not require the construction of a new intake structure. Without the use of East River water, the air-cooled condenser eliminates potential aquatic impacts due to impingement and entrainment of aquatic organisms and meets the technical standards of NYSDEC regarding new electric generating units. Potential biothermal impacts associated with the process water discharge from the proposed Project are discussed in Section 8 of this Application.

A hybrid cooling tower would require the use of East River water for cooling tower make-up. With this alternative, a new intake structure would be constructed using state-of-the-art intake screens and fish protection. Nevertheless, the new East River water intake would result in some impingement and entrainment of aquatic organisms and may not meet the NYSDEC technical standards.

15.7 Alternative Sources for Process Water Supply

A preliminary analysis has been conducted to determine the feasibility of using the effluent from one of the City's Water Pollution Control Plants (WPCPs) or East River Water to meet the process water requirements of the proposed Facility. Treated sewage effluent (also known as gray water) could be obtained from either the Bowery Bay WPCP, located to the east of the Project site, or the Wards Island WPCP, located to the west. In addition, the East River could serve as an uninterruptible source of process water for the proposed facility. The analysis considered technical merits, availability and costs of each water source. Based on this preliminary analysis, the use of New York City water is preferred over the other alternatives.

15.7.1 East River Water

The use of water from the East River through a new intake structure was evaluated to meet the water supply requirements for the proposed Facility. Although, the water supply from the East River is free (aside from pumping and treatment costs) and could provide an uninterruptible source of water, the impurities present in the East River water, including total suspended solids, total dissolved solids and organic and inorganic phosphates, would require treatment to meet the water quality requirements for boiler make-up and water injection for NOx control. The costs associated with the construction, operation and maintenance of a new intake structure and the necessary treatment plant would be significantly greater than the costs associated with connecting to the New York City water supply. Other disadvantages of using East River water to meet the process water requirements include the potential impacts to local ecology during the construction of the intake structure and the potential for entrainment and impingement of aquatic organisms associated with water withdrawals.

15.7.2 Treated Effluent (Gray Water)

The use of gray water for cooling tower make-up is generally accepted in the power industry, and the close proximity of the Bowery Bay WPCP and the Wards Island WPCP warranted consideration of this alternative for the proposed Combined Cycle Project. However, the use of gray water to meet the process water supply requirements of the proposed Facility is more problematic and less desirable than using New York City water supply. The gray water's composition is generally comparable to East River water. Gray water is high in total dissolved solids, suspended solids, organic and inorganic phosphate, as well as ammonia. In addition, the chemical composition of gray water is seasonal. In the winter, the influx of road salt can change water composition, as can storm conditions. Considering the variable composition of gray water and the potential for untreated sewage, costly treatment would be needed to meet the water quality requirements for boiler make-up and water injection for NOx control. Piping requirements would add to the cost of this alternative.

15.7.3 City Water

City water, with minimal pre-treatment, is the most chemically suited to meet the water quality requirements for boiler make-up and water injection for NOx control. NYPA has proposed to interconnect to an existing 20-inch water main located on the NYPA property; therefore, there will be only minimal infrastructure required to meet the proposed Facility's process water demands. Accordingly, considering costs, technical requirements and potential environmental impacts, the use of New York City water supply to meet the process water requirements of the proposed Facility is the preferred alternative.

15.0 ALTERNATIVES

A detailed description of the proposed NYPA Combined Cycle Project has been presented in Section 3.0 of this Application. This section provides a discussion of alternatives to the proposed Project. Alternatives addressed include a "No Action" alternative as well as alternative project locations, designs and cooling systems.

15.1 "No-Action" Alternative

16 NYCRR § 1001.2(c) requires the applicant to address a "no-action" alternative to the Project. The no-action alternative assumes that NYPA would not construct the proposed Project. This would be detrimental to the development of a competitive electric market. The strategy of the 1998 State Energy Plan is to:

> Support market initiatives to develop new electric-generating facilities and encourage competitive procurement of energy supplies and services by regulated load-serving entities, mindful of short-and long-term economic and environmental considerations.[1]

The "no-action" alternative would be inconsistent with the objectives of the NYSPSC and the 1998 State Energy Plan. Failure to build the Project would result in higher capacity operation of older, higher emitting generating units. Under the "no-action" alternative, existing units in the region will continue to operate at current, and likely higher, capacity levels as energy demands in the region increase. To the extent that the proposed Project could displace the output from older, higher emitting energy generating units, the operation of the proposed Project would reduce regional air emissions.

Moreover, one of the principal reasons for pursuing the development of the Combined Cycle Project is to enable NYPA to meet the 80% in-city generation requirements established by the New York Independent System Operator. On March 2, 1998, Con Edison filed a divestiture plan to auction a portion of its fossil fueled generating capacity in compliance with a New York State Public Service Commission (NYSPSC or Commission) Restructuring Order[2]. The Agreement and Settlement[3] filed in this proceeding provides that load serving entities in New York City will

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Finally, the NYPA Combined Cycle Project will assist in providing economical, reliable, efficient and environmentally safe electricity, an essential public service, to government, institutional, and commercial customers in the New York metropolitan area. As described previously in this Application, power demand within the region is rising faster than the ability of the region's power systems to generate and deliver it. Locating an additional source of power on a brownfield site within an existing industrial development is an appropriate and preferable response to the increased demands for power supply in New York and will result in improved system reliability.

The "no-action" alternative is inconsistent with the goals and objectives of the NYSPSC and the 1998 State Energy Plan, could result in adverse air quality impacts, and does not address the need for increased power supply in New York City nor the 80% in-city generation requirements of the New York Independent System Operator. The "no-action" alternative, therefore, is not considered a reasonable alternative to the proposed NYPA Combined Cycle Project.

15.2 Alternate Sites

The New York Power Authority operates 10 power generating facilities, the majority of which are hydroelectric facilities in upstate New York. NYPA has recently negotiated the sale of their nuclear generating stations, the James A. FitzPatrick Nuclear Power Plant on the shore of Lake Ontario, and the Indian Point 3 Nuclear Power Plant on the Hudson River in Westchester County. Of these generating facilities, only the Charles Poletti Power Project is located in New York City. The power generating sites located outside of New York City are not considered appropriate for the proposed Combined Cycle Project as development of those sites will not address the 80% in-city generation requirement. Therefore, of the sites currently under control of NYPA, only the proposed Project site is considered appropriate for the proposed Combined Cycle Project.

Additionally, the proposed Project site is superior because of its current use as a major electric generating station, thereby eliminating impacts to greenfield areas. The proposed Project location also affords NYPA the ability to optimize the infrastructure attendant to the existing Charles Poletti Power Project, thus minimizing the size of the Project footprint and overall environmental impacts. Moreover, siting the proposed Project at an existing power facility site minimizes visual impacts to the surrounding area and region. Finally, the proposed Project site also benefits from existing gas and electric transmission facilities at the Charles Polleti Power Project, including

Con Edison's Astoria East and Astoria West 138 kV Substations, located approximately 3,000 and 300 feet from the proposed Combined Cycle Project, respectively.

15.3 Alternate Project Designs

NYPA prepared an in-house generation study in January 1998 that identified and evaluated several alternate project designs. These options included the following:

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- Add three 168 MW simple cycle gas turbines and purchase energy from the spot market or generate as economics dictate

Several assumptions were made in performing the generation study:

- NYPA would continue to supply the existing southeast New York (SENY) load together with its forecasted load growth.
- An in-city generation requirement of 70% would be immediately required of all new load servers until the ISO determines a different requirement. If no requirement is set by the ISO, the default requirement is 80% (as noted above, the 80% requirement has since been adopted by the ISO).
- At an 80% in-city requirement, NYPA is forecasted to be 500 MW short of the requirement in 2004.

To evaluate the cost-effectiveness of the options identified above, production cost simulations for the years 2000 through 2010 were run using General Electric's Multi-Area Production Simulation (MAPS) Program. These model runs provided the annual generation and associated fuel cost for each of the options for the years 2000 through 2010, which were extrapolated through the year 2031.

Captial cost estimates were also developed for each option, including the cost of transmission interconnections. The original estimates for the electrical interconnections were based on 345 kV connections, but the feasibility of a 138 kV interconnection was subsequently confirmed. The 138 kV interconnection would avoid the costs associated with the breaker upgrades or replacement that would be required for the 345 kV interconnection.

An evaluation of the generation planning simulations and the capital cost estimates indicated that the construction of two stand-alone combined-cycle units with a total capacity of approximately 500 MW is the most cost-effective option for meeting the in-city generation requirements.

15.4 Repowering Alternative

In response to public comments advocating the complete shutdown of the existing Charles Poletti Power Project, NYPA evaluated the feasibility of repowering the existing facility with a nominal 800 MW combined cycle facility in conjunction with the new 500 MW Combined Cycle Project. The construction of a nominal 800 MW combined cycle plant would enable NYPA to decommission the existing 825 MW Poletti Project and replace that generating capacity with a newer, state-of-the-art facility. Following a preliminary analysis of several options, it was determined that the optimum configuration would consist of the proposed 500 MW Combined Cycle Project in conjunction with an additional 800 MW facility. This alternative would be developed in two phases with the 500 MW Combined Cycle Project as the initial phase and the 800 MW facility as the second phase. The Poletti Project would continue to operate on a limited basis while the second phase is under construction but would be decommissioned once the 800 MW facility became operational. A decommissioning plan for the Poletti Project would identify the specific facilities that would be removed

The 800 MW facility would consist of two combustion turbines (GE "H" frame turbines or equivalents), two heat recovery steam generators (HRSGs), and a steam turbine generator. The 800 MW facility would include hybrid cooling towers for condenser cooling, relying on the East River for cooling water. The 800 MW facility would displace the Poletti Project on Con Edison's 345 kV system. Further evaluation is needed to determine the optimum intake and discharge facilities for the 800 MW facility.

Preliminary air quality modeling indicated that air quality impacts for this alternative would be below significant impact concentrations for criteria pollutants, but further modeling would be necessary to confirm stack locations, heights and configurations (i.e., two single stacks or collocated stacks). Further analyses would be necessary to identify potential cooling tower impacts, although the use of plume abatement would significantly reduce potential cooling tower plume impacts.

With regard to potential water quality and aquatic resource impacts, use of a closed-cycle cooling system with this alternative would result in net benefits as compared to the existing once-through cooling system used by the Poletti Project.

A preliminary site plan for this alternative indicates that the sintering building would need to be demolished to provide the necessary land for the 800 MW power block and cooling towers. This building has been determined eligible for the National Register of Historic Places. Further documentation of the sintering building in accordance with Historic American Buildings Survey/Historic American Engineering Record guidelines may be required prior to its removal. In addition, archeological investigations may be required in the area surrounding the sintering building to address the documented potential for historic archeological resources in this area (Appendix 11A).

With regard to other potential impacts, further analyses would be required, but no significant issues beyond those discussed throughout this Application are anticipated with this alternative. While this alternative remains a viable option for NYPA, the Authority believes that the 500 MW Combined Cycle Project meets environmental and in-city generation goals in a more cost effective manner.

15.5 Alternate Design Options

During preparation of this Article X Application NYPA identified and evaluated various design options for selected plant components. These included:

- Power Block Alternatives
- Alternate Stack Design
- Alternate cooling systems

The results of these alternative design evaluations are described in greater detail below.

15.5.1 Power Block Alternatives

NYPA has selected the power block described in Section 3.0, Project Description. The selection was based on the reliability and economics of the equipment. The reliability information is provided in Section 3.14 of this Application. The performance of the GE Model MS7001 (7FA) unit has been found to be superior to the industry average.

15.5.2 Alternate Stack Design

Initial consideration was given to the use of single stacks for each HRSG, but air quality modeling indicated that potential air quality impacts could be reduced by constructing collocated stacks. Collocated stacks require additional ductwork, resulting in minor penalties in terms of reduced operating efficiency with a corresponding increase in cost. These costs were considered reasonable when compared to the reduced air quality impacts.

15.5.3 Alternate Cooling Systems

Plant cooling system alternatives reviewed by NYPA included the following:

- Once-through cooling system;
- Mechanical draft (wet) cooling tower; and
- Air-cooled (dry) condenser.

The evaluation of the alternative cooling system technologies includes system feasibility, environmental considerations and costs. The use of hybrid (wet/dry) Cooling Tower System discussed in Section 3.0 (Description of the Proposed Project) offers the best balance of technical, environmental, visual and economic criteria examined.

a. Once-through Cooling System

A once-through cooling system would circulate water drawn from the East River through the condensers. Heat from the condenser would be transferred to the cooler circulating water. The same quantity of water would then be returned directly to the East River. This system is referred to as "once-through" because the cooling water is passed through the condenser one-time before being returned to the East River water source.

The once-through cooling option would provide maximum efficiency and have the least visual impacts on the surrounding landscape. However, NYPA has not selected once-through cooling as a technology because it would require the use of more East River water resulting in an increase in the potential for associated aquatic impacts in comparison to the proposed hybrid cooling system.

b. Mechanical Draft (Wet) Cooling Tower System

A mechanical draft cooling tower uses evaporative cooling to cool the circulating water. Cooling is achieved through evaporation. A supply of makeup water is required to account for evaporation losses. In addition to water lost by evaporation, water also is lost due to drift and blowdown. Drift losses result from water being entrained in the exhaust air stream. Drift losses are minimized by proper cooling tower design and maintenance. Blowdown is required of wet towers because evaporation concentrates the impurities in the circulating water. Blowing down the circulating water reduces the impurities. Water vapor in the saturated air discharged from the cooling tower will condense upon contact with cooler ambient air creating a plume. The plume has significant visual impacts as well as the potential to cause hazardous icing conditions during winter operation. For these reasons, the mechanical draft wet cooling tower alternative was eliminated from further consideration.

c. Air-Cooled Condenser (Dry) System

An air-cooled condenser would rely solely on ambient air as a direct steam-cycle heat sink without the use of any water or other intermediary heat transfer medium. Steam would be routed from the turbine exhaust through ducts to a series of fin tube heat exchangers. The steam flows through the tubes and condenses inside the tubes forming condensate while air flows over the outer tube surface. Condensate would be discharged from the air-cooled condenser and returns to the heat recovery steam generator (HRSG) after the latent heat of vaporization is transferred from the turbine steam directly to the air stream. Air is moved through the air-cooled condensers by a series of fans, with ambient air drawn from below the condenser and the heated warmer air discharged from the top of the condenser. The air-cooled condenser option would be the tallest and require the largest footprint of all cooling system options. Accordingly, this alternative would have the greatest visual impact on the surrounding landscape.

15.6 Cooling System Technology Evaluation

The cooling system technologies were evaluated with respect to environmental and economic criteria. The Once-Through Cooling System Alternate was rejected because it would result in the potential for additional aquatic impacts when compared with the proposed hybrid cooling tower system. The Mechanical Draft (wet) Cooling tower Option was rejected because of the increased visual impact and the potential to cause hazardous icing conditions during winter operation when compared with the proposed hybrid cooling tower system. The remaining option, the Air-Cooled Condenser (dry) System Alternative was evaluated with respect to the following factors:

- Cost;
- Efficiency;
- Visual Impacts;
- Land Use Requirements;
- Visible Plume Potential;

15.6.1 Cost Comparison of Cooling System Alternatives

The cost for the Air-Cooled (dry) Condenser System Alternatives was compared to the cost of the proposed hybrid (wet/dry) Cooling Tower System. The cost differential was found to be on the order of $25 million. Costs include engineering, procurement and construction. The differences in cost of the technologies are mainly due to the increase in physical size, electrical equipment (switchgear and transformers), mechanical equipment (fans) and noise abatement equipment.

The cost comparison demonstrates the significant cost increase associated with the air-cooled condenser alternative. There are also additional operation and maintenance costs associated with the air-cooled condenser alternative including, but not limited to, electric for fans and corrosion control in addition to efficiency penalties which drive up fuel use/costs and increase air emissions.

15.6.2 Net Power Output and Heat Rate Comparison

Efficiency of the steam turbine generator is impacted significantly by the condenser operating temperature that, in turn, is affected by the method of cooling. The output and heat rate of the hybrid cooling tower system was compared to the output and heat rate of the air-cooled condenser system. Power plant simulation software was utilized to determine the effects of condenser cooling alternatives on power generation (output) and plant heat rate. Table 15.1 summarizes these results.

Table 15.1: Net Power Output and Heat Rate Comparisons

Ambient Conditions		Air-Cooled Condenser Alternative
90 °F 60 % RH	Plant Net Power Output, kW	-15,800
	Heat Rate, BTU/kWh	+227
55 °F 60 % RH	Plant Net Power Output, kW	-2,634
	Heat Rate, BTU/kWh	+34
20 °F 60 % RH	Plant Net Power Output, kW	-1,840
	Heat Rate, BTU/kWh	+23

This analysis demonstrates that the application of dry cooling technology, using an air-cooled condenser system, results in significant penalties. Power output during summer operation, when power demand is greatest, is reduced by almost 16,000 kW while plant heat rate is increased by 227 BTU/kWh.

Application of the hybrid cooling technology selected by NYPA has less impact on power production and heat rate, while significantly reducing the potential water vapor plumes associated with a mechanical draft cooling tower.

15.6.3 Visual Impacts and Land Use Requirements

The proposed hybrid cooling tower will result in a new visual element along East River shoreline, with a structure rising to a height of about 65 feet above grade for a linear distance of approximately 270 feet (see Figure 3-2). This additional structure would screen the view of the existing NRG simple cycle combustion turbines which are located south of the Project Site. While the hybrid cooling tower would increase the visibility of the proposed Project, this incremental visual change would not constitute a significant visual impact.

A once-through cooling system would not require any above ground structures and would not increase the Project's visibility from the East River or neighboring residential areas. However, this alternative would require additional fender protection beyond the present bulkhead, resulting in a new visual element to the East River shoreline. This new element, extending above mean high water will be marginally noticeable from the East River but would not constitute a significant visual impact.

As stated previously, the air-cooled condenser option would be the tallest and require the largest footprint of all cooling system options and would have the greatest visual impact on the surrounding landscape. The air-cooled condenser alternative would result in a new visual element with a height of approximately 100 to 120 feet above grade with a linear distance of approximately 200 to 300 feet. If an air-cooled condenser were used it would need to be located adjacent to the turbine building. An air-cooled condenser needs to be in close proximity to the steam turbine in order to minimize pressure drop through the exhaust duct and minimize the exhaust duct run. This alternative would require a modification to the turbine building arrangement and would most likely place the air-cooled condenser in a more prominent position along the East River shorefront, resulting in the greatest visual impacts of all cooling alternatives.

15.6.4 Visible Plume Analysis

A cooling tower analysis was performed using the Electric Power Research Institute's Seasonal and Annual Cooling Tower Impact (SACTI) cooling tower model. A detailed description of this model and the analysis is presented in Appendix 10A of this Application. Based on this analysis, the impacts associated with the proposed hybrid cooling tower (i.e., fogging, salt deposition, and plume shadowing and visibility) are expected to be minimal. The proposed hybrid tower will result in minimal hours of both plume fogging and rime ice formation, and these impacts will be confined to the NYPA property. Similarly, elevated plumes resulting from the hybrid tower will be few in number and will generally be confined to the NYPA property. Plume shadowing is expected to be negligible with less than 300 hours per year of visible plume formation. In addition, salt deposition is nearly exclusively confined to the NYPA property. In conclusion, the proposed hybrid cooling tower will not result in adverse environmental effects from the emitted water vapor plume.

The air-cooled condenser option will not result in any visible plumes since this technology does not rely on water as a cooling medium.

5.7 Alternative Source for Cooling Tower Make-Up Water

A preliminary analysis has been conducted to determine the feasibility of using the effluent from one of the City's Water Pollution Control Plants (WPCPs) or City water as a source for cooling tower make-up as an alternative to the East River. Treated sewage effluent (also known as gray water) could be obtained from either the Bowery Bay WPCP, located to the east of the Project site, or the Wards Island WPCP, located to the west. City water is available at the Project site, however the potential of an interrupted supply during drought conditions precludes its use for this purpose. The analysis considered technical merits, availability and costs of each water source. Based on this preliminary analysis, the use of East River water for cooling tower make-up is the preferred alternative.

15.7.1 East River Water

The use of water from the East River is considered the base design as presented throughout this Application. The proposed intake is described in Section 3.7 of this Application. The use of East River water is the preferred option primarily for economic reasons. The water supply from the East River is free (aside from pumping and treatment costs) and provides an uninterruptible source of make-up water. In addition, East River water requires minimal treatment prior to its use for cooling tower make-up.

Relative to the gray water alternative, the capital cost for an East River water make-up system is less than that for a gray water system, primarily due to the shorter piping distance. Operating costs for the river water system would be marginally more expensive due to the larger motors required to move the slightly larger flows associated with the fewer cycles of concentration required for East River water (i.e., two cycles of concentration for East River water versus an estimated five cycles of concentration for gray water).

15.7.2 Treated Effluent (Gray Water)

The use of gray water for cooling tower make-up is generally accepted in the power industry, and the close proximity of the Bowery Bay WPCP and the Wards Island WPCP increases the viability of this alternative for the proposed Combined Cycle Project. The effluent from both WPCPs is the result of primary and secondary wastewater treatment. However, further treatment at the Project site would be required before the water can be used for cooling tower make-up in order to meet requirements mandated by future USEPA and NYCDEP guidelines for the Project's discharge and to handle the potential for untreated sewage.

Gray water is generally comparable to river water. Gray water is high in total dissolved solids, suspended solids, organic and inorganic phosphate, as well as ammonia. In addition, the chemical composition of gray water is seasonal. In winter, the influx of road salt can change water composition, as can storm conditions. According to the preliminary analysis, the Bowery Bay WPCP option would be less expensive than the Wards Island WPCP option due to the greater cost associated with an underwater pipe across the East River that would be required with the Wards Island WPCP option. However, the Bowery Bay WPCP option is considerably more costly than the East River water alternative.

15.7.3 City Water

City water is the most chemically suited for cooling tower make-up, requiring only minimal chemical injection for treatment and biological growth prevention. The use of City water would allow an estimated ten cycles of concentration in the cooling tower, reducing the total volume of make-up water required compared to the other alternatives. The use of City water is the least expensive alternative for cooling tower make-up due to the need for less treatment and the shorter length of piping required. However, the use of City water is not considered a viable alternative for two reasons. Most importantly is the potential for curtailment during a drought due to mandated rationing. The potential shortfall in make-up water supply to the cooling towers during the summer months (i.e., July, August and September) could cause the Combined Cycle Project to shutdown or operate at reduced loads. This period of potential curtailment of water supply coincides with the likely peak demand period for electricity. In addition, the existing 20-inch mains beneath 20th Avenue that would be the source of City water would not be adequate to supply the proposed Combined Cycle Project and provide for future expansion.

Section 16

Section 16

16.0 Market Assessment and Portfolio Strategies (MAPS)

This section addresses the requirements of 16 NYCRR § 1001.3 (a) and (b).

16.1 Model Description

This section presents the results of the Market Assessment and Portfolio Strategies (MAPS) study performed on the New York power system at the request of the NYSDPS to estimate the effect of adding NYPA's proposed Combined Cycle Project to the system. MAPS is General Electric's production simulation program, used to simulate the operation of an interconnected utility power system. The major objective of MAPS is to simulate the operation of a power system while insuring the system's security constraints are not violated. Security constraints include the operating limits and capabilities of generation sources, constraints and contingencies imposed by the transmission system, and the operational limits such as minimum operating reserve levels.

A base case database for year 2004 (including all new units that go into service before 2004 per data obtained from the New York State Public Service Commission) was developed for this study. The following new units were added: Ramapo, Bethlehem, Athens, Glenville, Heritage, Bowline, East River, Astoria, Ravenswood, Sunset and Torne Valley combined cycle facilities and 11 other NYPA gas turbines. A unit representing NYPA's proposed Combined Cycle Project (with unit-specific heat rate information) was added to this system. A MAPS study was performed on this database with and without the NYPA Combined Cycle Project in service with the following objectives:

- Measure the change in generation of the existing units in New York City with the NYPA Combined Cycle Project in service.
- Measure the change in air emissions (SO_X, NO_X and CO_2) of existing units in New York City due to the addition of the NYPA Combined Cycle Project.
- Measure the specific impact on selected New York City units due to the addition of the NYPA Combined Cycle Project.

16.2 Results from the Study:

The addition of the NYPA Combined Cycle Project will result in lower generation, and therefore lower emissions from the existing New York City units. The new Combined Cycle Project will also displace less efficient thermal units in New York City and as a result lower the average spot price. The test results are tabulated below.

16.2.1 Change in Generation Output

Table 16.1 shows an increase of 652.96 gigawatt-hours (GWH) in total New York City generation due to the addition of the NYPA Combined Cycle Project. Because the projected Combined Cycle Project generation is 1,031.82 GWH, net displacement from other in-city units is 378.86 GWH (1,031.82-652.96=378.86).

Table 16.1: Total New York City Generation With and Without the NYPA Combined Cycle Project

	Without NYPA Combined Cycle Project	With NYPA Combined Cycle Project	Change
Total NYC Generation (GWH)	38,964.13	39,617.09	652.96

Source: General Electric MAPS model output, 2001.

16.2.2 Reduction in Air Emissions

The MAPS simulations show that the addition of the NYPA Combined Cycle Project will result in the displacement of older, higher emitting electric generating units in New York City, with a corresponding reduction in statewide as well as New York City air emissions. Table 16.2 shows the statewide reduction in air emissions with the addition of the NYPA Combined Cycle Project. Table 16.3 shows the reduction in air emissions in New York City.

Table 16.2: Statewide Reduction in Air Emissions

Pollutant	Total Annual Emissions (In Tons)		Change
	Without NYPA Combined Cycle Project	With NYPA Combined Cycle Project	
SO_x	155,309	153,460	-1,849 (1.2%)
NO_x	41,641	40,935	-706 (1.7%)
CO_2	53,007,928	52,875,524	-132,404 (0.2%)

Source: General Electric MAPS model output, 2001.

Table 16.3: New York City Reduction in Air Emissions

Pollutant	Total Annual Emissions (In Tons)		Reduction
	Without NYPA Combined Cycle Project	With NYPA Combined Cycle Project	
SO_X	234	230	-4 (1.7%)
NO_X	3,974	3,664	-310 (7.8%)
CO_2	14,906,278	14,704,376	-201,902 (1.4%)

Source: General Electric MAPS model output, 2001.

More specifically, as shown in Table 16.4, the MAPS analyses indicate that the operation of the NYPA Combined Cycle Project will reduce emissions from the existing Astoria, Ravenswood and Arthur Kill facilities as well as the proposed SCS Astoria Project.

Table 16.4: Reductions in Air Emissions of Selected New York City Generating Units

Unit	Pollutant	Total Annual Emissions (In Tons)		Reduction
		Without NYPA Combined Cycle Project	With NYPA Combined Cycle Project	
SCS Astoria CC	SO_X	0	0	0
SCS Astoria CC	NO_X	174	171	3 (1.7%)
SCS Astoria CC	CO_2	2,772,497	2,724,482	48,015 (1.7%)
Astoria5	SO_X	3.2	3.0	0.2 (6.3%)
Astoria5	NO_X	1,234	1,156	78 (6.3%)
Astoria5	CO_2	606,908	568,994	37,914 (6.2%)
Ravenswood 1	SO_X	1.9	1.8	0.1 (5.3%)
Ravenswood 1	NO_X	281	272	9 (3.2%)
Ravenswood 1	CO_2	359,024	348,135	10,889 (3.0%)
Arthurkill 3	SO_X	1.5	1.2	0.3 (20.0%)
Arthurkill 3	NO_X	14	7	7 (50.0%)
Arthurkill 3	CO_2	14,246	7,556	6,690 (47.0%)

Source: General Electric MAPS model output, 2001.

In summary, the NYPA Combined Cycle Project is expected to reduce the operation of older, less efficient generating units in New York City, resulting in a corresponding reduction in local emissions of NO_x, SO_x and CO_2. In addition, the proposed Project is expected to reduce the number of megawatt-hours imported into New York City from other New York State and regional sources. Since much of the energy from these other sources is fossil (oil and coal) fueled, additional reductions in statewide and regional NO_x, SO_x and CO_2 emissions are also expected. Accordingly, the operation of the NYPA Combined Cycle Project will provide a clear environmental benefit to New York State, New York City, and the residents of Queens.

Testimony

Testimony

DIRECT TESTIMONY
IN SUPPORT OF THE
NEW YORK POWER AUTHORITY COMBINED CYCLE PROJECT
ARTICLE X APPLICATION
ADDRESSING 16 NYCRR § 1000.5(c)(1)

Sponsoring	Witnesses
Section 1.0 (Introduction)	Craig Wolfgang
Section 2.0 (Public Involvement)	Rick Chase
Section 3.0 (Description of Proposed Facility)	Woodrow Crouch Charles Lipsky Ralph Rufrano
Section 4.0 (Land Use, Zoning and Public Policy)	Craig Wolfgang
Section 5.0 (Air Resources)	Ted Main Jay Snyder Mitchell Lagerstrom
Section 6.0 (Soils, Geology and Hydrogeology)	Steve Panter
Section 7.0 (Surface Water Resources)	David Schafer
Section 8.0 (Aquatic Resources)	David Schafer
Section 9.0 (Vegetation and Wildlife)	Craig Wolfgang
Section 10.0 (Visual Resources)	Craig Wolfgang
Section 11.0 (Cultural Resources)	Craig Wolfgang William Slade
Section 12.0 (Noise)	Anthony Agresti
Section 13.0 (Traffic and Transportation)	Brian Dempsey
Section 14.0 (Socioeconomics)	Craig Wolfgang
Section 15.0 (Alternatives)	Woodrow Crouch

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

ANTHONY C. AGRESTI
Senior Noise Analyst
Mid-Atlantic Office
TRC Environmental
Corporation

Q. Please state your name and business address.

A. Anthony C. Agresti, TRC Environmental Corporation, Lyndhurst, New Jersey.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as a Senior Noise Analyst.

Q. Please describe your educational background.

A. I received a Bachelor of Science degree in Meteorology from Kean College of New Jersey in 1984. In addition, I am certified as a State of New Jersey Noise Control Officer.

Q. Please describe your professional experience.

A. I was employed as a meteorologist/noise analyst for Enserch Environmental Corporation (formerly Ebasco Environmental), from 1986 to 1994. I joined TRC Environmental in 1994 and am currently employed by TRC Environmental as a Senior Noise Analyst. I have over 14 years of professional experience encompassing noise analyses and impact assessments, design and implementation of ambient noise monitoring programs, and noise compliance.

My experience includes developing noise analyses and impact assessments for over 25 independent power and cogeneration facilities, including projects under New

York State's Article X law. Specific project experience includes the 1000 MW Astoria Energy combined cycle project in Queens, New York; the 750 MW Bowline Unit 3 combined cycle project in Haverstraw, New York; the Inter-Power of New York, Inc., Halfmoon Cogeneration Facility in Halfmoon, New York; the Crown Vista Energy Independent Power Project in West Deptford, New Jersey; Destec Energy's 57 MW Northway Cogeneration Facility in Harriman, New York; the Freehold Cogeneration Project in Freehold, New Jersey; the Lavair Cogeneration facility in Catskill, New York; and the Dunkirk Cogeneration facility in Dunkirk, New York. I have also prepared the noise impact assessments for electric generating projects in other parts of the country, including the Duke Energy Moss Landing and Morro Bay projects in California; the Kendall Square project in Cambridge, Massachusetts; Con Edison Development's Newington Energy Project in Newington, New Hampshire; and PPL Wallingford Energy's simple cycle project in Wallingford, Connecticut.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Section 12 of the Application.

Q. What is the purpose of your testimony?

A. The purpose of my expert testimony is to provide the requisite support for the sections of the Authority's Application that were prepared by me or were prepared under my direct supervision.

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

FREDERICK E. CHASE
Director, Community
Relations
New York Power Authority
30 South Pearl Street
Albany, New York

Q. Please state your name and business address.

A. FREDERICK E. CHASE, New York Power Authority, 30 South Pearl Street, Albany, New York.

Q. By whom are you employed and in what capacity?

A. I am employed by the New York Power Authority as the Director of Community Relations.

Q. Please describe your educational background.

A. I graduated from LeMoyne College in 1975 with a Bachelor of Science degree in biology and professional experience.

A. Please describe you professional experience.

I have served as Director, Community Relations at the New York Power Authority since 1987. From 1983 to 1987, I was public information officer at the Authority's James A. FitzPatrick Nuclear Power Plant. From 1979 to 1983, I was employed at the Frederick R. Clark Energy Center in community relations, becoming regional manager in the community relations division in 1981. I was employed by Power Authority from 1977 to 1979 as an assistant information officer assigned to a field office along with route of the Massena-Marcy 765,000-volt transmission line, which was under construction at the time. From 1976 to 1979, I was employed by Continental Field Service Corporation as a property negotiator responsible for the acquisition of land easements for the 765,000-volt transmission line project.

In my current position, I am responsible for the Power Authority's statewide community relations program including outreach to government officials, business and community leaders, the Authority's education program and the utility's visitors centers. I am also responsible for the public participation program associated with the licensing of the Power Authority's hydroelectric generating plants and the proposed Combined Cycle Project in Queens.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Section 2.0 of the Application pertaining to the Power Authority's Public Involvement Program.

Q. What is the purpose of your testimony?

A. The purpose of my expert testimony is to provide the requisite support for the sections of the Power Authority's Application that were prepared by me or were prepared under my direct supervision.

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Woodrow W. Crouch
Vice President - Project
Management
New York Power Authority
123 Main Street
White Plains, New York

Q. Please state your name and business address.
A. Woodrow W. Crouch, New York Power Authority, 123 Main Street, White Plains, New York.
Q. By whom are you employed and in what capacity?
A. I am employed by the New York Power Authority as Vice President - Project Management.
Q. Please describe your educational background.
A. I graduated from the U.S. Merchant Marine Academy with a B.S. and from Columbia University with a M.S. in Mechanical Engineering.
Q. Please describe your professional registrations and affiliations.
A. I am on the Board of Directors of the U.S. Committee on Large Dams and the Executive Committee of Water Power. I am also a licensed Professional Engineer in New York State.
Q. Please describe your professional experience.
A. I have been employed by the Power Authority since August 1973. Since June 1988, I have been employed as Vice President - Project Engineering with responsibility for all of the Power Authority's capital power projects. From April 1973 to June 1988, I was first mechanical engineer then Project Engineer and then Project Manager for the Power Authority's proposed 700 MW Fossil Power Plant. This

involved review and approval of technical specifications for mechanical equipment, direction of licensing aspects of the facility and direction of overall engineering. From September 1966 to August 1973, I was employed by Consolidated Edison Company of New York, Inc. as a mechanical engineer with responsibility for scheduling and engineering design of equipment for fossil and nuclear steam electric facilities. From May 1966 to June 1966, I was employed by M. Rosenblatt & Son, Naval Architects and Marine Engineers as a marine engineer responsible for the preparation of drawings and technical manuals and specifications for boiler plant equipment. From August 1964 to May 1965, I was employed on the SS American Packer, SS Transcaribbean and SS Pioneer Minx as Third Assistant Engineer. My responsibilities included operation and maintenance of steam boilers, turbines, pumps and associated equipment and controls.

Q. Have you previously testified in connection with the construction of generating facilities?

A. Yes, I testified in connection with the Power Authority's proposed 700 MW Fossil Fueled plant Case 80004 under the Public Service Law Article VIII.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Sections 3 and 15 of the Application pertaining to the Project Description and Alternatives.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the requisite support for the sections of the Power Authority's Application that were prepared by me or were prepared under my supervision.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Brian E. Dempsey, P.E., P.T.O.E.

Traffic Engineer

TRC Raymond Keyes Associates

7 Skyline Drive

Hawthorne, New York 10532

Q. Please state your name and business address.

A. My name is Brian E. Dempsey, and I am a Traffic Engineer at TRC. My Business address is 7 Skyline Drive, Hawthorne, NY 10532.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as a Traffic Engineer with the title of Project Manager. As Traffic Engineer for TRC, I am responsible for the designing and conducting of traffic analyses for traffic engineering studies undertaken in conjunction with environmental analyses required for client development projects. My duties as Traffic Engineer include analysis of existing conditions and projecting future conditions on major arterials, local roadways, and parking resources.

Q. Please describe your educational background.

A. I received a Bachelor of Civil Engineering from Villanova University in 1986, and a Masters of Business Administration from Fordham University in 1992.

Q. Please describe your professional registrations and affiliations.

A. I am a Registered Professional Engineer in the states of New York, New Jersey, Delaware, Pennsylvania and Connecticut. I am also a certified Professional Traffic Operations Engineer. I am a member of the Institute of Transportation Engineers.

Q. Please describe your professional experience.

A. I have had 14 years of experience encompassing the preparation of traffic engineering studies, traffic planning studies, parking studies, traffic demand management studies, environmental impact statements, and Article X Applications. I have been involved with traffic studies for various power plant projects in New York, Connecticut and Massachusetts, among others. I have been employed by TRC since 1986. From 1984 to 1985, I was a Civil Engineering Intern at the Westchester County Department of Public Works.

Q. Have you previously testified in connection with the construction of generation facilities?

A. No. However, I have prepared testimony on behalf of other electric generation facilities that are currently under review.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Section 13 (Traffic and Transportation) of the Application.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW Combined Cycle facility to be constructed in Queens, New York.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

N. Mitchell Lagerstrom

Air Quality Engineer

TRC Environmental Corporation

1200 Wall Street West

Lyndhurst, New Jersey 07071

Q. Please state your name and business address.

A. N. Mitchell Lagerstrom, TRC Environmental Corporation, Lyndhurst, New Jersey.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as an Air Quality Engineer.

Q. Please describe your educational background.

A. I graduated from the University of Virginia in 1999 with a Bachelors of Science in Chemical Engineering.

Q. Please describe your professional experience.

A. During the summer of 1998 I worked for the Pechan-Avanti Group, Inc. as a Chemical Engineer, I calculated emissions and control costs for several industries. Since August 16, 1999 I have worked for TRC Environmental as an Air Quality Engineer where my primary responsibilities include performing facility permitting in support of Clean Air Act Amendment Title V work and Article X applications in the State of New York. As a result of my experience performing emission calculations, I have working knowledge of many of the available calculation techniques including; USEPA AP-42 and other USEPA guidance documents, mass-balance, application of vendor guaranteed data and other client-specific approaches. To support current and future assignments in this area, I have developed several emission calculation spreadsheets to support these tasks and I maintain a library of reference material. Within the State of New York I have worked on two other Article X projects. Including Southern Energy's 750 MW combined cycle plant at the existing Bowline site in Rockland County and KeySpan's 250 MW cogeneration facility at the existing Ravenswood plant in Long Island City. My duties for these projects were to calculate potential emissions of U.S. EPA criteria and non-criteria pollutants from the combustion turbines, duct burners, cooling towers and existing equipment at each facility, assist in writing the PSD air permit applications, and assist in writing Section 5, "Air Resources" of the Article X permit applications.

Q. Have you previously testified in connection with the construction of generating facilities?

A. No.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I served as Air Quality Engineer for the preparation of Section 5 of the Article X Application and the PSD Air Permit Application.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW Combined Cycle facility to be constructed in Queens, New York.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Charles I. Lipsky, P.E.
Vice President & Chief Engineer
Power Generation
New York Power Authority
123 Main Street
White Plains, New York

Q. Please state your name and business address.

A. Charles I. Lipsky, New York Power Authority, 123 Main Street, White Plains, New York

Q. By whom are you employed and in what capacity?

A. I am employed by the New York Power Authority as a Vice President & Chief Engineer, Power Generation.

Q. Please describe your educational background.

A. I graduated from Rensselaer Polytechnic Institute in 1963 with a Bachelors Degree in Electrical Engineering, and in 1967 with a Masters in Management.

Q. Please describe your professional registrations and affiliations.

A. I am a registered Professional Engineer in the State of New York. I am a member of the Electric Power Research Institute, Institute of Electronic and Electrical Engineers, CIGRE and I am on the Hydro Review Magazine Editorial Board.

Q. Please describe your professional experience.

A. From 1963 to 1965, I was employed as a Supervisory Trainee at Niagara Mohawk Power Corporation. From 1965 to 1966, I was employed as a General Line

Foreman for the Niagara Mohawk Power Corporation, responsible for all distribution, maintenance and construction in part of the Albany region. Was responsible for all street light construction and maintenance. From 1966 to 1967, I was Assistant to Superintendent at Niagara Mohawk Power Corporation, Albany Steam Plant, involved with operation, maintenance and capital improvements to a 400 MW electric steam generation plant. From 1967 to 1969 I was Assistant to Superintendent at Niagara Mohawk Power Corporation, Nine Mile One Nuclear Plant, involved in Chemistry, radiation protection and health physics. From 1969 to 1974 I was Electrical Engineer New York Power Authority, Niagara Power Project. From 1974 to 1981 I was Superintendent of Power, New York Power Authority, Blenheim-Gilboa Power Project responsible for all operation, maintenance and capital improvements of 1000 MW pumped storage and associated transmission and substation facility. From 1981 to 1986 I was Superintendent of Power at the Niagara Power Project, responsible for all operation, maintenance and capital improvements of 2000 MW run of river and pump storage plant; associated transmission and substation facilities. I assumed my present position as Vice President & Chief Engineer Power Generation at the New York Power Authority White Plains Office in 1987. I have been in this position for 13+ years. During this period I have overseen the Regulatory dealings with Federal Energy Regulatory Commission on six operating hydro generation plants from 2,400 MW to 6 MW including, but not limited to, dam safety, rehabilitation, annual inspections and Emergency Action Plans. In addition I have overseen the following design, modifications, repairs and additions to plants for all the Power Authority's Hydro, Fossil and Transmission facilities: Relicensing; SCADA; security; Unit breakers; zebra mussel control; magnetic field mitigation; fire pump replacement; transient recovery voltage studies; system disturbance analysis; protection and relaying; transient recorder; plant metering; revenue metering;

building renovation; floor plan study; microwave system replacement; slope stability; general protection; fiber optic cable installation; control room modification; metallurgical & failure analysis; system short circuit study; Flexible AC Trans System (FACTS); foundation leakage; HRSG instrument; Fuel gas compressor; Denitrification system; crane modifications; fire protection; warehouse design; drinking water backflow prevention; maintenance & testing practice; concrete wing wall; gas & oil analysis; unit upgrades; unit overhaul; unit automation; bridge inspections; ice boom modifications; tower relocation; ultrasonic flowmeters; radio console replacement; cooling water modification for exciter cooler; fuel oil piping; vibration monitoring; current limit reactors; repowering study; control systems modification; main steam pipe hanger studies; shoreline erosion repair; HVAC and sprinkler systems; circuit breakers; static exciters; hydroturbine model studies; microturbine generators; WDPF control systems;

foundation grouting; station service modification; radio replacement; harmonic disturbance; MALMS; Y2K. I have been responsible for performance engineering and implementation for the work force utilization program at the Power Authority.

Q. Have you previously testified in connection with the construction of generating facilities?

A. No

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Plant Site Plan including water, storm sewers, sanitary sewers, potable water, gas and oil, and the electrical connecting to the grid.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW Combined Cycle facility to be constructed in Queens, New York.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Theodore Main

Manager, Air Quality Modeling

TRC Environmental Corporation

1200 Wall Street West

Lyndhurst, New Jersey 07071

Q. Please state your name and business address.
A. Theodore Main, TRC Environmental Corporation, Lyndhurst, New Jersey.
Q. By whom are you employed and in what capacity?
A. I am employed by the TRC Environmental Corporation as the Manager of the Air Quality Modeling Group.
Q. Please describe your educational background.
A. I graduated from The Pennsylvania State University in 1978 with a Bachelor of Science degree in Meteorology.
Q. Please describe your professional registrations and affiliations.
A. I am a member of the American Meteorological Society.
Q. Please describe your professional experience.
A. From 1978 to 1981, I was employed as a Meteorologist and Air Quality Modeler at Stanley Consultants in Muscatine, Iowa. From 1981 to 1994, I was employed as an Air Quality Meteorologist and Project Manager at Ebasco Services (collectively, Envirosphere, Ebasco Environmental and Enserch Environmental). I

assumed my present position as Manager, Air Quality Modeling at TRC Environmental Corporation in 1994.

I have 22 years of experience encompassing the areas of

(1) Project Management

(2) Prevention of Significant Deterioration Permit Applications

(3) Air Quality/New Source Review Permitting

(4) Title V Permitting

(5) Air Quality Dispersion Modeling

(6) Cooling Tower Assessments

(7) Visible Plume Studies

(8) Environmental Impact Studies

(9) Air Quality Monitoring

(10) Air Quality/Meteorology Computer Applications

(11) Environmental Due Diligence

(12) Expert Testimony

Applications I have experience as a Project Manager and Air Quality Specialist on a variety of development and energy related projects. Specific project experience includes the preparation of air quality analyses for the following: Inter-Power of New York's Halfmoon Cogeneration Project, a 210 MW coal-fired, fluidized-bed cogeneration project near Albany, New York; Enserch Development Corporation's Lavair Cogeneration Project, a 120 MW gas-fired cogeneration project near Catskill, New York; serving as project manager to prepare a Title V permit application for Fort Drum Cogeneration Partners, Fort Drum, NY coal-fired fluidized bed cogeneration facility; provided project management and technical support for air quality modeling and permitting for a 600 MW combined cycle cogeneration facility in Linden, NJ; and, project management and air quality modeling support for a 750 MMBTU/hr boiler permitting study for Merck Rahway Facility, Rahway NJ.

Q. Have you previously testified in connection with the construction of generating facilities?

A. Yes. I testified before the Planning Board of Parlin Township, NJ in support of the O'Brien Parlin Cogeneration Facility; before the Planning

Board of Rahway, NJ to support a 750 MMBTU/hr new boiler construction project; and, before the Planning Board of Lawrenceville Township to support a heating boiler project for Bristol Myers-Squibb.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I served as Technical Manager for the preparation of the Air Quality, Cooling Tower, and Visual Plume Analyses for Sections 5 and 10 of the Application.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW Combined Cycle facility to be constructed in Queens, New York.

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

STEVEN E. PANTER,CGWP
Senior Project Manager
Mid-Atlantic Office
TRC Environmental
Corporation

Q. Please state your name and business address.
A. Steven E. Panter, TRC Environmental Corporation, Lyndhurst, New Jersey.
Q. By whom are you employed and in what capacity?
A. I am employed by TRC Environmental Corporation as a Senior Project Manager/Senior Hydrogeologist.
Q. Please describe your educational background and professional experience.
A. I graduated from the New Jersey Institute of Technology in 1990 with a Master of Science degree in Environmental Engineering. I graduated from the University of Wisconsin, Madison, in 1978 with a Bachelor of Science degree in Forest Science.
Q. Please describe your professional registrations and affiliations.
A. I am a member of the Association of Ground Water Scientists and Engineers, a division of the National Ground Water Association, and with that organization I am a Certified Ground Water Professional (CGWP), registration number 437.
Q. Please describe your professional experience.
A. From 1980 to 1983 I was employed as a soil scientist at Natural Resource Dynamics, Inc. From 1983 to 1987 I was employed as a hydrogeologist by Gibbs & Hill,

Inc. From 1987 to 1988 I was employed by Environmental Science & Engineering as an associate environmental scientist. From 1988 to 1989, I was employed as a project manager by ICF Kaiser Engineers. I assumed my present position as a Senior Project Manager at TRC in 1989.

I have 18 years professional experience encompassing the areas of (1) environmental site investigation and remediation of soils and ground water, (2) preparing environmental baseline studies, (3) evaluating environmental liabilities, (4) Project Management, (5) experience investigating and interpreting site contamination associated with fossil fueled electrical generating facilities, including coal- and oil-fired plants and former manufactured gas plants (MGP).

I have experience as a Project Manager and hydrogeologist on a variety of site development, investigation, and remediation programs. Specific project experience includes site baseline assessment and investigation/remediation experience for the following: Eight (8) years as a project manager directing multiple site investigation and remediation programs at Con Edison's former Arthur Kill facility, an 850 MW coal-, oil-, and natural gas-fired electrical generating station in Staten Island, New York; this included site investigation and remediation of soil and ground water impacted by fuel oil and PCBs, identification, delineation, and remediation of areas of concern throughout the majority of the site, delineation and evaluation of ash disposal and coal storage areas, a risk analysis of site wide compounds associated with plant operations, and remediation of the building, pavement, soils, and discharge canal; in addition, my experience encompasses site investigation of oil-impacted soils and ground water on NRG's Astoria Gas Turbine facility, Astoria, Queens, New York; evaluating the contaminant behavior, regulatory, and remediation implications of MGP contamination at Keyspan Energy's 1,100 MW Ravenswood electrical generating facility in Queens, New York; I participated in the investigation, feasibility studies, and oversight of five MGP facilities in New Jersey, owned and operated by Jersey Central Power and Light Company; I have supervised and/or participated in environmental assessments of more than 20 fossil-fueled electrical generating facilities throughout the United States as part of due-diligence pre-acquisition programs, where one of the key objectives was to identify environmental contamination and the liabilities caused by it and formulate means and cost estimates to address the contamination; and delineation of oil-impacted soils at the Indian Point Nuclear Power plant, Buchanan, New York.

Q. Have you previously testified in connection with the construction of generating facilities?

A. Yes. In 1987 I testified by proxy before the Lacy Township Planning Board in Lacy Township, Ocean County, New Jersey on behalf of Jersey Central Power & Light Company in connection with expansion of their fossil fuel electrical generating capacity at the Forked River facility.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Section 6 (Soils, Geology and Hydrogeology) of the Application.

Q. What is the purpose of your testimony?

The purpose of my expert testimony is to provide the requisite support for the sections of the Authority's Application that was prepared by me or was prepared under my direct supervision.

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

DAVID E. SCHAFER, P.E.
Professional Engineer
TRC Environmental
Boots Mill South
Foot of John Street
Lowell, MA 01852

Q. Please state your name and business address.

A. David E. Schafer, TRC Environmental Corporation, New Jersey.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as a Professional Engineer.

Q. Please describe your educational background and professional experience.

A. I received a Bachelor of Science degree in Civil Engineering from SUNY College of Environmental Science and Forestry. I also completed my Masters degree in Environmental Engineering from Northeastern University, as well as my OSHA Hazardous Waste Site Training. I have 18 years of experience encompassing Water Resource Engineering, NPDES/SPDES Permitting, Application of Analytical and Numerical Modeling Techniques, Erosion and Sediment Control, Hazardous Waste Site Assessment and Remediation, Ground Water Development and Management, Contaminant Transport Simulation, Storm Water Management/Permitting, Subsurface Investigation Programs and Receiving Water Modeling. I have worked on NPDES Permitting for the Newington NH 525 MW generating station and Canal Electric's additional 525 MW combined cycle expansion project. SPDES Permitting for the East Syracuse Generating Company, L.P. for discharge of cooling tower, storm water and boiler blowdown from 150 MW cogeneration facility, and modification for the joint discharge of process waste streams from the General Electric Plastics, 80 MW Selkirk Cogeneration Phase and 262 MW Selkirk Cogeneration Phase II facilities. I also worked on the hydrodynamic and thermal discharge modeling for the construction of an intake, discharge, and pier/jetty for a 500 MW combined cycle generating station for Enron Engineering and Construction Co.

I have worked for the Department of Defense in New Hampshire and Massachusetts as senior technical hydrogeologist and remediation engineer during the Installation Restoration Program remedial design/remedial action activities.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I supervised the preparation of Sections 7 and 8 of the Application pertaining to Water Resources and Aquatic Resources

Q. What is the purpose of your testimony?

A. The purpose of my expert testimony is to provide the requisite support for the sections of the Power Authority's Application that were prepared by me or were prepared under my direct supervision.

BEFORE THE
STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING
AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

William V. Slade
Director, Environmental
Division
New York Power Authority
123 Main Street
White Plains, New York

Q. Please state your name and business address.

A. William V. Slade, New York Power Authority, 123 Main Street, White Plains, New York.

Q. By whom are you employed and in what capacity?

A. I am employed by the New York Power Authority as the Director of the Environmental Division.

Q. Please describe your educational background.

A. I graduated from Rensselaer Polytechnic Institute with a Bachelor of Science degree in Biology in 1975. I received a Master of Science degree in Environmental Engineering from the State University of New York at Stony Brook in 1989. In addition to my university education, I have taken a number of courses offered by professional organizations related to cultural resources including *Introduction to Federal Projects and Historic Preservation Law, Advanced Seminar on Preparing Agreement Documents Under Section 106, Cultural Resource Management Plans*, and *Identification and Management of Traditional Cultural Places*.

Q. Please describe your professional registrations and affiliations.

A. I have been certified since June 1991 by the National Registry of Environmental Professionals as a Registered Environmental Manager (REM # 2681). I am a member of the Board of Directors of the National Association for Environmental Management. I am currently a member of the Administrative Committee of the Environmental Energy Alliance of New York, and served for many years on the Environmental and Land Use Committees of the Empire State Electric Energy Research Corporation (ESEERCO).

Q. Please describe your professional experience.

A. I joined the New York Power Authority in 1981, and worked on the final stages of licensing and the initial phases of construction for the Arthur Kill 700 MW Power Plant. The primary focus of my efforts were in evaluating the potential impacts of construction, preparing environmental specifications that would minimize those impacts, and organizing plans to address specific mitigation issues. In 1983, I was appointed lead environmental engineer for the Marcy South 345kV Transmissions Facilities Project. I worked in licensing support and provided oversight of a staff of environmental monitors affiliated with this 200-mile long construction project. I was responsible for the development of specifications and implementation of cultural resources studies for the project, and helped to secure a Memorandum of

Agreement between the Corps of Engineers and the State Historic Preservation Officer relative to the overall impact of the project. As part of the completion work on the Marcy South Project, I supervised and participated in a large-scale visual impact assessment effort that identified and mitigated specific visual impact areas. Following completion of the Marcy South Project, I worked in the Power Authority's headquarters office, supervising engineers and scientists in a wide variety of disciplines. During that time period, I supervised the completion of cultural resources reports for each of our operating facilities. I also directed and participated in a visual impact assessment of the Authority's proposed Holtsville Power Project. I assumed the title of Director, Environmental Division in March 1997; as such, I am also the Agency Preservation Officer, as that term is defined in the New York State Historic Preservation Act. As Agency Preservation Officer, I have been responsible for the oversight of a number of reports dealing with cultural resources associated with the relicensing of the Authority's St. Lawrence-FDR Power Project near Massena, New York. These reports include an assessment of the potential eligibility of the Project structures for the National Register of Historic Places.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I participated directly in the preparation of Section 11 of the Application pertaining to Cultural Resources.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the requisite support for the conclusions of Section 11; namely, that the project proposed in this proceeding will not encounter previously undocumented pre-contact or historic-period cultural resources and that no further investigations or mitigation with regard to historic architectural resources are needed.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Jay A. Snyder

Air Quality Scientist

TRC Environmental Corporation

1200 Wall Street West

Lyndhurst, New Jersey 07071

Q. Please state your name and business address.

A. Jay A. Snyder, TRC Environmental Corporation, Lyndhurst, New Jersey.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as an Air Quality Scientist.

Q. Please describe your educational background.

A. I graduated from the Pennsylvania State University in 1992 with a Bachelor of Science degree in Meteorology.

Q. Please describe your professional registrations and affiliations.

A. I am a member of the American Meteorological Society and a member of the Air and Waste Management Association.

Q. Please describe your professional experience.

A. From 1992 to 1998, I was employed as an Atmospheric Scientist at Radian International, LLC, formerly Radian Corporation. I assumed my present position as Air Quality Scientist at TRC Environmental Corporation in 1998.

I have eight years of experience encompassing the areas of (1) Project Management, (2) New Source Review and Prevention of Significant Deterioration (PSD) Modeling, (3) Toxic Air Pollutant Modeling, (4) Regional Haze (Visibility and Long-Range Transport) Modeling and (5) Health Risk Assessments.

I have experience as an Air Quality Project Manager and Team Member on a variety of new facility construction and facility modification or expansion projects. Specific project experience includes the preparation of PSD applications for the Southern Energy Bowline, L.L.C., 750 MW combined cycle facility in Rockland County, New York; KeySpan Energy's 250 MW Ravenswood Cogeneration Facility in Queens, New York; the AES Red Oak 616 MW combined cycle facility in Sayreville, New Jersey; the Con Ed Development 500 MW simple cycle facility in Lakewood, New Jersey; the Liberty Electric 500 MW combined cycle facility in Eddystone, Pennsylvania; the FPL Energy Marcus Hook, L.P. 750 MW Cogeneration Facility in Marcus Hook, Pennsylvania; and the

Reliant Hunterstown Station which is a 800 MW combined cycle cogeneration facility in Hunterstown, Pennsylvania.

I have prepared toxic air pollutant analyses for the Southern Energy Bowline, L.L.C., 750 MW combined cycle facility in Rockland County, New York; KeySpan Energy's 250MW Ravenswood Cogeneration Facility in Queens, New York; multiple Texas Gas Transmission Corporation natural gas compressor stations throughout southeastern United States; and the GlaxoWellcome Inc. facility in Research Triangle Park, North Carolina.

I have also conducted regional haze analyses for the AES Red Oak 616 MW combined cycle facility in Sayreville, New Jersey; the Con Ed Development 500 MW simple cycle facility in Lakewood, New Jersey; the Liberty Electric 500 MW combined cycle facility in Eddystone, Pennsylvania; and the FPL Energy Marcus Hook, L.P. 750 MW Cogeneration Facility in Marcus Hook, Pennsylvania.

Q. Have you previously testified in connection with the construction of generating facilities?

A. No.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I served as Air Quality Scientist for the preparation of Section 5 of the Application.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Power Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW combined cycle facility to be constructed in Queens, New York.

BEFORE THE

STATE OF NEW YORK

BOARD ON ELECTRIC GENERATION SITING

AND THE ENVIRONMENT

In the Matter of

New York Power Authority

Case 99-F-1627

August 2000

Prepared Testimony of:

Craig H. Wolfgang, AICP

Senior Environmental Planner

TRC Environmental Corporation

1200 Wall Street West

Lyndhurst, New Jersey 07071

Q. Please state your name and business address.

A. Craig H. Wolfgang, TRC Environmental Corporation, Lyndhurst, New Jersey.

Q. By whom are you employed and in what capacity?

A. I am employed by the TRC Environmental Corporation as a Senior Environmental Planner.

Q. Please describe your educational background.

A. I graduated from Georgia Institute of Technology in 1979 with a Masters degree in City Planning. I graduated from the University of Connecticut in 1976 with a Bachelor of Science degree in Natural Resource Conservation.

Q. Please describe your professional registrations and affiliations.

A. I am a member of the American Planning Association and a member of the American Institute of Certified Planners

Q. Please describe your professional experience.

A. From 1980 to 1983, I was employed as an Environmental Planner at Claude Terry & Associates. From 1983 to 1986, I was employed as a licensing Specialist by the New York Power

Authority. From 1986 to 1994, I was Supervisor, Resources Planning at Ebasco Environmental. From 1994 to 1999, I was a Principal Planner at Louis Berger & Associates, Inc. I assumed my present position as Project Manager at TRC Environmental Corporation in 1999.

I have 20 years of experience encompassing the areas of (1) Project Management, (2) NEPA Compliance, (3) Environmental Permitting, (4) Land Use and Aesthetic Impact Assessment and (5) Public Participation Program Management.

I have experience as a Project Manager and Environmental Planner on a variety of development and infrastructure improvement projects. Specific project experience includes the preparation of environmental analyses for the following: Inter-Power of New York's Halfmoon Cogeneration Project, a 210 MW coal-fired, fluidized-bed cogeneration project near Albany, New York; New York Power Authority's Marcy South Project, a 200-mile, 345 kV transmission facility in upstate New York, and the Sound Cable Project, a 27-mile, 345 kV underground/submarine transmission line between Westchester County and Nassau County, New York; Destec Energy's 57 MW gas-fired Northway Cogeneration Project near Harriman, New York; the Iroquois/Tennessee Pipeline in New York, Massachusetts, Connecticut, and Rhode Island; and the Empire State Pipeline Project in New York. I have participated in traffic studies and environmental analysis on several projects including the Edison Bridge Rehabilitation Project for the New Jersey Department of Transportation; the Driscoll Bridge Rehabilitation and Improvement Project for the New Jersey Highway Authority; and the rehabilitation of the Roosevelt Avenue/74th Street Station Complex, the replacement of the 100th Street bus depot, and the development of new electrical substations on Roosevelt Island and at Columbus Park in Brooklyn for the New York City Transit Authority. I have also have conducted socioeconomic assessments, historic preservation planning and visual impact assessments for a variety of projects including the Liberty Pipeline

Project; Historic Preservation Plan, City of Paterson, New Jersey; General Public Utilities, Oyster Creek Nuclear Generating Station; and Enserch Development Corporation's Lavair Cogeneration Project, a 120 MW gas-fired cogeneration project near Catskill, New York.

Q. Have you previously testified in connection with the construction of generating facilities?

A. Yes. I testified before the New York State Board on Electric Generation Siting And the Environment in August, 1990 in connection with Inter-Power of New York's Halfmoon Cogeneration Project, a 210 MW coal-fired, fluidized-bed cogeneration project near Albany, New York. I also provided testimony before the Public Service Commission regarding potential visual effects and potential land use impacts to the former Delaware and Hudson Canal, a National Historic Landmark, and Minnewaska State Park resulting from Central Hudson Gas & Electric's upgrade of the P&MK Transmission Lines in Ulster County, New York.

Q. Did you prepare or supervise the preparation of part of the Application filed by the New York Power Authority in this proceeding?

A. Yes, I served as Project Manager for the preparation of the entire Application and supervised the preparation of Sections 4, 9, 10, 11, and 14 of the Application.

Q What is the purpose of your testimony?

A. The purpose of my testimony is to offer evidence in support of the Authority's Application for a Certificate of Environmental Compatibility and Public Need for a 500 MW Combined Cycle facility to be constructed in Queens, New York.

Appendix 2A

Appendix 2A

APPENDIX 2A

Public Involvement Materials:
New York Power Authority – Combined Cycle Project
Astoria, Queens, New York

Newspaper Notices

New York Power Authority
COMBINED CYCLE
FACILITY

Open House

The New York Power Authority, which supplies low-cost electricity for the subways, schools, hospitals and other public facilities in New York City as well as for businesses throughout the metropolitan area, will hold an open house on September 23 to discuss its plan to build a combined-cycle generating plant next to its Charles Poletti Power Project, in Astoria.

The new facility may be required to meet proposed state and federal requirements for new generating capacity in the city. If built, the plant will be one of the city's cleanest power plants, resulting in a reduction in NYPA's annual air emissions.

The purpose of the open house is to provide information about the project and solicit comments from the community.

September 23, 1999
3-5 p.m. and 7-9 p.m.
Astoria World Manor
25-22 Astoria Blvd., Queens, N.Y.

For information call, Luis Rodriguez at 718-626-8239.

New York Power Authority

NEWSDAY

AFFIDAVIT OF PUBLICATION

NEW YORK POWER AUTHORITY — NY POWER
31-03 20TH AVENUE
ASTORIA NY 11105-

STATE OF NEW YORK) — 7331
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COUNTY OF SUFFOLK)

Madeline Johansen

of Newsday, Inc., Suffolk County, N.Y., being duly sworn, says that such person is, and at the time of publication of the annexed Notice was a duly authorized custodian of records of Newsday, Inc., the publisher of NEWSDAY, a newspaper published in the County of Suffolk, County of Nassau, County of Queens, and elsewhere in the State of New York and other places, and that the Notice of which the annexed is a true copy, was published in the following editions/ counties of said newspaper on the following dates:

September 15, 1999 QUEENS

Sworn To Before Me This
15 day of September, 1999
Notary Public

Legal Notice 7331
POWER AUTHORITY
OF THE
STATE OF NEW YORK
NOTICE OF OPEN HOUSE

The Power Authority of the State of New will hold an open house on September 23, 1999, from 1:00 p.m. to 5:00 p.m. and from 7:00 p.m. to 9:00 p.m. at the Astoria World Manor, 25-22 Astoria Boulevard, Astoria, New York, 11102, to discuss its plans to construct a combined cycle facility adjacent to the existing Poletti Project. The new facility may be required if the state's Independent System Operator rules that more of New York City's electricity be provided by power plants within the five boroughs. The purpose of the open house is to solicit comments from the community at large on the proposal. The Power Authority intends to file permit applications early next year, with the new plant generating first power by late 2002.

For further information contact,
Luis Rodriguez
Charles Poletti Power Project
31-03 20th Avenue
Astoria, New York 11105-2014
718-626-8239

CATHERINE PIZZO
Notary Public, State of New York
No. 5004975
Qualified in Nassau County
Commission Expires November 30, 2000

123 Main Street
White Plains, New York 10601
914 681 6200

New York Power Authority

March 13, 2000

Ms. Debra Renner
Acting Secretary
NYS Siting Board
3 Empire State Plaza, 14th Floor
Albany, New York 12223

Subject: New York Power Authority – Case 99-F-1627
Proposed Combined Cycle Facility
Astoria, Queens

Dear Ms. Renner:

Enclosed are proofs of publication for the advertisement the Authority placed announcing the filing of the Pre-Application Report. Also enclosed are copies of recent newspaper articles on the project and meeting notes of conference.

Sincerely,

Ellen Koivisto
Licensing Manager

cc: Alan Domaracki, NYS Dept. of Public Service

NEWSDAY

AFFIDAVIT OF PUBLICATION

NEW YORK POWER AUTHORITY NY Power

1633 Broadway 21st Flr

New York NY 10019-

STATE OF NEW YORK) 9806

:SS.:

COUNTY OF SUFFOLK)

Madeline Johansen

of Newsday, Inc., Suffolk County, N.Y., being duly sworn, says that such person is, and at the time of publication of the annexed Notice was a duly authorized custodian of records of Newsday, Inc., the publisher of NEWSDAY, a newspaper published in the County of Suffolk, County of Nassau, County of Queens, and elsewhere in the State of New York and other places, and that the Notice of which the annexed is a true copy, was published in the following editions/ counties of said newspaper on the following dates:

December 21, 1999 QUEENS

Madeline Johansen

Sworn To Before Me This
21 day of December, 1999
Notary Public

Catherine Pizzo

CATHERINE PIZZO
Notary Public, State of New York
No. 5[illegible]
Qualified in Nassau County
Commission Expires Nov. [illegible] 2000

L98W

PRE-APPLICATION REPORT

The New York Power Authority filed a Pre-Application Report with the New York State Department of Public Service on November 17, 1999, for a proposed combined-cycle generating facility in Astoria, Queens.

The filing is the first step in the permitting process for the facility, which may be required to meet proposed state and federal requirements for new generating capacity in New York City. The Power Authority supplies low-cost electricity for the subways, schools, hospitals and other public facilities in the city as well as for businesses throughout the metropolitan area.

If built, the new facility will be one of the city's cleanest power plants and result in a reduction in NYPA's annual air emissions at the Queens site.

NYPA will initiate formal consultations with state and federal agencies and the public regarding the scope of studies to be conducted in support of a future application to the Siting Board on Electric Generation Siting and the Environment in accordance with Article X of the New York State Public Service Law.

THE REPORT IS AVAILABLE FOR REVIEW AT:

Queens Public Library
21-45 31st Street
Long Island City, NY 11105

Fordham Library Center
2556 Bainbridge Ave.
Bronx, NY 10458

Mid-Manhattan Library
455 Fifth Avenue
New York, NY 10016

Comments on the report should be submitted no later than December 31, 1999, to:

Ms. Ellen Koivisto
Licensing Manager
New York Power Authority
1633 Broadway
New York, NY 10019

For more information and/or a copy of the report, please call, toll free, 1-888-NYPA-332. Or visit our web site at: www.nypa.gov

New York Power Authority

...e 9823

...TO BIDDERS
...ersity Construction will ...roposals for the ...roject No 13476 ...ment of Feeder #3 ... Brock, Stony Brook, NY ... Local Time on 1/20/00 ... Office at the State Univ ... 353 Broadway, P.O. Box 1946, ... NY 12201-1946 and such ... be publicly opened and ... ediately thereafter. ... work ... his Contract is to be ...pleted on ... before 12/15/2000 ... on 1/4/00 @ 10:00 a.m ... ontract Documents may ... free of charge at: (for ... a street address and a ... number, use street ... advertisement.)

... Associates ... ineers ... Amityville, New York ... 1701 ...(516)789-... The Hathaw... SUNY Stony ...ook ... Stony Bro... New York 11790 ... Inc. ... Avenue, West Patterson, ... Hollow Road Melville, NY ... New York State Association of Minority Contractors Brooklyn Navy Yard Building #280 - 4th Floor ... York ... Albany, New York 12205 ... ontract Documents may ... Wesler-Cohen Associates Consulting Engineers ... Amityville NY

Legal Notice 9714

SUPREME COURT - COUNTY OF QUEENS HSBC BANK USA, FORMERLY MARINE MIDLAND BANK, SUCCESSOR BY MERGER AND ACQUISITION TO FIRST FEDERAL SAVINGS AND LOAN ASSOCIATION OF ROCHESTER Plaintiff against HUGO MALDONADO et al Defendant(s) Pursuant to a Judgment of Foreclosure and Sale entered herein and dated October 15, 1999, I, the undersigned Referee will sell at public auction at the Queens County General Courthouse, 88-11 Sutphin Blvd in Court Room #25, Jamaica, NY on the 21st day of January, 2000 at 11:00 AM premises lying and being in the Borough of Queens BEGINNING at a point on the westerly side of 99th street (formerly known as Marlowe Avenue) distant 100.27 feet northerly from the corner formed by the intersection of the westerly side of 99th street with the northerly side of Alstyne Avenue; being a plot 105 90 feet by 25 feet by 104.065 feet by 25.007 feet Said premises known as 47-32 99TH STREET, QUEENS, NY Approximate amount of lien $175,057 plus interest & costs. Premises will be sold subject to provisions of filed judgment and terms of sale Index Number [illegible] IRA HALFOND, ESQ., Referee Phillips Lytle Hitchcock Blaine & Huber LLP Attorney(s) for Plaintiff [illegible] First Federal Plaza, Rochester, NY [illegible]

Legal Notice 9766

NOTICE TO VENDORS
DORMITORY AUTHORITY -- STATE OF NEW YORK
("Owner")
BID NUMBER: 9566

Sealed bids for Graduate School & University Center, 365 5th Avenue, New York, NY 10036 will be received by the Dormitory Authority - State of New York Purchasing Department, 515 Broadway Albany, New York 12207-[illegible] bearing on the outside the name of the Bidder, his address, and designated as bid for: **PERSONNEL LIFTS**

Only [illegible]

New York Power Authority

COMBINED CYCLE

FACILITY

PRE-APPLICATION REPORT

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Contract Doc... shall be made payable to the ... Bids must be ... in duplicate in accordance ... the instructions contained in the Information for Bidders. Security will be required for each bid in an amount not less than 5 percent of the Total Bid.
It is the policy of the State and the Fund to encourage minority business enterprise participation in this project by contractors, subcontractors and suppliers, and all bidders are expected to cooperate in implementing this policy. The Fund reserve the right to reject any or all bids.
State University Construction Fund

Legal Notice 9377
NOTICE OF SALE
SUPREME COURT QUEENS COUNTY
COUNTRYWIDE HOME LOANS, INC. D/B/A AMERICA'S WHOLESALE LENDERS INC PLAINTIFF VS SANDRA BUDHRAM, SUROJNIE BUDHRAM ET AL DEFENDANTS
ATTORNEY (S) FOR PLAINTIFF ROSICKI, ROSICKI & ASSOCIATES, P.C., ONE OLD COUNTRY ROAD, SUITE 495, CARLE PLACE, NEW YORK 11514 (516) 741-2585
Pursuant to judgment of foreclosure and sale entered herein dated on September 15,1999, I will sell at Public Auction to the highest bidder at the Courtroom #25, General Courthouse at 88-11 Sutphin Blvd., Jamaica, Queens 11463.
On Friday, the 7th day of January, 2000 at 11:00 a.m.
Premises in Woodhaven, NY and described as follows: BEGINNING at a point on the southerly side of 87th Avenue, formerly First Street, distant 145 feet easterly from the corner formed by the intersection of the southerly side of 87th Avenue and the easterly side of 78th Street, formerly Snedeker Avenue; RUNNING THENCE easterly and along the southerly side of 87th Avenue, 27.33 feet; RUNNING THENCE southerly parallel with the easterly side of 78th Street, 100 feet; RUNNING THENCE westerly and parallel with the southerly side of 87th Avenue, 27.33 feet; RUNNING THENCE northerly and again parallel with the easterly side of 78th Street 100 feet to the southerly side of 87th Avenue, to the point or place of BEGINNING.
Premises known as 78-16 87th Avenue, Woodhaven, New York 11421
Sold subject to all of the terms and conditions contained in said judgment and terms of sale. Approximate amount of judgment $253,761.50 plus interest and costs. INDEX NO. 1268/99
Arthur Terranova, Esq., REFEREE

Legal Notice 9072
QUEENS MEDICAL AND DIABETIC, PLLC
Notice of formation of Professional Service Limited Liability Company ("PSLLC"). Articles of organization filed with the Sec. of State of NY ("SSNY") on 11/4/99. Office location: Queens County. SSNY has been designated as agent of the PSLLC upon whom process against it may be served. SSNY shall mail a copy of any process to the LLC, 37-47 77th Street, Jackson Heights, NY 13372. Latest date to dissolve: 1/1/2000. Purpose: To practice the profession of medicine.

... of the Dormitory Authority in Albany, New York (518) 257-3164 (FAX), and copies thereof obtained.
Thomas J. Murphy
Executive Director
YOUR FEDERAL TAX ID NUMBER MUST BE INCLUDED WITH REQUESTS
"NO REQUESTS FOR BID PACKAGES SHALL BE MAILED WITHIN ONE WEEK OF THE BID OPENING DATE, WITHOUT SPECIAL ARRANGEMENTS.
DATE: 12/14/99

Legal Notice 9378
NOTICE OF SALE
SUPREME COURT QUEENS COUNTY
THE BANK OF NEW YORK AS CO-TRUSTEE UNDER THE POOLING AND SERVICING AGREEMENT DATED AS OF FEBRUARY 28, 1998, SERIES 1998-A-II PLAINTIFF VS ANNIE L PAYNE ET AL DEFENDANTS
ATTORNEY(S) FOR PLAINTIFF-ROSICKI, ROSICKI & ASSOCIATES, P.C., 439 MAIN STREET, ISLIP, NEW YORK 11751 (516) 224-4673
Pursuant to Judgment of foreclosure and sale entered herein dated on September 17, 1999, I will sell at Public Auction to the highest bidder at the Court Room #25, 88-11 Sutphin Blvd., Jamaica, NY.
On Friday the 7th day of January, 2000 at 11:00 a.m.
Premises in Hollis, NY and described as follows. BEGINNING at a point on the easterly side of Manor Street now known as 191st Street distant 100 feet southerly from the corner formed by the intersection of the easterly side of Manor Street with the southerly side of Beaufort Avenue (104th Avenue); RUNNING THENCE easterly parallel with Beaufort Avenue, 100 feet; THENCE southerly parallel with Manor Street, 40 ft. THENCE westerly again parallel with Beaufort Avenue, 100 feet to the easterly side of Manor Street; THENCE northerly along the easterly side of Manor Street, 40 feet to the point or place of BEGINNING.
Premises known as 104-13 191st Street, Hollis, New York 11412
Sold subject to all of the terms and conditions contained in said judgment and terms of sale.
Approximate amount of judgment $123,083.20 plus interest and costs
INDEX NO. 27886-98
Robert M. Brill, Esq., REFEREE

Legal Notice 9071
FIVE STAR ELECTRIC/JB ELECTRIC JOINT VENTURE, LLC
Notice of formation of Limited Liability Company ("LLC"). Articles of Organization filed with the Sec. of State of NY ("SSNY") on 11/4/99. Office location: Queens County. SSNY has been designated as agent of the LLC upon whom process against it may be served. SSNY shall mail a copy of any process to the LLC, 101-32 101st Street, Ozone Park, NY 11416. Latest date to dissolve: 12/31/2039. Purpose: To engage in any lawful activity.

Legal Notice 9615
NOTICE OF FORMATION OF LIMITED LIABILITY COMPANY. NAME: GALIT NETWORK, LLC. Articles of Organization were filed with the Secretary of State of New York (SSNY) on 11/12/99. Office location: Queens County. SSNY has been designated as agent of the LLC upon whom process against it may be served. SSNY shall mail a copy of process to the LLC, 139-27 Queens Boulevard, Briarwood, New York. Purpose: For any lawful purpose.

Legal Notice 9518
SUPREME COURT - COUNTY OF QUEENS THE GREEN POINT SAVINGS BANK Plaintiff against GABRIEL SAMSON MOISE, et al defendant(s). Pursuant to a Judgment of Foreclosure and Sale entered herein and dated May 18, 1993, I, the undersigned Referee will sell at public auction at the front steps of the Queens County Court house, 88-11 Sutphin Blvd., Jamaica, NY on the 14th day of January, 2000 at 10:30 AM premises BEGINNING at a point on the easterly side of 204th Street distant 108.47 feet northerly from the corner formed by the intersection of the northerly side of 118th Avenue and the easterly side of 204th Street; being a plot 100 feet by 22 feet by 100 feet by 22 feet. Said premises known as 117-21 204TH STREET, ST. ALBANS, NY. Approximate amount of lien $89,052.96 plus interest & costs. Premises will be sold subject to provisions of filed judgment and terms of sale. Index Number 12152/92. ANN B. DUFFICY, Referee. Einig & Bush, L.L.P. Attorney(s) for Plaintiff 420 Lexington Ave., Ste 1727 New York, NY 10170

Legal Notice 9718
SUPREME COURT - COUNTY OF QUEENS COUNTRYWIDE FUNDING ORPORATION, Plaintiff against ROBERT VALLEY, et al Defendant(s). Pursuant to a Judgment of Foreclosure and Sale entered herein and dated June 16, 1998, I, the undersigned Referee will sell at public auction at the Queens County General Courthouse, 88-11 Sutphin Blvd., in Court Room #25, Jamaica, NY on the 21st day of January, 2000 at 11:00 AM premises BEGINNING at a point on the westerly side of 147th Street, formerly Hazel Street, distant 325 feet southerly from the corner formed by the intersection of the westerly side of 147th Street and the southerly side of 133rd Avenue, formerly Bayview Avenue. Being a plot 98 feet by 25 feet by 98 feet by 25 feet. Said premises known as 133-36 147th Street, South Ozone Park, NY. Approximate amount of lien $100,537.74 plus interest & costs. Premises will be sold subject to provisions of filed judgment and terms of sale. Index Number 028579/97. Leon Beerman, Referee. Eschen & Frenkel, LLP Attorney(s) for Plaintiff 93 E. Main St., Bay Shore, NY 11706

Legal Notice 9715
SUPREME COURT - COUNTY OF QUEENS FEDERAL NATIONAL MORTGAGE ASSOCIATION Plaintiff against WINSTON PETER BAILEY, et al Defendant(s). Pursuant to a Judgment of Foreclosure and Sale entered herein and dated October 22, 1999, I, the undersigned Referee will sell at public auction at the Queens County General Courthouse, 88-11 Sutphin Blvd., in Court Room #25, Jamaica, NY on the 14th day of January, 2000 at 11:00 AM premises lying and being in the County of Queens. BEGINNING at a point on the easterly side of 135th place, distant 168 feet southerly from the corner formed by the intersection of the easterly side of 135th place and southerly side of 130th Avenue; being a plot 100 feet by 21 feet by 100 feet by 21 feet. Said premises known as 130-17 135TH PLACE, SOUTH OZONE PARK, NY Approximate amount of lien $103,516.50 plus interest & costs. Premises will be sold subject to provisions of filed judgment and terms of sale. Index Number 24487/98. FRANCIS K. KENNA, ESQ., Referee. Certilman Balin Adler & Hyman, LLP Attorney(s) for Plaintiff 90 Merrick Ave., East Meadow, NY 11554

Legal Notice 9599
SUPREME COURT - COUNTY OF QUEENS NYCTL 1996-1 TRUST AND THE BANK OF NEW YORK, AS COLLATERAL AGENT AND CUSTODIAN FOR THE NYCTL 1996-1 TRUST, Plaintiff against YIU KEE TAM, et al Defendant(s). Pursuant to a Judgment of Foreclosure and Sale entered herein and dated May 5, 1999, I, the undersigned Referee will sell at public auction at the Queens County General Courthouse, 88-11 Sutphin Blvd., in Court Room #25, Jamaica, NY on the 7th day of January, 2000 at 11:00 AM premises all that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the Borough and County of Queens, City and State of New York, designated on the Tax Map of the City of New York, for the Borough of Queens. Block 2712 Lot 1. Said premises known as 61-01 GRAND AVENUE, LONG ISLAND CITY, NY. Approximate amount of lien $74,503.07 plus interest & costs. Premises will be sold subject to provisions of filed judgment and terms of sale. Index Number 13096/98. JOHN R. DIETZ, Referee. Jay ... Yackow, Esq., Attorney(s) for Plaintiff, 1 Old Country Rd. Ste 370, Carle Place, NY 11514.

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AFFIDAVIT OF PUBLICATION

STATE OF NEW YORK
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Steven Blank, being duly sworn,
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BAYSIDE, NEW YORK
Borough of Queens, City and State of
New York, County of Queens, and that
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DECEMBER 23, 1999

Sworn to before me this
Day of DECEMBER 23, 1999

Valerie Tyner

Notary Public,

State of New York

VALERIE M. TYNER
Notary Public, State of New York
No 4953419
Qualified in Nassau County
Commission Expires July 10, 20 01

PRE-APPLICATION REPORT

The New York Power Authority filed a Pre-Application Report with the New York State Department of Public Service on November 17, 1999, for a proposed combined-cycle generating facility in Astoria, Queens.

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THE REPORT IS AVAILABLE FOR REVIEW AT:

Queens Public Library
21-45 31st Street
Long Island City, NY 11105

Fordham Library Center
2556 Bainbridge Ave.
Bronx, NY 10458

Mid-Manhattan Library
455 Fifth Avenue
New York, NY 10016

Comments on the report should be submitted no later than December 31, 1999, to:

Ms. Ellen Koivisto
Licensing Manager
New York Power Authority
1633 Broadway
New York, NY 10019

For more information and/or a copy of the report, please call, toll free, 1-888-NYPA-332. Or visit our web site at: www.nypa.gov

New York Power Authority

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New York Power Authority

19800

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New York Power Authority

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NFB	NATL FOOD BROKERS
NHO	NATL HOTELS/RESORTS
NIN	NATL INTERNET SVCS
NLH	NATL LOCAL HOTEL
NMA	NATL MAIL ORDER
NMM	NATL MILLION MARKET
NMO	NATL MOTION PICTURE
NSK	NATL SKI
NTB	NATL TRAVEL BULLETIN
REM	RTL NON-PROFIT
RES	RTL RESTAURANT
RET	RETAIL
RFI	RTL FINANCIAL
RLQ	RETAIL LIQUOR
RP3	RTL PART 3
RSA	RTL SATURDAY
RST	RETAIL LOCAL BUSINESS

PUBLICATION CODES

COM	COMICS
MAG	MAGAZINE
PP	PREPRINTS
ROP	RUN OF PAPER
TV	TV PLUS
XND	NEWSDAY.COM
ZCLS	CLASSIFIED MAIN SECTION
ZJB	JOBS
ZPP	PREPRINTS
ZCOM	COMICS
ZMAG	MAGAZINE
ZTV	TV PLUS
ZTRA	PRIVATE PARTY

PRE-APPLICATION REPORT

The New York Power Authority filed a Pre-Application Report with the New York State Department of Public Service on November 17, 1999, for a proposed combined-cycle generating facility in Astoria, Queens.

The filing is the first step in the permitting process for the facility, which may be required to meet proposed state and federal requirements for new generating capacity in New York City. The Power Authority supplies low-cost electricity for the subways, schools, hospitals and other public facilities in the city as well as for businesses throughout the metropolitan area.

If built, the new facility will be one of the city's cleanest power plants and result in a reduction in NYPA's annual air emissions at the Queens site.

NYPA will initiate formal consultations with state and federal agencies and the public regarding the scope of studies to be conducted in support of a future application to the Siting Board on Electric Generation Siting and the Environment in accordance with Article X of the New York State Public Service Law.

THE REPORT IS AVAILABLE FOR REVIEW AT:

Queens Public Library
21-45 31st Street
Long Island City, NY 11105

Fordham Library Center
2556 Bainbridge Ave.
Bronx, NY 10458

Mid-Manhattan Library
455 Fifth Avenue
New York, NY 10016

Comments on the report should be submitted no later than December 31, 1999, to:

Ms. Ellen Koivisto
Licensing Manager
New York Power Authority
1633 Broadway
New York, NY 10019

For more information and/or a copy of the report, please call, toll free, 1-888-NYPA-332. Or visit our web site at: www.nypa.gov

New York Power Authority

DRAFT STIPULATIONS

The New York Power Authority has filed draft stipulations with the New York State Public Service Commission, state and federal agencies, legislative representatives, municipal officials and other interested parties describing the proposed studies the Power Authority plans to conduct to support its Article X Application for a 500-megawatt combined-cycle generating facility in Astoria, Queens.

The Power Authority supplies low-cost electricity for the subways, schools, hospitals and other public facilities in New York City, as well as for businesses throughout the metropolitan area.

The new facility may be required to meet proposed state and federal requirements for new generating capacity in New York City.

The draft stipulations have been posted on the Authority's website, www.nypa.gov/ccf/ccf.html. Hard copies of the draft stipulations are available from the Authority (address below).Copies are also available for review at:

- Queens Public Library, 21-45 31st Street, Long Island City, NY 11105
- Fordham Library Center, 2556 Bainbridge Avenue, Bronx, NY 10458
- Mid-Manhattan Library, 455 Fifth Avenue, New York, NY 10016

Comments should be filed with the New York State Public Service Commission and the New York Power Authority by June 30, 2000:

Janet H. Deixler
Secretary
New York State Public Service Commission
Executive Office, 14th Floor
3 Empire State Plaza
Albany, NY 12223

Ellen P. Koivisto
Licensing Manager
New York Power Authority
123 Main Street
White Plains, NY 10601-3170

For information, call 1-888-NYPA-332

New York Power Authority

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Secretary
New York State Public
Service Commission
Executive Office, 14th Floor
3 Empire State Plaza
Albany, NY 12223

Ellen P. Koivisto
Licensing Manager
New York Power Authority
123 Main Street
White Plains, NY 10601-3170

The Q-23 route in Forest Hills should be relocated in the opinion of the Van-Court Homeowners Association as expressed by its president, Brian Nixon, at last week's meeting of Community Board 6. The bus stops in question are at the corner of Juno Street and 69th Avenue and at Kessel Street and 70th Avenue, and according to Nixon, they are inappropriate locations for picking up and dropping off passengers. "We see that we have two bus stops now that are in fairly busy, dangerous school crossings," Nixon said, "one for P.S. 144 and another for Our Lady of Mercy Church and School. What we've recommended for the Department of Transportation (DOT) through the community board is to move both bus stops away from the school crossings. One can be located further on Kessel Street. The one on Juno Street would move further north to Ingram Street, still on 69th Avenue. This would not create any further hardship for elderly or disabled bus riders, and it would make the bus stops safer around school locations."

In 1998, the DOT eliminated two bus stops in that area: one at Kessel Street and 69th Avenue, the other at Ingram Street and 69th Avenue. Both were replaced by the Juno Street stop. "We wholeheartedly agree with [the Van-Court Homeowners Association] that the bus stop should not have been moved and that it shouldn't be where it is now," Joann Ciociari, chairperson of the Board 6 transportation committee, said. "Now we're waiting for an answer from the DOT."

Board 6 has asked DOT Queens Commissioner William Baier to look into the matter. Also, the transportation committee has invited John Greany, DOT director of community affairs in Queens, and representatives of Triboro Coach to attend the next committee meeting to discuss the problem. "Our responsibility is to see that the citizens get a bus service at a safe location within reasonable walking distance," Board 6 Chairman Joseph Henessy said. "Hopefully the DOT will do two things : one, come to the community board and two, listen to the suggestions from the community."

Heidi Chain, chairperson of the board's economic development committee, reported that representatives of the New York City Economic Development Corporation (EDC) attended the committee's last meeting on May 5th. At the meeting, EDC Chief of staff Catherine Giuliani told the committee that the EDC is currently recruiting businesses to come to the city and offering them financial incentives to set up and expand. Giuliani also discussed a current program which encour-

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require hundreds of hours of special training and drills throughout the year. These locations include subway lines, Rikers Island, LaGuardia and [John F.] Kennedy [International] Airports, Elmhurst Hospital Center and other hospitals, the Consolidated Edison utility plants and housing, to name a few.

"All of these specialty locations, coupled with the wide variety of buildings in the borough, many of which have alterations only local fire companies would recognize through familiarity and drills, make this an especially difficult locale for fire and emergency activity. Seconds count and the time for familiarization is not at the scene. Indeed, it takes years to be properly prepared to do the best job possible in a fire emergency."

Although he acknowledged that the Fire Department is "widely recognized as the very best in the world," he said that "each company would compromise its effectiveness in an unfamiliar locale."

The veteran cleric also criticized the department for not consulting with community officials and residents before initiating the program.

Tenant Pleads Guilty In Gardens Murder

Queens District Attorney Richard Brown announced recently that a 25-year-old woman who rented a room from a Kew Gardens Hills man pleaded guilty Sept. 9th to first degree manslaughter in connection with his death and to tampering with physical evidence by placing his body in a bathtub and pouring acid into the tub.

Brown identified the defendant as Bernadette Staubitz, a boarder in the apartment at the deceased Anthony Pickens, at 153-31 73rd Ave., Kew Gardens Hills. The crime occurred during the early morning hours of Jan. 25, 1997. Two other defendants, Eric Williams, 24, of 140-71 Ash Ave., Flushing, and Guy Daquin, 21, of 92-35 214th Pl., Jamaica, are awaiting trial in the case.

The defendant entered her guilty plea before Supreme Court Justice Robert Hanophy, who indicated that he would sentence her to 12 and one-half to 25 years on the manslaughter charge and an additional one-and-one-third to four years on the tampering with physical evidence charge. Hanophy will impose sentence on Sept. 30th.

Brown said, "Based on all of the evidence available, including the medical examiner's findings with regard to cause of death, this was a good and fair disposition. It assures certain justice."

According to the charges, the defendants repeatedly punched, kicked, choked and cut the deceased about the head and body after a dispute arose between the deceased and Staubitz. In order to conceal the killing, Staubitz, and allegedly Williams, placed Pickens' body in a bathtub and poured

Western Queens Gazette Sept. 15, 1999 Page

New York Power Authority
COMBINED CYCLE
FACILITY

Open House

The New York Power Authority, which supplies low-cost electricity for the subways, schools, hospitals and other public facilities in New York City as well as for businesses throughout the metropolitan area, will hold an open house on September 23 to discuss its plan to build a combined-cycle generating plant next to its Charles Poletti Power Project, in Astoria.

The new facility may be required to meet proposed state and federal requirements for new generating capacity in the city. If built, the plant will be one of the city's cleanest power plants, resulting in a reduction in NYPA's annual air emissions.

The purpose of the open house is to provide information about the project and solicit comments from the community.

September 23, 1999
3-5 p.m. and 7-9 p.m.
Astoria World Manor
25-22 Astoria Blvd., Queens, N.Y.

For information call, Luis Rodriguez at 718-626-8239.

New York Power Authority

HOUSING ADVISOR

Barbara Boyle • Central Astoria LDC
204-1056

My new landlord is ignoring my requests to make repairs. I have problems in my apartment and the building itself is not being maintained. Are there any laws that require the landlord to correct the problems?

In 1975, the New York State Legislature enacted Section 235-b of the Real Property Law (RPL), known as the "Warranty of Habitability," for the protection of residential tenants. The Warranty of Habitability makes the landlord responsible for keeping habitable the public areas of residential buildings (entranceways, lobbies, hallways, etc.), as well as the tenant's apartment in safe, habitable condition with accompanying services.

Tenants have a right to expect not only shelter but a package of goods and services, including adequate heat, hot water, light and ventilation, plumbing, secure windows, doors, ceilings and walls, proper sanitation and maintenance. The tenant can legally expect the premises and the areas within the landlord's control to be habitable at all times during the term of the lease.

The following are some examples of a breach of the Warranty of Habitability:

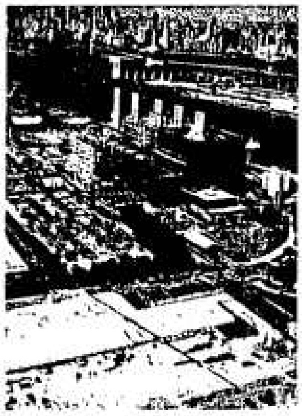
- Vermin and/or rodent infestation;
- Failure to provide heat and hot water as required by law;
- Hazardous conditions caused by construction or renovation, or from unreasonable neighbors;
- Failure to secure a premises from theft and burglary (a secure front door and working intercom);
- Water leaks in ceilings, defective ceilings, leaks around windows;
- Deprivation of janitorial services;
- Defective appliances, such as stoves and refrigerators.

Rather than verbal communication, tenants should report all conditions to the landlord and management in writing and send correspondence by certified mail, return receipt. Whenever possible, take photos of the problem as further evidence of conditions. Lastly, document heat complaints with temperature readings taken throughout the day, both inside and outside.

ADVERTORIAL

Project Fact Sheet

Combined-Cycle Facility



NYPA BENEFITS TO NEW YORK CITY

In New York City, NYPA's low-cost power lights the streets, runs the subways and commuter rail lines and serves schools, hospitals and other public facilities. Government customers obtain additional savings through the NYPA's wide-ranging energy-efficiency programs. NYPA:

- supplies economical electricity that saves government customers—and taxpayers—an estimated $250 million a year;
- provides economic development power that helps to protect 144,000 jobs in New York City, including more than 23,500 in Queens;
- provides energy-efficient lighting for government facilities (46 in Queens);
- replaces coal furnaces in public schools (11 in Queens);
- supplies high-efficiency refrigerators for public housing (5,000 in Queens);
- installs energy-efficient traffic signals (18,000 in Queens);
- provides electric vehicles to its government customers to help promote clean air.

PROJECT OVERVIEW

NYPA is planning to build a highly efficient combined-cycle power-generating facility next to its Charles Poletti Power Project, in Astoria, Queens. The proposed plant will provide New York City with adequate, reliable power supplies in the new era of electricity-industry deregulation. Approximately 200 to 250 local union jobs will be created during construction.

NEED FOR A NEW POWER PLANT

NYPA is exploring construction of a new power plant to meet proposed federal and state requirements for the deregulation of New York's electricity industry. To continue serving its New York City customers in the new era, NYPA may be required to create additional generating capacity within the city. To that end, it has approved funding for preliminary engineering and environmental work related to the licensing of the facility at the Poletti project site.

ENVIRONMENTAL BENEFITS

The combined-cycle plant will be one of the cleanest power plants in New York City's history. The new plant will:

- **actually reduce the nitrogen oxide (NOx), sulfur dioxide (SO_2), and particulate emissions in the New York City airshed on an annual basis by allowing us to reduce operations of the existing Poletti plant, but still meet our responsibility to provide adequate and reliable electricity;**
- burn fuel more efficiently than do plants of earlier designs. Clean-burning natural gas would be the primary fuel, with low sulfur oil as the backup fuel;
- meet Lowest Achievable Emission Rate (LAER) requirements.

COMBINED-CYCLE GENERATION

The proposed plant will use a combined-cycle process, in which two combustion turbine-generators would operate in conjunction with two heat-recovery steam generators and a steam turbine-generator. Combustion gases from the burning of natural gas or low sulfur oil would drive the two combustion turbine-generators to produce electricity. The two heat-recovery steam generators would capture waste heat from the first cycle to create steam to spin the steam turbine-generator, producing additional electricity. The steam turbine-generator would discharge the steam into a condenser to return the steam to its liquid state for recycling.

PROJECT SITE

The proposed site is an undeveloped four-acre parcel next to the Poletti project. This site has been used since 1953 for the generation of electricity, fuel storage and associated purposes. The proposed project would take advantage of the unique opportunities provided by the existing facilities and interconnections, with a natural gas supply, electric transmission, fuel storage, and water intake and discharge facilities.

REQUIRED APPROVALS

NYPA may be required to obtain approval for the project from the New York State Siting Board, the New York State Department of Environmental Conservation and the U.S. Environmental Protection Agency. NYPA is working with those agencies to develop a unified permitting process, providing opportunities for public participation.

To assess potential project impacts and support the required permit applications, detailed studies in areas such as air quality, water quality, aquatic ecology, and noise will be completed.

New York Power Authority

Project Mailing List

Ms. Jacqueline Arrington
Vice President
Citibank, N.A.
One Court Square, 43rd Fl. Zone 10
Long Island City, NY 11120

Mr. George Alexiou
Alexiou Realty
NYC/Community Board #1
31-23 23 Avenue
Astoria, NY 11105

Mr. George J. Androsiglio
NYC/Community Board #1
20-53 21 Street
Astoria, NY 11105

Ms. Anne Marie Anzalone
District Representative
82-11 37th Avenue Suite 607
Jackson Heights, NY 11372

The Honorable Carmen Arroyo
Assemblywoman
New York State Assembly - District 74
384 E. 149 th Street, S-608
Bronx, NY 10455

Ms. Joan Asselin
City of NY Community Board #1, Borough of Queens
36-01 35th Avenue
Astoria, New York 11106

The Honorable Jeffrion Aubry
New York State Assembly
102-13a Northern Blvd.
Corona, NY 11368

Mr. Charles Bartha
Chief Deputy Commissioner
Department of Public Works
335 Yaphank Avenue
Yaphank, NY 11980

Mr. Robert Bass
NYC/Community Board #1
37-08 Astoria Blvd.
Astoria, NY 11105

Att: Mr. Gordon Bastian
West Queens Greens
23-55 31st Street
Astoria, NY 11105

Mr. Jose Batista
NYC/Community Board #1
18-01 21st Road
Astoria, NY 11105

Mr. Joe Bechtold
International Brotherhood of Electrical Workers
Affiliated with the A.F.L.-C.I.O., C.F.L.
158-11 Harry Van Arsdale Jr. Avenue
Flushing, NY 11365

Mr. Victor Beecher
Vice President
NAB Construction Corp.
112-20 14th Avenue
College Point, NY 11356

Ms. Joanne Billharz
Program Chairman
Kiwanis Club of Sunnyside
45-25 47th Street
Woodside, NY 11377

Ms. Marilyn Bitterman
District Manager
Community Board #7
45-35 Kissena Blvd.
Flushing, NY 11355

Mr. John Blumenfeld
NYC/Community Board #1
30 Olive Place
Forest Hills, NY 11375

The Honorable Joseph Boardman
Commissioner
NYS Department of Transportation
5 Governor Harriman State Campus
Albany, NY 12232

Ms. Anne Marie Boranian
District Manager
Community Board #11
213-02A 42nd Avenue
Bayside, NY 11361

Ms. Betty Braton
Chairperson
Community Board #10
115-01 Lefferts Blvd
South Ozone Park, New York 11420

Ms. Lillian R. Brown
NYC/Community Board #1
41-12 Vernon Boulevard
Long Island City, NY 11101

Ms. Ann Bruno
President
114th Precinct Community Council
25-42 Crescent Street
Astoria, NY 11102

Mr. Gus Buitrago
Vice President - Team Leader
Banco Popular
918 Seneca Avenue
Ridgewood, NY 11385

Mr. Thomas Bullaro
NYC/Community Board #1
25-19 Steinway Street
Astoria, NY 11103

The Honorable Denis J. Butler
New York State Assembly
District Office
43-08 30th Avenue
Long Island City, NY 11103

The Honorable John Cahill
Commissioner
NYS Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233

Mr. Ted Caliendo
NYC/Community Board #1
34-41 28 Street
Astoria, NY 11106

Mr. Gerald Caliendo, R.A, A.I.A.
NYC/Community Board #1
1008-18 Queens Blvd.
Forest Hills, NY 11375

Ms. Mary Ann Carey
District Manager
Community Board #9
120-55 Queens Blvd., Rm. 310A
Kew Gardens, NY 11424

Mr. John Carusone
NYC/Community Board #1
31-87 30th Street
Astoria, NY 11106

Mr. William Chatterton
Port Authority of NY & NJ
LaGuardia Airport - Hangar 7C
Flushing, NY 11371

Ms. Diane Cohen
District Manager
Community Board #8
81-26 150th St.
Jamaica, NY 11435

The Honorable Michael Cohen
New York State Assembly
District Office
98-08 Metropolitan Avenue
Forest Hills, NY 11375

Mr. Joseph Conley
Chairperson
Community Board #2
43-22 50th Street
Woodside, NY 11377

Mr. Jerry Connolly
Bus. Mgr. Sec. Treas.
Boilermakers Local Union #5
320 Northern Boulevard
Great Neck, NY 11021

Mr. Tom Cook
Assistant Business Manager
Boilermakers Local Union #5
320 Northern Boulevard
Great Neck, NY 11021

The Honorable Joseph Crowley
District 7
House of Representatives
82-11 37th Avenue Room 607
Jackson Heights, NY 11372

Ms. Francis D'Orazi
Chairperson
Community Board # 9
Queensborough Hall
Kew Gardens, New York 11424

Dr. Donald Davidsen
Commissioner
NYS Department of Agriculture & Markets
1 Winners Circle
Albany, NY 12235

Mr. James Davis
Chairperson
Community Board #12
90-28 161st Street
Jamaica, New York 11432

Ms. Janet H. Deixler
Secretary
NYS Department of Public Service Commission
Empire State Plaza, Executive Office -14th Floor
Albany, NY 12223

Mr. George Delis
District Manager
Community Board #1
36-01 35th Avenue
Long Island City, NY 11106

Mr. Michael Della Vecchia
President
Steinway Industrial Park Association
33-01A 20th. Avenue
Astoria, New York 11105

Ms. Jean Marie Delleva
NYC/Community Board #1
26-02 14th Street
Astoria, NY 11102

Ms. Ammeda DeMonte
NYC/Community Board #1
31-24 30 Street
Astoria, NY 11106

The Honorable Nelson Antonio Denis
NYS Assembly - District 68
248 E. 119th Street
New York, NY 10035

The Honorable Ruben Diaz, Jr.
Assemblyman
New York State Assembly - District 75
1163 Manor Avenue
Bronx, NY 10472

Mr. Robert Doelger
41-10 Bowne Street
Apartment # 7N
Flushing, NY 11355

Mr. Alan Domaracki
NYS Department of Public Service
3 Empire State Plaza
Albany, NY 12223

Mr. Vinicio Donato
Chairperson
Community Board #1
36-01 35 Avenue
Long Island City, NY 11106

The Honorable Thomas Duane
NYS Senate
275 7th Avenue
New York, NY 10011

Ms. Elizabeth Erion
NYC/Community Board #1
21-65 79th Street
Jackson Heights, NY 11370

Mr. Joseph Farber
Partner
Previte, Farber and Rosen, P.C.
97-77 Queens Boulevard
Rego Park, NY 11374

0

The Honorable C. Virginia Fields
Manhattan Borough President
Municipal Building
1 Centre Street - 19 South
New York, NY 10007

Mr. Stephen A. Fink
President
Fink Baking Company
5-35 54th Avenue
Long Island City, New York 11101

Dr. John FitzPatrick
President, College of Aeronautics
LaGuadia Airport
86-01 23rd Avenue
Flushing, NY 11371

Ms. Anne Fitzpatrick
NYC/Community Board #1
51-34 30th Avenue
Apt. 6J
Woodside, NY 11377

Mr. Scott Forsmith
Leasing Director
Atria Kew Gardens
117-01 84 Avenue
Kew Gardens, NY 11418

Mr. Domonick Fucile
Office of Honorable Carolyn Maloney, Dist. Office
District Representative
28-11 Astoria Blvd.
Long Island City, New York 11102

Mr. Salvatore Gagliardo
NYC/Community Board #1
21-39 38 Street
Astoria, NY 11105

Mr. Jonathan L. Gaska
District Manager
Community Board #14
19-31 Mott Ave.,
Far Rockaway, NY 11691

Mr. Anthony J. Gigantiello, Jr.
President
Coalition Helping Organize a Kleaner Environment
33-60 21st Street
Long Island City, NY 11106

Ms. Madeleine E. Gillis
NYC/Community Board #1
32-54 35 Street
Astoria, NY 11106

Mr. Angelo Gimondo
Superintendent
School District #30
49-05 20th Ave.
Jackson Heights, NY 11370

Mr. Gary Giordano
District Manager
Community Board #5
61-23 Myrtle Ave.
Glendale, NY 11385

The Honorable Rudolph Giuliani
City of New York
Office of the Mayor
51 Chambers Street - Room 630
New York, NY 10007

Mr. David E. Givens
Chairman
Bronx Community Board
55 East 115th Street
New York, NY 10029

Mr. Jeffrey C. Gold
NYC/Community Board #1
14-34 30th Road
Astoria, NY 11102

Ms. Aida Gonzalez
Dir. of Cultural Affairs
Office of the Boro President
120-55 Queens Blvd.
Kew Gardens, NY 11424

Mr. Hernand V. Gonzalez Jr.
Dir. of Special Markets
Pepsi Cola Bott. Co. of NY
46-00 Fifth Street
Long Island City, New York 11101

The Honorable Roy Goodman
NYS Senate
270 Broadway, S-2400
New York, NY 10007

Mr. A. Gordon
President
Roosevelt Savings Bank
1122 Franklin Avenue
Garden City, New York 11530

The Honorable Richard Gottfried
NYS Assembly
270 Broadway, Rm 1516
New York, NY 10007

The Honorable Alexander Pete Grannis
NYS Assembly
1672 First Avenue
New York, NY 10128

The Honorable Edward Griffith
New York State Assembly
District Office
270 Broadway, Room 720
New York, NY 10007

Mr. Joseph Guarino
NYC/Community Board #1
112-41 Queens Boulevard
Forest Hills, NY 11375

Ms. Syvial Hack
Chairperson
Community Board #9
120-55 Queens Boulevard Room 310A
Kew Gardens, NY 11424

Mr. James Haggerty
Chief of Eastern Permits Section
U.S. Army Corps of Engineers
Room 1937 - Federal Plaza
New York, NY 10278

Mr. Paul Halvatzis
President
Astoria/LIC Kiwanis
36-01 30th Avenue
Astoria, New York 11103

Anwar Haque
President
Dollar Connection Corp.
75-15 37 Avenue
Jackson Heights, NY 11372

Mr. John K. Hawley, Ph.D.
Research Dir. - Div. Of Environ. Health Assessment
NYS Department of Health-Flanigan Square, Room 500
547 River Street
Troy, NY 12180

The Honorable Maureen Helmer
Chairperson
NYS Department of Public Service
3 Empire State Plaza
Albany, NY 12223

Mr. Joseph Hennessy
Chairperson
Community Board #6
73-05 Yellowstone Blvd.
Forest Hills, NY 11375

The Honorable Daniel Hevesi
NYS Senate
70-17 Austin Street, Suite 2
Forest Hills, 11375

The Honorable Daniel Hevesi
New York State Senate
District Office
70-17 Austin Street
Forest Hills, NY 11375

Mr. William Higgins
Principal
St. John's Preparatory School
21-21 Crescent Street
Astoria, NY 11105

Mr. James Hill
NYC/Community Board #1
21-57 33 Street
Astoria, NY 11105

Mr. Jack Hogan
President
Flushing Chamber of Commerce
136-29 38th Ave.
Flushing, NY 11355

Ms. Laura Howkins
District 36
43-08 30th Ave.
Long Island City, NY 11103

Mr. Vincent Iannece
NYC/Community Board #1
25-18 34 Street
Astoria, NY 11103

Mr. Richard Italiano
Chairperson
Community Board #4
104-03 Corona Avenue
Corona, New York 11368

Mr. Joseph Ithier
President
Bronx Overall Economic Development Corporation
198 East 161st Street, Suite 201
Bronx, NY 10451

Mr. Owen A. Jackson
Principal
Hugh & Cameron Systems Advantage
98-12 Astoria Boulevard
E. Elmhurst, NY 11369

Mr. Adrian Joyce
Chairperson
Community Board #7
45-35 Kissena Blvd.
Flushing, NY 11355

Mr. Eric Kaltman
Chief Executive Officer
Queens Group Inc.
52-35 Barnett Avenue
Long Island City, New York 11104

Ms. Gloria Kavanah
NYS Department of Economic Development
30 South Pearl Street
Albany, NY 12207

Ms. Helen Keit
V.P. Relocation & New
First Choice Relocation Services
61-43 186 Street
Fresh Meadows, NY 11365

Mr. Steven Kizis
Field Representative
NYC & Vicinity Carpenters Labor-Management Cooperation Trust Fund
395 Hudson Street
New York, NY 10014

Mr. Tom Knierim
Executive Director
LIC Business Devel. Corp.
29-10 Thomson Ave. 9th Fl.
Long Island City, NY 11101

Ms Anna Kril
NYC/Community Board #1
23-55 21 Street
Astoria, NY 11105

Mr. Warren Kroeppel
General Manager
Port Authority of NY & NJ
LaGuardia Airport - Hangar 7C
Flushing, NY 11371

0

Ms. Susan Lacerte
Executive Director
Queens Botanical Garden
43-50 Main St.
Flushing, NY 11355

The Honorable Ivan C. Lafayette
New York State Assembly
District Office
33-46 92nd Street
Jackson Heights, NY 11372

Mr. Mario Lalicata
NYC/Community Board #1
25-55 48 Street
Astoria, NY 11103

Dr. Howard Lapidus
President
Queensboro Comm. Coll.
56th Ave. & Springfield Blvd.
Bayside, NY 11364

Ms. Penny Lee
Dept. of City Planning
NYC/Community Board #1
29-27 41 Avenue - 9th Floor
Long Island City, NY 11101

Mr. Stanley J. Legan
Attorney
Ross, Legan, Rosenberg, Zelen &
37-06 82 Street 3 Floor
Jackson Heights, NY 11372

Mr. John Lesica
Field Representative
NYC & Vicinity Carpenters Labor-Management Cooperation Trust Fund
395 Hudson Street
New York, NY 10014

Ms. Robin Levine
NYC Department of Environmental Protection
59-17 Junction Blvd.
Corona, NY 11368

Mr. Orest LeWinter
NYS Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233

Mr. Bill Lewis
President
United 40's Block Association
50-62 45th Street
Woodside, NY 11377

Mr. Paul Lipson
Executive Director
The Point Development Corporation
940 Garrison Avenue
Bronx, NY 10474

Mr. Melvin Ludwig
President
Eagle Electric Mfg. Co.,Inc.
45-31 Court Street
Long Island City, NY 11101

The Honorable Peter Magnani
Office of the Borough President
120-55 Queens Blvd.
Kew Gardens, NY 11424

Mr. Brendan Mahoney
Greater Astoria Historical Society
Quinn's Gallery 4th Floor
35-20 Broadway
Long Island City, NY 11103

The Honorable Serphin Maltese
New York State Senate
7104 Myrtle Ave.
Glendale, NY 11385

0

0

The Honorable Serphin Maltese
NYS Senate
71-04 Myrtle Avenue
Glendale, NY 11385

Mr. Andrew F. Manger
Mgr. Econ. Dev. - Queens
Consolidated Edison Co. of NY, Inc.
118-29 Queens Boulevard
Forest Hills, NY 11375

Mr. Mark H. Mantell
CLU, ChFC
Mark H. Mantell, CLU, ChFC
530 Fitth Avenue
New York, NY 10036

Ms. Debra Markell
City of New York
Office of the Mayor
New York, New York 10007

The Honorable Margaret Markey
NYS Assembly
84-32 Grand Ave.
Elmhurst, NY 11373

0

Mr. Melvil Marks
36-10 Utopia Parkway
Flushing, NY 11358

The Honorable Helen M. Marshall
New York City Council
District Office
97-19 Astoria Blvd.
East Elmhurst, NY 11369

Ms. Sally Martino-Fisher
District Manager
Community Board #13
219-41 Jamaica Ave.
Queens Village, NY 11428

The Honorable Brian Mc Laughlin
New York State Assembly
District Office
35-20 147 Street
Flushing, NY 11354

The Honorable Walter McCaffrey
New York City Council
62-07 Woodside Avenue
Woodside, NY 11377

Ms. Fran McDonald
NYC Council Speaker Peter Vallone
22-45 31st Street
Astoria, New York 11105

Mr. Anthony McFadden
Industrial Manager
Con Edison Solutions
701 Westchester Ave. Suite 301
White Plains, NY 10604

Mr. Kevin R. McHale
Vice President
Citibank, N.A.
One Court Square (43rd Floor)
Long Island City, NY 11120

Dr. James Conti
V.P. & Director
Polytechnic Inst. of New York
LI Campus Rte 110
Farmingdale, New York 11735

Mr. Dennis McSpedon
President
International Brotherhood of Electrical Workes/Affiliated with the A.F.L.-C.I.O., C.F.L.
158-11 Harry Van Arsdale Jr. Avenue

Mr. Antonio Meloni
21-17 23rd Avenue
Astoria, NY 11105

Ms. Eileen Mentone
Ass't Dean, External Affairs
LaGuardia Community College
31-10 Thomson Avenue
Long Island City, NY 11101

Ms. Lucille Merkison
NYC Community Board #1
27-25 First Street
Astoria, NY 11102

Mr. Richard B. Miller, Esq.
Vice President
Energy Division, NYC Economic Development Corp.
110 William Street, 4th Floot
New York, NY 10038

The Honorable James Molinaro
Deputy Borough President
Borough President's Office
120 Boro Hall
Staten Island, NY 10301

Mr. Ray Molville
International Brotherhood of Electrical Workers
Affiliated with the A.F.L.-C.I.O., C.F.L.
158-11 Harry Van Arsdale Jr. Avenue
Flushing, N.Y. 11365

Mr. Philip Morrow
President
South Bronx Overall Economic Development Corp.
370 E. 149th Street
Bronx, NY 10455

Mr. Richard Murphy
Chief of Operations
NYC Department of Parks
80-30 Park Lane, The Overlook
Kew Gardens, NY 11415

Ms. Rosemary Murray
Chairperson
Community Board #14
19-31 Mott Avenue
Far Rockaway, NY 11691

Riverkeeper
25 Wing and Wing
Garrison, NY 10524

Long Island Soundkeeper
50 Barry Drive
Glen Cove, NY 11542

Ms. Marie Nahikian
Executive Director
Queens County Overall Econ. Dev.
120-55 Queens Blvd.
Kew Gardens, NY 11424

Ms. Norma Nieves-Blas
NYC/Community Board #1
31-35 Crescent St., 6H
Astoria, NY 11106

The Honorable Catherine Nolan
NYS Assembly
45-25 47th Street
Woodside, NY 11377

Ms. Susan Noreika
Chairperson
Community Board #13
219-41 Jamaica Avenue
Queens Village, New York 11428

Ms. Lucy C. Nunziato
Executive V.P.
Queens Chamber of Commerce
75-20 Astoria Blvd. Suite 140
Jackson Heights, NY 11370

Mr. Gary O'Gwen
Chief Operating Officer
Elmhurst Hospital Center
79-01 Broadway
Elmhurst, New York 11373

Ms. Marie O'Hara
City of NY Community Board #1, Borough of Queens
36-01 35th Avenue
Astoria, New York 11106

Ms. Rose Mary O'Keefee
Commissioner
Community Assistance Unit/Office of the Mayor
51 Chambers Street - Rm. 630
New York, NY 10007

Mr. Thomas O'Neill
NYC/Community Board #1
19-14 21 Drive
Astoria, NY 11105

The Honorable George Onorato
New York State Senate
District Office
28-11 Astoria Blvd
Long Island City, NY 11102

The Honorable Frank Padavan
NYS Senate
89-39 Gettysburg Street
Bellerose, NY 11426

Mr. Peter S. Pallos
Co-Chair Public Safety
City of NY Community Board #1, Borough of Queens
36-01 35th Avenue
Astoria, NY 11106

Mr. Lawrence Parness
Director
Queensboro Planning Office
29-27 41st Avenue
Long Island City, NY 11101

Ms. Linda Passtiglione
Administrator
LaGuardia Medical Group
86-15 Queens Blvd.
Elmhurst, NY 11373

Mr. John Pellitteri
President
Astoria Civic Association
28-12 21st Avenue
Astoria, New York 11105

Ms. Rose Pepe
District Manager
Community Board #10
115-01 Lefferts Blvd.
South Ozone Park, NY 11420

Mr. Joseph Perez
Executive Director
South Bronx Clean Air Coalition
2417 3rd Avenue
Bronx, NY 10451

Ms. Linda Perno
NYC/Community Board #1
26-10 12 Street
Astoria, NY 11102

Mr. Anthony Petrocelli
NYC/Community Board #1
35-20 29 Street
Astoria, NY 11106

Mr. Stephen Phelps
VP Public Affairs
Cath. Med. Center of B & Q
88-25 153rd Street
Jamaica, New York 11432

Mr. Robert Piazza
NYC/ Community Board #1
55-03 31 Avenue
Woodside, NY 11377

Mr. Gerald Pinsky
Executive Vice President
Bestform Foundations Inc.
38-01 47th Avenue
Long Island City, New York 11101

Mr. Ryan Poscablo
Schedular
14th District
28-11 Astoria Blvd.
Long Island City, New York 11102

Ms. Rosemarie Poveromo
President
United Community Civic Association
22-32 81st. Street
Jackson Hts., New York 11370

The Honorable Morton Povman
New York City Council
108-18 Queens Blvd.
Forest Hills, NY 11375

Mr. Frank Principe
Chairperson
Community Board #5
61-23 Myrtle Avenue
Glendale, NY 11385

Mr. Alfred A. Puglisi
CPA
Alfred A. Puglisi, CPA
29-27 41 Avenue
Long Island City, NY 11101

Ms. Yvonne Reddick
District Manager
Community Board #12
90-28 161st Street
Jamaica, NY 11432

Mr. Jim Reed
Chairman
St. John's Prep Trustees
21-24 Crescent St.
Astoria, NY 11105

Ms. Giovanna Reid
District Manager
Community Board #3
82-11 37th Ave. Suite 606
Jackson Heights, NY 11372

Ms. Kathleen Reilly
District Manager
Community Board #6
73-05 Yellowstone Blvd.
Forest Hills, NY 11375

Mr. Robert Richards
President
Jamaica Chamber of Commerce
89-31 161st Street
Jamaica, NY 11432

Mr. Joseph Risi
NYC/Community Board #1
23-19 31 Street
Astoria, NY 11105

The Honorable Peter Rivera
Assemblyman
New York State Assembly - District 76
1506 Castle Hill Avenue
Bronx, NY 10462

Riverkeeper
25 Wing and Wing
Garrison, NY 10524

Mr. Louis J. Rivoli
Queens Chamber of Commerce
67 Pell Terrace
Garden City, NY 11530

Ms. Dolores Rizzotto
District Manager
Community Board #2
43-22 50th Street
Woodside, NY 11377

Ms. Madeline Roaervaccio
2502 37th Street
Astoria, NY 11103

Mr. Melvin Robbins
President
Robbins MBW Corp.
39-34 43rd Street
Long Island City, New York 11104

The Honorable Victor Robles
New York City Council
815 Broadway (Rm 404)
Brooklyn, New York 11206

Ms. Elizabeth Rodriguez
Chairperson
Community Board #9
1967 Turnbull Avenue
Bronx, NY 10473

The Honorable David Rosado
NYS Senate - District 32
1729 Boston Road, 2nd Fl.
Bronx, NY 10460

Mr. Joseph Rose
NYC Department of City Planning
22 Reade Street
New York, NY 10007

Mr. David Rosen
President
Jamaica Hospital
89th Avenue & Van Wyck Exp.
Jamaica, New York 11458

Ms. Rose Rothschild
District Manager
Community Board #4
104-03 Corona Ave.
Corona, NY 11368

Mr. George Rozansky
V.P. of Industrial
ATCO Properties & Management Inc.
8000 Cooper Avenue
Glendale, NY 11385

Mr. Tom Ryan
NYC/Community Board #1
33-47 60 Street
Woodside, NY 11377

Ms. Anne Marie Ryan
District Manager
Community Board #11
203-06 Rocky Hill Rd.
Bayside, NY 11361

The Honorable John Sabini
New York City Council
District Office
37-32 75th Street
Jackson Heights, NY 11372

Ms. Allison Sacks
The Council - The City of New York
75 Park Place 5th Floor
New York, NY

The Honorable Steven Sanders
NYS Assembly
201 E. 16th Street, 4th Floor
New York, NY 10003

Mr. Rudolfo Sarchese
President
Ditmars Homeowners & Tenants Civic Association Inc
45-09 Ditmars Blvd.
Astoria, New York 11105

The Honorable William Scarborough
New York State Assembly
District Office
119-02 Merrick Blvd.
St. Albans, NY 11434

Mr. John A. Scourakis
NYC/Community Board #1
20-59 29 Street
Astoria, NY 11105

The Honorable Larry Seabrook
NYS Senate
3765 White Plains Road
Bronx, NY 10467

The Honorable Anthony S. Seminerio
New York State Assembly
District Office
114-19 Jamaica Avenue
Richmond Hill, NY 11418

The Honorable Jose Serrano
U.S. House of Representatives - District 16
890 Grand Concourse
Bronx, NY 10451

Mr. Howard Shapiro
Energy Association of New York State
111 Washington Ave. Suite 601
Albany, NY 12210

Mr. Michael Shatz
NRG
31-03 20th Avenue
Astoria, NY 11105

The Honorable Claire Shulman
Borough President
Office of the Borough President
120-55 Queens Blvd
Kew Gardens, NY 11424

Mr. Lawrence L Sills
President
Standard Motors
37-18 Northern Blvd.
Long Island City, New York 11101

The Honorable Sheldon Silver
NYS Assembly
270 Broadway, S - 1800
New York, NY 10007

Mr. Michael Sinansky
NYC Department of City Planning
29-27 41st Ave.
9th Floor
Queens, NY 11101

Sister Thomas, S.C.
Chair Lady
Community Board #2
1029 East 163rd St. 2nd Floor, Room 202
Bronx, NY 10459

Mr. Gerald Slochevsky
Port Authority of NY & NJ
LaGuardia Airport - Hangar 7C
Flushing, NY 11371

Ms. Rochelle Slovin
Executive Director
Museum of the Moving Image
36-01 35th Avenue
Astoria, NY 11106

The Honorable Ada Smith
New York State Senate
District Office
116-43 Sutphin Blvd.
Jamaica, NY 11434

The Honorable Ada L. Smith
NYS Senate
116-43 Sutphin Blvd.
Jamaica, NY 11434

Mr. Jimmy Smith
Chairperson
Community Board #3
82-11 37th Ave. Suite 606
Jackson Heights, NY 11372

Ms. Catherine Smoak
NYC/Community Board #1
34-05 44 Street
Astoria, NY 11101

Mr. Bryan Smolarz
President
Kings Pest Control Inc.
96-08 72 Avenue
Forest Hills, NY 11375

The Honorable Archie Spigner
New York City Council
113-39 Farmers Blvd
St. Albans, NY 11412

The Honorable Alfonso Stabile
New York City Council
District 32
105-20 Cross Bay Blvd
Ozone Park, NY 11417

Mr. George L. Stamatiades
NYC/Community Board #1
38-21 31 Street
Long Island City, NY 11101

Mr. Ed Stein
St. John's Queens Hospital
Div. Cath. Medical Center
90-02 Queens Blvd.
Elmhurst, NY 11373

Mr. Henry Stern
Commissioner
City of NY Parks and Recreation
830 Fifth Ave.
New York, NY 10021

Mr. Bruce Stevens
President
Steinway & Sons
Steinway Place
Long Island City, NY 11105

The Honorable Robert A. Straniere
New York State Assembly
District Office
182 Rose Avenue
Staten Island, New York 10306

The Honorable Scott Stringer
NYS Assembly
230 W. 72nd Street
New York, NY 10023

Mr. Gary E. Strong
Director
Queensboro Public Library
89-11 Merrick Blvd.
Jamaica, NY 11432

Mr. Herman Stuhl
Executive Director and Chairman of the Board
New York Institute of Legal Research
P.O. Box 398
Yorktown Heights, NY 10598

Mr. Wilson Suarez
Queens Citizen
32-40 93rd Street, Apt. D6
Flushing, NY 11369

Mr. Paul Svensson
Chief Executive Officer
Parkway Hospital
70-35 113th Street
Forest Hills, NY 11375

Mr. Dennis Syntilas
NYC/Community Board #1
22-01 29 Street
Astoria, NY 11105

Mr. Steve Tanklowitz
Vice President/TL
The Chase Manhattan Bank
241-02 Northern Boulevard
Douglaston, NY 11362

Mr. Nicholas C. Tavantzis
Vice President
National Bank of Canada
125 W. 55 Street, 23 Floor
New York, NY 10019

Mr. Kimon C. Thermos
NYC/Community Board #1
20-72 32nd Street
Astoria, NY 11105

Mr. Brian Thomson
Deputy Commissioner
Community Assistance Unit/Office of the Mayor
51 Chambers Street - Rm. 630
New York, NY 10007

Mr. Gerard Thornton
Vice President - Sales
Runway Tire Service Co. Inc.
41-15 19th Avenue
Astoria, NY 11105

Mr. Roger Tilles
President
Tilles Management
7600 Jericho Turnpike
Woodbury, NY 11797

Mr. Dennis Tortora
Controller & Assistant Treasurer
Steinway Piano
Long Island City, NY 11105

Mr. Carlisle Towery
President
Greater Jamaica Development Corp.
90-04 161st Street
Jamaica, NY 11432

The Honorable Alexander Treadwell
Secretary of State
NYS Department of State
41 State Street
Albany, NY 12231

Mr. Tom Tukenis
Deputy Director for Facility Engr.
Bureau of Clean Water
9605 Horace Harding Expressway
Corona, NY 11368

Mr. William Ungar
Owner
New York Envelope Co.
29-10 Hunters Point Ave.
Long Island City, New York 11101

The Honorable Peter Vallone
Speaker
New York City Council
City Hall
New York, NY 10007

Ms. Debbie Van Cura
President
Greater Astoria Historical Society
Quinn's Gallery(4th floor), 35-20 Broadway,
Long Island City, NY 11106

The Honorable Guy J. Velella
Senator
New York State Senate - District 34
2019 Williamsbridge Road
Bronx, NY 10461

Mr. Michael Vickerman
Sierra Club
Atlantic Chapter
41-41 51st Street
Woodside, New York 11377

The Honorable Eric N. Vitaliano
New York State Assembly
District 59
1736 Richmond Ave.
Staten Island, NY 10314

Ms. Claire Vogel
Queens Network for Peace & Justice
138-18 28th Road
Flushing, New York 11354

Mr. Julian Wager
City of NY Community Board #1, Borough of Queens
36-01 35th Street
Astoria, New York 11106

The Honorable Alton R. Waldon, Jr.
Judge
New York State Court of Claims
5 World Trade Center
New York, NY 10048

Mr. Alvin Warshaviak
Chairperson
Community Board #8
81-26 150th Street
Jamaica, NY 11430

Mr. Rudy Washington
Deputy Mayor of NYC
Office of the Mayor
City Hall
New York, NY 10007

Mr. Harvey Weinstein
President
Lord West
57-07 31st Avenue
Woodside, NY 11377

The Honorable Mark Weprin
New York State Assembly
District Office
61-08A 224 Street
Bayside, NY 11364

The Honorable Thomas White, Jr.
New York City Council
134-45 166th Place
Jamaica, NY 11434

Mr. William Williams
Business Manager
CUNY Law School, Queens College
65-21 Main Street
Flushing, NY 11367

Ms. Mannie Wilson
NYC/Community Board #1
35-19 12 Street
Astoria, NY 11105

Mr. Robert A. Yamuder
Administrative Project Manager
Borough President of Queens Office
120-55 Queens Boulevard
Kew Gardens, NY 11424

Mr. Alan Zimmerman
Sierra Club
Atlantic Chapter
110-45 Queens Blvd.#902
Forest Hills, New York 11375

Appendix 3A

Appendix 3A

APPENDIX 3A

Capacity Analysis Request of the New York City Water Distribution System and the New York City Sewage Treatment System:
New York Power Authority – Combined Cycle Project
Astoria, Queens, New York

123 Main Street
White Plains, New York 10601
914 681 6200

New York Power Authority

August 4, 2000

Mr. Doug Smith
New York City Department of Environmental Protection
Bureau of Water and Sewer Operations
59-17 Junction Boulevard
3rd Floor, Low Rise
Corona, NY 11368

Subject: Capacity Analysis of the New York City Water Distribution System and the New York City Sewage Treatment System for the Proposed NYPA 500 MW Combined Cycle Project

Dear Mr. Smith:

The New York Power Authority (NYPA) is proposing to construct a nominal 500 MW combined-cycle natural gas fired facility at our existing Charles Poletti Power Project in Astoria, Borough of Queens, New York. NYPA submitted an Article X Pre-Application Report to the New York State Department of Public Services (NYSDPS) in November 1999. This Pre-Application Report initiated the formal consultation with the NYSDPS, the New York State Department of Environmental Conservation (NYSDEC), the New York City Department of Environmental Protection (NYCDEP) and other involved agencies regarding the scope of studies to be conducted in support of the future Article X Application to the Siting Board on Electric Generation Siting and the Environment in accordance with the Article X of the New York State Public Service Law. A brief project description is provided below of the proposed facility.

The existing Charles Poletti Power Project occupies approximately 47 acres adjacent to the Astoria Generating Station formerly owned by Con Edison. NYPA's existing facilities include the 825 MW Poletti Generating Station, an adjacent administration and warehouse building, an intake structure and discharge canal along the East River, a 1.0 million gallon water storage tank and miscellaneous ancillary facilities (i.e., foam pump house, underground piping, etc.). NYPA's existing facilities also include a fuel oil tank farm consisting of six, 6.0 million gallon oil storage tanks, located at the eastern end of NYPA's property. Figure 1 shows the existing facilities and proposed facility location and the surrounding land areas on a portion of a USGS 1:24000 quadrangle map.

The proposed facility will be located approximately at 40°47'17" North Latitude, 73°54'20" West Longitude. The site for the proposed combined cycle project is currently paved and was previously used for contractor parking. The area is now used for outdoor storage of miscellaneous equipment and materials. The approximate 4-acre site is south of and adjacent to NYPA's existing oil storage tanks and west of an area occupied by several simple cycle combustion turbines recently acquired from Con Edison by NRG. The major components of the proposed nominal 500 MW combined cycle project include two combustion turbine generators, two heat recovery steam generators (HRSG), one steam turbine generator with condenser and a cooling system that includes a mechanical draft cooling tower and a water treatment facility with associated storage tanks. A Site Plan of the proposed facilities (Drawing No. 12593.02-FY-51, Rev A) is provided with this letter.

The combustion turbines will be designed for natural gas firing as the primary fuel and low sulfur (< 0.04%) kerosene as backup fuel. Natural gas will be supplied to the power plant through interconnection to an existing natural gas pipeline, and kerosene will be delivered to the site via barge. The kerosene will be stored on-site in two (out of the six) existing 6.0 million gallon storage tanks which currently store No. 6 fuel oil. The tanks will be thoroughly cleaned, modified by removing the roof and a portion of the sidewalls will be reinforced, certified and inspected for suitability as the secondary containment dike for the new tanks. The exhaust gas from each combustion turbine will flow to the HRSG, through the SCR (located in the high-pressure evaporator), and out two 250-foot collocated stacks.

The facility's process, fire protection, and potable water requirements will be met through interconnections to the New York City municipal water supply distribution system. The process water requirements include the inlet to the leased demineralization system, makeup to the freon chiller system and service water for miscellaneous uses throughout the facility.

The makeup water to the cooling tower, which serves the steam turbine condenser, will be supplied from a proposed new intake on the East River fitted with a wedge wire screen. The proposed combined cycle project will use the existing Poletti Project discharge structure located west of the proposed plant site on the East River to discharge the cooling tower blowdown and low volume waste streams such as the boiler blowdown, granular filtration, reverse osmosis plant reject water, air inlet chiller blowdown, floor drains and stormwater. All sanitary wastewater will be sent to the New York City sewer system for treatment.

As part of the Article X Process, NYPA obtained comments from the NYSDPS, NYSDEC and NYCDEP on the Article X Pre-Application Report submitted in November 1999. The NYSDPS requested that that NYPA include an analysis of the available capacity of the municipal water supply source in terms of quantity, quality and pressure and an analysis of the impacts on such water usage during both normal and drought periods on other users of the water supply source. In accordance with Section 321 of the City Environmental Quality Review (CEQR) Technical Manual, NYPA is providing the NYCDEP with the preliminary (average and peak) facility water demand based on expected use. Figures 2 through 6 provide the Preliminary Facility Water Balance Diagrams based on various modes of operation. Based on the water balance diagrams, the maximum City water required for operation on kerosene is 863 gallons per minute (gpm). Of this amount, 530 gpm is required for NOx control by water injection. During operation on natural gas fuel, City water requirements are reduced to 511 gpm with the chiller system in operation and 135 gpm with the chiller system out of service.

A dedicated new 8-inch underground service water line will be tied into an existing 20-inch main located on the NYPA property (see enclosed Site Plan) The interconnect will be equipped with a flow meter and backflow prevention device. The existing 20-inch main ultimately ties into the municipal water distribution system located on 20th Avenue.

NYPA is requesting that the NYCDEP perform a capacity analysis which considers the pipe sizes and grid of the existing New York City water supply distribution system on 20th Avenue to determine if the City water distribution system has sufficient capacity to maintain adequate supply and pressure during both normal and drought periods once the proposed facility is operating.

In addition, the NYSDPS requested that NYPA also identify all wastewaters that will be discharged to the New York City Sewage Treatment System and demonstrate that that the system is capable of accepting the wastewater. It is important to note that NYPA is only proposing to discharge sanitary wastewater to the New York City Sewage Treatment System at a rate of 2 gpm (2,880 gallons per day). All other wastewater generated on-site will be appropriately treated and discharged to the existing discharge canal located on the East River in accordance with the State Pollution Discharge Elimination System Permit (SPDES) permit. Because of the small volume of sanitary wastewater generated by the proposed combined cycle project, NYPA does not anticipate that the operation of the proposed project will have any adverse impacts on the municipal sewer system

NYPA is proposing to build a new underground 4-inch diameter sanitary sewer which will be tied into the existing sanitary manhole located on the site access road approximately 200 feet east of the guardhouse (see enclosed Site Plan). From the manhole, the existing underground sanitary system flows by gravity flow through a 4-inch and 6-inch sewer main to a pump station located between the Charles Poletti Power Project and the administration building. This underground system is currently servicing the guardhouse, which has only two fixtures, so that nearly all the sewer capacity is available for future use. The administration building also has a 4-inch sewer main directly connected to the pump station. The discharge of the pump station is a 6-inch diameter main that runs under the power plant into Con Edison's property and connects into a 12-inch main on the south side of the power plant. The 12-inch main flows into the municipal sewer system located on 20th Avenue.

NYPA is requesting that the NYCDEP perform a capacity analysis to determine if the existing New York City Sewage Treatment System is capable of receiving the additional flow of 2 gpm (2,880 gpd) once the facility is operating.

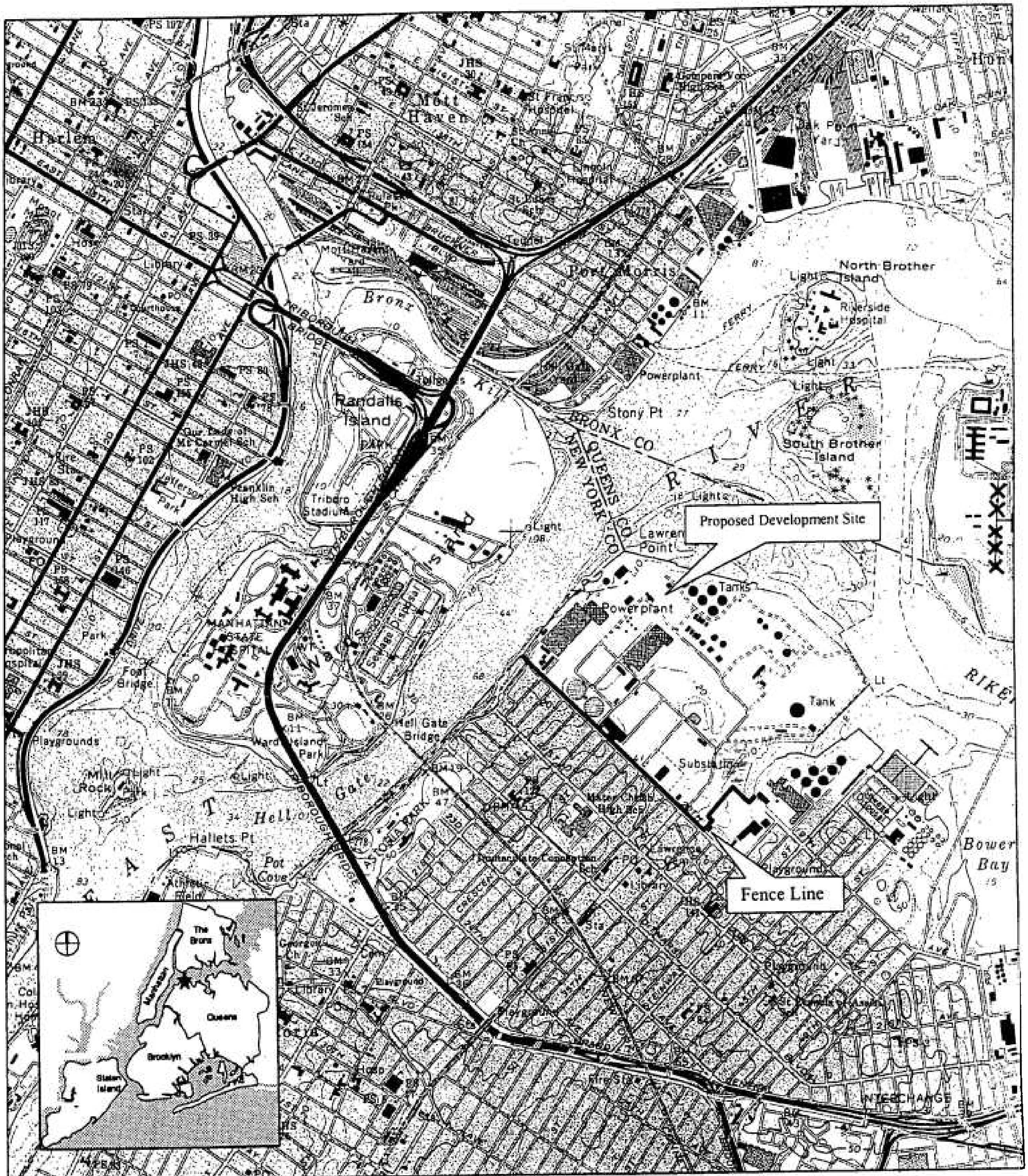
Thank you in advance for your cooperation. If you have any questions or need additional information to perform the requested capacity analyses, please do not hesitate to call me at (914) 287-3438.

Sincerely,

Ellen Koivisto
Licensing Manager

Enclosures

cc: C. Wolfgang, TRC



TRC

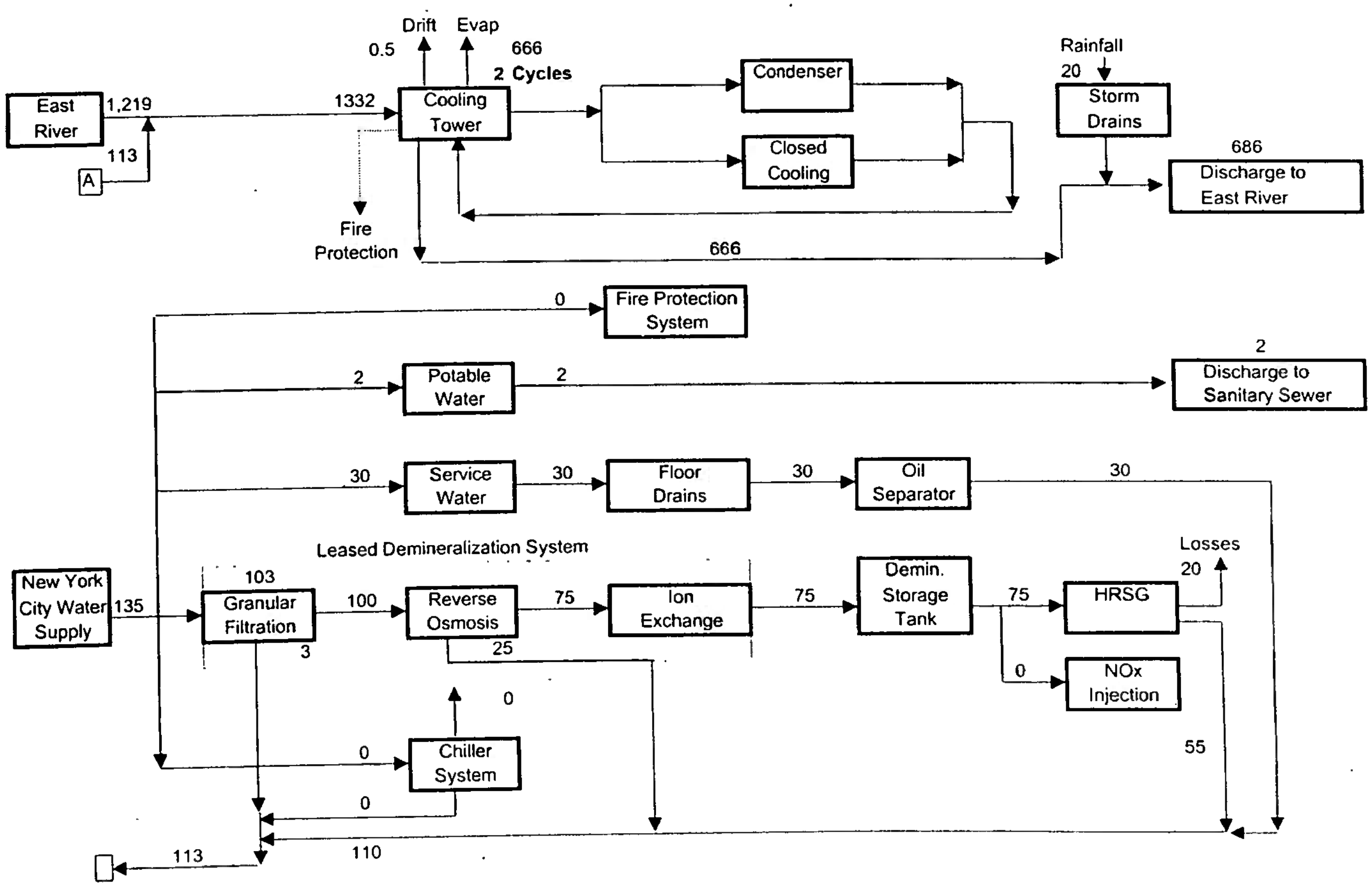
New York Power Authority
500 MW Combined Cycle Facility
Astoria, Queens, NY

Figure 1. Site Location Map
Scale: 1" = 2000'

Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

Figure 2. Gas Fuel Fired at Full Load (Winter)

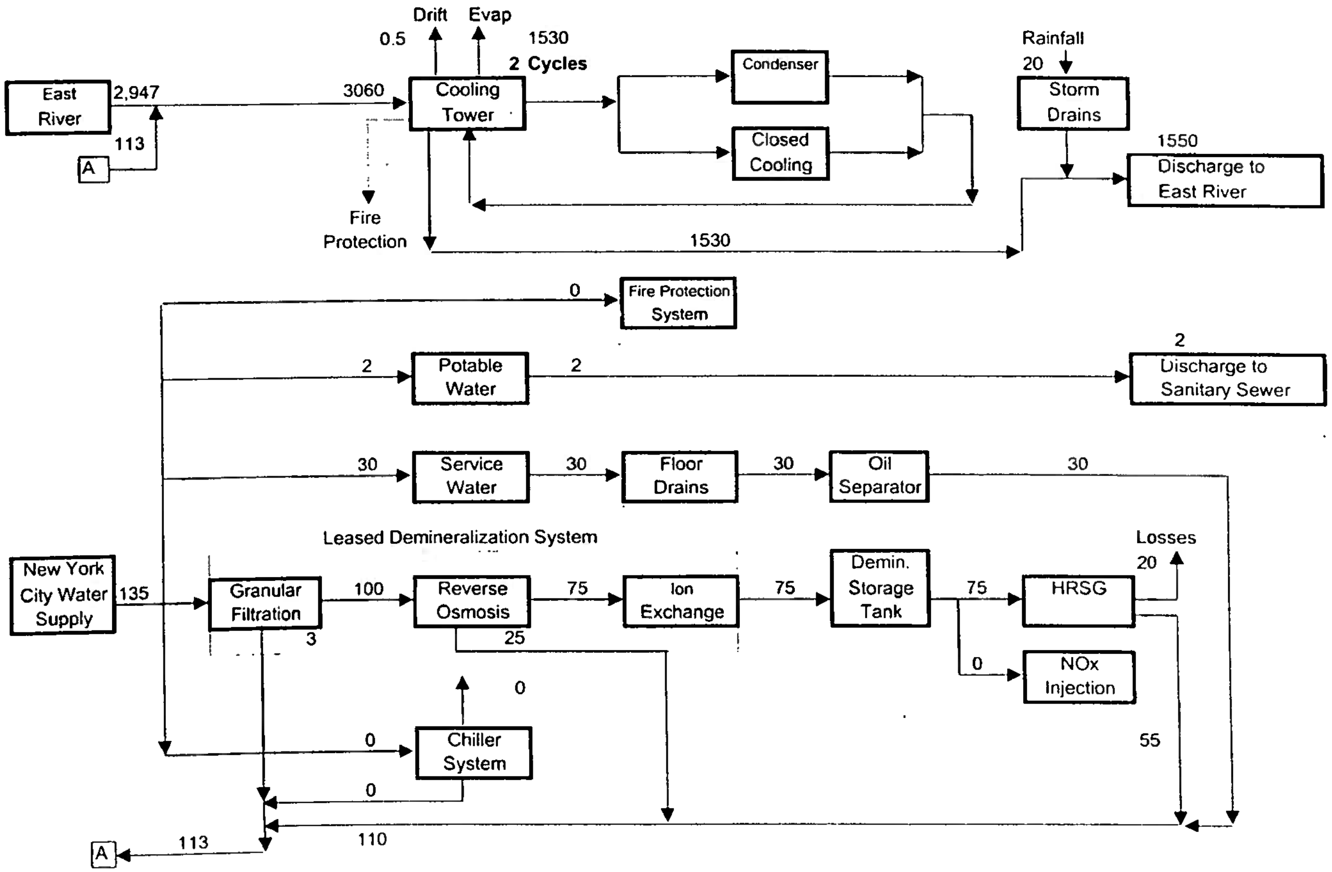
Fuel Fired	**Natural Gas**
Ambient Temperature, F	**-5**
Turbine Load, %	**100**
Evaporative Condenser	**Off**



Note: 1. All flows in gpm

Figure 3. Gas Fuel Fired at Full Load (Spring/Fall)

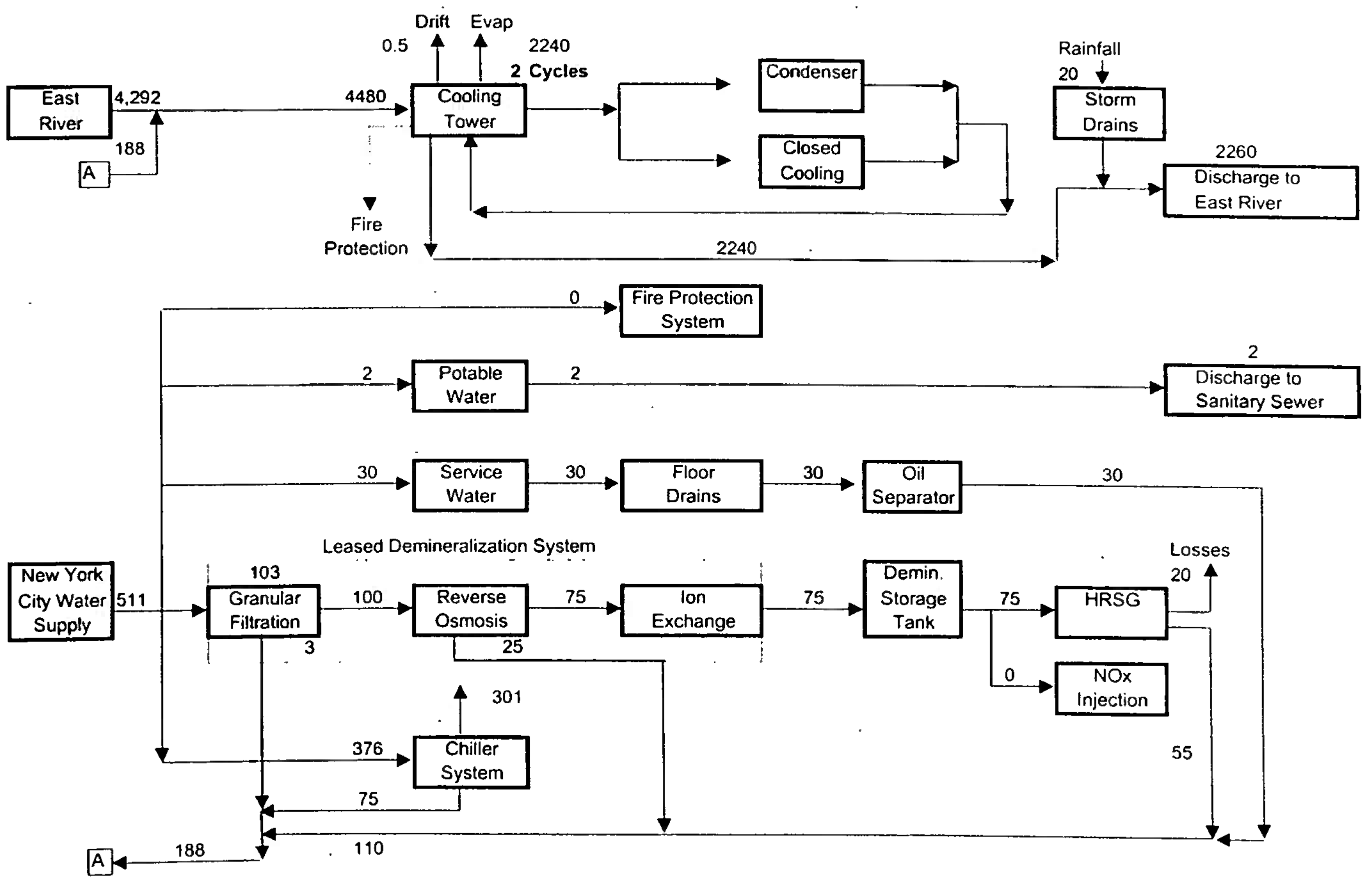
Fuel Fired	Natural Gas
Ambient Temperature, F	54.6
Turbine Load, %	100
Evaporative Condenser	Off



Note: 1. All flows in gpm

Figure 4. Gas Fuel Fired at Full Load (Summer)

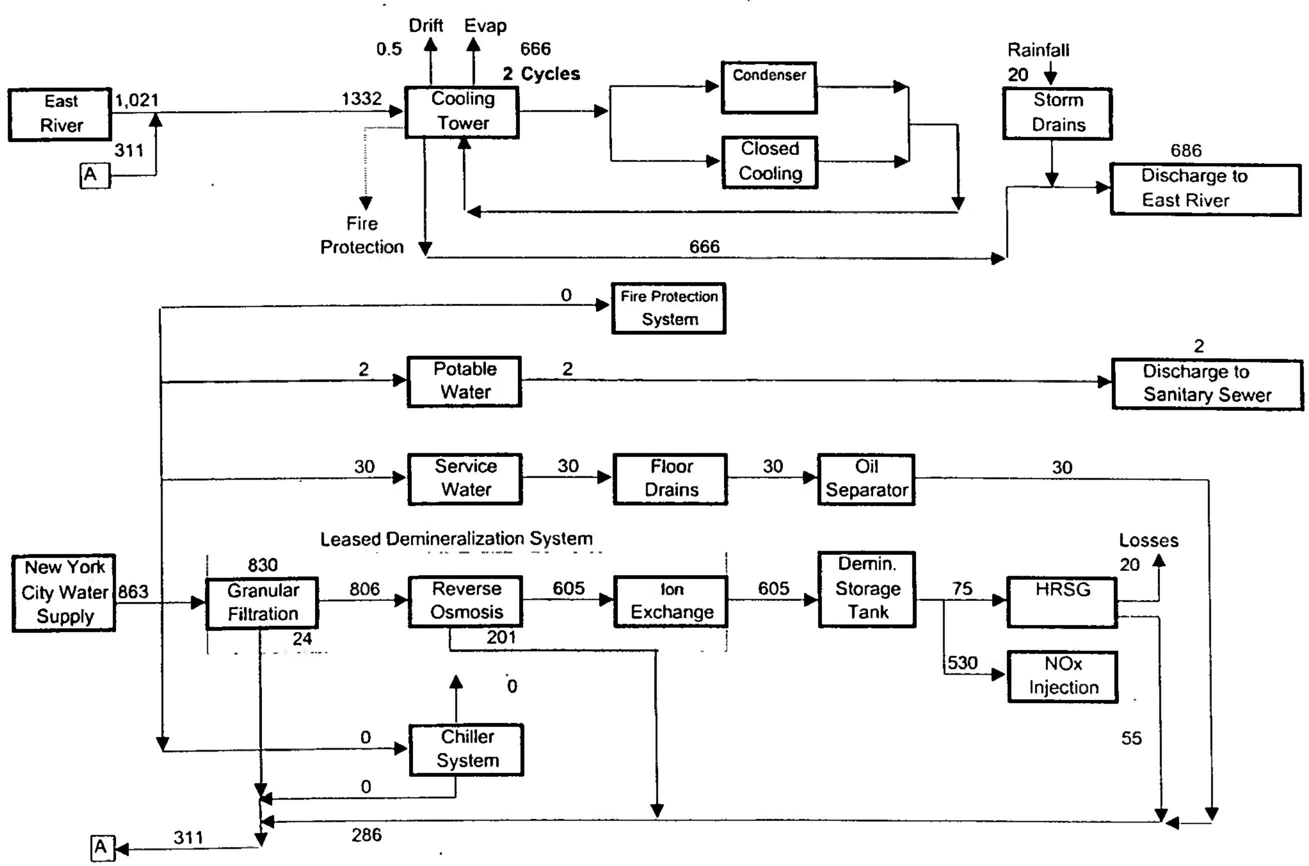
Fuel Fired	Natural Gas
Ambient Temperature, F	100
Turbine Load, %	100
Evaporative Condenser	On



Note: 1. All flows in gpm *** BURNS AND ROE CHECKING ON FLOW VOLUMES FOR THE FREON CHILLER SYSTEM***

Figure 5. Liquid Fuel Fired at Full Load (Winter)

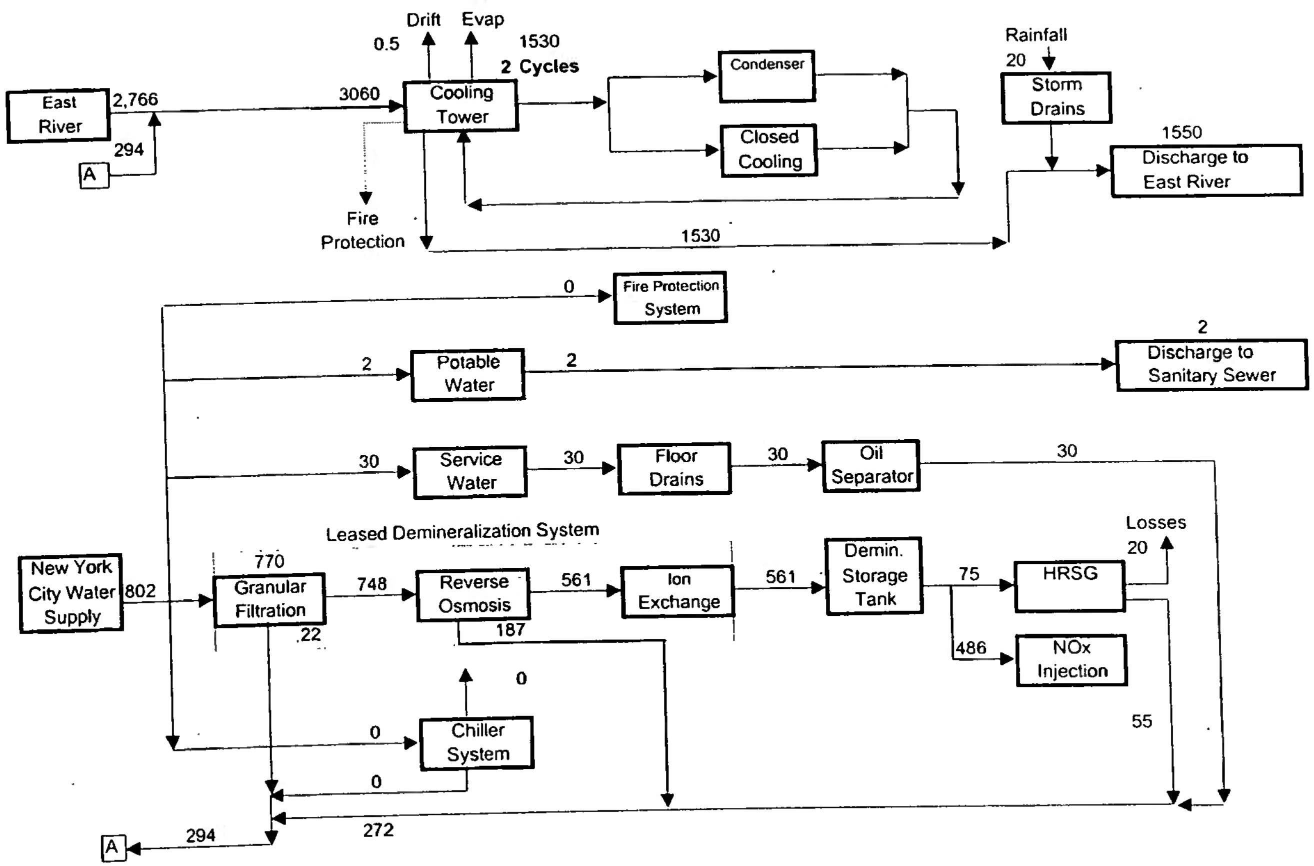
Fuel Fired	**Distillate**
Ambient Temperature, F	**-5**
Turbine Load, %	**100**
Evaporative Condenser	**Off**



Note: 1. All flows in gpm

Figure 6. Liquid Fuel Fired at Full Load (Spring/Fall)

Fuel Fired	**Distillate**
Ambient Temperature, F	**54.6**
Turbine Load, %	**100**
Evaporative Condenser	**Off**



Note: 1. All flows in gpm

Appendix 3B

Appendix 3B

APPENDIX 3B

1999, 1998, and 1997 New York City Drinking Water Supply and Quality Reports: New York Power Authority – Combined Cycle Project Astoria, Queens, New York

NEW YORK CITY

1999 DRINKING WATER SUPPLY AND QUALITY REPORT

www.ci.nyc.ny.us/dep

Rudolph W. Giuliani, Mayor

Joel A. Miele Sr., P.E., Commissioner

New Croton Reservoir

NEW YORK CITY 1999 DRINKING WATER SUPPLY AND QUALITY REPORT

The New York City Department of Environmental Protection is pleased to present its 1999 Annual Water Quality Report. This presentation is in accordance with Part 5-1.72 of the New York State Sanitary Code (10NYCRR), and the National Primary Drinking Water Regulations, 40 CFR Part 141 Subpart O, of the Environmental Protection Agency, which require all drinking water suppliers to provide the public with an annual statement describing the water supply and the quality of its water.

New York City's Water Supply

The New York City surface (reservoir) water supply system (PWSID NY0003493) provides approximately 1.3 billion gallons of safe drinking water daily to nearly 8 million residents of New York City, as well as visitors, commuters and approximately one million people living in Westchester, Putnam, Ulster, and Orange counties. In addition to our surface water supplies, approximately 350,000 people in southeastern Queens receive groundwater or a blend of groundwater and surface water. In all, the City system supplies high quality water to nearly half the population of New York State.

Where Does New York City's Water Come From?

New York City's surface water is supplied from a network of 19 reservoirs and three controlled lakes in a 1,969 square-mile watershed that extends 125 miles north of New York City. Approximately 90% of our water comes from the Catskill/Delaware System, located in Delaware, Greene, Schoharie, Sullivan, and Ulster counties, west of the Hudson River. The Croton System, the City's original upstate supply, provides about 10% of our daily water from 12 reservoir basins in Putnam, Westchester, and Dutchess counties. In 1999, New York City's Groundwater System in southeastern Queens operated 20 wells and supplied an average of 20 million gallons of drinking water per day, or less than 2% of the City's total use.

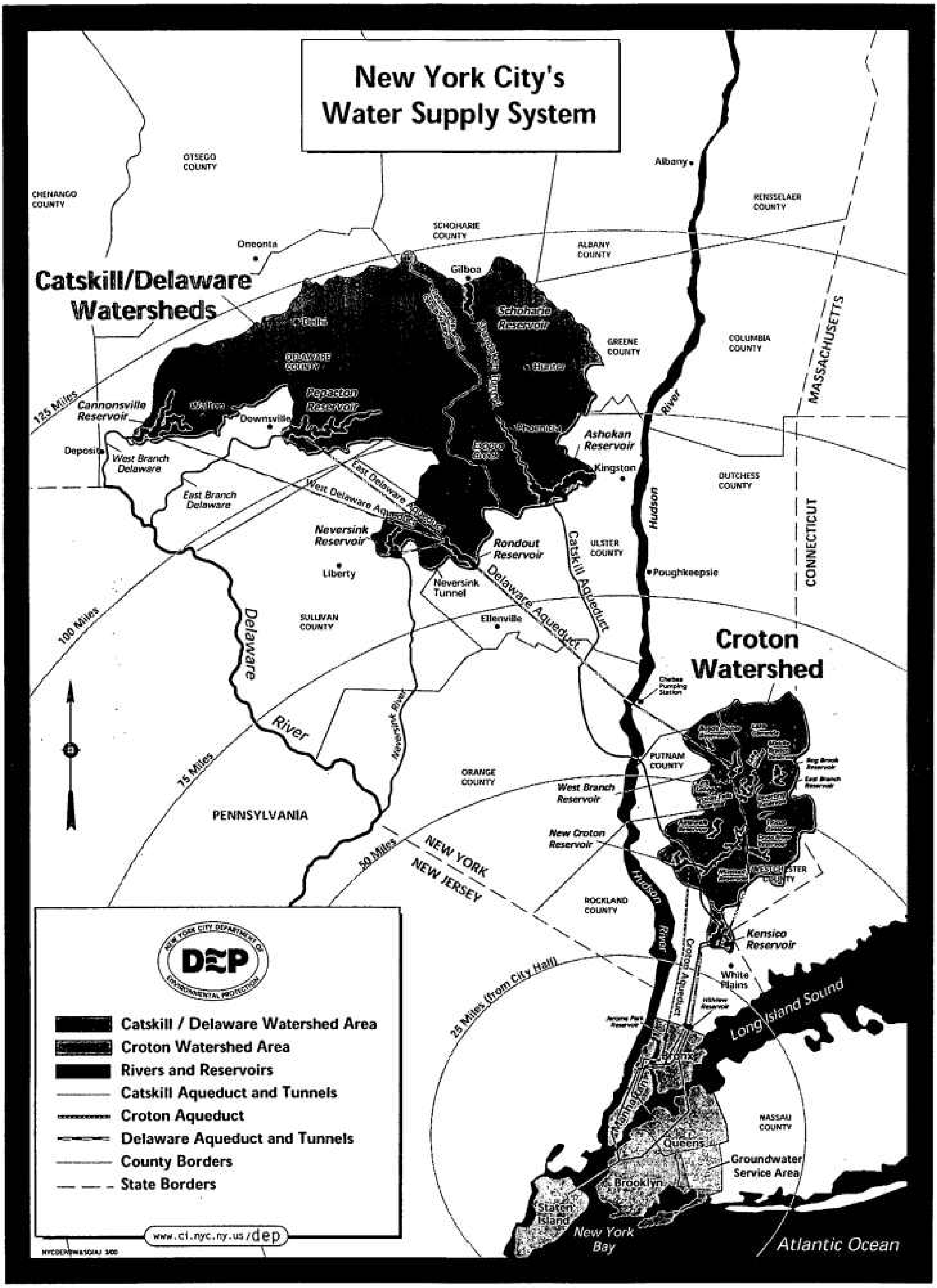
What's in Source Water?

Sources of drinking water worldwide (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activities. Contaminants that may be present in source water include: microbial contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants.

Regulation of Drinking Water

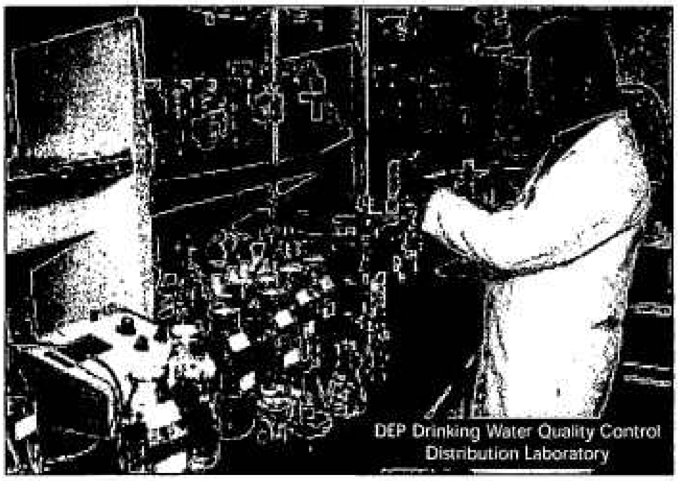
In order to ensure that tap water is safe to drink, the New York State Department of Health and the United States Environmental Protection Agency (EPA) prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. The State Health Department's and the federal Food and Drug Administration's regulations establish limits for contaminants in bottled water.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.


New York City's
Water Supply System
Catskill/Delaware Watersheds
Croton Watershed
OTSEGO COUNTY
CHENANGO COUNTY
SCHOHARIE COUNTY
ALBANY COUNTY
RENSSELAER COUNTY
GREENE COUNTY
COLUMBIA COUNTY
DELAWARE COUNTY
DUTCHESS COUNTY
ULSTER COUNTY
SULLIVAN COUNTY
ORANGE COUNTY
PUTNAM COUNTY
ROCKLAND COUNTY
WESTCHESTER COUNTY
NASSAU COUNTY
MASSACHUSETTS
CONNECTICUT
PENNSYLVANIA
NEW YORK
NEW JERSEY
Albany
Oneonta
Gilboa
Delhi
Hunter
Walton
Downsville
Deposit
Phoenicia
Kingston
Liberty
Ellenville
Poughkeepsie
White Plains
Schoharie Reservoir
Schoharie Creek
Pepacton Reservoir
Cannonsville Reservoir
Ashokan Reservoir
Esopus Creek
Neversink Reservoir
Rondout Reservoir
Neversink Tunnel
West Branch Delaware
East Branch Delaware
East Delaware Aqueduct
West Delaware Aqueduct
Delaware Aqueduct
Catskill Aqueduct
Croton Aqueduct
Delaware River
Neversink River
Hudson River
Chelsea Pumping Station
West Branch Reservoir
New Croton Reservoir
Kensico Reservoir
Long Island Sound
Bronx
Manhattan
Queens
Brooklyn
Staten Island
New York Bay
Atlantic Ocean
Groundwater Service Area
125 Miles
100 Miles
75 Miles
50 Miles
25 Miles (from City Hall)
DEP
Catskill / Delaware Watershed Area
Croton Watershed Area
Rivers and Reservoirs
Catskill Aqueduct and Tunnels
Croton Aqueduct
Delaware Aqueduct and Tunnels
County Borders
State Borders
www.ci.nyc.ny.us/dep

Water Quality

The New York City Department of Environmental Protection (DEP) operates the water supply system that delivers water to City residents. DEP's monitoring program — far more extensive than required by law — demonstrates that the quality of New York City's drinking water remains high and meets all health-related State and federal drinking water standards. Color, an aesthetic condition in the Croton and Groundwater Systems, may exceed the standard on a seasonal basis.


DEP Drinking Water Quality Control Distribution Laboratory

DEP monitors the water in the distribution system, the upstate reservoirs and feeder streams, and the wells that are the sources for our supply. Water quality is monitored continuously as the water enters the distribution system, and is regularly tested at sampling points throughout the entire City. DEP conducts analyses for a broad spectrum of microbiological, chemical, and physical measures of quality. In 1999, DEP collected more than 41,500 in-City samples and performed approximately 594,300 analyses.

Test Results

The results of the tests conducted in 1999 on distribution water samples under DEP's Distribution System Monitoring Program are summarized in the tables in this Statement. Data is presented separately for the Croton, Catskill/Delaware, and Groundwater Systems. Whether a particular user receives Croton, Catskill/Delaware, groundwater, or a mixture, depends on location, system operations, and consumer demand.

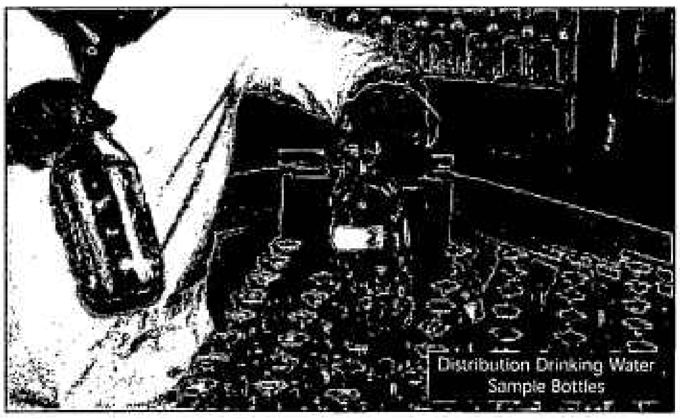
The State requires monitoring for some parameters at a frequency of less than once per year because the concentrations of these parameters do not change frequently. Accordingly, some of these data, though representative, are more than one year old. Unregulated parameter monitoring is conducted to help EPA determine where certain parameters occur and whether it needs to regulate those parameters.

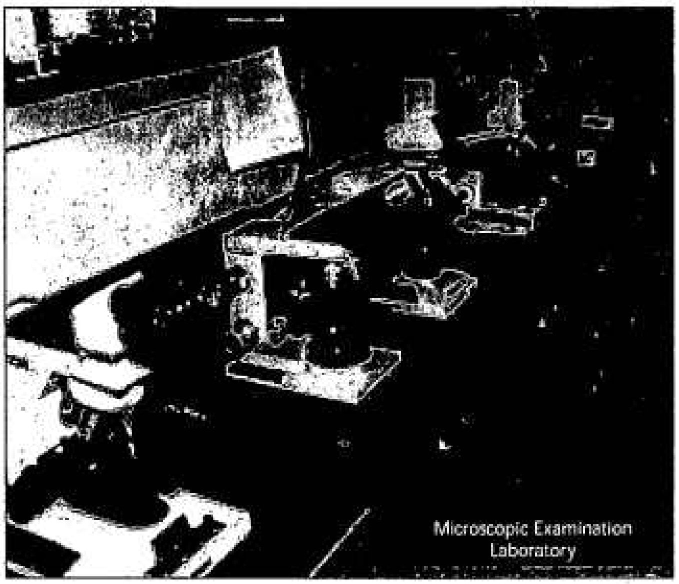
Recently, considerable attention has been focused on the chemical MTBE (methyl tertiary butyl ether), an oxygenate widely used in the United States as a gasoline fuel additive. In the U.S., MTBE has been found mainly in ground water supplies as a result of leaking gasoline storage tanks and pipelines. The potential for MTBE groundwater contamination is exacerbated by its solubility in water, which allows it to travel through groundwater aquifers faster than the other, less soluble, components of gasoline. The chemical has also been detected at much lower levels in surface water supplies, due more to air emissions and recreational power boating, than to leaking underground storage tanks. Even though the State does not require water supplies to monitor for MTBE, DEP has made it part of its analytical protocol since 1996.

Lead in Drinking Water

New York City water is lead-free when it is delivered from the City's upstate reservoir system, but water can absorb lead from solder, fixtures, and pipes found in the plumbing of some buildings or homes. Mandated at-the-tap lead monitoring is conducted at various households around the City twice a year. Based on the results of the 1999 monitoring of 107 homes, New York City met the established standard or Lead Action Level (AL).

Infants and young children are typically more vulnerable to lead in drinking water than the general population. It is possible that lead levels at your home may be higher than at other homes in the community as a result of materials used in your home's plumbing. If you are concerned about elevated lead levels in your home's water you may flush your cold-water tap for 30 seconds to 2 minutes, until the water turns cold, before using water that has been standing in the pipes for more than six hours. Use only water from the cold water tap for cooking, drinking, and making baby formula. You also may wish to have your water tested. To request a free kit to test for lead in your drinking water, call DEP's 24-hour Help Center at (718) DEP-HELP. Additional information is available from the EPA's Safe Drinking Water Hotline (800) 426-4791.


Distribution Drinking Water Sample Bottles



Microscopic Examination Laboratory

Cryptosporidium and Giardia

While there is no evidence of illness related to the New York City water supply, federal and New York State law requires all water suppliers to notify their customers about the potential risks of *Cryptosporidium* and *Giardia*. Cryptosporidiosis and giardiasis are intestinal illnesses caused by microscopic pathogens which can be waterborne. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome both of these diseases within a few weeks.

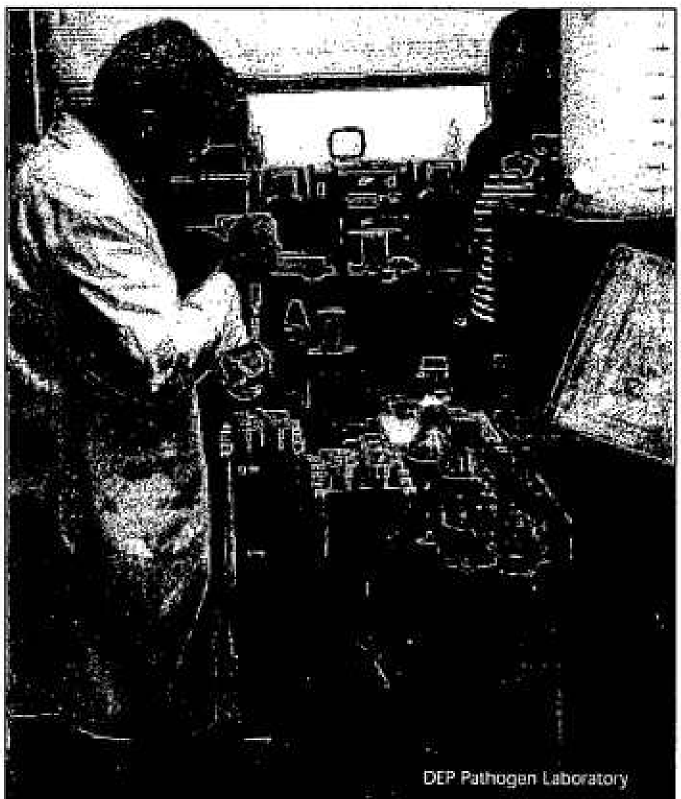
According to the EPA and the Centers for Disease Control and Prevention (CDC), it is unclear how most cases of cryptosporidiosis in the United States are contracted. The relative importance of various risk factors are unknown. Such factors include eating contaminated food, swallowing contaminated recreational water while swimming or camping, contact with animals, contact with human waste, certain sexual practices, or drinking contaminated water. Individuals who think they may have cryptosporidiosis or giardiasis should contact their health care provider immediately.

Some people may be more vulnerable to disease-causing microorganisms or pathogens in drinking water than the general population. Immuno-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with Crohn's disease or HIV/AIDS or other immune system disorders, some elderly, and infants, can be particularly at risk from infections. These people should seek advice from their health care providers about their drinking water. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium*, *Giardia* and other microbial contaminants are available from the EPA's Safe Drinking Water Hotline (800) 426-4791.

DEP's Monitoring for Pathogens

In 1992, the City added a pathogen monitoring component to its comprehensive watershed monitoring program. Since then, samples have been collected weekly from the effluents of Kensico and New Croton Reservoirs, before water is first chlorinated in the Catskill/Delaware and Croton Systems, respectively. In May 1999, DEP implemented a more sensitive analytical method which improved the Department's ability to detect both *Giardia* cysts and *Cryptosporidium* oocysts. Current test methods, however, are limited in that they do not allow us to determine if organisms identified are dead or if they are capable of causing disease.

In 1999, as part of the routine sampling program, 109 samples of Kensico Reservoir effluent and 37 samples of New Croton Reservoir effluent were collected and analyzed for *Giardia* cysts and *Cryptosporidium* oocysts. Of the 109 Kensico Reservoir samples, 47 samples were presumed positive for *Giardia* and 5 samples were confirmed positive. Five samples were presumed positive for *Cryptosporidium* at Kensico and two were confirmed. The New Croton Reservoir samples produced seven presumed positive *Giardia* samples, and no samples confirmed positive; and of two presumed positive *Cryptosporidium* samples no samples confirmed positive. DEP's *Giardia* and *Cryptosporidium* data from 1992 to the present can be viewed on our web site www.ci.nyc.ny.us/dep/html/pathogen.html, where updates are made weekly.

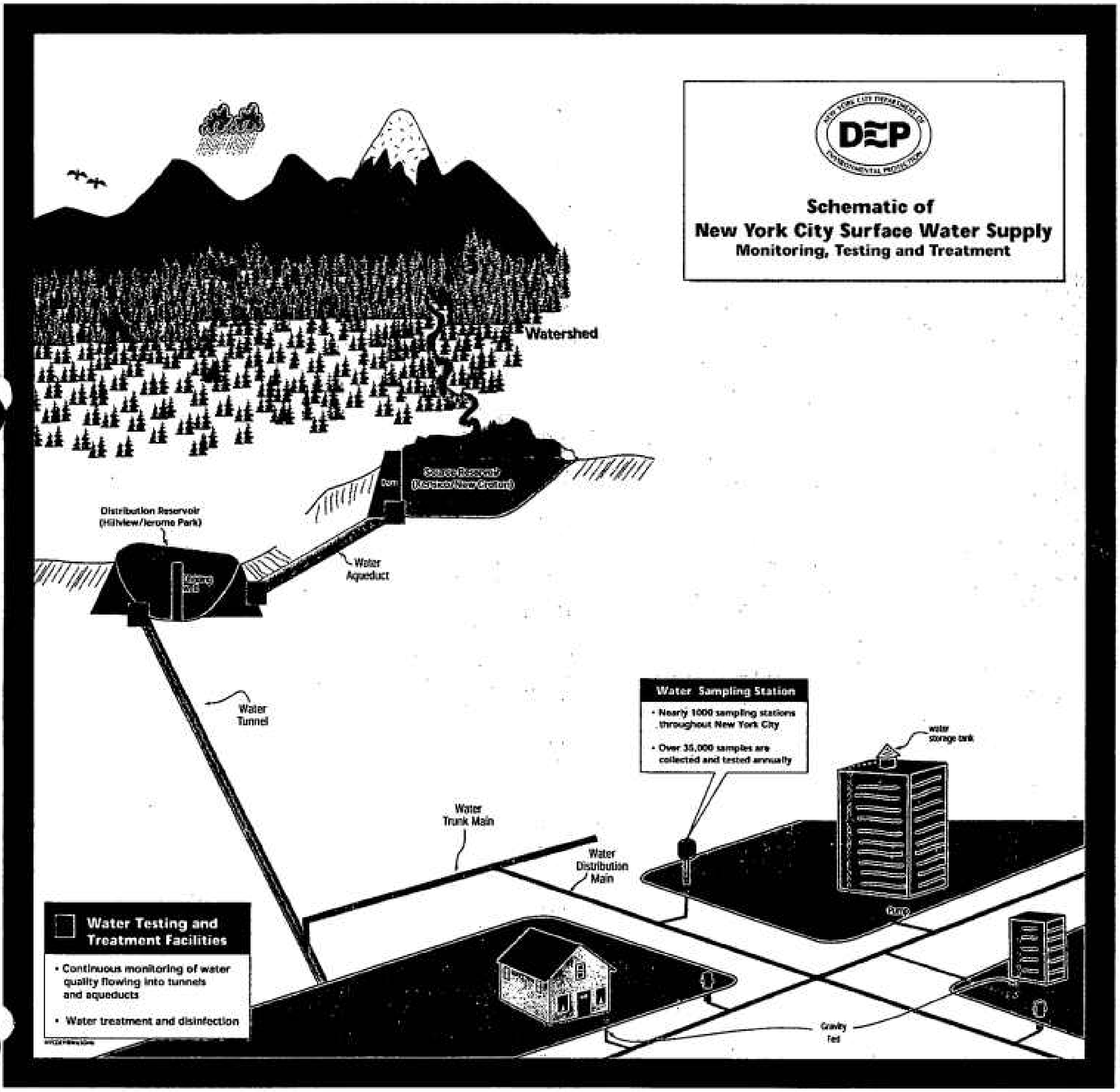


DEP Pathogen Laboratory

How is New York City's Water Treated?

All surface water and groundwater entering New York City's distribution system is treated with chlorine, fluoride, orthophosphate, and, in some cases, sodium hydroxide. New York City uses chlorine to meet the New York State Sanitary Code and federal Safe Drinking Water Act disinfection requirements. Fluoride, at a concentration of one part per million, is added to help prevent tooth decay and has been added since the mid-1960's in accordance with the New York City Health Code. Orthophosphate is added to create a protective film on pipes which reduces the release of metals such as lead from household plumbing. Sodium hydroxide is added to Catskill/Delaware water to raise the pH and reduce corrosivity.

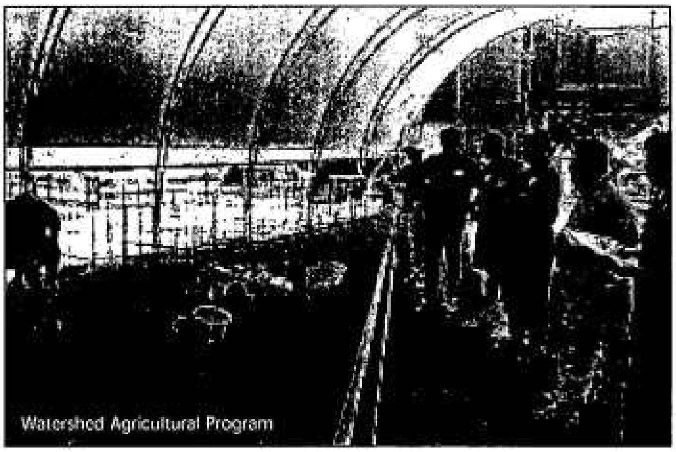
A sequestering phosphate is applied at several wells to prevent the precipitation of naturally occurring minerals, mostly iron and manganese, in the distribution mains and customers' household piping. Air stripper facilities operate at several wells to remove volatile organic chemicals.



Ensuring a Safe and Sufficient Supply of Water

Watershed Programs

During 1999, New York City continued implementation of the watershed protection and partnership programs set forth in the January 1997 Watershed Memorandum of Agreement (MOA). These efforts focused on three key programs: the acquisition of watershed lands; the enforcement of strengthened Watershed Regulations; and the expansion of partnership programs that target specific sources of pollution in the watershed. In addition, DEP continued work on a number of water quality studies, and continued implementing the upgrades of City-owned and non-City-owned wastewater treatment plants (WWTPs).



Watershed Agricultural Program

Land Acquisition

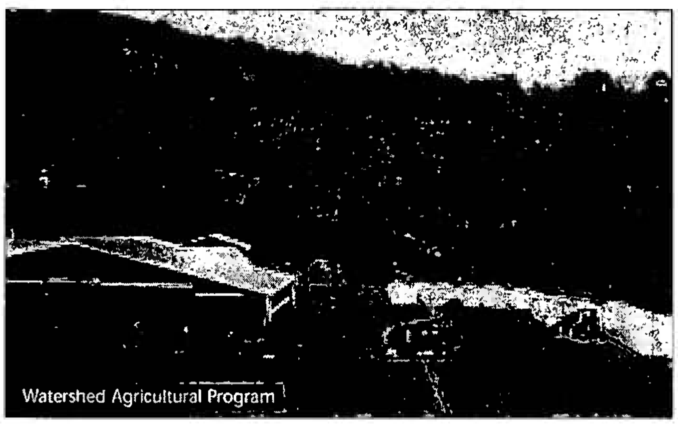
In 1999, DEP met the goals for procuring watershed lands set forth in the 1997 Filtration Avoidance Determination (FAD) and the MOA. Specifically, DEP solicited 42,733 acres of watershed lands in designated priority areas. As of December 1999, DEP had 18,669 acres in 287 parcels either acquired or under purchase contract for a cost of $55.8 million. DEP also began an initiative to purchase conservation easements from willing sellers and a Whole Farm Easement Program in partnership with the Watershed Agricultural Council.

Watershed Regulations

On May 1, 1997, enhanced Watershed Regulations became effective, replacing regulations that had been in place since 1953. The Regulations are vital to water supply protection and provide a higher level of defense against modern-day threats to water quality. By vigorously enforcing the new Regulations, DEP is ensuring that the City's source waters are protected. The steps taken to ensure a high quality water supply include: aggressive policing and inspection of the watersheds, greatly increased water quality monitoring, systematic inspections of wastewater treatment plants, investigations of other potentially-polluting activities, and legal actions against polluters. Furthermore, in 1999, DEP staff reviewed more than 1,330 applications for new or remediated septic systems, 50 stormwater pollution prevention plans, and more than 90 proposals for projects that included one or more regulated activities.

Partnership Programs

In 1999, New York City made nearly $30 million in payments to support a variety of partnership programs in accordance with the terms of the MOA. West of the Hudson River, many of the partnership programs are being administered by the Catskill Watershed Corporation (CWC), a non-profit corporation formed solely for that purpose. Together, CWC and DEP continued to implement programs that remediated 374 failing septic systems, completed construction of 17 winter road de-icing materials storage facilities, processed funding applications for new stormwater control facilities for 11 projects, and solicited proposals for construction of best management practices to address existing stormwater runoff. In addition, CWC completed a study for the use of the City-funded $60 million Catskill Fund for the Future, which seeks to assist economic development opportunities in the watershed consistent with the City's water quality objectives.



Watershed Agricultural Program

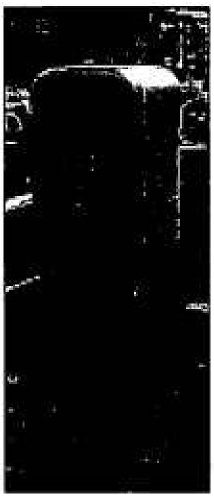
Wastewater Treatment Plant Upgrades

The City continues to advance the program to upgrade all of the 102 non-City-owned wastewater treatment plants (WWTP) in the watershed. All facilities have signed agreements to participate in the upgrade program and have begun the process of hiring engineers to complete upgrade designs. In addition, the City completed the multi-million dollar upgrade of the Margaretville WWTP in Delaware County, the seventh of the City's eight watershed wastewater treatment facilities to be completely redesigned and upgraded.

Upstate Capital Improvements

The City continued to implement a multi-year program to upgrade and improve its upstate water supply facilities, including gatehouses, aqueducts, water testing laboratories, and other facilities which are important to ensuring a safe and reliable supply of drinking water. An ongoing dam reconstruction program has also been in effect for rehabilitation of dams. In 1999, work was done on facilities at the Amawalk, Titicus, Cross River, and West Branch Reservoirs, and at Kirk Lake, Lake Gilead, and Lake Gleneida.

The Distribution System



Sampling Stations

Since May 1, 1999, 28 fixed sampling sites (26 compliance and 2 surveillance) have been in use in the Groundwater System. The new stations replace internal compliance sampling sites, marking the completion of a project to install nearly 1000 fixed sampling stations throughout the entire City. These stations, which you may have seen in your neighborhood, allow DEP to collect water samples throughout the distribution system in an efficient and sanitary manner.

Water Quality Tracking System

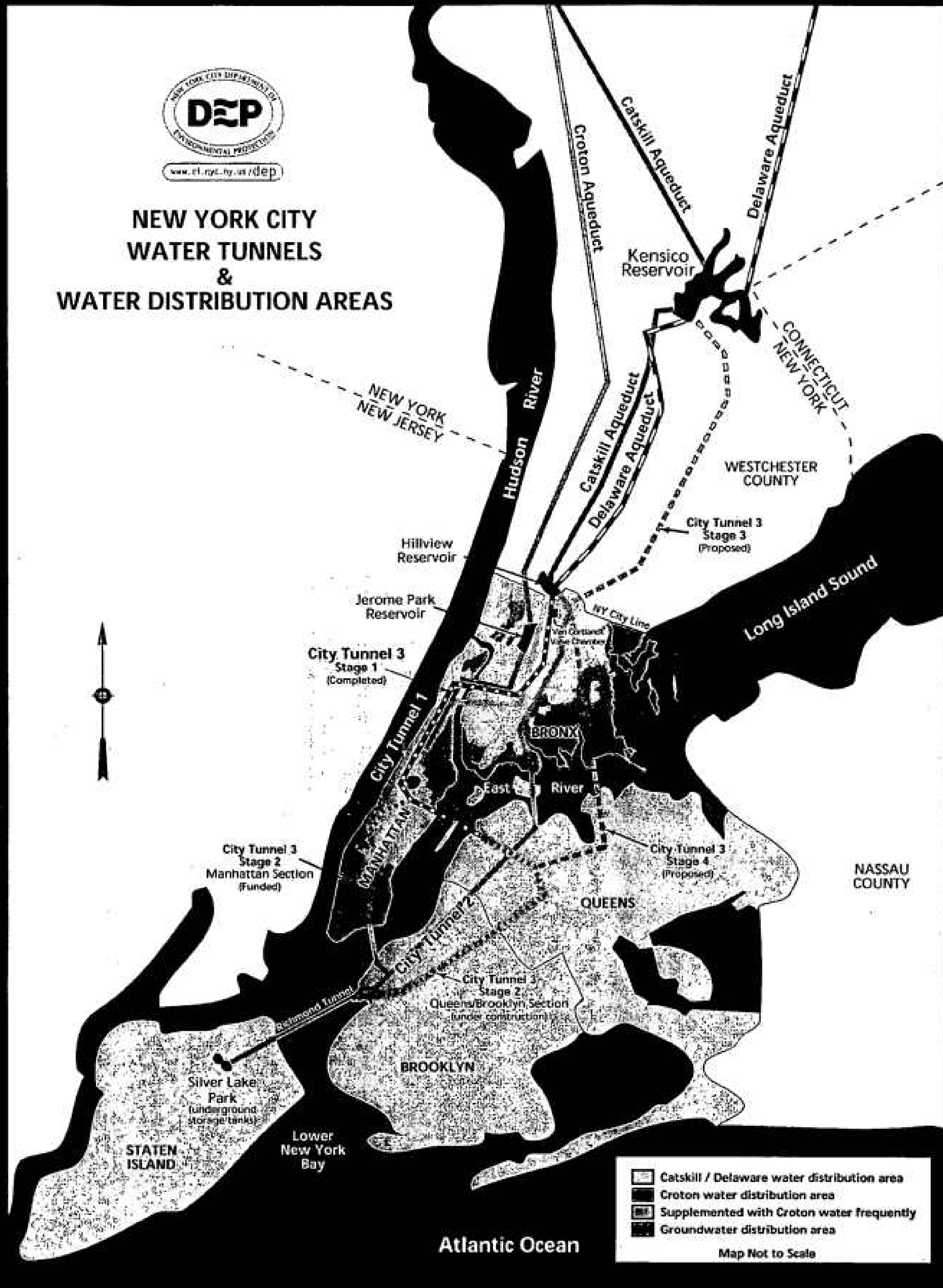
DEP has put in place a new state of the art computer program and water quality tracking system. This system, called the Distribution Water Quality Module (DWQM), allows Drinking Water Quality Control staff to quickly access a large number of water quality parameters, including, chlorine residual, orthophosphate concentration, color, turbidity, bacteria, Heterotrophic Plate Count, and disinfection by-products, throughout the City as a whole or any section of the City. The system's ability to almost instantaneously identify problem locations or areas with low chlorine or high color, and track water quality trends, makes it an effective water quality management tool and helps to provide the best possible water quality throughout the City.

City Water Tunnel No. 3

The Third Water Tunnel, begun in 1970, is being built in three stages. The first stage of Tunnel No. 3, which became operational in July 1998, has already helped to improve the reliability of the City's drinking water distribution system. Stage II of Tunnel No. 3 includes two segments, and is scheduled to be finished in 2008. The first segment of Stage II which is in Brooklyn and Queens, is currently under construction and upon completion will improve service to Staten Island, Brooklyn and Queens. This phase will be followed by the construction of the Manhattan segment of Stage II.

Eventually, Stage III will extend from the Kensico Reservoir in Westchester County to the Van Cortlandt Park Valve Chamber in the Bronx, and Stage IV will deliver water to the eastern parts of the Bronx and Queens. When finished in 2020, Tunnel No. 3 will create a more flexible means of supplying drinking water to the entire City and will provide delivery alternatives in the event of disruption in any of the older tunnels. It will also permit New York City to drain, examine and rehabilitate City Tunnels No. 1 and 2.


NYC Tunnel No. 3 Construction



This map of the City indicates the general areas where water can be supplied by the Croton and Groundwater Systems when they are on line. It is possible to supply the entire City from the Catskill/Delaware System.

Operations

In our ongoing efforts to maintain the appropriate volume and high quality of water in the distribution system, there is some rotation in the water sources used by DEP. In the Groundwater System, wells are routinely removed and returned to service for maintenance or due to changes in demand. The entire Croton System was shut down from September 17, 1999, through the end of the year due to elevated levels of color, (which is an aesthetic problem, not a public health concern), and to permit contract work in the Croton Aqueduct. The Groundwater wells were then shut down in succession, in November and December of 1999, during an exercise in Y2K preparedness. Subsequently, for a few days, on December 29 & 30, 1999, the entire City was supplied by the Catskill/Delaware system.

Croton Filtration Plant

The City is planning to build a treatment facility to filter water from the Croton system. A preferred location for the filtration plant, the Mosholu Driving Range of Van Cortlandt Park in the Bronx, was announced in December 1998 and a design for the proposed facility is being prepared. The Croton filtration plant is slated to be operational by 2007.

The federal Surface Water Treatment Rule (SWTR) requires that all water supplies be filtered by June 29, 1993, unless the system meets special criteria to receive a waiver. Even though Croton water quality is high, it experiences seasonal color problems and will be subjected to stricter standards for disinfection by-products in the near future. In 1992, the City entered into a Stipulation with the New York State Department of Health calling for the construction of a Croton filtration facility.

In May 1998, the City entered into a Consent Decree with the United States and the State of New York, thereby settling an enforcement action brought against the City because it is not filtering Croton water at this time. In November 1998, the U.S. District Court for the Eastern District of New York approved the Consent Decree. The Consent Decree supercedes the 1992 Stipulation and sets out a revised timetable for the design and construction of the Croton filtration facility.

Until DEP begins to filter Croton water we are required to make the following statement: *Inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.*

DEFINITION OF TERMS

Action Level (AL):

The concentration of a contaminant, which if exceeded, triggers treatment or other requirements which a water system must follow. An exceedence occurs if more than 10% of the samples exceed the Action Level.

Maximum Contaminant Level (MCL):

The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG):

The level of a contaminant in drinking water below which there is not known or expected risk to health. MCLGs allow for a margin of safety.

Treatment Technique (TT):

A required process intended to reduce the level of a contaminant in drinking water.

90th Percentile Value:

The values reported for lead and copper represent the 90th percentile. A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below the value. The 90th percentile is equal to or greater than 90% of the lead and copper values detected at your water system.

ABBREVIATIONS

NA = Not Applicable
ND = Non Detect
NDL = No Designated Limit
CFU/ml = colony forming units per milliliter
mg/L = milligrams per liter (10-3 grams per liter)
µg/L = micrograms per liter (10-6 grams per liter)
pCi/L = picocurie per liter (a measure of radioactivity)
NTU = Nephelometric Turbidity Units
µmho/cm = micromhos per centimeter

REGULATED PARAMETERS

PARAMETERS	NYS DOH MCL	US EPA MCLG	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER
			# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
REGULATED CONVENTIONAL PHYSICAL AND CHEMICAL PARAMETERS												
Barium (mg/L)	2.00	2	192	ND	ND	36	ND	ND	85	ND - 0.08	<0.005	Erosion of natural deposits
Chloride (mg/L)	250.0	-	192	5.9 - 15.9	9.1	36	30.9 - 57.2	48.0	281	6.4 - 138.0	42.2	Naturally occurring; road salt
Chromium (µg/L)	100	100	192	ND	ND	36	ND	ND	86	ND - 3	<2	Erosion of natural deposits
Color - entry points (color units)	15 (1)	-	1111	3 - 13	7	255	4 - 28	12	527	1 - 22	5	Iron and manganese; or organic sources, such as algal growth
Copper (mg/L)	1.3 (2)	1.3	278	ND - 0.06	0.01	41	ND - 0.04	0.01	285	ND - 1.07	0.04	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Fluoride (mg/L)	2.2	4	9268	0.05 - 1.30	1.08	883	0.90 - 1.14	1.01	1231	0.18 - 1.65	1.07	Erosion of natural deposits; water additive which promotes strong teeth; runoff from fertilizer
Gross Beta particle (pCi/L) (3)	50 (4)	-	9	ND - 1.0	< 0.7	3	1.2 - 2.1	1.7	1	1.8	1.8	Decay of natural deposits and man-made emissions
Iron (µg/L)	300 (5)	-	192	20 - 160	40	36	30 - 110	70	297	ND - 1360	260	Naturally occurring
Lead (µg/L)	15 (2)	0	280	ND - 4	<2	41	ND - 4	<2	299	ND - 35	<2	Corrosion of household plumbing systems; erosion of natural deposits
Manganese (µg/L)	300 (5)	-	192	10 - 80	20	36	20 - 100	50	295	ND - 430	50	Naturally occurring
Nitrate (mg/L nitrogen)	10	10	192	0.10 - 0.25	0.18	36	ND - 0.64	0.28	281	ND - 8.84	3.35	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
pH (pH units)	6.5 - 8.5	-	9269	6.6 - 8.8	-	883	6.9 - 7.6	-	1234	5.8 - 8.3	-	
Sodium (mg/L)	NDL (6)	-	192	5.8 - 12.7	7.9	36	14.8 - 30.0	24.4	140	3.5 - 49.7	24.4	Naturally occurring; road salt; water softeners; animal waste
Sulfate (mg/L)	250.0	-	192	5.9 - 7.3	6.2	36	8.8 - 13.8	12.6	281	5.8 - 95.0	34.6	Naturally occurring
Turbidity (7) - distribution system (NTU)	5 (8)	-	8158	0.1 - 3.6	0.7	628	0.3 - 1.7	0.8	1234	0.1 - 5.3	0.5	Soil runoff
Turbidity (7) - entry points (NTU)	1 (9)	-	-	-	-	255	0.5 - 1	0.8	-	-	-	Soil runoff
Zinc (mg/L)	5	-	192	ND - 0.02	<0.01	36	ND	ND	295	ND - 0.51	0.06	Naturally occurring
Regulated Conventional Physical and Chemical Parameters not detected:												
Antimony, Arsenic, Asbestos (10), Beryllium, Cadmium, Cyanide, Gross Alpha particle (3), Mercury, Nickel, Nitrite, Selenium, Silver, Thallium												
REGULATED ORGANIC CONTAMINANTS												
Total Trihalomethanes (µg/L)	100 (11)	-	194	11 - 64	33	36	28 - 76	44	189	ND - 45	6	By-product of drinking water chlorination
Principal Organic Contaminants detected:												
Tetrachloroethylene (µg/L)	5	0	194	ND	ND	36	ND	ND	189	ND - 6.1 (12)	1.0	Discharge from dry cleaners
Trichloroethene (µg/L)	5	0	194	ND	ND	36	ND	ND	189	ND - 1.5	<0.5	Residual of cleaning solvents and metal degreasers
Trichlorofluoromethane (µg/L)	5		194	ND	ND	36	ND	ND	189	ND - 6.2 (13)	<0.5	Emissions of solvents, chemical intermediate, blowing agent for polyurethane foams, dry cleaning, aerosol propellant and in fire extinguishing agent
Specified Organic Contaminants detected:												
Di(2-ethylhexyl) phthalate (µg/L)**	6	0	3	ND	ND	6	ND	ND	13	ND - 1.7 (14)	ND	Plasticizer from flexible plastics
Simazine (µg/L)**	4	4	3	ND	ND	6	ND - 0.05*	ND	13	ND	ND	Runoff from herbicide use
Principal Organic Contaminants not detected:												
Benzene, Bromobenzene, Bromochloromethane, Bromomethane, n-Butylbenzene, sec Butylbenzene, tert-Butylbenzene, Carbon Tetrachloride, Chlorobenzene, Chloroethane, Chloromethane, 2-Chlorotoluene, 4-Chlorotoluene, Dibromomethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Dichlorodifluoromethane, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethene, cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2 Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3 Dichloropropene, Ethylbenzene, Hexachlorobutadiene, Isopropylbenzene, p-Isopropyltoluene, Methylene chloride, n-Propylbenzene, Styrene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Toluene, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene												
Specified Organic Contaminants not detected:												
Alachlor, Aldicarb (Temik), Aldicarb sulfone, Aldicarb sulfoxide, Aldrin, Atrazine, Benzo(a)pyrene, Butachlor, Carbaryl, Carbofuran (Furadan), Chlordane, 2,4-D, Dalapon, 1,2-Dibromo-3-chloropropane, Dicamba, Dieldrin, Di(2-ethylhexyl)adipate, Dinoseb, Diquat, Endothall, Endrin, Ethylene dibromide (EDB), Glyphosate, Heptachlor, Heptachlor epoxide, Hexachlorobenzene, Hexachlorocyclopentadiene, 3-Hydroxycarbofuran, Lindane, Methomyl, Methoxychlor, Metolachlor, Metribuzin, Oxamyl (Vydate), Pentachlorophenol, Picloram, Polychlorobiphenyls [PCBs], Propachlor, Toxaphene, 2,4,5-TP (Silvex), Vinyl chloride												
MICROBIAL PARAMETERS												
Total Coliform Bacteria (% of samples positive/month)	5%	0	9283	0.0% - 1.0%	0.20%	883	0.0% - 8.0%	0.1%	1221	0.0% - 2.0%	0.3%	Naturally present in the environment
E. coli (CFU/100mL)	(15)	0	9283	ND	ND	883	ND	ND	1221	ND	ND	Human and animal fecal waste
Heterotrophic Plate Count (CFU/mL)	TT	-	9227	ND - 1120	1	881	ND - 388	1	1205	ND - 618	2	Naturally present in the environment

UNREGULATED PARAMETERS

PARAMETERS	NYS DOH MCL	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER
		# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
UNREGULATED CONVENTIONAL PHYSICAL AND CHEMICAL PARAMETERS											
Alkalinity (mg/L $CaCO_3$)	-	277	8.0 - 26.1	11.8	40	24.5 - 57.2	44.7	305	10.5 - 221.8	57.7	Erosion of natural deposits
Aluminum (mg/L)	0.05 - 0.2 [15]	192	ND - 0.04	0.02	36	ND - 0.02	0.01	69	ND - 0.03	<0.01	Erosion of natural deposits
Ammonia (mg/L nitrogen)	-	192	ND - 0.03	<0.03	36	ND	ND	86	ND - 0.15	<0.03	Animal waste and fertilizer runoff
Boron (mg/L)	-	192	ND - 0.12	0.05	36	ND - 0.12	0.06	69	ND - 0.26	0.10	Erosion of natural deposits
Bromide (mg/L)	-	24	ND	ND	13	ND - 0.02	< 0.02	15	0.10 - 0.14	0.12	Erosion of natural deposits
Calcium (mg/L)	-	278	3.9 - 9.4	5.4	41	11.3 - 23.0	19.0	319	4.2 - 92.6	24.6	Erosion of natural deposits
Carbon dioxide (mg/L)	-	12	1.10 - 2.00	1.50	9	3.08 - 4.40	3.88	-	-	-	Present in air
Chemical Oxygen Demand (mg/L O_2)	-	192	ND - 10.6	4.7	36	5.7 - 12.1	8.9	69	ND - 5.4	<2.4	
Chlorate (mg/L)	-	8	ND	ND	-	-	-	8	ND - 0.17	0.05	By-product of drinking water chlorination
Chlorine Residual, free (mg/L)	-	9266	0.00 - 1.73	0.70	883	0.15 - 1.64	0.72	1229	0.02 - 1.46	0.69	Water additive for disinfection
Color - distribution system (color units)	-	8158	2 - 40	7	628	3 - 40	10	1234	1 - 68	6	Presence of iron, manganese, and organics in water
Corrosivity (Langelier index)	0 [16,17]	192	-3.04 to -1.72	-2.47	36	-1.78 to -1.20	-1.48	135	-3.29 to 0.89	-1.43	
Dissolved Oxygen (mg/L)	-	12	8.7 - 15.9	12.1	9	5.6 - 12.4	9.1	-	-	-	
Foaming Agents (µg/L linear alkyl sulfonate)	500 [16]	180	ND - 10	<10	33	ND - 10	<10	75	ND - 20	<10	Residual of washing detergents
Hardness (grains/gallon [US] $CaCO_3$) [18]	-	192	0.9 - 1.8	1.1	36	3.0 - 5.1	4.5	308	1.0 - 24.7	6.7	Erosion of natural deposits
Iodide (mg/L)	-	192	ND	ND	36	ND - 0.01	<0.01	69	ND	ND	Erosion of natural deposits
Magnesium (mg/L)	-	192	1.0 - 2.5	1.3	36	4.3 - 8.8	7.1	69	1.2 - 39.0	11.8	Erosion of natural deposits
Phosphate, Ortho- (mg/L)	-	9265	0.26 - 3.30	1.83	883	0.30 - 2.75	1.21	1229	0.56 - 2.99	1.63	Water additive for corrosion control
Phosphate, Total (mg/L)	-	192	0.64 - 2.92	1.58	36	0.60 - 1.30	0.85	125	0.63 - 5.94	1.98	Water additive for corrosion control
Potassium (mg/L)	-	192	0.42 - 6.70	0.62	36	1.20 - 2.60	1.95	69	0.54 - 3.53	1.51	Erosion of natural deposits
Silica [silicon oxide] (mg/L)	-	192	1.8 - 3.2	2.5	36	2.6 - 4.6	3.8	215	1.0 - 29.9	13.2	Erosion of natural deposits
Specific Conductance (µmho/cm)	-	9269	66 - 179	83	883	180 - 389	268	1234	69 - 874	245	
Strontium (mg/L)	-	192	ND	ND	36	ND - 0.09	<0.05	69	ND - 0.17	<0.05	Erosion of natural deposits
Temperature (°F)	-	9269	34 - 76	55	883	37 -75	54	1234	39 - 78	58	
Total Dissolved Solids (mg/L)	500 [16]	192	21 - 75	46	36	128 - 180	158	135	27 - 540	210	Metals and salts naturally occurring in the soil; organic matter
Total Organic Carbon (mg/L carbon)	-	192	1.1 - 2.4	1.6	36	1.9 - 3.6	2.9	69	0.1 - 1.7	0.8	Organic matter naturally present in the environment
UV 254 Absorbency (absorbency unit)	-	192	0.019 - 0.040	0.028	36	0.033 - 0.067	0.053	69	0.002 - 0.049	0.017	Organic matter naturally present in the environment

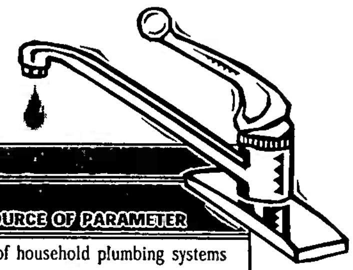
Unregulated Conventional Physical and Chemical Parameters not detected:

Lithium, Phenols, ^{90}Strontium - radiological [3], Tritium (^{3}H) - radiological [3]

PARAMETERS	NYS DOH MCL	CD # SAMPLES	CD RANGE	CD AVERAGE	CROTON # SAMPLES	CROTON RANGE	CROTON AVERAGE	GW # SAMPLES	GW RANGE	GW AVERAGE	SOURCE OF PARAMETER
UNSPECIFIED ORGANIC CHEMICALS											
Disinfection By-Products detected											
Bromochloroacetic acid (µg/L)	50	182	ND - 2.70	1.40	31	0.89 - 3.56	2.15	73	ND - 2.58	0.75	By-product of drinking water chlorination
Bromodichloroacetic acid (µg/L)	50	47	1.90 - 3.10	2.45	8	5.60 - 8.70	7.30	22	ND - 2.80	0.91	By-product of drinking water chlorination
Chloral Hydrate (µg/L)	50	143	1.35 - 13.78	5.74	19	3.26 - 11.22	5.65	74	ND - 9.50	1.39	By-product of drinking water chlorination
Chloropicrin (µg/L)	50	181	ND - 1.14	0.49	28	ND - 0.91	0.47	91	ND - 0.82	0.08	By-product of drinking water chlorination
Haloacetic acid 5 (HAA5) (µg/L)	[19]	134	16.2 - 51.0	33.2	20	39.7 - 58.2	50.5	64	ND - 32.6	9.7	By-product of drinking water chlorination
Haloacetonitriles (HANs) (µg/L)	[19]	81	1.55 - 4.60	3.13	16	0.94 - 6.63	4.85	70	ND - 4.44	1.77	By-product of drinking water chlorination
Halogenated ketones (HKs) (µg/L)	[19]	116	1.40 - 5.61	2.86	16	2.84 - 5.52	4.31	89	ND - 3.46	0.78	By-product of drinking water chlorination
Total Organic Halogen (mg/L)	-	192	0.09 - 0.24	0.15	36	0.12 - 0.32	0.24	69	ND - 0.15	<0.10	By-product of drinking water chlorination
Unspecified Organic Chemicals detected											
DCPA (Dacthal) (µg/L)**	5	3	ND	ND	1	ND	ND	8	ND - 0.17 *	ND	Runoff from pesticide use
Di-n-Butyl phthalate (µg/L)**	5	3	ND	ND	6	ND	ND	9	ND - 0.70 *	ND	Plasticizer from flexible plastics
Methyl tert-butyl ether (MTBE) (µg/L)	50	194	ND - 3.0	NA	36	ND - 0.60	NA	189	ND - 10.1	NA	Additive to gasoline in the winter

Unspecified Organic Chemicals not detected:

Acenaphthene, Acenaphthylene, Acetochlor, Acifluorfen, Anthracene, Bentazon, Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[g,h,l]perylene, a-BHC, b-BHC, d-BHC, g-BHC, Bromacil, Butylbenzylphthalate, Caffeine, Carboxin, a-Chlordane, g-Chlordane, Chlorobenzilate, Chloroneb, Chlorothalonil (Draconil, Bravo), Chrysene, Cyanazine, 2,4-DB, p,p'DDD, p,p'DDE, p,p'DDT, Diazinon, Dibenz[a,h]anthracene, 3,5-Dichlorobenxoic acid, Dichlorprop, Diethylphthalate, Dimethoate, Dimethylphthalate, 2,4-Dinitrotoluene, Di-N-octylphthalate, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin aldehyde, Etridiazole, EPTC, Fluoranthene, Fluorene, Indeno[1,2,3-cd] pyrene, Isophorone, Malathion, Methiocarb, MGK - 264, Molinate, Naphthalene, 4-Nitrophenol, trans-Nonachlor, Norflurazon, Paraquat, Parathion, Permethrin, Phenanthrene, Prometryn, Propoxur (Baygon), Pyrene, 2,4,5-T, Terbacil, Terbufos, Tetrachloroterephthalic acid, Thiobencarb, Trifluralin, Vernolate



LEAD AND COPPER RULE SAMPLING AT RESIDENTIAL WATER TAPS: July - December 1999							
PARAMETERS	NYS DOH AL	US EPA MCLG	# SAMPLES	RANGE	90th PERCENTILE VALUES	# SAMPLES EXCEEDING ACTION LEVEL (AL)	SOURCE OF PARAMETER
Copper (mg/L)	1.3	1.3	107	0.006 - 0.496	0.199	0	Corrosion of household plumbing systems
Lead (µg/L)	15	0	107	ND - 177	12	7	Corrosion of household plumbing systems

FOOTNOTES

(1) Determination of MCL violation: If a sample exceeds 15 color units, a second sample must be collected from the same location within 2 weeks. If the average of the two results exceeds 15 color units, then an MCL violation has occurred. In the Croton System there were 3 color violations on 7/17/99, 8/7/99 and 8/10/99. The Groundwater System experienced 2 violations on 6/9/99 at Well 14 and Well 45, and 1 on 8/4/99 at Well 14.

(2) Action Level (not an MCL) measured at the tap.

(3) Reported radiological data for gross alpha, gross beta, strontium 90, and tritium are for samples collected during 1997. Regulations stipulate that samples be taken every 4 years.

(4) New York State considers 50 pCi/L to be the level of concern for beta particles.

(5) If iron and manganese are present, the total concentration of both should not exceed 0.5 mg/L. Higher levels may be allowed by the State when justified by the supplier of water.

(6) Water containing more than 20 mg/L of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/L of sodium should not be used for drinking by people on moderately restricted sodium diets.

(7) Turbidity is a measure of cloudiness of the water. Turbidity is monitored because it is a good indicator of water quality and can hinder the effectiveness of disinfection.

(8) MCL is the monthly average. Data presented are individual sample results.

(9) This MCL only applies to the Croton System. The MCL and data presented are monthly averages. This MCL was not exceeded.

(10) Reported asbestos data was collected in 1993. Regulations require this parameter to be sampled every 9 years.

(11) MCL is the calculated quarterly running average. In 1999 the MCL was never exceeded. Data presented are based on individual sampling results.

(12) Well 27, Well 47, and Well 48 tested positive for this parameter and were removed from service on 9/8/99, 8/5/99, and 7/29/99 respectively.

(13) Well 45 tested positive for this parameter and was removed from service 12/9/99.

(14) Two samples tested positive for this parameter. They were Well 53 sampled on 12/14/99 at 0.8 µg/L, and Well 58 on 12/14/99 at 1.7 µg/L.

(15) If a sample and its repeat sample are both positive for coliform bacteria and one of the two samples is positive for *E. coli*, then an MCL violation has occurred.

(16) USEPA Secondary MCL; NYSDOH has not set an MCL for this parameter.

(17) A Langelier Index of less than zero indicates corrosive tendencies.

(18) Hardness of up to 3 grains per gallon is considered soft water; between 3 and 9 is moderately hard water.

(19) No MCL currently exists for these groups of chemicals

* The contaminant was detected in only one sample. The level found was below the MCL.

** In the Croton System this parameter's data is from 1998. Data was not analyzed in 1999 due to system shutdown.

Color - entry point [illegible] highlighted [illegible] bolded indicate a violation occurred, see footnote (1)

1998 CORRECTIONS

PARAMETERS	NYS DOH MCL	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER
		# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
Methyl tert-butyl ether (MTBE) (µg/L)	50	164	ND - 5.0	<0.5	41	ND - 0.60	<0.5	102	ND - 62	3.50	Additive to gasoline in the winter

The values for MTBE were incorrectly reported in the New York City 1998 Drinking Water Supply and Quality Statement; these are the corrected numbers. Though an individual sample result exceeded 50 in the Groundwater System, no MCL violation occurred in 1998. Determination of MCL violation: If a sample exceeds the MCL, one to three more samples must be collected from the same sampling point within 30 days. If at least one of the confirming samples is positive and the average of the initial and all confirming samples exceeds the MCL, then a MCL violation has occurred.

Water Conservation

The average single family household in New York City uses approximately 100,000 gallons of water each year, at a cost of $1.30 per 100 cubic feet of water (748 gallons), or about $174.00 each year. Although New York City is fortunate to have a plentiful supply of reasonably priced drinking water, everyone should do their part to conserve this precious resource.

DEP's ongoing efforts to save water include: use of sonar equipment to survey all water supply piping for leaks; replacement of approximately 70 miles of old water supply pipe a year; equipping fire hydrants with special locking devices; and installing home water meters to encourage conservation. These programs and others have proven successful and together have reduced water consumption in the City by approximately 200 million gallons per day in the last ten years. This is more water than the City of Boston or Westchester County uses in a day.

Here are some ways that you can help save water:

- Repair all leaks promptly. Leaks waste water 24 hours a day, 7 days a week. Check all faucets for leaks.
- Install aerators on all sinks and use a high-pressure, low-flow showerhead. Replacing old fixtures with water-conserving models can produce substantial savings without reducing effectiveness and comfort.
- Order a Home or Apartment Water Saving Kit. If you are an apartment building owner/manager or a home owner, you can obtain a free leak survey, along with water saving showerheads and other products. Call our Leak Survey contractor at (718) 326-9426 for information.
- Water your garden in the evening instead of the heat of day to reduce evaporation.

Frequently Asked Questions

My drinking water often looks "milky" when first taken from a faucet, but then clears up. Why?

Air becomes trapped in the water as it makes its long trip from the upstate reservoirs to the City. As a result, the water can sometimes appear cloudy or milky. This condition is not a public health concern. The cloudiness is temporary and clears quickly after the water is drawn from the tap and the excess air is released.

What can I do about chlorine odors in tap water?

Chlorine odors may be more noticeable when the weather is warmer. Chlorine is essential to kill organisms that may cause disease. The following are ways you can remove the chlorine and its odor from your drinking water:

- Fill a pitcher and let it stand in the refrigerator overnight. (This is the best way.)
- Fill a glass or jar with water and let it stand in sunlight for 30 minutes.
- Pour water from one container to another about 10 times.
- Heat the water to about 100 degrees Fahrenheit.

Once you remove the chlorine, be sure to refrigerate the water to limit bacterial regrowth.

Sometimes my water is a rusty brown color. What causes this?

Brown water is commonly associated with plumbing corrosion problems inside buildings and from rusting hot water heaters. If you have an ongoing problem with brown water, it is probably due to rusty pipes. It is recommended that you run your cold water for 2 - 3 minutes if it has not been used for an extended period of time. This will flush the line. You can avoid wasting water by catching your "flush" water in a container and using it to water plants or for other purposes. In addition, brown water can result from street construction or water main work being done in the area. Any disturbance to the main, including the opening of a fire hydrant, can cause pipe sediment to shift, resulting in brown water. The settling time of the main will vary, depending on the size of the water main.

Should I buy bottled water?

You do not need to buy bottled water for health reasons in New York City since our water meets all federal and State health-based drinking water standards. Also, bottled water costs up to 1,000 times more than the City's drinking water.

Is New York City's water "hard?"

Hardness is a measure of dissolved calcium and magnesium in the water. The less calcium and magnesium in the water ("soft" water), the easier it is to create lather and suds. New York City's water is predominantly "soft."

Contact Us

For a copy of this report, to report unusual water characteristics, or to request a free kit to test for lead in your drinking water, call DEP's 24-hour Help Center at (718) DEP-HELP (337-4357).

For more information on *Giardia* and *Cryptosporidium*, please contact the Parasitic Disease Surveillance Unit of the New York City DEP and New York City Department of Health (NYCDOH) at: (212) 788-4728.

To contact NYCDOH about other water supply health related questions call (212) 442-9666 or call the New York State Department of Health Bureau of Public Water Supply Protection at (518) 402-7650.

To report any polluting activities occurring in the watershed, call 1-888-DEP-NYC1 (1-888-337-6921), 24-hours a day.

To view this 1999 Statement, announcements of public hearings, or other information, visit DEP's Web site at:

www.ci.nyc.ny.us/dep

Este reporte contiene información muy importante sobre el agua que usted toma. Haga que se la traduzcan o hable con alguien que la entienda.

Ce rapport contient des informations importantes sur votre eau potable. Traduisez-le ou parlez en avec quelqu'un qui le comprend bien.

Rapò sa a gen enfòmasyon ki enpòtan anpil sou dlo w'ap bwè a. Fè tradwi-l pou ou, oswa pale ak yon moun ki konprann sa ki ekri ladan-l.

Ten raport zawiera bardzo istotną informacje o twojej wodzie pitnej. Przetłumacz go albo porozmawiaj z kimś kto go rozumie.

В этом материале содержится важная информация относительно вашей питьевой воды. Переведите его или поговорите с кем-нибудь из тех, кто понимает его содержание.

這個報告中包含有關你的飲用水的重要信息。請將此報告翻譯成你的語言，或者詢問懂得這份報告的人。

이 보고서는 귀하의 식수에 관한 매우 중요한 정보를 포함하고 있습니다. 이 정보에 대해 이해하는 사람에게 그 정보를 번역하여 달라거나 통역해 받으세요.

New York City
Department of Environmental Protection
59-17 Junction Boulevard
Corona, New York 11368-5107

NEW YORK CITY - 1998 DRINKING WATER SUPPLY AND QUALITY STATEMENT

In accordance with Section 1150 of the New York State Public Health Law, as amended in 1998, and the National Primary Drinking Water Regulations, 40 CFR Part 141, of the Environmental Protection Agency, all drinking water suppliers are required to provide the public with an annual statement describing the water supply and the quality of its water. The New York City Department of Environmental Protection is pleased to present its 1998 Annual Water Supply Statement/Consumer Confidence Report.

New York City's Water Supply

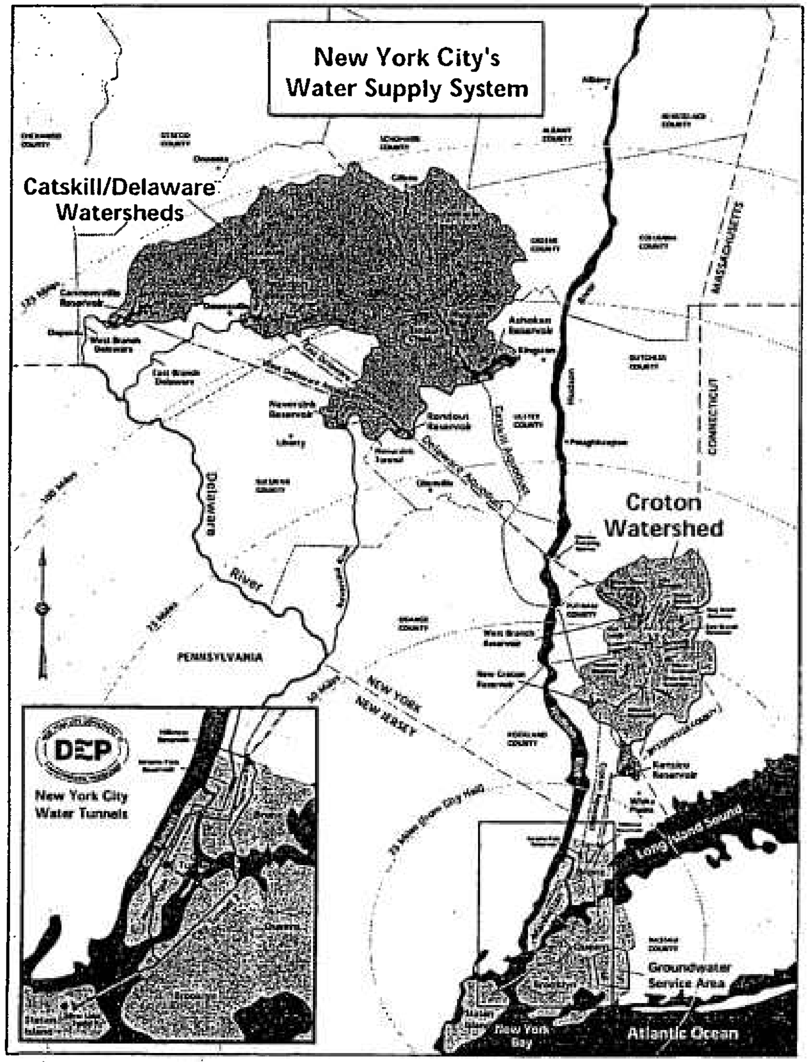
The New York City surface (reservoir) water supply system provides approximately 1.3 billion gallons of safe drinking water daily for nearly 8 million residents of New York City, as well as visitors, commuters and approximately one million people living in Westchester, Putnam, Ulster, and Orange counties. In addition to our surface water supplies, approximately 520,000 people in southeastern Queens receive groundwater or a blend of groundwater and surface water. In all, the City system supplies high quality water to nearly half the population of New York State.

Where Does New York City's Water Come From?

Most of New York City's water is supplied from a network of 19 reservoirs and three controlled lakes in a 1,969 square-mile watershed that extends 125 miles north of New York City. The Croton system, the City's original upstate supply, provides about 10% of our daily water from 12 reservoir basins in Putnam, Westchester, and Dutchess counties. Approximately 90% of our water comes from the Catskill/Delaware watershed, located in Delaware, Greene, Schoharie, Sullivan, and Ulster counties, west of the Hudson River. In 1998, New York City's groundwater system in southeastern Queens operated 27 wells to supply an average of 31 million gallons of drinking water per day, or about two percent of the City's total use.

What's in the Source Water?

The sources of drinking water worldwide (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and radioactive elements. As it moves, water also absorbs substances present due to human and animal activity.



Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, soil, farming, domestic animals, and wildlife.
- Inorganic contaminants, such as salts, nutrients and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, septic systems, and naturally occuring organic matter from decaying vegetation.
- Radioactive contaminants, which can be naturally-occurring.

Regulation of Drinking Water

In order to ensure that tap water is safe to drink, the New York State Department of Health and the United States Environmental Protection Agency (EPA) prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration regulations establish limits for contaminants in bottled water.

All drinking waters contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.

Water Quality

The New York City Department of Environmental Protection (DEP) operates the water supply system that delivers water to City residents. The monitoring program — far more extensive than required by law —demonstrates that the quality of New York City's drinking water remains high, meeting all health-related State and Federal drinking water standards. (Color, an aesthetic condition in the Croton and Groundwater systems, excedes the standard on seasonal basis.)

DEP monitors the water in the distribution system, the upstate reservoirs and feeder streams, and the wells that are the sources for our supply. Water quality is monitored continuously as the water enters the distribution system, and is tested at sampling points throughout the entire City. Water is analyzed for a broad spectrum of microbiological, chemical, and physical measures of quality. In 1998, DEP collected more than 39,000 in-City samples and performed approximately 424,000 analyses.

Test Results

The results of the tests conducted on distribution water samples under DEP's Distribution System Monitoring Program in 1998 are summarized in the **tables in this Statement.** Data is presented separately for the Croton, Catskill/Delaware, and Groundwater systems. More detailed results can be obtained from DEP. Whether a particular user receives Croton, Catskill/Delaware, groundwater, or a mixture, depends on location, system operations, and consumer demand.

The State requires DEP to monitor for some parameters less than once per year because the concentrations of these parameters do not change frequently. Some of these data, though representative, are more than one year old. Unregulated parameter monitoring helps EPA to determine where certain parameters occur and whether it needs to regulate those parameters.

Lead in Drinking Water

New York City water is lead-free when it is delivered from the City's upstate reservoir system, but water can absorb lead from solder, fixtures, and pipes found in the plumbing of some buildings or homes. At-the-tap lead monitoring is conducted at various households around the City semi-annually. Based on the results of the 1998 monitoring of 107 homes, the tap water at some of these homes exceeded the Lead Action Level (AL).

Infants and young children are typically more vulnerable to lead in drinking water than the general population. Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

It is possible that lead levels at your home may be higher than at other homes in the community as a result of materials used in your home's plumbing. If you are concerned about elevated lead levels in your home's water, you may wish to have your water tested. You may also flush your tap for 30 seconds to 2 minutes, until it is cold, before using water that has been standing in the pipes for more than six hours. Use only cold water for cooking, drinking, and making baby formula. To request a free kit to test for lead in your drinking water, call DEP's 24-hour Help Center at (718) DEP-HELP. Additional information is available from the EPA's Safe Drinking Water Hotline (800) 426-4791.

Cryptosporidium and Giardia

While there is no evidence of illness related to the New York City water supply, Federal and New York State law requires all water suppliers to notify their customers about the potential risks of *Cryptosporidium* and *Giardia.* Cryptosporidiosis and giardiasis are intestinal illnesses caused by microscopic pathogens which can be waterborne. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks.

According to the EPA and the Centers for Disease Control and Prevention (CDC), it is unclear how most cases of cryptosporidiosis in the United States are contracted. The relative importance of various risk factors are unknown. Such factors include eating contaminated food, swallowing contaminated recreational water while swimming or camping, contact with animals, contact with human waste, certain sexual practices, or drinking contaminated water. Individuals who think they may have cryptosporidiosis or giardiasis should contact their health care provider immediately.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants or dialysis, people with Crohn's disease or HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers about the need to take extra precautions such as boiling water, using a certified bottled water or a specially approved home filter. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the EPA's Safe Drinking Water Hotline (800) 426-4791.

NYC DEP's Monitoring for Pathogens

To better understand the nature of potential risks, in 1992 the City added a pathogen monitoring component to its comprehensive watershed monitoring program. Since then, samples have been collected weekly from the effluents of Kensico and New Croton Reservoirs, before water is first chlorinated in the Catskill/Delaware and Croton systems, respectively. Current test methods, however, do not allow us to determine if the organisms are dead nor if they are capable of causing disease.

In 1998, as part of the routine sampling program, 104 samples of Kensico Reservoir effluent and 51 samples of New Croton Reservoir effluent were collected and analyzed for *Giardia* cysts and *Cryptosporidium* oocysts and showed no confirmed detections of either organism. Of the 104 Kensico Reservoir samples, 5 samples were presumed positive for *Giardia* and no samples were confirmed positive. Likewise, two samples were presumed positive for *Cryptosporidium* at Kensico, but none confirmed. The New Croton Reservoir samples produced no *Giardia* cysts, and no *Cryptosporidium* oocysts.

In a separate study, conducted for EPA's Information Collection Rule (ICR), 24 samples of Kensico Reservoir effluent and 12 samples of New Croton Reservoir effluent were collected and analyzed for *Giardia* cysts and *Cryptosporidium* oocysts. This study used a different method of analysis prescribed by the ICR. Of the 24 Kensico Reservoir samples, 19 samples were presumed positive for *Giardia*, and 3 samples were confirmed positive. Three samples were presumed positive for *Cryptosporidium* at Kensico, and one was confirmed positive. The New Croton Reservoir samples resulted in one sample presumed positive, and none confirmed positive for *Giardia*, and one sample presumed positive and one confirmed positive for *Cryptosporidium.*

How is New York City's Water Treated?

All surface water and groundwater entering New York City's distribution system is treated with chlorine, fluoride, orthophosphate, and, in some cases, sodium hydroxide. New York City uses chlorine to meet the New York State Sanitary Code and Federal Safe Drinking Water Act disinfection requirements. A small amount of fluoride (one part per million) to help prevent tooth decay has been added to the City's water supply since the mid-1960s in accordance with the New York City Health Code. Orthophosphate is added to create a protective film on pipes which reduces the release of metals such as lead from household plumbing. Sodium hydroxide is added to the water to raise the pH and reduce corrosivity.

A sequestering phosphate is added at several wells to keep naturally occurring minerals, mainly iron and manganese, from settling out in distribution and household piping. Air stripper facilities operate at several wells to remove volatile organic chemicals.

Ensuring a Safe and Sufficient Supply of Water

Watershed Programs

1998 was the first full year of implementation of the watershed protection and partnership programs set forth in the January 1997 Watershed Memorandum of Agreement (MOA). Building on the achievements of prior years -- including the important 1997 finalization of the MOA -- DEP continued implementation of four key programs: the acquisition of watershed lands; the enforcement of strengthened Watershed Regulations; the expansion of environmental and economic partnership programs that target specific sources of pollution in the watershed; and the development of water quality models to help provide a framework for assessing the progress of the watershed protection program. In addition, DEP continued implementation of a number of special studies of water quality, and advanced the upgrades of City-owned and non-City-owned watershed wastewater treatment plants.

Land Acquisition

In 1998, DEP met the goals for solicitation of owners of watershed lands set forth in the 1997 Filtration Avoidance Determination (FAD) and the MOA. Specifically, DEP solicited owners of 51,266 acres of watershed lands in designated priority areas. Through December 1998, DEP had 13,098 acres either acquired or under purchase contract.

Watershed Regulations

On May 1, 1997, enhanced Watershed Rules and Regulations (WR&R) became effective, replacing regulations that had been in place since 1953. The Regulations are vital to water supply protection and provide a higher level of defense against modern-day threats to water quality. By vigorously enforcing the new Regulations, DEP is ensuring that the City's source waters are protected. These measures include aggressive policing and inspection of the watershed; greatly increased water quality monitoring; systematic inspections of wastewater treatment plants; investigations of other potentially-polluting activities; and legal actions against polluters.

In 1998, DEP staff reviewed over 769 applications for new or remediated septic systems, 21 stormwater pollution prevention plans and over 75 other projects that proposed one or more regulated activities. In addition, DEP staff issued 19 Notices of Violation and over 810 Notices of Failure.

In another initiative designed to help DEP monitor development activities in the watershed, DEP established a schedule whereby project review staff regularly attend planning board meetings in the watershed. Through these meetings, DEP stays abreast of important projects in the watershed and ensures close coordination with local authorities.

Environmental and Economic Partnership Programs

As of December 31, 1998, New York City had made over $230 million in payments to support a variety of partnership programs in accordance with the terms of the MOA. West of the Hudson River, many of the partnership programs are being administered by the Catskill Watershed Corporation (CWC), a non-profit corporation formed solely for that purpose. Together, CWC and DEP continued to implement programs that remediated 339 failing septics in the Catskill and Delaware watershed, secured contracts with municipalities that are eligible for the upgrade of facilities that store winter road de-icing materials, and developed program rules for the construction of new stormwater control facilities to comply with the WR&R.

Wastewater Treatment Plant Upgrades

The wastewater treatment plant (WWTP) upgrade program met two significant milestones in 1998. By May, all WWTP owners in the Catskill/Delaware and East-of-Hudson watersheds signed agreements to participate in the program. By November, those owners gained DEP approval of upgrade compliance schedules to meet the requirements of section 18-36(a)(10) of the WR&R. In addition, upgrades were also completed at city owned Catskill/Delaware WWTPs located in Pine Hill, Grand Gorge, and Tannersville.

Capital Improvements

City Water Tunnel No. 3.

In August 1998, Mayor Rudolph W. Giuliani and DEP Commissioner Joel A. Miele Sr., P.E. announced the activation of the first stage of City Water Tunnel No. 3. The tunnel, the largest capital construction project in New York City history, will eventually span more than 60 miles and is expected to be finished in 2020 at an estimated cost of $6 billion dollars.

Currently, City Tunnel No. 3 is serving the Upper East and Upper West Sides of Manhattan, Roosevelt Island, and many neighborhoods in the Bronx west of the Bronx River. The activated portion of the tunnel, constructed in bedrock 250 to 800 feet below the surface, runs 13 miles, beginning at Hillview Reservoir in Yonkers.

The operation of Tunnel No. 3 will allow inspection and repair to take place on City Tunnels No.1 or 2 for the first time since they were put into operation in 1917 and 1936, respectively, thereby ensuring the future reliability of the water delivery system.

Hillview Reservoir

December 1998 saw the completion of a project to remove sediment from the bottom of Hillview Reservoir. The sediment removal, in conjunction with waterfowl control, improved chlorination and improved pH control, have contributed to the decrease in microbial levels seen in distribution water over the last 4 years. Since November 1994, DEP has collected approximately 43,000 compliance samples, only two of which tested positive for E. coli.

Croton Filtration Plant

The City is planning to build a treatment facility to filter water from the Croton system. A preferred location for the filtration plant, the Mosholu Driving Range of Van Cortland Park in the Bronx, was announced in December 1998 and a design for the proposed facility is being prepared. The Croton filtration plant is slated to be operational by 2007.

The fedral Surface Water Treatment Rule (SWTR) requires that all water supplies be filtered by June 29, 1993, unless the system meets special criteria to receive a waiver. Even though Croton water quality is high, it experiences seasonal color problems and will be subjected to stricter standards for disinfection by-products in the near future. In 1992, the City entered into a Stipulation with the New York State Department of Health calling for the construction of a Croton filtration facility.

In May 1998, the City entered into a Consent Decree with the United States and the State of New York, thereby settling an enforcement action brought against the City because it is not filtering Croton water at this time. In November 1998, the U.S. District Court for the Eastern District of New York approved the Consent Decree. The Consent Decree supercedes the 1992 Stipulation and sets out a revised timetable for the design and construction of the Croton filtration facility.

Until DEP begins to filter Croton water we are required to make the following statement: *Inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.*

Water Conservation

Did you know that the average single family household in New York City uses approximately 100,000 gallons of water each year, at a cost of $1.25 per 100 cubic feet of water (748 gallons), or about $167.00 each year? Although New York City is fortunate to have a plentiful supply of reasonably priced drinking water, everyone should do their part to conserve this precious resource.

In its ongoing efforts to save water, DEP: uses sonar equipment to survey all water supply piping for leaks; replaces approximately 55 miles of old water supply pipe a year; equips fire hydrants with special locking devices; and installs home water meters to encourage conservation. These programs and others have proven successful and together have reduced water consumption in the City by approximately 200 million gallons per day in the last five years. This is more water than the City of Boston or Westchester County uses in a day.

Here are some ways that you can help save water:

- Repair all leaks promptly. Leaks waste water 24 hours a day, 7 days a week. Check all faucets for leaks.
- Install aerators on all sinks and use a high-pressure, low-flow showerhead. Replacing old fixtures with water conserving models can produce substantial savings without reducing effectiveness and comfort.
- Order a Home or Apartment Water Saving Kit. If you are an apartment building owner/manager or a home owner, you can obtain a free leak survey, along with water saving showerheads and other products. Call our Leak Survey contractor at (718) 326-9426 for information.
- Water your garden in the evening instead of the heat of day to reduce evaporation.

Frequently Asked Questions

What can I do about chlorine odors in tap water?

Chlorine odors may be more noticeable when the weather is warmer.

Chlorine is essential to kill organisms that may cause disease. The following are ways you can remove the chlorine odor from your drinking water.

- Fill a pitcher and let it stand in the refrigerator overnight. (This is the best way.)
- Fill a glass or jar with water and let it stand in sunlight for 30 minutes.
- Pour water from one container to another about 10 times.
- Heat the water to about 100 degrees Fahrenheit.

Once you remove the chlorine, be sure to refrigerate the water to limit bacterial regrowth.

Sometimes my water is a rusty brown color. What causes this?

Brown water is often the result of street construction or water main work being done in the area. Any disturbance to the main, including the opening of a fire hydrant, can cause pipe sediment to shift, resulting in brown water. The settling time of the main will vary, depending on the size of the water main. In addition, brown water is commonly associated with plumbing corrosion problems inside buildings and from rusting hot water heaters. If you have an ongoing problem with brown water, it is probably due to rusty pipes. It is recommended that you run your cold water for 2 - 3 minutes if it has not been used for an extended period of time. This will flush the line. You can avoid wasting water by catching your "flush" water in a container and using it to water plants or for other purposes.

Drinking water often looks cloudy when first taken from a faucet, but then clears up. Why?

Air becomes trapped in the water as a very large volume of pressurized water travels down the long distance of the aqueducts to the City. The water, as a result, can sometimes appear cloudy or milky. This condition presents no threat to public health. The cloudiness is temporary and clears quickly after the water is drawn from the tap and the excess air is released.

Should I buy bottled water?

You do not need to buy bottled water for health reasons in New York City since our water meets all health-based drinking water standards. Also, bottled water costs up to 1,000 times more than the City's drinking water.

Is New York City's water "hard?"

Hardness is a measure of calcium in the water. The less calcium in the water ("soft" water), the easier it is to create lather and suds. New York City's water is predominantly "soft."

Contact Us

For a copy of this report, to report unusual water characteristics, or to request a free kit to test for lead in your drinking water, call DEP's 24-hour Help Center at (718) DEP-HELP.

For more information on *Giardia* and *Cryptosporidium*, please contact the Parasitic Disease Surveillance Unit of the New York City DEP and DOH at: (212) 788-4728.

To report any polluting activities occurring in the watershed, call 1-888-DEP-NYC1, 24-hours a day.

To view this 1998 Statement, announcements of public hearings, or other information, visit DEP's Web site at: www.ci.nyc.ny.us/dep

Este reporte contiene información muy importante sobre el agua que usted toma. Haga que se la traduzcan o hable con alguien que la entienda.

Ce rapport contient des informations importantes sur votre eau potable. Traduisez-le ou parlez en avec quelqu'un qui le comprend bien.

Rapò sa a gen enfòmasyon ki enpòtan anpil sou dlo w'ap bwè a. Fè tradwi-l pou ou, oswa pale ak yon moun ki konprann sa ki ekri ladan-l.

Ten raport zawiera bardzo istotną informacje o twojej wodzie pitnej. Przetłumacz go albo porozmawiaj z kimś kto go rozumie.

В этом материале содержится важная информация относительно вашей питьевой воды. Переведите его или поговорите с кем-нибудь из тех, кто понимает его содержание.

這個報告中包含有關你的飲用水的重要信息。
請將此報告翻譯成你的語言，或者詢問懂得這份報告的人。

이 보고서는 귀하의 식수에 관한 매우 중요한 정보를 포함하고 있습니다. 이 정보에 대해 이해하는 사람에게 그 정보를 번역하거나 통역해 받으십시오.

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NEW YORK CITY - 1998 DRINKING WATER SUPPLY AND QUALITY STATEMENT
Data Tables

REGULATED CONVENTIONAL PHYSICAL AND CHEMICAL PARAMETERS

PARAMETERS (unit)	NYS DOH MCL	US EPA MCLG	CATSKILL-DELAWARE SYSTEM # SAMPLES	RANGE	AVERAGE	CROTON SYSTEM # SAMPLES	RANGE	AVERAGE	GROUNDWATER SYSTEM # SAMPLES	RANGE	AVERAGE	SOURCE OF PARAMETER (IF DETECTED)
Alkalinity (mg/L - Calcium Carbonate)	NDL	-	227	3.9 - 19.5	10.7	39	32.5 - 56.1	49.4	413	10.0 - 227.2	66.4	Erosion of natural deposits
Antimony (mg/L)	0.006	0.006	155	ND	ND	36	ND	ND	103	ND	ND	
Arsenic (mg/L)	0.05	-	155	ND	ND	36	ND	ND	103	ND	ND	
Asbestos (million fibers/L longer than 10 μm) [1]	7.0	7	1	ND	ND	-	-	-	-	-	-	
Barium (mg/L)	2.00	2	155	ND	ND	36	ND	ND	103	ND - 0.09	< 0.05	Erosion of natural deposits
Beryllium (mg/L)	0.004	0.004	155	ND	ND	36	ND	ND	103	ND	ND	
Cadmium (mg/L)	0.005	0.005	155	ND	ND	36	ND	ND	104	ND	ND	
Chloride (mg/L)	250.0	-	155	5.6 - 15.1	9.1	36	41.7 - 54.4	48.4	384	8.0 - 144.0	51.5	Erosion of natural deposits
Chromium (mg/L)	0.10	0.1	155	ND	ND	36	ND	ND	103	ND - 0.008	< 0.002	Erosion of natural deposits
Color - entry points (color units)	15 [2]	-	920	3 - 15	7	233	5 - 19	9	727	ND - 34	5	Iron and manganese; or organic sources, such as algal growth
Copper (mg/L)	1.3 [3]	1.3	233	ND - 0.15	0.01	40	ND - 0.10	< 0.01	368	ND - 0.78	0.07	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Cyanide (mg/L) [4]	0.2	0.2	239	ND	ND	36	ND	ND	100	ND - 0.05	< 0.02	Erosion of natural deposits, runoff from fertilizer
Fluoride (mg/L)	2.2	-	9040	ND - 1.31	1.07	841	0.60 - 1.18	1.05	1475	ND - 1.52	1.01	Erosion of natural deposits; water additive which promotes strong teeth; runoff from fertilizer
Gross Alpha particle (pCi/L) [5]	15	-	9	ND	ND	3	ND	ND	1	ND	ND	Erosion of natural deposits
Gross Beta particle (pCi/L) [5]	50	-	9	ND - 1.0	< 0.7	3	1.2 - 2.1	1.7	1	1.8	1.8	Decay of natural and man-made deposits
Iron (mg/L)	0.3 [6]	-	155	0.01 - 0.12	0.04	36	0.03 - 0.11	0.07	335	ND - 3.50	0.22	Erosion of natural deposits
Lead (mg/L)	0.015 [3]	0	233	ND - 0.007	< 0.002	40	ND	ND	368	ND - 0.017	< 0.002	Corrosion of household plumbing systems; erosion of natural deposits
Manganese (mg/L)	0.3 [6]	-	155	ND - 0.06	0.02	36	0.03 - 0.09	0.05	335	ND - 0.48	0.05	Erosion of natural deposits
Mercury (mg/L)	0.002	0.002	157	ND	ND	36	ND	ND	103	ND	ND	
Nickel (mg/L)	0.1 [7]	-	155	ND	ND	36	ND	ND	103	ND	ND	
Nitrate (mg/L nitrogen)	10	10	155	0.09 - 0.39	0.18	36	0.16 - 0.67	0.32	384	ND - 8.85	3.67	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (mg/L nitrogen)	1	1	155	ND	ND	36	ND	ND	233	ND	ND	
pH (pH units)	6.5 to 8.5	-	9043	6.6 - 7.8	-	841	6.8 - 7.6	-	1478	5.8 - 8.3	-	
Selenium (mg/L)	0.05	0.05	155	ND	ND	36	ND	ND	103	ND - 0.003	< 0.002	Erosion of natural deposits
Silver (mg/L)	0.1	-	155	ND	ND	36	ND	ND	103	ND	ND	
Sodium (mg/L)	NDL [8]	-	158	5.4 - 9.7	7.0	36	17.9 - 27.5	22.4	156	2.4 - 50.0	25.8	Erosion of natural deposits
Specific Conductance (μmho/cm)	NDL	-	9043	66 - 179	79	841	180 - 332	273	1478	65 - 792	323	
Sulfate (mg/L)	250.0	-	155	5.7 - 10.6	7.4	36	12.1 - 15.2	13.7	384	8.0 - 128.0	41.4	Erosion of natural deposits
Temperature (°F)	NDL	-	9030	37 - 77	56	840	39 -70	50	1475	39 - 77	60	
Thallium (mg/L)	0.002	0.0005	155	ND	ND	36	ND	ND	103	ND	ND	
Turbidity - entry points (NTU)	5 [9]	-	921	0.3 - 1.6	0.6	233	0.4 - 1.5	0.7	727	0.1 - 4.1	0.3	Soil erosion and stream sediments
Turbidity - distribution (NTU)	5 [10]	-	8118	0.2 - 4.1	0.6	608	0.3 - 2.2	0.7	1478	0.1 - 4.9	0.5	Soil erosion and stream sediments
Zinc (mg/L)	5	-	155	ND	ND	36	ND	ND	334	ND - 0.50	0.07	Erosion of natural deposits

(1) *Reported asbestos data was collected in 1993.*

(2) *MCL violation determination: If a sample exceeds 15 color units, a second sample must be collected from the same location within 2 weeks. If the average of the two results exceeds 15 color units, then an MCL violation has occurred. In the Croton system there were 2 color violations on 6/30/98 and 12/21/98. The Groundwater system experienced eleven violations between March and September 1998.*

(3) *Action limit (not an MCL) measured at the tap. Data presented reflect distribution system levels, except Groundwater which is sampled at internal taps. See the separate table for Lead and Copper Rule Sampling.*

(4) *Cyanide was analyzed after distillation from acid, which frees cyanides from compounds that might not be toxic. Cyanide was found in only two samples (from the Groundwater System).*

(5) *Reported radiological data for gross alpha, gross beta, and tritium are for samples collected during 1997.*

(6) *If iron and manganese are present, the total concentration of both should not exceed 0.5 mg/L. Higher levels may be allowed by the State when justified by the supplier of water.*

(7) *USEPA MCL; NYSDOH has not set an MCL for this parameter.*

(8) *Water with >20 mg/L of sodium should not be consumed by people on severely restricted sodium diets. Water with >270 mg/L of sodium should not be consumed by people on moderately restricted sodium diets.*

(9) *MCL is the average of two consecutive days. Data presented are individual sample results.*

(10) *MCL is the monthly average. Data presented are individual sample results.*

UNREGULATED CONVENTIONAL PHYSICAL AND CHEMICAL PARAMETERS

PARAMETERS (unit)	NYS DOH MCL	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER (IF DETECTED)
		# SAMPLE	RANGE	AVERAGE	# SAMPLE	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
Aluminum (mg/L)	[10]	155	ND - 0.03	0.01	36	ND - 0.02	< 0.01	72	ND - 0.02	< 0.01	Erosion of natural deposits
Ammonia (mg/L nitrogen)	-	155	ND	ND	36	ND	ND	94	ND - 0.09	< 0.03	Animal waste and fertilizer runoff
Boron (mg/L)	-	155	ND - 0.09	0.04	36	ND - 0.10	0.06	72	0.02 - 0.19	0.08	Erosion of natural deposits
Bromide (mg/L)	-	24	ND	ND	13	ND - 0.02	< 0.02	15	0.10 - 0.14	0.12	Erosion of natural deposits
Calcium (mg/L)	-	235	4.2 - 11.6	5.8	39	14.8 - 24.8	21.4	392	4.6 - 98.1	28.3	Erosion of natural deposits
Carbon dioxide, dissolved (mg/L)	-	12	1.32 - 2.64	1.84	8	3.50 - 11.50	5.29	-	-	-	Present in air
Chemical Oxygen Demand (mg/L O_2)	-	155	1.2 - 7.8	4.2	36	6.4 - 9.8	8.4	72	ND - 6.1	1.8	
Chlorate (mg/L)	-	8	ND	ND	-	-	-	8	ND - 0.17	0.05	By-product of drinking water chlorination
Chlorine Residual, free (mg/L)	-	9040	0.05 - 2.20	0.81	841	0.08 - 2.20	0.67	1477	0.02 - 1.65	0.73	Water additive for disinfection
Color - distribution system (color units)	-	8111	3 - 40	7	608	3 - 24	9	1478	ND - 40	5	Presence of iron, manganese, and organics in water
Corrosivity (Langelier index)	0 [10, 11]	155	-3.01 to -2.13	-2.55	36	-1.47 to -1.18	-1.32	124	-3.25 to 0.94	-1.21	
Dissolved Oxygen (mg/L)	-	12	5.8 - 12.8	10.0	8	3.5 - 12.1	7.8	-	-	-	
Foaming Agents (mg/L linear alkyl sulfonate)	0.5 [10]	155	ND	ND	36	ND	ND	95	ND	ND	
Hardness (grains/gallon [US] $CaCO_3$)[12]	-	155	0.6 - 1.7	1.1	36	4.6 - 5.1	4.9	415	1.1 - 24.7	7.8	Erosion of natural deposits
Iodide (mg/L)	-	155	ND	ND	36	ND	ND	72	ND	ND	
Lithium (mg/L)	-	155	ND	ND	36	ND	ND	72	ND	ND	
Magnesium (mg/L)	-	155	0.99 - 2.40	1.34	36	6.5 - 8.80	7.64	72	2.00 - 40.50	14.32	Erosion of natural deposits
Phenols (mg/L phenol)	-	143	ND	ND	32	ND	ND	66	ND	ND	
Phosphate, Ortho- (mg/L)	-	9040	0.18 - 3.30	1.74	841	0.56 - 2.40	1.26	1477	0.65 - 3.30	1.50	Water additive for corrosion control
Phosphate, Total (mg/L)	-	155	0.10 - 3.25	1.51	36	0.63 - 1.88	1.08	124	0.36 - 5.20	1.83	
Potassium (mg/L)	-	155	0.37 - 3.50	0.70	36	1.60 - 2.40	1.92	72	0.66 - 4.80	2.00	Erosion of natural deposits
Silica [silicon oxide] (mg/L)	-	155	1.9 - 5.3	2.5	36	3.7 - 5.7	4.7	263	2.5 - 28.9	16.6	Erosion of natural deposits
Strontium (mg/L)	-	155	ND	ND	36	ND	ND	72	ND - 0.12	< 0.05	Erosion of natural deposits
Total Dissolved Solids (mg/L)	500 [10]	155	25 - 76	46	36	130 - 183	161	145	33 - 610	248	Metals and salts naturally occurring in the soil; organic matter
Total Organic Carbon (mg/L carbon)	-	155	1.2 - 2.1	1.5	36	2.2 - 3.5	2.6	72	ND - 2.0	0.4	Organic matter naturally present in the environment
Total Organic Halogen (mg/L)	-	155	0.07 - 0.23	0.16	36	0.19 - 0.33	0.25	72	ND - 0.21	0.03	By-product of drinking water chlorination
Tritium (^3H) - radiological (pCi/L) [5]	20000	9	ND	ND	3	ND	ND	1	ND	ND	Artificial radioisotope
UV 254 Absorbency (abs unit)	-	155	0.018 - 0.037	0.027	36	0.050 - 0.058	0.054	72	0.002 - 0.041	0.012	Organic matter naturally present in the environment

[10] *USEPA Secondary MCL; NYSDOH has not set an MCL for this parameter.*

[11] *A Langelier Index of less than zero indicates corrosive tendencies.*

[12] *Hardness of up to 3 grains per gallon is considered soft water; between 3 and 9 is moderately hard water.*

SPECIFIED ORGANIC CHEMICALS

PARAMETERS (mg/L)	NYS DOH MCL	US EPA MCLG	CATSKILL-DELAWARE SYSTEM # SAMPLES	RANGE	AVERAGE	CROTON SYSTEM # SAMPLES	RANGE	AVERAGE	GROUNDWATER SYSTEM # SAMPLES	RANGE	AVERAGE	SOURCE OF PARAMETER (IF DETECTED)
Alachlor	0.002	0	4	ND	ND	6	ND	ND	45	ND	ND	
Aldicarb (Temik)	0.003	-	32	ND	ND	10	ND	ND	72	ND	ND	
Aldicarb sulfone	0.002	-	32	ND	ND	10	ND	ND	72	ND	ND	
Aldicarb sulfoxide	0.004	-	32	ND	ND	10	ND	ND	72	ND	ND	
Aldrin	0.005	-	4	ND	ND	1	ND	ND	38	ND	ND	
Atrazine	0.003	0.003	4	ND	ND	6	ND	ND	45	ND - 0.0002*	ND	Runoff from herbicide used on row crops
Benzo(a)pyrene	0.0002	0	4	ND	ND	6	ND	ND	45	ND	ND	
Butachlor	0.05	-	4	ND	ND	6	ND	ND	45	ND	ND	
Carbaryl	0.05	-	32	ND	ND	10	ND	ND	72	ND	ND	
Carbofuran (Furadan)	0.04	0.04	32	ND	ND	10	ND	ND	72	ND	ND	
Chlordane	0.002	0	4	ND	ND	1	ND	ND	45	ND	ND	
2,4-D	0.05	0.07	4	ND	ND	1	ND	ND	50	ND	ND	
Dalapon	0.2	0.2	4	ND	ND	1	ND	ND	50	ND	ND	
1,2-Dibromo-3-chloropropane	0.0002	0	109	ND	ND	33	ND	ND	109	ND	ND	
Dicamba	0.05	-	4	ND	ND	1	ND	ND	50	ND	ND	
Dieldrin	0.005	-	4	ND	ND	1	ND	ND	42	ND - 0.00004*	ND	Runoff from pesticide use
Di(2-ethylhexyl) adipate	0.4	-	4	ND	ND	6	ND	ND	45	ND	ND	
Di(2-ethylhexyl) phthalate	0.006	0	4	ND	ND	6	ND	ND	45	ND - 0.001	< 0.0006	Plasticizer in flexible plastics
Dinoseb	0.007	0.007	4	ND	ND	1	ND	ND	47	ND	ND	
Diquat	0.02	0.02	31	ND	ND	11	ND	ND	79	ND	ND	
Endothall	0.1	0.1	4	ND	ND	1	ND	ND	45	ND	ND	
Endrin	0.002	0.002	4	ND	ND	1	ND	ND	42	ND	ND	
Ethylene dibromide (EDB)	0.00005	0	109	ND	ND	33	ND - 0.0001§	ND	109	ND	ND	Runoff from fungicide use
Glyphosate	0.7	0.7	4	ND	ND	1	ND	ND	45	ND	ND	
Heptachlor	0.0004	0	4	ND	ND	1	ND	ND	38	ND	ND	
Heptachlor epoxide	0.0002	0	4	ND	ND	1	ND	ND	41	ND - 0.00001	< 0.00001	Breakdown of heptachlor, runoff of pesticide
Hexachlorobenzene	0.001	0	4	ND	ND	6	ND	ND	45	ND	ND	
Hexachlorocyclopentadiene	0.05	0.05	4	ND	ND	6	ND	ND	45	ND	ND	
3-Hydroxycarbofuran	0.05	-	32	ND	ND	10	ND	ND	72	ND	ND	
Lindane	0.0002	0.0002	4	ND	ND	1	ND	ND	41	ND	ND	
Methomyl	0.05	-	32	ND	ND	10	ND	ND	72	ND	ND	
Methoxychlor	0.04	0.04	4	ND	ND	6	ND	ND	45	ND	ND	
Metolachlor	0.05	-	4	ND	ND	6	ND	ND	45	ND	ND	
Metribuzin	0.05	-	4	ND	ND	6	ND	ND	45	ND	ND	
Oxamyl (Vydate)	0.2	0.2	32	ND	ND	10	ND	ND	72	ND	ND	
Pentachlorophenol	0.001	0	4	ND	ND	1	ND	ND	50	ND	ND	
Picloram	0.5	0.5	4	ND	ND	1	ND	ND	50	ND	ND	
Polychlorobiphenyls [PCB]	0.0005[13]	0	4	ND	ND	1	ND	ND	42	ND	ND	
Propachlor	0.05	-	4	ND	ND	6	ND	ND	45	ND	ND	
Simazine	0.004	0.004	4	ND	ND	6	0.00005*	ND	45	ND	ND	Runoff from herbicide use
Toxaphene	0.003	0	4	ND	ND	1	ND	ND	45	ND	ND	
2,4,5-TP (Silvex)	0.01	0.05	4	ND	ND	1	ND	ND	50	ND	ND	
Vinyl chloride	0.002	0	164	ND	ND	41	ND	ND	103	ND	ND	

* *The contaminant was detected in only one sample. The level found was below the MCL.*

§ *The contaminant was detected in only one sample. The initial sample was above the MCL, but the repeat was ND. Therefore no MCL exceedence occurred.*

(13) *MCL is for total PCB measured as decachlorobiphenyl.*

REGULATED ORGANIC CONTAMINANTS

Principal Organic Contaminants have an MCL of 0.005 mg/l. In total 164 samples were collected in the Catskill/Delaware system, 41 in the Croton system, and 102 in the groundwater system.

Principle Organic Contaminants not detected:

Benzene, Bromobenzene, Bromochloromethane, Bromomethane, sec Butylbenzene, tert-Butylbenzene, Carbon Tetrachloride, Chlorobenzene, Chloroethane, Chloromethane, 2-Chlorotoluene, 4-Chlorotoluene, Dibromomethane, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, 1,2-Dichloropropane, 1,3-Dichloropropane, 2,2 Dichloropropane, 1,1-Dichloropropene, cis-1,3-Dichloropropene, trans-1,3 Dichloropropene, Ethylbenzene, Hexachlorobutadiene, Isopropylbenzene, p-Isopropyltoluene, n-Propylbenzene, Styrene, 1,1,1,2-Tetrachloroethane, 1,1,2,2-Tetrachloroethane, Toluene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethene, Trichlorofluoromethane, 1,2,3-Trichloropropane, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, m-Xylene, o-Xylene, p-Xylene

PARAMETERS (mg/L)	NYS DOH MCL	US EPA MCLG	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER (IF DETECTED)
			# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
Principle Organic Contaminants detected at levels below the MCL												
n-Butylbenzene	0.005	-	164	ND	ND	41	ND	ND	102	ND - 0.0022*	ND	Residue of gasoline
Dichlorodifluoromethane	0.005	-	164	ND	ND	41	ND	ND	102	ND - 0.002	< 0.0005	Leaching from refrigerators and air conditioners
Methylene chloride	0.005	0	164	ND - 0.0008*	ND	41	ND	ND	102	ND - 0.0011*	ND	Discharge from dry cleaners
Tetrachloroethylene	0.005	0	164	ND	ND	41	ND	ND	102	ND - 0.011[15]	0.001	Discharge from dry cleaners
1,2,3-Trichlorobenzene	0.005	-	164	ND	ND	41	ND	ND	102	ND - 0.0014*	ND	Runoff from pesticide
1,2,4-Trichlorobenzene	0.005	0.07	164	ND	ND	41	ND	ND	102	ND - 0.0013*	ND	Runoff from pesticide
Disinfection By-Products												
Total Trihalomethanes[16]	0.10	-	164	0.008 - 0.080	0.031	41	0.035 - 0.071	0.045	102	ND - 0.021	0.004	By-product of drinking water chlorination

* *The contaminant was detected in only one sample. The level found was below the MCL.*

[15] *Though an individual sample result exceeded 0.005 mg/L, no MCL violation occurred in 1998. Determination of MCL violation: If a sample exceeds the MCL, one to three more samples must be collected from the same sampling point within 30 days. If at least one of the confirming samples is positive and the average of the initial and all confirming samples exceeds the MCL, then an MCL violation has occurred.*

[16] *MCL is the calculated quarterly running average. In 1998 the MCL was never exceeded. Data presented are based on individual sample results.*

UNSPECIFIED ORGANIC CHEMICALS

Unspecified Organic Chemicals not detected:

Acenaphthene, Acenaphthylene, Acetochlor, Acifluorfen, Anthracene, Betazon, Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[g,h,I]perylene, a-BHC, b-BHC, d-BHC, g-BHC, Bromocil, Butylbenzylphthalate, Caffeine, Carboxin, a-Chlordane, g-Chlordane, Chlorobenzilate, Chloroneb, Chlorothalonil (Draconil, Bravo), Chrysene, Cyanazine, 2,4-DB, p,p'DDD, p,p'DDE, p,p'DDT, Diazinon, Dibenz[a,h]anthracene, 3,5-Dichlorobenzoic acid, Dichlorprop, Dimethoate, Dimethylphthalate, 2,4-Dinitrotoluene, Di-N-octylphthalate, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin aldehyde, Etridiazole, EPTC, Fluoranthene, Fluorene, Indeno[1,2,3-cd] pyrene, Malathion, Methiocarb, MGK - 264, Molinate, Naphthalene, 4-Nitrophenol, trans-Nonachlor, Norflurazon, Paraquat, Parathion, Permethrin, Phenanthrene, Prometryn, Propoxur (Baygon), Pyrene, 2,4,5-T, Terbacil, Terbufos, Tetrachloroterephthalic acid, Thiobencarb, Trifluralin, Vernolate

PARAMETERS (mg/L)	NYS DOH MCL	CATSKILL-DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM			SOURCE OF PARAMETER (IF DETECTED)
		# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	
Disinfection By-Products detected											
Bromoacetic acid	0.05	105	ND - 0.002	< 0.00016	20	ND - 0.0002	< 0.00016	41	ND - 0.002	0.0002	By-product of drinking water chlorination
Bromochloroacetic acid	0.05	105	0.0006 - 0.0025	0.0014	20	0.0007 - 0.0018	0.0013	41	ND - 0.002	0.0006	By-product of drinking water chlorination
Bromochloroacetonitrile	0.05	78	ND - 0.0006	0.0003	20	0.0007 - 0.0014	0.001	44	ND - 0.0009	0.0002	By-product of drinking water chlorination
Chloral Hydrate	0.05	80	0.001 - 0.016	0.006	18	0.003 - 0.009	0.0058	50	ND - 0.014	0.0008	By-product of drinking water chlorination
Chloroacetic acid	0.05	105	ND - 0.003	0.001	20	ND - 0.003	0.002	41	ND - 0.001	< 0.00022	By-product of drinking water chlorination
Chloropicrin	0.05	112	ND - 0.0009	0.0006	24	0.0003 - 0.0009	0.0005	54	ND - 0.0003	< 0.00010	By-product of drinking water chlorination
Dibromoacetic acid	0.05	105	ND - 0.0009	< 0.00010	20	ND - 0.002	0.0002	41	ND - 0.002	0.0007	By-product of drinking water chlorination
Dibromoacetonitrile	0.05	77	ND - 0.0006	< 0.00010	20	ND - 0.0006	0.0002	45	ND - 0.0024	0.0007	By-product of drinking water chlorination
Dichloroacetic acid	0.05	105	0.009 - 0.037	0.018	20	0.007 - 0.021	0.013	41	ND - 0.011	0.0015	By-product of drinking water chlorination
Dichloroacetonitrile	0.05	99	0.001 - 0.004	0.003	27	0.0005 - 0.009	0.005	53	ND - 0.0014	0.0002	By-product of drinking water chlorination
1,1-Dichloropropanone	0.05	85	0.0002 - 0.001	0.0005	27	0.0005 - 0.0024	0.001	51	ND - 0.0003	< 0.00010	By-product of drinking water chlorination
Trichloroacetic acid	0.05	105	0.008-0.050	0.002	20	0.027 - 0.043	0.035	41	ND - 0.015	0.002	By-product of drinking water chlorination
Trichloroacetonitrile	0.05	91	ND - 0.0002	< 0.00010	27	ND - 0.0005	< 0.00010	49	ND	ND	By-product of drinking water chlorination
1,1,1-Trichloropropanone	0.05	93	0.001 - 0.005	0.003	27	0.0003 - 0.0095	0.0038	54	ND - 0.0016	0.0002	By-product of drinking water chlorination
Unspecified Organic Chemicals detected											
DCPA (Dacthal)	0.005	4	ND	ND	1	ND	ND	25	ND - 0.0041	0.0003	Runoff from pesticide use
Di-n-Butylphthalate	0.005	4	ND	ND	6	ND	ND	45	ND - 0.0007	< 0.00050	Plasticizer from flexible plastics
Diethylphthalate	0.005	4	ND	ND	6	ND	ND	45	ND - 0.004	0.0006	Plasticizer from flexible plastics
Isophorone	0.05	4	ND	ND	6	ND	ND	45	ND - 0.0007*	ND	Runoff from pesticide use, solvent in paints
Methyl tert-butyl ether (MTBE)	0.05	104	ND - 0.005	< 0.0005	21	ND	ND	62	ND - 0.028	0.003	Additive to gasoline in the winter

* *The contaminant was detected in only one sample. The level found was below the MCL.*

LEAD AND COPPER RULE SAMPLING AT RESIDENTIAL WATER TAPS

PARAMETERS (mg/L)	NYS DOH MCL	US EPA MCLG	90th PERCENTILE VALUES	# SITES EXCEEDING ACTION LEVEL	SOURCE
Copper	AL= 1.3	1.3	0.179	All sample results were below the Action Level	Corrosion of household plumbing systems
Lead	AL = 0.015	0	0.016	12 of 107 samples (more than 10 %) collected between July and December 1998 exceeded the Action Level of 0.015 mg/L	Corrosion of household plumbing systems

MICROBIAL PARAMETERS

PARAMETERS (units)	NYS DOH MCL	US EPA MCLG	# SAMPLES	RANGE	AVERAGE	SOURCE
Total Coliform Bacteria (% of samples positive/month)	5%	0	11350	ND - 0.5%	0.23%	Naturally present in the environment
E. coli (CFU/ml)	[17]	0	11350	0 - 1*	0	Human and animal fecal waste
Heterotrophic Plate Count (CFU/ml)	TT	-	11184	ND - 500	1	Naturally present in the environment

* *Only one sample with one colony was detected.*

[17] *If a sample and its repeat sample are both positive for coliform bacteria and one of the two samples is positive for* E. coli, *then the MCL is exceeded.*

AL = Action Level: The concentration of a contaminant, which if exceeded, triggers treatment or other requirements which a water system must follow. An exceedence occurs if more than 10% of the samples exceed the Action Level.

MCL = Maximum Contaminant Level: the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology
MCLG = Maximum Contaminant Level Goal: the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety
mg/L = milligrams per liter
ND = Non-Detect
NDL = No Designated Limit
TT = Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water
Parameters with highlighted values indicate a violation

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEP
www.ci.nyc.ny.us/dep

New York City 1997 Water Supply Statement

Rudolph W. Giuliani, Mayor

Joel A. Miele Sr., P.E., Commisioner

In accordance with Chapter 752 of the New York State Public Health Law, as amended in 1996, all large drinking water suppliers in the State are required to provide the public with an annual statement describing the water supply and the quality of its water. The New York City Department of Environmental Protection is pleased to present its 1997 Annual Water Supply Statement.

The New York City surface (reservoir) water supply system provides approximately 1.3 billion gallons of safe drinking water daily for nearly 8 million residents of New York City, as well as visitors, commuters and approximately one million people living in Westchester, Putnam, Ulster, and Orange counties. In addition to our surface water supplies, approximately 520,000 people in southeastern Queens receive groundwater or a blend of groundwater and surface water. In all, the City system supplies high quality water to nearly half the population of New York State.

Where Does New York City's Water Come From?

Most of New York City's water is supplied from a network of 19 reservoirs and three controlled lakes in a 1,969 square-mile watershed that extends 125 miles north of New York City. The Croton system, the City's original upstate supply, provides about 10% of our daily water from 12 reservoir basins in Putnam, Westchester, and Dutchess counties. Approximately 90% of our water comes from the Catskill/Delaware watershed, located in Delaware, Greene, Schoharie, Sullivan, and Ulster counties, west of the Hudson River. New York City's groundwater system in southeastern Queens operated 26 wells to supply an average of 22 million gallons of drinking water per day, or about two percent of the City's total need.

Water Quality

The New York City Department of Environmental Protection (DEP) operates the water supply system that delivers water to City residents. An extensive monitoring program—far more extensive than required by law — demonstrates that the quality of New York City's drinking water remains high, meeting all State and Federal drinking water standards except for color (a seasonal, aesthetic condition in the Croton and groundwater systems.)

DEP monitors the water in the distribution system, the upstate reservoirs and feeder streams, and the wells that are the sources for our supply. Water quality is monitored continuously as the water enters the distribution system, and is tested at sampling points throughout the entire City. Water is analyzed for a broad spectrum of microbiological, chemical, and physical measures of quality. In 1997, DEP collected more than 36,000 in-City samples and performed approximately 340,000 analyses.

TEST RESULTS

The results of the tests for parameters conducted on distribution water samples under DEP's Distribution System Monitoring Program in 1997 are summarized in the attached tables. Data is presented separately for the Croton, Catskill/Delaware, and groundwater systems. Detailed results can be obtained from DEP. Whether a particular location receives Croton, Catskill/Delaware, groundwater, or a mixture, varies depending on system operations and consumer demand.

CRYPTOSPORIDIUM AND GIARDIA

While there is no evidence of illness related to the New York City water supply, New York State law requires all water suppliers to notify their customers about the potential risks of Cryptosporidium and Giardia. Cryptosporidiosis and giardiasis are intestinal illnesses caused by microscopic pathogens which can be waterborne. Cryptosporidiosis can be very serious for people with weak immune systems, such as chemotherapy, dialysis, or transplant patients, and people with Crohn's disease or HIV infection. People with weakened immune systems should discuss with their health care providers the need to take extra precautions such as boiling water, using a certified bottled water, or a specially approved home filter. Individuals who think they may have cryptosporidiosis or giardiasis should contact their health care provider immediately.

According to the United States Environmental Protection Agency and the Centers for Disease Control and Prevention, it is unclear how most cases of cryptosporidiosis in the United States are transmitted. The relative importance of various risk factors are unknown. Such factors include eating contaminated food, swallowing contaminated recreational water while swimming or camping, contact with animals, contact with human waste, certain sexual practices, or drinking contaminated water.

To better understand the nature of potential risks, in 1992 the City added a pathogen monitoring component to its comprehensive watershed monitoring program. Since then, samples have been collected weekly from the effluents of Kensico and New Croton Reservoirs, before water is first chlorinated in the Catskill/Delaware and Croton systems, respectively.

In 1997, 104 samples of Kensico Reservoir effluent and 48 samples of New Croton Reservoir effluent collected and analyzed for Giardia and Cryptosporidium showed no confirmed detections of either organism. Of the 104 Kensico Reservoir samples, three presumed positive Giardia cysts were identified, but further analysis did not confirm their presence. Likewise two presumed Cryptosporidium oocysts were identified at Kensico, but their presence was not confirmed after further analysis. The New Croton Reservoir samples produced two presumed and no confirmed Giardia cysts, and no Cryptosporidium oocysts. Additionally, the City's interagency Active Disease Surveillance unit continued to track the incidence of giardiasis and cryptosporidiosis.

How is New York City's Water Treated?

All surface water and groundwater entering New York City's distribution system is treated with chlorine, fluoride, orthophosphate, and, in some cases, sodium hydroxide. New York City uses chlorine to meet the New York State Sanitary Code and Federal Safe Drinking Water Act disinfection requirements. A small amount of fluoride (one part per million) to help prevent tooth decay has been added to the City's surface water supply since the mid-1960s in accordance with the New York City Health Code. Orthophosphate is added to create a protective film on pipes which reduces the release of metals such as lead from household plumbing. Sodium hydroxide is added to the water to raise the pH and reduce corrosivity.

A sequestering phosphate is added at several wells to keep naturally occurring minerals, mainly iron and manganese, from settling out in distribution and household piping. Air stripper facilities operate at several wells to remove volatile organic chemicals.

Water Conservation

Did you know that the average single family household in New York City uses approximately 100,000 gallons of water each year, at a cost of $1.20 per 100 cubic feet of water, or about $160.00 each year? Although New York City is fortunate to have a plentiful supply of reasonably priced drinking water, everyone should do their part to conserve this precious resource.

In its ongoing efforts to save water DEP: uses sonar equipment to survey all water supply piping for leaks; replaces approximately 40 miles of old water supply pipe each year; equips fire hydrants with special locking devices; and installs home water meters to encourage conservation. These programs and others have proven successful, and together have reduced water consumption in the City by approximately 175 million gallons per day in the last five years.

Here are some ways that you can help save water:

- Repair all leaks promptly. Leaks waste water 24 hours a day, 7 days a week. Check all faucets for leaks.
- Install aerators on all sinks and use a high-pressure, low-flow showerhead. Replacing old fixtures with water conserving models can produce substantial savings without reducing effectiveness and comfort.
- Order a Home or Apartment Water Saving Kit. If you are an apartment building owner/manager or a home owner, you can obtain a free leak survey, along with water saving showerheads and other products. Call our Leak Survey contractor at (718) 326-9426 for information.
- Water your garden in the evening instead of the heat of day to reduce evaporation.

Ensuring a Safe and Sufficient Supply of Water

The landmark New York City Watershed Memorandum of Agreement (MOA) was signed on January 21, 1997, by Mayor Rudolph W. Giuliani, Governor George E. Pataki, the USEPA, officials from watershed communities of the Hudson Valley and Catskill Mountain regions, and representatives of New York's environmental community. The Agreement is designed to protect the City's water supply well into the next century, while preserving the autonomy and economic viability of the watershed communities. The MOA initiatives fall into three major categories: Land Acquisition, Watershed Regulations and Partnership Programs.

LAND ACQUISITION

The MOA requires the City to implement a 10-year, $250 million program to acquire hydrologically sensitive watershed land. This program protects land from adverse development and helps maintain the economy and character of the region. In 1997, DEP exceeded the first year goal of soliciting the owners of 56,609 acres of watershed land. DEP placed over 9,100 acres of land under purchase contracts worth $24 million, and closed on 147 acres.

WATERSHED REGULATIONS

Revised for the first time since 1953, the Watershed Regulations in the MOA became effective on May 1, 1997. The Regulations are vital to water supply protection and provide a higher level of defense against modern-day threats to water quality. By vigorously enforcing the new Regulations, DEP is ensuring that the City's source waters are protected. These measures include aggressive policing and inspection of the watershed; greatly increased water quality monitoring; systematic inspections of sewage treatment plants; investigations of other potentially-polluting activities; and legal actions against polluters.

Another vital element of DEP's protection program is the review of proposed development projects for compliance with our new Regulations. In 1997, DEP reviewed applications for 700 new septic systems, nearly 100 stormwater pollution prevention plans, seven regulatory variances and nearly 100 other projects.

PARTNERSHIP PROGRAMS

In accordance with the terms of the MOA, the City will invest $1.2 billion in water quality-related partnership programs over the next 10 years in the watershed. In 1997, over $100 million was paid to various parties and local governments for programs stiplutated in the MOA.

In the watershed communities west of the Hudson River, three key programs funded by the City and administered locally were launched in 1997:

- Septic Rehabilitation and Replacement Program - The goal is to maintain, repair or replace all septic systems in the watershed. In the program's initial phase, the owners of nearly 300 residential septic systems that had been repaired or replaced since 1995 were reimbursed for their costs.
- Sand and Salt Storage Facilities Program - This program will improve the storage of sand, salt and other road de-icing materials to better protect water quality, which can be severely harmed by uncontrolled run-off of these materials.
- New Sewage Treatment Infrastructure Program - Of 22 possible participating communities identified in the MOA, DEP began work with seven -- whose water quality problems are greatest -- to study the feasibility of constructing sewage treatment plants.

East of the Hudson, Putnam and Westchester Counties are overseeing programs within their boundaries. In 1997, DEP began working with both counties on the Croton Planning process, outlined in the MOA and the Regulations, to identify the most effective way to deploy MOA funding to protect water quality.

Major steps were made in the 5-year program to upgrade the non-City-owned sewage treatment plants in the watershed. DEP, in partnership with the New York State Environmental Facilities Corporation, completed first round discussions with virtually all plant owners and began the coordination process for designing upgrades.

UPSTATE CAPITAL IMPROVEMENTS

The City is in the midst of a multi-year, multimillion dollar program to upgrade and improve its upstate water supply facilities, including dams, gatehouses, aqueducts, laboratories and other facilities needed to ensure the continued supply of safe and reliable drinking water. The City is also investing $160 million to rebuild the eight sewage treatment plants it owns and operates in the watershed. Incorporating the latest treatment technologies, work was substantially completed on four facilities in 1997; Grahamsville in Sullivan County, Tannersville in Greene County, Grand Gorge in Schoharie County and Mahopac in Westchester County.

Contact Us

For a copy of this report, to report unusual water characteristics, or to request a free kit to test for lead in your drinking water, call the 24-hour DEP Help Center at (718) DEP-HELP.

For more information on Giardia and Cryptosporidium, please contact the Parasitic Disease Surveillance Unit of the New York City DEP and DOH at: (212) 788-4728.

To report any polluting activities occuring in the watershed, call 1-888-DEP-NYC1, 24-hours a day.

Visit DEP's Web site at: www.ci.nyc.ny.us/dep

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

REGULATED CONVENTIONAL PHYSICAL AND CHEMICAL PARAMETERS

PARAMETERS (UNITS)	NYS DOH	LABORATORY	CATSKILL - DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM		
	MCL	MDL	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE
Alkalinity (mg/L Calcium Carbonate)	No designated limit	0.5	144	6.1- 13.2	9.4	44	36.8 - 56.7	45.5	72	7.3 - 189.6	50.9
Antimony (mg/L)	0.006 [1]	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Arsenic (mg/L)	0.05	0.005	144	ND	ND	44	ND	ND	72	ND	ND
Barium (mg/L)	2	0.05	144	ND	ND	44	ND	ND	72	ND	ND
Beryllium (mg/L)	0.004 [1]	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Cadmium (mg/L)	0.005	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Chloride (mg/L)	250.0	1	144	6.6 -13.9	8.6	44	31.7 - 50.5	43.8	72	7.2 - 103.6	48.9
Chromium (mg/L)	0.1	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Color - entry points (color units)	15 [2]	1	734	3 - 15	6	345	4 - 34	5	533	ND - 30	5
Copper (mg/L)	1.3 [3]	0.01	144	ND - 0.07	< 0.02	44	ND - 0.07	< 0.02	72	ND - 0.73	< 0.09
Cyanide [free] (mg/L)	0.2 [1]	0.02	144	ND	ND	44	ND	ND	72	ND	ND
Fluoride (mg/L)	2.2	0.1	9005	0.10 - 1.50	1.08	1073	0.10 - 1.28	0.99	977	ND - 1.41	< 1.03
Iron (mg/L)	0.3	0.01	144	0.01 - 0.17	0.05	44	0.02 - 0.20	0.07	72	ND - 0.58	< 0.1
Lead (mg/L)	0.015 [3]	0.001	144	ND - 0.011	< 0.001	44	ND - 0.0055	< 0.001	72	ND - 0.007	< 0.001
Manganese (mg/L)	0.3	0.01	144	ND - 0.09	< 0.03	44	0.03 - 0.30	0.07	72	ND - 0.06	< 0.01
Mercury (mg/L)	0.002	0.0002	144	ND	ND	44	ND	ND	72	ND	ND
Nickel (mg/L)	0.1 [1]	0.05	144	ND	ND	44	ND	ND	72	ND	ND
Nitrate (mg/L Nitrogen)	10	0.1	144	0.17 - 0.52	0.31	44	ND - 0.79	< 0.4	72	0.20 - 7.56	4.11
Nitrite (mg/L Nitrogen)	1	0.001	144	ND - 0.025	< 0.001	44	ND - 0.002	< 0.001	72	ND - 0.004	< 0.001
pH (pH units)	between 6.5 and 8.5	-	9005	6.0 - 7.8	-	1074	6.8 - 7.5	-	986	5.8 - 8.2	-
Selenium (mg/L)	0.01	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Silver (mg/L)	0.05	0.01	144	ND	ND	44	ND	ND	72	ND	ND
Sodium (mg/L)	No designated limit	0.01	144	5.20 - 60.00	7.45	44	10.20 - 27.31	20.66	72	5.60 - 50.50	23.24
Specific Conductance (µmho/ cm)	No designated limit	-	9005	64 - 179	78	1074	180 - 340	225	986	101- 846	341
Sulfate (mg/L)	250	2	144	6.30 - 9.20	7.7	44	10.40 - 14.60	12.6	72	7.10 - 87.50	38.1
Temperature (° F)	No designated limit	-	9009	35 - 79	54	1074	37 - 80	53	986	30 - 79	58
Thallium (mg/L)	0.002 [1]	0.002	144	ND	ND	44	ND	ND	72	ND	ND
Turbidity (NTU)	5 [4]	0.1	9005	0.1 - 7.3	0.8	1074	0.3 - 2.7	0.8	986	0.1- 7.3	0.4
Zinc (mg/L)	5	0.01	144	ND - 0.01	< 0.01	44	ND	ND	72	ND - 0. 47	< 0.04

MCL = Maximum Contaminant Level   MDL = Minimum Detection Limit - lowest level the analytical method can detect   mg/L = milligrams per liter   ND = Not Detected

[1] USEPA MCL. NYSDOH has not set an MCL for this parameter.
[2] MCL is based on the average of a sample which is greater than 15 and a second sample collected from the same site within two weeks. In the Croton System there were 8 color violations between July and November 1997. The Groundwater System exepienced three violations at well 50/50A on: 4/15/97, 8/5/97, and 10/1/97.
[3] Action limit (not an MCL)
[4] MCL is the monthly average. Although single values are greater than 5 NTU, no monthly average for any system exceeded the MCL.

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

UNREGULATED CONVENTIONAL CHEMICALS AND PHYSICAL PARAMETERS

PARAMETERS (UNITS)	NYS DOH MCL	LABORATORY MDL	CATSKILL - DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM		
			# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE
Aluminum (mg/L)	0.05 to 0.2 [5]	0.01	144	ND - 0.08	< 0.02	44	ND - 0.06	< 0.01	72	ND - 0. 90	< 0.01
Ammonia (mg/L Nitrogen)		0.03	144	ND	ND	44	ND	ND	72	ND	ND
Boron (mg/L)		0.02	144	ND - 0.10	< 0.05	44	0.03 - 0.13	0.07	72	0.02 - 0. 20	0.09
Calcium (mg/L)		0.02	144	ND	ND	44	ND	ND	72	ND	ND
Carbon Dioxide (mg/L)		0.2	12	1.32 - 3.52	2	11	2.64 - 5.28	3.98	-	-	-
Chemical Oxygen Demand (mg/L Oxygen)		1	144	0.9- 8.8	3.9	44	4.6 - 9.4	6.9	72	ND - 9.8	< 1.34
Color - distribution systems (color units)		1	7842	2 - 100	7	737	4 - 30	9	1399	1 - 80	5
Corrosivity	Non-corrosive [5] [6]	-	144	- 3.24 to -2.26	-2.7	44	-1.72 to -1.02	-1.44	72	-3.38 to 0.84	-1.47
Dissolved Oxygen (mg/L)		1	12	4.8 - 12.6	8.8	11	4.0 - 11.8	8.4	-	-	-
Dissolved Solids (mg/L)	500[5]	5	144	23 - 78	43	44	124 - 174	150	72	39 - 616	213
Foaming Agents (mg/L Linear Alkyl Sulfonate)	0.5[5]	0.01	144	ND	ND	44	ND	ND	72	ND	ND
Hardness (grains/gallon [US] Calcium Carbonate) [7]		0.03	144	0.8 - 1.6	1.1	44	3.5 - 5.3	4.4	72	1.1 - 21.3	6.8
Iodide (mg/L)		0.01	144	ND	ND	44	ND	ND	72	ND	ND
Lithium (mg/L)		0.01	144	ND	ND	44	ND	ND	72	ND	ND
Magnesium (mg/L)		0.1	144	1.00 - 2.20	1.26	44	4.66 - 8.40	6.59	72	1.60 - 38.00	13.76
Phenols (mg/L Phenol)		0.002	140	ND	ND	44	ND	ND	72	ND	ND
Orthophosphate (mg/L)		0.02	8582	< 0.10 - 3.30	< 1.28	1074	< 0.10 - 2.20	< 1.12	1399	0.03 - 2.17	1.25
Potassium (mg/L)		0.1	144	0.41 - 0.86	0.58	44	1.32 - 1.96	1.69	72	0.47 - 3.10	1.58
Silica [Silicon Dioxide] (mg/L)		0.2	144	1.20 - 4.40	2.8	44	3.10 - 7.40	4.9	72	2.60 - 29.80	15.8
Strontium (mg/L)		0.05	144	ND	ND	44	ND	ND	72	ND	ND
Total Organic Carbon (mg/L Carbon)		0.15	144	0.80 - 2.70	1.7	44	1.40 - 3.00	2.38	72	ND - 2.10	< 0.56
Total Organic Halogen (mg/L)		0.02	140	0.061 - 0.257	0.152	43	0.121 - 0.494	0.248	65	ND - 0.138	< 0.045

MCL = Maximum Contaminant Level MDL = Minimum Detection Limit - lowest level the analytical method can detect mg/L = milligrams per liter ND = Not Detected

[5] USEPA Secondary Maximum Contaminant Level. NYSDOH has not set an MCL for this parameter.
[6] A Langelier Index value less than zero indicates corrosive tendencies.
[7] Hardness of up to 3 grains/gallon is considered soft water, between 3 and 9 is moderately hard.

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

REGULATED ORGANIC CONTAMINANTS

PARAMETERS (mg/L)	NYS DOH	LABORATORY	CATSKILL - DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM		
	MCL	MDL	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE
Total Trihalomethanes [a]	0.1	0.002	144	0.009 - 0.062	0.029	44	0.034 - 0.065	0.047	72	ND - 0.033	< 0.009
Principal Organic Contaminants:											
Benzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Bromobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Bromochloromethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Bromomethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
n-Butylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
sec-Butylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
tert-Butylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Carbon tetrachloride	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Chlorobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Choloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Chloromethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
2-Chlorotoluene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
4-Chlorotoluene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Dibromomethane	0.005	0.0005	144	ND	ND	44	ND - 0.0006*	ND	96	ND - 0.001*	ND
1,2-Dichlorobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,3-Dichlorobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,4-Dichlorobenzene	0.005	0.0005	144	ND - 0.0014	<0.0005083	44	ND	ND	96	ND	ND
Dichlorodifluoromethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND - 0.0013	< 0.0005177
1,1-Dichloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2-Dichloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,1-Dichloroethene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
cis-1,2-Dichloroethene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND - 0.0014	< 0.0005156
trans-1,2-Dichloroethene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2-Dichloropropane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,3-Dichloropropane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
2,2-Dichloropropane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,1-Dichloropropene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
cis-1,3-Dichloropropene	0.005	0.0005	120	ND	ND	36	ND	ND	80	ND	ND
trans-1,3-Dichloropropene	0.005	0.0005	120	ND	ND	36	ND	ND	80	ND	ND
Ethylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Hexachlorobutadiene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Isopropylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
p-Isopropyltoluene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Methylene Chloride	0.005	0.0005	144	ND - 0.0008	<0.0005049	44	ND - 0.0006	<0.00050027	96	ND - 0.0007*	ND
n-Propylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Styrene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,1,1,2-Tetrachloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,1,2,2-Tetrachloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Tetrachloroethene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND - 0.0047	< 0.0010418
Toluene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2,3-Trichlorobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2,4-Trichlorobenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,1,1-Trichloroethane	0.005	0.0005	144	ND - 0.0013	<0.0005132	44	ND - 0.001*	ND	96	ND	ND
1,1,2-Trichloroethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
Trichloroethene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND - 0.0006	< 0.0005021
Trichlorofluoromethane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2,3-Trichloropropane	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,2,4-Trimethylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
1,3,5-Trimethylbenzene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
m-Xylene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
o-Xylene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND
p-Xylene	0.005	0.0005	144	ND	ND	44	ND	ND	96	ND	ND

MCL = Maximum Contaminant Level　　MDL = Minimum Detection Limit　　mg/L = milligrams per liter　　ND = Not Detected

[a] MCL is the calculated quarterly running average. In 1997 the MCL was never exceeded. Data presented are based on individual sample results.

* Only one sample was detected with the contaminant at levels below the MCL.

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

SPECIFIED ORGANIC CHEMICALS

PARAMETERS (mg/L)	NYS DOH	LABORATORY	CATSKILL - DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM		
	MCL	MDL	# SAMPLES	RANGE	AVERAGE	#SAMPLES	RANGE	AVERAGE	#SAMPLES	RANGE	AVERAGE
Alachlor	0.002	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Aldicarb	0.003	0.001	24	ND	ND	11	ND	ND	24	ND	ND
Aldicarb Sulfone	0.002	0.002	24	ND	ND	11	ND	ND	24	ND	ND
Aldicarb Sulfoxide	0.004	0.002	24	ND	ND	11	ND	ND	24	ND	ND
Aldrin	0.005	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Atrazine	0.003	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Benzo(a)pyrene	0.05	0.00002	16	ND	ND	7	ND	ND	16	ND	ND
Butachlor	0.05	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Carbaryl	0.05	0.002	24	ND	ND	11	ND	ND	24	ND	ND
Carbofuran	0.04	0.0015	24	ND	ND	11	ND	ND	24	ND	ND
Chlordane	0.002	0.0005	2	ND	ND	1	ND	ND	2	ND	ND
2,4-D	0.05	0.002	10	ND	ND	5	ND	ND	10	ND	ND
Dalapon	0.05	0.00032	47	ND - 0.00210	< 0.00067	16	0.00043 - 0.00121	< 0.00082	32	ND	ND
Dibromochloropropane [DBCP]	0.0002	0.00007	45	ND	ND	9	ND	ND	24	ND	ND
Di(2-ethylhexyl)adipate	0.05	0.001	2	ND	ND	1	ND	ND	2	ND	ND
Di(2-ethylhexyl)phthalate	0.05	0.003	2	ND	ND	1	ND	ND	2	ND	ND
Dicamba	0.05	0.002	10	ND	ND	5	ND	ND	10	ND	ND
Dieldrin	0.005	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Dinoseb	0.05	0.002	10	ND	ND	5	ND	ND	10	ND	ND
Diquat	0.05	0.001	24	ND	ND	11	ND	ND	24	ND	ND
Endrin	0.0002	0.000004	10	ND	ND	5	ND	ND	10	ND	ND
Endothall	0.05	0.005	2	ND	ND	1	ND	ND	2	ND	ND
Ethylene Dibromide [EDB]	0.00005	0.00005	34	ND	ND	6	ND	ND	24	ND	ND
Glyphosate	0.05	0.009	2	ND	ND	1	ND	ND	2	ND	ND
Heptachlor	0.0004	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Heptachlor Epoxide	0.0002	0.000001	10	ND	ND	5	ND	ND	10	ND	ND
Hexachlorobenzene	0.005	0.000002	10	ND	ND	5	ND	ND	10	ND - 0.005	< 0.0023
Hexachlorocyclopentadiene	0.05	0.000004	10	ND	ND	5	ND	ND	10	ND - 0.020	< 0.006
3-Hydroxycarbofuran	0.05	0.002	24	ND	ND	11	ND	ND	24	ND	ND
Lindane	0.0002	0.000025	2	ND	ND	1	ND	ND	2	ND	ND
Methomyl	0.05	0.0005	24	ND	ND	11	ND	ND	24	ND	ND
Metolachlor	0.05	0.000005	10	ND	ND	5	ND	ND	10	ND	ND
Metribuzin	0.05	0.000005	10	ND	ND	5	ND	ND	10	ND	ND
Methoxychlor	0.04	0.000009	10	ND	ND	5	ND	ND	10	ND	ND
Oxamyl [Vydate]	0.05	0.002	24	ND	ND	11	ND	ND	24	ND	ND
Pentachlorophenol	0.001	0.002	10	ND	ND	5	ND	ND	10	ND	ND
Picloram	0.05	0.001	10	ND	ND	5	ND	ND	10	ND	ND
Polychlorobiphenyls [PCBs] [a]	0.0005	0.0005	2	ND	ND	1	ND	ND	2	ND	ND
Propachlor	0.05	0.000005	10	ND	ND	5	ND	ND	10	ND	ND
Simazine	0.05	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
2,4,5-TP (Silvex)	0.01	0.002	10	ND	ND	5	ND	ND	10	ND	ND
Toxaphene	0.003	0.0025	2	ND	ND	1	ND	ND	2	ND	ND
Vinyl Chloride	0.002	0.0005	144	ND	ND	44	ND	ND	72	ND	ND

MCL = Maximum Contaminant Level MDL = Minimum Detection Limit mg/L = milligrams per liter ND = Not Detected

[a] Total PCBs (< 0.0005 mg/l)

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

UNSPECIFIED ORGANIC CHEMICALS

PARAMETERS (mg/L)	NYS DOH MCL	LABORATORY MDL	CATSKILL - DELAWARE SYSTEM # SAMPLES	RANGE	AVERAGE	CROTON SYSTEM # SAMPLES	RANGE	AVERAGE	GROUNDWATER SYSTEM # SAMPLES	RANGE	AVERAGE
Acenaphthene	0.05	0.003	16	ND	ND	7	ND	ND	16	ND	ND
Acenaphthylene	0.05	0.003	16	ND	ND	7	ND	ND	16	ND	ND
Anthracene	0.05	0.0002	16	ND	ND	7	ND	ND	16	ND	ND
Baygon (propoxur)	0.05	0.001	24	ND	ND	11	ND	ND	24	ND	ND
Benzo[a]anthracene	0.05	0.000008	16	ND	ND	7	ND	ND	16	ND	ND
Benzo[b]fluoranthene	0.05	0.000006	16	ND	ND	7	ND	ND	16	ND	ND
Benzo[k]fluoranthene	0.05	0.000003	18	ND	ND	8	ND	ND	18	ND	ND
Benzo[g,h,i]perylene	0.05	0.00002	18	ND	ND	8	ND	ND	18	ND	ND
alpha-BHC	0.005	0.000001	10	ND	ND	5	ND	ND	10	ND	ND
beta-BHC	0.005	0.000009	10	ND	ND	5	ND	ND	10	ND	ND
delta-BHC	0.005	0.000002	8	ND	ND	4	ND	ND	8	ND	ND
gamma-BHC	0.0002	0.000006	10	ND	ND	5	ND	ND	10	ND	ND
Bromochloroacetic acid	0.05	0.00006	143	0.00050 - 0.01050	0.00163	43	0.00070 - 0.00473	0.00274	96	ND - 0.00278	< 0.00079
Bromochloroacetonitrile	0.05	0.0001	48	ND - 0.00218	< 0.00066	12	0.00078 - 0.00261	0.00133	36	ND - 0.00149	< 0.00052
Carboxin	0.005	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Chloral Hydrate	0.05	0.00005	58	0.00130 - 0.01621	0.00431	12	0.00427 - 0.01254	0.00688	36	ND - 0.00373	< 0.0011
Chlorobenzilate	0.005	0.000002	10	ND	ND	5	ND	ND	10	ND	ND
Chloropicrin	0.05	0.0001	58	ND - 0.00228	< 0.0009	12	0.00061 - 0.00252	0.00104	36	ND - 0.00150	< 0.00022
Chloroneb	0.005	0.000006	10	ND	ND	5	ND	ND	10	ND	ND
Chlorothalonil	0.05	0.000002	10	ND	ND	5	ND	ND	10	ND	ND
Chrysene	0.005	0.0002	18	ND	ND	8	ND	ND	18	ND	ND
Cyanazine	0.05	0.000007	10	ND	ND	5	ND	ND	10	ND	ND
Dacthal (DCPA)	0.005	0.000009	10	ND	ND	5	ND	ND	10	ND	ND
,4-DB	0.05	0.00002	10	ND	ND	10	ND	ND	10	ND	ND
4,4'-DDD	0.005	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
4,4'-DDE	0.005	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
4,4'-DDT	0.005	0.000004	10	ND	ND	5	ND	ND	10	ND	ND
Diazinon	0.05	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Dibenzo[a,h]anthracene	0.05	0.00004	18	ND	ND	8	ND	ND	18	ND	ND
Dibromoacetic acid	0.05	0.00008	131	ND - 0.00062	< 0.00017	39	ND - 0.00073	< 0.00025	88	ND - 0.00343	< 0.00085
Dibromoacetonitrile	0.05	0.00007	48	ND - 0.00163	< 0.00034	12	ND - 0.00178	< 0.00027	38	ND - 0.00279	< 0.00085
Dichloroacetic acid	0.05	0.00016	143	0.00788 - 0.03050	0.01889	43	0.00746 - 0.04099	0.01918	96	ND - 0.02470	< 0.00346
Dichloroacetonitrile	0.05	0.00007	58	0.00092 - 0.00345	0.00204	12	0.00353 - 0.00654	0.00492	36	ND - 0.00191	< 0.0005
1,1-Dichloropropanone-2	0.05	0.0001	58	0.00038 - 0.00176	0.00081	12	0.00075 - 0.00242	0.0013	36	ND - 0.00111	< 0.00035
Endosulfan-I	0.005	0.000006	10	ND	ND	5	ND	ND	10	ND	ND
Endosulfan-II	0.005	0.000001	10	ND	ND	5	ND	ND	10	ND	ND
Endosulfan Sulfate	0.005	0.000003	10	ND	ND	5	ND	ND	10	ND	ND
Endrin Aldehyde	0.005	0.000004	10	ND	ND	5	ND	ND	10	ND	ND
Etridiazole	0.05	0.000014	10	ND	ND	5	ND	ND	10	ND	ND
Fluoranthene	0.05	0.00001	16	ND	ND	7	ND	ND	16	ND	ND
Fluorene	0.005	0.0003	18	ND	ND	8	ND	ND	18	ND	ND
Indeno[1,2,3-cd]pyrene	0.005	0.00007	16	ND	ND	8	ND	ND	16	ND	ND
Methiocarb	0.05	0.004	24	ND	ND	11	ND	ND	24	ND	ND
Methyl tert-butyl ether	0.05	0.0005	148	ND - 0.0094	0.000794	52	ND - 0.0048	0.000629	117	ND - 0.0149	0.001692
MGK-264	0.05	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Monobromoacetic acid	0.05	0.00011	147	ND - 0.00040	< 0.00016	39	ND - 0.00050	< 0.00024	96	ND - 0.00093	< 0.00018
Monochloroacetic acid	0.05	0.00019	143	0.00035 - 0.00280	0.00114	43	0.00020 - 0.01830	1.04	96	ND - 0.00323	< 0.00113
Napthalene	0.05	0.003	18	ND	ND	8	ND	ND	18	ND	ND
Norflurazon	0.005	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Paraquat	0.05	0.001	24	ND	ND	11	ND	ND	24	ND	ND
cis-Permethrin	0.005	0.000009	10	ND	ND	5	ND	ND	10	ND	ND
trans-Permethrin	0.005	0.000007	10	ND	ND	5	ND	ND	10	ND	ND
Phenanthrene	0.05	0.0002	18	ND	ND	8	ND	ND	18	ND	ND

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

UNSPECIFIED ORGANIC CHEMICALS
(Continued)

PARAMETERS (mg/L)	NYS DOH	LABORATORY	CATSKILL - DELAWARE SYSTEM			CROTON SYSTEM			GROUNDWATER SYSTEM		
	MCL	MDL	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE	# SAMPLES	RANGE	AVERAGE
Pyrene	0.05	0.0004	16	ND	ND	7	ND	ND	16	ND	ND
Terbufos	0.05	0.0005	22	ND	ND	10	ND	ND	22	ND	ND
Tetrachloroterephthalic acid (TCPA)	0.005	0.005	10	ND	ND	5	ND	ND	10	ND	ND
Trichloroacetic Acid	0.05	.00007	131	0.00938 - 0.05200	0.02426	39	0.02340 - 0.06410	0.0412	88	ND - 0.03350	< 0.00475
Trichloroacetonitrile	0.05	0.0001	58	ND - 0.00073	< 0.00012	12	ND - 0.00257	< 0.00056	39	ND	ND
1,1,1-Trichloropropanone	0.05	0.0001	58	0.00145 - 0.00418	0.00242	12	0.00222 - 0.00621	0.00411	36	ND - 0.00195	< 0.00061
Trifluralin	0.05	0.000001	10	ND	ND	5	ND	ND	10	ND	ND
Vernolate	0.05	0.0005	22	ND	ND	10	ND	ND	22	ND	ND

MCL = Maximum Contaminant Level   MDL = Minimum Detection Limit   mg/L = milligrams per liter   ND = Not Detected

DRINKING WATER QUALITY CHARACTERISTICS OF NEW YORK CITY DISTRIBUTION SYSTEM FOR 1997

MICROBIAL ANALYSIS FOR COLIFORM BACTERIA

MONTH	TOTAL # SAMPLES ANALYZED	# SAMPLES POSITIVE FOR TOTAL COLIFORM	# SAMPLES POSITIVE FOR E. COLI	PERCENT OF SAMPLES CONTAINING COLIFORM (%)[10]	PERCENT OF SAMPLES CONTAINING E. COLI (%)[11]
Jan -97	899	1	0	0.1	0.0
Feb -97	823	1	0	0.1	0.0
Mar-97	937	0	0	0.0	0.0
Apr-97	913	2	0	0.2	0.0
May-97	944	0	0	0.0	0.0
Jun-97	913	6	1	0.7	0.1
Jul-97	972	6	0	0.6	0.0
Aug-97	930	1	0	0.1	0.0
Sep-97	924	1	0	0.1	0.0
Oct-97	955	2	0	0.2	0.0
Nov-97	910	3	0	0.3	0.0
Dec-97	949	1	0	0.1	0.0
Totals:	11069	24	1	0.2	0.0

[10] New York State DOH permits up to 5 percent of total coliform samples each month to be positive.

[11] A violation occurs if a sample and its repeat sample are both positive for coliform and one of the two samples is E. coli.

Appendix 3C

Appendix 3C

APPENDIX 3C
List of Chemical Additives/Conditioners Used at Proposed Facility Stored on Site, Method of Storage, and Typical Dosing Requirements:
New York Power Authority – Combined Cycle Project
Astoria, Queens, New York

Appendix 3 C

List of Chemical Additives/Conditioners Used at Proposed Facility Stored on Site and Method of Storage and Typical Dosing Requirements

Ammonia for condensate pH control

- Quantity stored in Skid: 400 gal
- Method of storage: Aqueous solution
- Dosing requirements: 390 gpd
- Quantity stored at site: 2200 gal (30 days storage)
- Method of storage: Aqueous solution (29% concentration, sp.gr-0.9)

Hydrazine (Oxygen scavenger)

- Quantity stored in Skid: 150 gal
- Method of storage: Aqueous solution
- Dosing requirements: 125 gpd
- Quantity stored at site: 80 gal (30 days storage)
- Method of storage: Aqueous solution (50% concentration)

Phosphate for boiler water pH control

- Quantity stored in Skid: 100 gal
- Method of storage: Aqueous solution
- Dosing requirements: 40 gpd
- Quantity stored at site: 100 lbs (30 days storage)
- Method of storage: Solids in bag or drum

Sodium Hypochlorite for cooling water system

- Quantity stored in Skid: 450 gal
- Method of storage: Aqueous solution with concentration as 10% available chlorine
- Dosing requirements: 5-PPM shock dosing 2-3 times a day for a total of one (1) hour per day
- Quantity stored at site: 13500 gal (30 days storage)
- Method of storage: Aqueous solution with concentration as 10% available chlorine (to be stored in closed and cool enclosure)

Sodium Sulfite for cooling water system

- Quantity stored in Skid: 30 gal 10% solution
- Method of storage: Aqueous solution with 10% concentration
- Dosing requirements: 0.0075 lbs./gal as 100% sodium sulfite
- Quantity stored at site: 720 lbs (30 days storage)
- Method of storage: Solids in bag or drum

Hydrogen (H_2) for Gas Turbine & Steam Turbine Generator Cooling

- Quantity stored for on-line operation: 8 bottles each 200 ft^3 for each generator
- Method of storage: Bottles located near the respective generators
- Quantity stored at site: 40 bottles each 200 ft^3 for each generator
- Method of storage: Bottles

Appendix 3 C

List of Chemical Additives/Conditioners Used at Proposed Facility Stored on Site and Method of Storage and Typical Dosing Requirements

<u>Carbon Dioxide (CO_2) for Gas Turbine & Steam Turbine Generator Purging</u>

- Quantity for one purge operation: 16 bottles each 435 ft^3 for each generator
- Method of storage: Bottles located near the respective generators
- Quantity stored at site: 16 bottles each 435 ft^3 for each generator
- Method of storage: Bottles

<u>Freon (R22) Refrigerant for Inlet Chillers</u>

- Quantity for on-line operation: 125, 000 lbs total. No additional storage supply will be needed on site
- Method of storage: Not applicable

Appendix 3D

Appendix 3D

APPENDIX 3D

System Reliability Impact Study for NYPA's 500 MW Combined Cycle Project:
New York Power Authority – Combined Cycle Project
Astoria, Queens, New York

System Reliability Impact Study

For

NYPA's 500MW Combined Cycle Project

At Poletti

July, 2000

New York Power Authority
Transmission Planning
1633 Broadway
New York, New York 10019

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EXECUTIVE SUMMARY

This system reliability impact study (SRIS) has been conducted to evaluate the impact of the New York Power Authority's (NYPA) 500 MW Combined–Cycle Combustion Turbine Facility (the Project) on the 138kV transmission system supplying the Astoria load pocket, as well as, the bulk power transmission system in the study area. This study will also identify modifications and/or reinforcements as may be required

The Project is currently scheduled to be in-service by Spring 2004, and will be connected into the Consolidated Edison Company of New York, Inc (Con Edison) 138kV transmission system in Astoria, Queens via both the Astoria East and West 138kV Substations. The interconnection facilities will consist of three 138/18 kV generator step-up transformers, three 138 kV transmission circuits, one 138 kV circuit breaker, and associated substation and transmission structures and equipment. One Gas Turbine Generator will be connected to the Astoria West 138kV substation and the second Gas Turbine Generator and the Steam Turbine Generator will both be connected to the Astoria East 138kV substation (see Appendix C). Four circuit positions are available at the Astoria West Substation and two circuit positions are available at the Astoria East Substation. The transmission circuits from the combined cycle plant will be connected at the existing vacant circuit breaker positions.

The power flow base case has been developed by Con Edison to evaluate the impact the Project generation in combination with all existing base load and gas turbine generators in the Astoria load pocket, as well as, the following future generation projects, which impact the study area ahead of NYPA's project in first the Con Edison and now the NYISO queue:

- Sunset Energy
- Cogen Tech Expansion
- Millennium
- ABB

Over a period of a year, based on a requirement of Con Edison -the transmission owner (TO), NYPA was required to develop jointly with the TO, a 138kV system representation that would allow for the full dispatching of the existing generation and the proposed generating units cited above. The representation includes a reconfiguration change of ABB's conceptual electrical plant interconnection (which has been discussed with ABB although not formally agreed to), as well as, assumed mitigation of the Con Edison 138kV system prior to the installation of NYPA's Project. In most cases this mitigation required the force cooling of specific circuits throughout the 138kV system and the replacement of transformers at Rainey 138kV, as indicated by Con Edison. Based on prudent engineering judgement and the physical realities of the facilities in question, a least cost, environmentally sound and electrically reliable transmission plan was employed (Appendix A.1- Con Edison case 18 Plot). Should any of the aforementioned projects not come to fruition, NYPA's Project would pose an even lesser impact or none at all on Con Edison's 138kV system depending on which projects remain and result in fewer transmission modifications.

As a result of this proposed system configuration critical analyses were conducted with the following results and conclusions:

Thermal Analysis

The thermal (normal and contingency) evaluation of the Project, a total of 500 megawatts connected nominally to the Con Edison 138kV system, split roughly two- thirds at the Astoria East 138kV Substation and one - third at the Astoria West 138kV Substation, has shown the following:

Summer Analysis

- Normal – utilizing the pre -NYPA Con Edison agreed upon configuration (Phase 1 pre -NYPA), which replaces the Rainey transformers (8E&8W) and upgrades the associated feeders; force cools the existing Astoria West to Hell Gate #24056 feeder (to accommodate Millennium); moves three of the four ABB generator interconnects to E179st. and force cools the remaining radial ABB generator lead to Hell Gate, to accommodate the generator size; only requires the additional force cooling of both the Astoria East to Hell Gate #1 &#4 circuits (feeders #34051 & 34052, respectively (Phase 2 with NYPA), along with the proposed NYPA interconnection, itself. This configuration along with optimization of the phase angle regulators (PARs) in the pocket allows for the simultaneous operation all the existing base load and gas turbine generation, along with the proposed queue generation in the pocket.
- Contingency analysis – an analysis was conducted evaluating the impact of the Project on the base configuration assumed in Phase 1. This analysis simulated faults deemed to be the most critical contingencies to the pocket. A number of the faults even exceeded Con Edison's more stringent double contingency criteria (loss of two heavily loaded independent facilities) by more conservatively tripping these facilities simultaneously. Con Edison's 138kV transmission pocket is a cable system with N-1 PAR control. Criteria allow for cable circuits to exceed Long Term Emergency (LTE) ratings up to the Short-Term Emergency (STE) rating. All of these severe contingencies resulted in conditions that could be mitigated via normal operating procedures. Some of these conditions exist on the pre – NYPA system. None of these critical contingencies resulted in any facilities exceeding STE ratings.
- Since load flow analysis was used to conduct the above-mentioned studies, a simultaneous local area voltage assessment was conducted and found to be within operational guidelines.

Winter Analysis

- The impact of the Project under winter peak conditions was judged not necessary by Con Edison for the following reasons:
  1. No thermal problems are expected with the proposed modified system configuration.
  2. The Con Edison's transmission facilities have higher ratings in the winter.
  3. Total system load in the NYC area is less in the winter and it is expected that total generation dispatch will be less in the winter than in the summer.

Transfer Limit Analysis

The NYPA Project is electrically connected and physically located inside the Astoria Load Pocket. As such, NYPA's Project is electrically remote from the NYC cable system, UPNY-Con ED, UPNY-SENY, Total East and Central East Interfaces and studies verified that the Project therefore has little or no impact on these transfer limits. Similarly, inter-ISO transfers also were not affected between NYISO and PJM ISO and NYISO and ISO-NE in both directions. Refer to Section 5.0 – Transfer Limit Analysis Tables 1 & 2, respectively.

Voltage Analysis

NYPA has reviewed the local area voltage in conjunction with the thermal analysis. With the proposed configuration, the pre and post disturbance voltages in the Astoria load pocket have been found to be within their permissible range. No attempt was made to optimize the system by varying the VAR output of the other projects. The addition of the Project along with the other new generating projects in the area should enhance the voltage performance of the Astoria load pocket as well as provide Con Edison with greater flexibility on the overall 138kV transmission system as long as NYPA's Project and other proposed generating units adheres to Con Edison's Engineering Specification No. Eo-2097 (Manual of General Requirements for Connection to Con Edison's Electric Transmission System). NYPA's Project has complied. An assessment of the system-wide voltage profile was conducted, employing both 'Voltage Collapse' and Operating Procedure-1 (OP-1)' criteria and the results illustrate no adverse impact on the voltage performance of the bulk power system resulting from the installation of NYPA's Project.

As discussed previously, for the same reasons mentioned in the thermal analysis section, it was deemed unnecessary to perform a voltage analysis for winter loading conditions.

Stability Analysis

In order to evaluate the impact of NYPA's Project on the stability performance of the interconnected bulk power system, a stability analysis was performed in accordance with the North American Electric Reliability Council (NERC) Planning Standards, Northeast Power Coordinating Council (NPCC) Criteria and Guidelines and the New York State Reliability Council (NYSRC) Reliability Rules, including local reliability rules where applicable.

The simulations tested a number of selected normal and extreme criteria contingencies in the Con Edison 138kV Pocket. The normal criteria faults were simulated conservatively as three phase stuck breaker faults with delayed clearing, including the loss of generation; extreme contingency simulations modeled the loss of an entire substation with and without a fault.

Since NYPA's Project is electrically connected within Con Edison's 138kV load pocket, the results of this analysis indicated that the stability performance of the interconnected bulk power system is not adversely impacted by the addition of this generator in this load pocket. Also based on the results of the simulation of severe three phase stuck breaker faults with delayed clearing, critical clearing times were unaffected.

Short Circuit Analysis

Due to the relative uncertainty as to whether all of the proposed generating units will actually be built and the accuracy of their models and that of the system available to NYPA, NYPA enlisted Con Edison to perform a preliminary short circuit analysis to assess the relative impact of NYPA's Project on their system. This analysis adopted the Classical methodology used in assessing fault duty, modeling all the Merchant plants ahead of NYPA in the Con Edison queue, as the base condition and a second case adding NYPA's Project. Although this analysis shows increases in the fault duty levels at stations near the interconnection points of the Project, due to the uncertainties mentioned above it is premature to try to determine the number of breakers that will be over-dutied at this time. Con Edison has already replaced and is currently continuing to replace the breakers at these substations. Therefore, it will suffice, at this time, to identify the stations whose total fault duty increases as a result of the addition of NYPA's Project to the system (refer to Appendix G – Tables 1&2). Additionally, it should be noted that Con Edison is in the process of developing a comprehensive plan to resolve the over-duty conditions caused by the cumulative fault current contribution from all the various interconnection projects, including the NYPA Project. Subsequently the issue will be revisited again at that time.

Along these same lines, relay coordination will be handled with Con Edison at a later date, when some of the aforementioned uncertainty has been resolved.

Conclusion

This system impact study is based on a year-long concerted effort of both NYPA and Con Edison to rely on the Con Edison and then the NYISO queue for plants in the study area and adheres to the TO's requirement that all projected generation, along with existing generation be simultaneously dispatched. The impact study results show no degradation to the Con Edison system, provided that the modifications/reinforcements are implemented. The conclusions reached are based on the assumptions made herein and with the consent of Con Edison, along with discussions held with another merchant generator in the study area with regard to the proposed electrical system configuration. Therefore, NYPA requests that the NYISO accept this proposal for interconnection to the Con Edison 138kV Astoria transmission system.

1.0 Introduction

The New York Power Authority (NYPA) is proposing a 500 megawatt (MW) combined-cycle, combustion turbine electric generating project to be developed on a site at its existing Charles Poletti Power Project in Astoria, Queens. The proposed project will allow NYPA to meet/provide an in-city installed capacity requirement of 80% if mandated by the New York Independent System Operator (NYISO), while providing clean, adequate and reliable electricity to its in-city load.

The NYPA project is planned to interconnect into the Consolidated Edison Company of New York, Inc (Con Edison) 138kV transmission system in Astoria, Queens. Two of the units will be connected to the Astoria East 138kV substation with the remaining unit connected to the Astoria West 138kV substation. The interconnection plan is shown in Appendix - C.

This report summarizes the Phase I system impact study for the NYPA Project which involves the conducting of load flow, contingency (Thermal and Voltage), transfer limit, stability and short circuit analyses evaluating the critical contingencies and conditions. This study focuses on the projected 2003 summer peak condition and models all generators (i.e. Sunset Energy, Millennium, Cogentech and ABB) ahead of the NYPA project in the New York Independent System Operator (NYISO) queue deemed pertinent by Con Edison as impacting the study area. The study base case was developed in close cooperation with Con Edison based on a modified interconnection configuration agreed upon by Con Edison, which allows all of aforementioned Con Edison/NYISO queue projects, as well as the existing base load units and gas turbines in the 138kV in-city load pocket to operate reliably.

2.0 Project Description

The proposed combined cycle plant is comprised of two (2) Gas Turbine Generators, each rated 217 MVA, 18 kV at .85 power factor and one (1) Steam Turbine Generator rated 230 MVA, 18 kV at .85 power factor. Three power transformers, located adjacent to the power plant building will step up the generator voltage from 18 kV to 138 kV.

The output from the Project's three generating units will be delivered to the bulk power system at Con Edison's existing 138 kV Astoria Substation via three separate transmission circuits. One Gas Turbine Generator will be connected to Astoria West 138 kV Substation, and the second Gas Turbine Generator and the Steam Turbine Generator will be connected to Astoria East 138 kV Substation. Appendix C - Figures 1 and 2 are the basic one line diagrams showing the Project's generators and transmission interconnections at the Astoria Substation.

2.1 Interconnection Facilities

NYPA and Con Edison have performed preliminary system studies and physical investigation of existing transmission and substation facilities at the Astoria generating facility. It is feasible to interconnect NYPA's combined cycle plant to the Con Edison's system at the Astoria 138 kV Substations with minor modification of the existing substation facilities. Four circuit positions are available at the Astoria West Substation and two circuit positions are available at the Astoria East Substation. The transmission circuits from the combined cycle plant will be connected at the existing circuit breaker positions.

The interconnection facilities will consist of three 138/18 kV generator step-up transformers, three 138 kV transmission circuits, one 138 kV circuit breaker, and associated substation and transmission structures and equipment.

As shown in Figure 1, Gas Turbine Generator 1 will be connected to an available line position on bus section 6N at the Astoria West Substation. To enhance system reliability and provide for operational flexibility, an additional 138 kV circuit breaker will be installed at the available breaker position. The Astoria West Substation is located across a road from proposed site for the combined cycle plant. Total distance from the Gas Turbine Generator step-up transformer to the bus section 6N is approximately 300 feet. A 138 kV solid dielectric cable (insulating oil not required) will be used for the transmission line segment from the step-up transformer to the substation bus. Three cables will be installed in individual PVC conduits, each approximately 6 inches in diameter. The cable conduits will be buried in an underground duct bank approximately 3 feet wide and 6 feet deep. Backfill material for the duct bank will consist of thermal sand material and native soil.

Figure 2 shows interconnection of Gas Turbine Generator 2 and Steam Turbine Generator to Astoria East 138 kV Substation, which is located approximately 3500 feet from the combined cycle plant. Each generator step-up transformer will be connected to the 138 kV substation bus through an overhead transmission circuit. A 138 kV double circuit steel pole line will be constructed along the plant access road. Steel poles will be approximately 75 feet high and spaced 400 to 500 feet apart. A section of an existing wood pole transmission circuit, which was previously used to interconnect barge mounted gas turbines to the 138 kV transmission system, occupies the right of way required to route the new double circuit line to the Astoria East Substation. Several spans of the existing line will be removed and installed on the new NYPA steel poles. Due to the location of existing transmission lines connecting to the Astoria Substation and system reliability criteria, the Gas Turbine Generator circuit will be converted from overhead to underground once near the substation.

The 138 kV transmission lines and substation connection equipment and design will conform to acceptable industry standards as well as Con Edison's typical standards and practices for the Astoria Substation. All transmission line work and the new substation adjacent to the combined cycle plant for the generator step-up transformers will be performed by NYPA. Con Edison will perform work inside the existing Astoria East and West substations. Depending on results of further system studies by Con Edison and NYPA, replacement of existing circuit breakers at Astoria Substation may be required.

3.0 Scope Of Study

3.1 Objective

The objective of this study is to evaluate the impact of NYPA's 500MW Combined –cycle project on the 138kV transmission system supplying the Astoria load pocket, as well as, the bulk power transmission system in the study area. This study will also identify modifications and/or reinforcements as may be required. NYPA's Project has an expected in-service date of Spring 2004.

3.2 Approach

This study consists of load flow, contingency (thermal and voltage), transfer limit, stability and short circuit analyses evaluating the critical contingencies and conditions. The study work was conducted utilizing the Power System Simulator for Engineering (PSS/E) software package licensed from Power Technologies, Inc. (PTI). The peak load base case used for this analysis is the New York Power Pool (NYPP) Summer 2003 "FERC 715 Filing" base case as modified by Con Edison to include all existing in-city 138kV base load and gas turbine generation dispatched, as well as, all new interconnection projects in the NYISO queue (originally from Con Edison's queue for new projects) considered by Con Edison as possibly impacting the study area.

The following In-City interconnection projects have been represented: Sunset Energy, Cogen Tech Expansion, Millennium, and ABB. The case has not incorporated the Keyspan (250MW) project because in Con Edison's view, modeling this unit and its interconnection point to the 345kV system will not have any affect on the Con Edison transmission system in the study area. However, all units will be modeled for short circuit assessment.

This study will be performed conforming to the NERC planning standards, NPCC criteria and guidelines and the NYSRC Reliability Rules, including local reliability rules where applicable.

4.0 Thermal Analysis

NYPA plans to interconnect a 500 MW Combined Cycle Combustion Turbine Generating Facility into the Consolidated Edison Company of New York, Inc., (Con Edison), 138kV transmission system in Astoria, Queens. The plant will be physically situated on a site at NYPA's Charles Poletti Power Project in Astoria and be electrically connected to Con Edison's Astoria East 138kV and Astoria West 138kV substations. One Gas Turbine Generator will be connected to the Astoria West 138kV substation and the second Gas Turbine Generator and the Steam Turbine Generator will be connected to the Astoria East 138kV substation.

In conjunction with Con Edison, a base-case loadflow representation was developed based upon a FERC 715 2003 Summer Peak horizon year which modeled the NYPA interconnection along with the proposed future generation projects which impact the study area and are ahead of NYPA in the Con Edison/NYISO study queue.

Case I, the basecase which modeled the Project in-service also included the following existing and proposed generation as listed in the NYISO study queue and slated to become operational by the time the NYPA plant comes on-line.

- Athens 1080 MW
- Bethlehem 480 MW
- ABB 1075 MW
- Millennium (MPG) 480 MW
- Sunset Energy 520 MW
- CogenTech Exp. 217 MW

In addition, the data for the following generator units was included in the loadflow but assumed to be out-of-service and not dispatched, due to their distant away and/or their specific electrical interconnection, which effectively isolates them from the study area.

- Sithe Thorne Valley (Ramapo)
- ANP (Ramapo)
- Keyspan (Rainey) – (not considered to impact 138kV system)
- Heritage (Oswego)

The following configuration assumptions were also made in the creation of **Case I**.

The replacement of the Rainey transformers, (8E & 8W), and upgrades to their associated feeders. The forced cooling of the existing Astoria West- Hell Gate feeder, **(#24056).** The movement of three of the four ABB generator interconnects to E 179th Street, the forced cooling of the radial ABB generator lead to Hell Gate and the forced cooling of both the Astoria East to Hell Gate #1 and #4 circuits. **(#34051 and # 34052)**

A companion loadflow, **Case II**, which modeled as-found conditions with the NYPA plant modeled out-of-service was also created. This as-found system base-case was constructed from the "NYPA-in" loadflow and additional generation, (500 MW), was dispatched at Port Jefferson, Barrett, and at the Glenwood GTs to account for the out-of-service Poletti generation.

First-cut thermal analysis screening throughout this study was based upon PSS/E's default of MVA for line ratings. However, Con Edison bases their operational cable rating system upon MW flows. If an MVA overload was present, a closer examination of the questionable area was made based upon Con Edison's MW rating criterion in order to determine if an actual thermal overload condition existed.

Thermal Analysis and local system voltage analysis under both normal and contingency conditions was performed upon both **Case I** and **Case II**.

Appendix A.1 is a graphical representation of **Case I** representing the proposed generating plants interconnection points. Appendix A.2 is a PSS/e loadflow plot detailing Con Edison's local 138kV/345kV system and the substations at which these connections are made. No thermal overloads are present for these basecase conditions when Con Edison's MW thermal rating criteria is employed and the previously mentioned basecase assumptions are taken into consideration.

The voltage profile present on the local 138kV and 345kV system is also within the NYISO guidelines of .95 p.u and 1.05 p.u.

The following is a listing of facilities/cables were Con Edison MW ratings were called into effect and/or study assumptions were invoked for **Case I**.

FACILITY:	**RATING/ASSUMPTION:**
HG6-E179th Street 138kV	222 MW normal rating
Astoria E-HG1 138kv Astoria E-HG4 138kV	Forced cooling assumption
Corona-Astoria E #1, #2, #3 138kV	154 MW normal rating
Rainey 8W transformer Rainey 8E transformer	Replacement assumption
Hudson Ave./Hudson Ave. transformer	110 MW normal rating
Farragut-Gowanus South 345kV	618 MW normal rating
Gowanus S –Gothls S. 345kV Gowanus N-Gothls N. 345kV	460 MW normal rating

Foxhills-Willowbrook #1, #2 138kV	199 MW normal rating (new) F.C.
Willowbrook-Fr Kills 138kV #1, #2 138kV	234 MW normal rating (new) F.C.

Six critical contingencies deemed to be the most critical to the Astoria Load Pocket were simulated and thermal loadings and contingency voltage profiles were monitored.

The six contingencies modeled were:

1. L/O HG5 & HG6-E 179th Street 138kV

2. Astoria E –HG1 138kv

3. L/O two Corona-Astoria E 138kV lines (heaviest loaded) (#1 & #3)

4. L/O two Queensbridge –Astoria W 138kV lines (heaviest loaded) (#3 & #4)

5. L/O HG1& HG4-E 179th Street 138kV lines

6. The non-simultaneous loss of Astoria units 4 & 5.

Contingencies **1** and **2** are single facility outages. Contingencies **3** and **5** are non-simultaneous double facility contingencies, which were simulated more conservatively as a simultaneous trip. Contingency **4** was also a non-simultaneous double circuit contingency simulated sequentially. Mitigation was not required for the loss of the first circuit (Long Term Emergency [LTE] not exceeded), however for the non simultaneous loss of the second circuit LTE was exceeded. Mitigation was achieved by utilizing the ability to adjust phase-angle-regulating transformers and/or adjustment of gas turbines to return all system loading to below LTE. Contingency **6** simulated the non-simultaneous loss of Astoria units 4& 5. This contingency was simulated according to Con Edison's double contingency criteria

Criteria allow for cable circuits to exceed (LTE) ratings up to the Short-Term Emergency, (STE) ratings assuming mitigative action (utilization of PAR control and/or Gas Turbine adjustment) could then be used to bring loadings down to below LTE limits within a 15-minute time period.

For all six contingencies modeled for the Project plant expansion basecase, no loadings were above STE line ratings and all contingencies exhibited acceptable voltage profiles. For Contingency **2**, (L/O Astoria E-HG1 138kV), PAR control was invoked in order to drop below LTE ratings post contingency, and for contingency **4**, (L/O Queensbridge-Astoria W #3 & #4 138kV), a combination of PAR control and Gas Turbine adjustment was required to achieve loadings below LTE post contingency. For contingency 6, PAR adjustment was utilized to achieve normal facility loadings.

Graphical representations of the contingencies studied are included as Appendix B.1.

Contingencies Project Plant In-Service

1. **L/O HG5&HG6-E 179th Street 138kV**

2. **L/O Astoria E-HG1 138kV**

   PAR control relieves overload(s)

3. **L/O Corona-Astoria E #1, #3 138kV**

4. **L/O Queensbridge-Astoria W #3 & #4 138kV**

- Line #4 was tripped
- Line # 3 was tripped
- PAR control and Gas Turbine adjustment relieves overloads(s)

5. **L/O HG1-E179th Street 138kV**
   L/O HG4-E179th Street 138kV

6. **The non-simultaneous loss of Astoria units 4 & 5.**

- This contingency modeled the non-simultaneous loss of the two largest Astoria generating units, (units #4 and #5), and was modeled in four distinct steps according to Con-Edison criteria.

- Astoria Unit #4 was tripped
- Corrective Actions
- Astoria Unit #5 was tripped
- Corrective Actions- PAR re-scheduling required to achieve normal ranges

Appendix A.3 - contains is a PSS/e loadflow plot detailing Con Edison's local 138kV/345kV system representation of **Case II**. **Case II,** the basecase which has the proposed Project Plant off-line was built from **Case I** and was redispatched as previously stated and subject to the same assumptions and Con Edison MW rating criteria as those adhered to and previously described for **Case I**.

PAR schedule adjustment was required to relieve basecase normal overload conditions.

No thermal overloads are present for the basecase conditions and the voltage profile present is within NYISO guidelines.

The same set of contingencies modeled for **Case I** was studied for **Case II.** For all six contingencies modeled for the Project plant off-line basecase, no loadings were above STE line ratings and all contingencies exhibited acceptable voltage profiles. For Contingency **4**, (L/O Queensbridge-Astoria W #3 & #4 138kV), PAR control was invoked in order to drop below LTE ratings post-contingency. For Contingency **6**, PAR adjustment was utilized to achieve normal facility loadings. Graphical representations of the contingencies studied are included in Appendix B.2.

Contingencies: Project Plant off-line

1. L/O HG5&HG6-E 179th Street 138 kV

2. L/O Astoria E- HG1 138kV

3. L/O Corona-Astoria East #1, #3 138kV

4. L/O Queensbridge-Astoria West #3 & #4 138kV

- Line #4 was tripped
- Line #3 was tripped
- PAR control relieves overload(s)

7. L/O HG1-E 179th Street 138kV
L/O HG4-E 179th Street 138kV

6. The non-simultaneous loss of Astoria units 4 & 5.

- This contingency modeled the non-simultaneous loss of the two largest Astoria generating units, (Units #4 and #5), and was modeled in four distinct steps according to Con-Edison criteria.

- Astoria Unit #4 was tripped
- Corrective Actions
- Astoria Unit #5 was tripped
- Corrective Actions- PAR re-scheduling required to achieve normal ranges

5.0 Transfer Limit Analysis

The PSS/e Transfer Limit Considering Generation (TLTG) module was used to identify thermal limits for Total East, Central East, UPNY-SENY Closed, UPNY-Con Ed Closed, and NYC-Cable interfaces. This exercise was conducted with and without the NYPA's project.

The results show that, for the As Found System (CASE 1), Total East (TE) is thermally limited to 3512MW, based on the Athens-Pleasant Valley 345Kv line reaching it's Long Term Emergency rating (LTE) of 1538MW, for the loss of Leeds-Pleasant Valley 345kV line. At this level of TE, Central East has a corresponding limit of 1962MW based on the same contingency. UPNY-SENY Closed, is limited to 4566MW, based on the Athens-Pleasant Valley 345kV line reaching LTE for the loss Leeds-Pleasant Valley 345kV line. UPNY-Con Ed Closed, is limited to 6216MW, based on Roseton-East Fishkill 345kV line reaching LTE of 2677MW for the loss of Rock Tavern-Ramapo 345kV line plus the Rock Tavern 345/115kV transformer. The New York City (NYC)-Cable interface is limited to 3448MW based on SprainBrook-W49St. 345kV ckt.1 reaching LTE of 866MW, for loss of SprainBrook-W49St. 345kV ckt.2 & SprainBrook-Dunwoodie North 138kV ckt.

The case with the Project in-service (CASE 2), has the Project's 500MW net output dispatched versus In-City (200MW) and Long Island (300MW) generation. The TLTG results show that Total East is limited to 3532MW based on Athens-Pleasant Valley reaching LTE for the loss of Leeds-Pleasant Valley. At this level of TE, Central East has a corresponding limit of 1972MW based on the same contingency. UPNY-SENY Closed, is limited to 4583MW, based on the Athens-Pleasant Valley 345kV line reaching LTE for the loss Leeds-Pleasant Valley 345kV line. UPNY-ConEd Closed, is limited to 6323MW, based on Roseton-East Fishkill 345kV line reaching LTE of 2677MW for the loss of Rock Tavern-Ramapo 345kV line plus the Rock Tavern 345/115kV transformer. The NYC-Cable interface is limited to 3343MW based on SprainBrook- W49St. 345kV ckt.1 reaching LTE of 866MW, for loss of SprainBrook-W49St. 345kV ckt.2 & SprainBrook-Dunwoodie North 138kV ckt.

These results are shown in Table 1. Also shown in Table 1 are the traditional limits for the respective interfaces (Notes 2, 3 & 4) before the advent of the various interconnection requests.

TABLE 1
NYPA's 500MW COMBINED CYCLE POWER PROJECT
NYPP TRANSFER LIMITS (MW)
YEAR 2003

	TOTAL EAST	CENTRAL EAST	UPNY SENY	UPNY CONED	NYC Cable System
CASE 1:	3512(1)	1962(1)	4566(1)	6216(5)	3448(4)
As Found System	5346(2)	2860(2)	5692(3)		
Case 2:	3532(1)	1972(1)	4583(1)	6323(5)	3343(4)
The Project displacing SENY.	5347(2)	2860(2)	5741(3)		

(1) Athens-Pleasant Valley 345 kV ckt.1 (@LTE (1538MW) for L/O Pleasant Valley-Leeds 345 kv ckt 2.
(2) N. Scot77-Leeds 345 @ LTE (1538MW) for L/O N. Scott99-Leeds 345
(3) Ramapo-Roct Tavern 345kV @LTE (1890MW) for L/O 2 Pleasant Valley-Millwood 345kV lines
(4) SprainBrook-W49St. 345kV ckt.1 @ LTE (866MW) for L/O SprainBrook-W49St ckt.2 & SprainBrook-Dunwoodie North 138kV.
(5) Roseton-East Fishkill 345kV @ LTE (2677MW) for loss of Rock-Tavern-Ramapo 345kV plus Rock Tavern 345/115kV Transformer

TLTG analyses were also conducted for New York-New England (NY-NE) both directions, and NY-PJM both directions. The impact of the Poletti project on those interfaces was insignificant. Those results are shown in Table 2.

TABLE 2
NYPA's 500MW COMBINED CYCLE POWER PROJECT
NYPP TRANSFER LIMITS (MW)
YEAR 2003

	NE-NY	NY-NE	PJM-NY	NY-PJM
CASE 1: As Found System	143(1)	627(2)	217(3)	31(4)
CASE 2: The Project Displacing SENY.	140(1)	631(2)	215(3)	32(4)

(1) Brswamp-E131 Tap 115kv ckt #2 for l/oBrswap-Rotterdam 2 230kv ckt #1
(2) Brswamp-Pratt J 230kv ckt #1 for l/o Sandy PD 345 kv load.
(3) Falconer-Warren 115kv ckt #1 for l/o Stole-Homer 345 KV ckt # 1..
(4) Goudy-Oakdale 115kv ckt #1 for l/o Waterc-HillsD 230 KV ckt #1.

Emergency Transfer Limits

TLTG was used to determine the emergency transfer limits of the NYISO inter-area interfaces, TE, CE, UPNY-SENY Closed, UPNY-ConEd Closed, and NYC-Cable. The results are shown in Table 3.

TABLE 3
NYPA's 500MW COMBINED CYCLE POWER PROJECT
NYPP TRANSFER LIMITS (MW)
YEAR 2003

	TOTAL EAST	CENTRAL EAST	UPNY SENY	UPNY CONED	NYC Cable System
CASE 1: As Found System	4170(1)	2284(1)	5223(1)	7431(2)	4282(3)
Case 2: The Project displacing SENY.	4190(1)	2294(1)	5240(1)	7538(2)	4173(3)

(1) Athens-Pleasant Valley 345 kV # 1(@ Short term emergency (STE)1724MW) for L/O Pleasant Valley-Leeds 345 kV ckt 2.
(2) Roseton-East Fishkill 345kV @ STE (3137MW) for loss of Rock-Tavern-Ramapo 345kV plus Rock Tavern 345/115kV Transformer
(3) SprainBrook-W49St 345kV ckt.1 @ Normal (774MW) in Base Case

6.0 Voltage Analysis

Load flow analysis was conducted to evaluate the impact of the NYPA's Poletti Generating facility on the voltage performance of the NYISO Bulk power system. The analysis was conducted in accordance with the NYISO Transmission Planning Guidelines. It should be noted here, that since the advent of the NYISO, the evaluation of major projects as planned or proposed, has only focused on their impact on bulk power system reliability. The section of the Transmission Planning Guidelines that deals with Economic Evaluation no longer applies to these studies, and therefore was not addressed in this study.

The methodology employed both the 'Voltage Collapse' and 'Operating Procedure-1 (OP-1)' criteria mentioned in the Guidelines. For the voltage collapse criteria, transfers are increased until the system collapses or fails to converge for the worst contingency. Then the transfers in the last solved case are recorded as 'test level' transfers. Applying a 5% safety margin to those transfers yields the 'Operating Level' voltage limit.

For OP-1, a base case is developed at the operating level and checked for recommended minimum and maximum bulk power system voltages. If there are no pre-contingency violations, the contingencies are again run to check for post-contingency minimum and maximum voltages. If violations are encountered (usually post-contingency minimum), transfers are reduced until the criteria is met.

The voltage analysis was conducted with and without the NYPA's Project in-service. The same base case used for the TLTG analyses were used for the voltage analysis. Voltage limits were determined by shifting generation from O.H (50%) to SENY (93% In-City, 7% Long Island). In both cases, the worst contingency was the loss of the Marcy-South double circuit (CE07: Loss of Marcy-Exeter & Edic-Fraser 345kV), which resulted in post-contingency minimum violation at the Oakdale 345kv bus. The results show that for the conditions studied in both cases, the voltage limit is determined by the OP-1 criteria.

In CASE 1, the limit for Total East Operating Level base case was 4584MW, with a corresponding flow of 2059MW on Central East. However, for the worst contingency, OP-1 post-contingency low voltage violation occurs at the Oakdale 345kV bus. To respect the OP-1 guidelines the Total East flow in the Operating Level base case was reduced to 4248MW, with a corresponding flow of 1968MW on Central East. At this level there were neither pre nor post-contingency voltage violations.

In CASE 2, the limit for Total East Operating Level base case was 4553MW, with a corresponding flow of 2047MW on Central East. For the worst contingency, OP-1 post-contingency low voltage violation occurred at the Oakdale 345kV bus. To respect the OP-1 guidelines the Total East flow was reduced to 4250MW, with a corresponding flow of 1968MW on Central East. At this level there were no neither pre- nor post-contingency voltage violations.

The results show that, based on the more restrictive OP-1 criteria, the voltage performance of the system is not adversely impacted by the NYPA project.

It should be noted that the voltage limits identified in this report are based on traditional generation shift patterns, where "economy" energy generated in the OH system flows from the northwestern portion of New York State to ultimately displace in-City units. For simplicity, the most limiting condition along this path has been used (i.e. the Oakdale bus voltage). The UPNY-SENY and UPNY-Con Ed interfaces, when considered individually, are usually well within their respective transfer capacities at the coincident TE limit. This is evidenced by the healthy post-contingency voltage at Ladentown 345kV bus(>1.0p.u) shown in table 6-1. In addition, the Con Edison Bulk Power Transmission System is designed to sustain, reliably, two non-simultaneous contingencies. As a result, we expect that a specific analysis for the UPNY-SENY area would reveal substantially higher voltage limits for the southeast New York interfaces, and, in particular for the UPNY-Con Ed

Table 6-1 shows the results of the analyses. The accompanying summaries and power-flow diagrams (refer to Appendix –E) - illustrates system conditions for both voltage criteria.

TABLE 6-1
VOLTAGE ANALYSIS

SYSTEM CONDITIONS	INTERFACE FLOWS				SYSTEM VOLTAGES (kV)				
	TE	CE	UPNY-SENY	UPNY-Con Ed	Mar.	Oak.	N.S.	PV	Ladn.
As Found System									
Operating Level	4584	2059	5612	4992	355	331	350	335	346
-CE07					348	321*	347	335	347
-CE08					349	336	344	330	346
-OP-1 Base case	4248	1968	5280	4608	354	338	355	339	349
-CE07					353	328	352	339	351
-CE08					353	342	349	335	349
Poletti I/S									
Operating Level	4553	2047	5583	5049	350	332	351	335	346
-CE07					349	322*	347	335	347
-CE08									
-OP-1 Base Case	4250	1968	5282	4714	354	337	355	338	348
-CE07					353	328	352	338	348
-CE08					354	341	349	334	349

Note: * OP-1 post-contingency low limit for Oakdale 345kV bus is 328kV.

7.0 Stability Analysis

The stability analysis was conducted for the As Found System and the system with NYPA's Project in-service. The base case used for this analysis was derived from a MEN/VEM 1997 stability study. It was reviewed by the NYISO and updated by NYPA to reflect expected conditions for 2003. This case was selected because it was compatible with Pss/e Revision 26. All appropriate assumptions in the thermal and voltage analyses were incorporated into this case, including the following generation projects; Athens(1080MW); Bethlehem(480MW); ABB (1075MW); Millenium(480MW; Sunset(520MW);and CogenTech(217MW). The NYPA, ABB, Millennium, Sunset, and CogenTech machines were represented with models similar to existing models at Sithe-Oswego. Two cases were developed, one representing the As Found System without NYPA's Project, and the other representing the system with NYPA's Project in-service. For the As Found System: Total East =5584MW; Central East =2890MW, UPNY-SENY =4539; UPNY-CONED = 4633. For the system with NYPA's Project: Total East = 5512; Central East = 2861; UPNY-SENY = 4476; UPNY-CONED = 4076. In both cases, the loading is more than the 10% margin above the thermal limit of Total East, (which is the most restrictive limit), **and** also above the voltage limit.

Six (6) normal, and six (6) extreme contingencies were selected to be tested for each case. They included:

Normal Criteria faults

- 3-Phase fault on the Astoria West-Queensbridge 138kV line, followed by stuck breaker at Astoria West trapping Astoria generating Unit #4.
- 3-Phase fault on the Astoria East-Hell Gate 138kV line, followed by stuck breaker at Astoria East trapping Astoria generating Unit #3.
- 3-Phase fault on the East 179th.St-Hell Gate 138kV line followed by stuck breaker at East 179th. Street trapping 138/69kV transformer at East 179th. St.
- Loss of Astoria unit #6 (Poletti).
- Loss of one of the new NYPA units.
- Loss of the double circuit from Hell Gate to Astoria East 138kV.

The normal contingencies (3-phase stuck breaker) were simulated with delayed (back-up) clearing of 11 cycles (verified by Con Ed).

Critical Clearing Time Evaluation

With regard to critical clearing time (CCT) assessment, the stability results of the above mentioned tests confirm that no problem exists with the setting for both primary and backup protection schemes at both the Astoria East and West substations, where NYPA's Project is connected. A backup clearing time of 11 cycles (confirmed with Con Edison) was utilized, which resulted in stable post contingency performance. Therefore, no adjustment of backup relaying settings is necessary for the addition of this plant.

Extreme Criteria faults

- Loss of Astoria West 138kV station with & without a fault
- Loss of Astoria East 138kV station with & without a fault.
- Loss of the NYPA project (2 units).
- Loss of the entire Ravenswood complex (units 1,2 & 3).
- Loss of Astoria generation complex (units #3, #4, #5 & #6).
- Loss of Farragut load center (Plymouth, Brownsville, Waterside, & Seaport).

The extreme contingencies were simulated with a fault at the appropriate high voltage bus identified by Con Edison. The results of both the normal and extreme contingency simulations indicate that the stability performance of the interconnected system in the Astoria load pocket in particular, and the Con Edsison system in general, is not adversely impacted by the addition of NYPA's 500MW generation project.

Plots and switching summaries are available for review in Appendix F.

8.0 Short Circuit Analysis

Having incorporated the characteristic parameters of the NYPA generators and step up transformers provided by NYPA into the 2003 base case, as reconfigured to reflect the proposed modifications (See Appendix C- case18), a short circuit study was conducted to determine the impact of the NYPA units on the fault duty levels of 345 kV, 138 kV and 69 kV substations in the Con Edison system.

The methodology adopted in the fault study is the Classical Method, which assumes the following:

- All generating units in service
- All transmission feeders in service
- All series reactors in service
- Loads, shunts, and line capacitance not modeled
- Pre-fault, flat-start power flow representation (e.g. unity operating voltages, unity transformer tap ratios, etc)

The data used for generators and step up transformers are:

- Gas Turbine- 178,000KVA, 0.90 pf, 160,000 KW, 13.8 kV, X"dv=0.15 p.u. on 178MVA.
- GSU- 13.8/138 kV, 16.0 % nominal impedance on 180MVA.

- Steam Turbine- 178,000KVA, 0.90 pf, 160,000 KW, 13.8kV X"dv=0.15 p.u. on 178MVA.
- GSU- 13.8/138 kV, 16.0 % nominal impedance on 180MVA.

One GT is connected to the Astoria West 138 kV Substation and the other GT and a Steam unit are connected to the Astoria East 138 kV Substation. In the configuration for case 18, 3 out of 4 ABB generator units are connected to E. 179 St. 138 kV Substation.

- **<u>Discussion of results</u>**

In order to determine the impact of the project's 500 MW on the fault duty levels for the 345 kV, 138 kV and 69 kV Substations in the Con Edison system and neighboring systems, a short circuit analysis was conducted for two cases: one for the 2003 Summer peak load condition Base Case with all the Merchant Plants ahead of the NYPA project per the NYISO queue, and the other for the Base Case including the NYPA units. The results of these two simulations were compared for 3-phase to ground, 2-phase to ground and 1-phase to ground faults and the incremental fault duties resulting from the addition of NYPA units are tabulated in Appendix G -Tables 1.

The results show significant increases in fault duty levels at stations near interconnection point of the project. To determine how many breakers are over-dutied, and require upgrading or replacement due to the project, an individual breaker analysis must be performed for those stations where:

- The total fault duty, after the NYPA units are in service, exceeds the fault current level calculated for 2003 Base Case system conditions, and the total fault duty also exceeds the nominal fault current interrupting rating of any breaker at that same station.

Based on this criteria, the stations for which an individual breaker analysis may be required are: Dunwoodie 345kV, Farragut 345kV, Rainey 345kV, Sprain Brook 345 kV, Astoria East 138 kV, Astoria West 138 kV, Corona 138kV, East 179th St. 138kV, Hell Gate 5 & 6 138 kV, Jamaica 138 kV, Queens Bridge 138 kV and Sherman Creek 138 kV (see Appendix G - Table 1).

However, a breaker analysis for these stations is not needed at this time. With the NYPA units in service, the total fault current at a station is a function of many assumptions with regard to many possible future developments in the Baseline system. Among the possible occurrences are:

- How many Plants will withdraw their interconnection application,
- How many Plants will alter the characteristic parameters of their generators and generator step up transformers,
- How many Plants will change their interconnection schemes, etc.

Because of these uncertainties in the future undertakings of the Merchant plants, it is premature to try to determine the number of breakers that will be over-dutied. It will suffice, at this time, to identify the stations whose total fault increase is due to the addition of NYPA units to the system. Additionally, Con Edison is in the process of developing a comprehensive plan to resolve over-duty conditions caused by the cumulative fault currents contribution from various interconnection projects including the NYPA project.

The 2003 Base Case includes the following Merchant plants: Bethlehem, Athens, Sithe, Sunset at Gowanus 138kV, ANP, Columbia, Millennium, Cogen Expansion, ABB and KeySpan.

9.0 Conclusions

This system impact study has been based on a year long concerted effort of both NYPA and Con Edison to rely on the Con Edison/ NYISO queue for plants in the study area and to adhere to the TO's requirement that all projected generation, along with existing generation be simultaneously dispatched. As a result, the impact study results show no degradation to the Con Edison system, provided that the modifications/reinforcements are implemented as proposed. The conclusions reached are based on the assumptions made herein and with the consent of Con Edison, along with discussions held with another merchant generator, ahead of NYPA in the queue and slated for interconnection in the study area, with regard to the proposed electrical system configuration.

Appendices

Due to their technical and voluminous nature, these appendices are not included in this Article X Application, but are available from the New York Power Authority upon request.

Appendix 4A

Appendix 4A

APPENDIX 4A

Coastal Policies Consistency Statement:
New York Power Authority — Combined Cycle Project
Astoria, Queens, New York

Coastal Policies Consistency Statement
New York Power Authority Combined Cycle Project
Astoria, Queens, New York

1.0 INTRODUCTION

Land along the upper East River in Astoria, Queens has been designated as a Coastal Management Zone. Accordingly, the New York Power Authority's (NYPA) proposed Combined Cycle Project will need to be reviewed for state consistency with the New York State Coastal Zone Management Program (NYSCMP), which was established in 1981 by the Waterfront Revitalization and Coastal Resources Act (Article 42 of the Executive Law) and is administered by the New York State Department of State (NYSDOS), under the Authority of the Federal Coastal Zone Management Act (CZMA) of 1972.

The principal function of the NYSCMP is to provide a framework for government decision making in the coastal area. The Coastal Management Program is based on 44 policies which are grouped into 10 categories that address: 1) Development; 2) Fish and Wildlife; 3) Flooding and Erosion; 4) Public Access; 5) Recreation; 6) Historic Resources; 7) Visual Quality; 8) Agricultural Lands; 9) Energy and Ice Management; and 10) Water and Air Resources.

Article 42 of the Executive Law requires state agency actions within the coastal zone to be undertaken in a manner that is consistent with the State's coastal area policies, or a State approved Local Waterfront Revitalization Program (LWRP). A LWRP is a refinement of the State's coastal policies, developed jointly by the State and a municipality. Land development and related activities in New York's coastal area which involve state agency direct action or funding, or requiring state permits must be consistent with the coastal policies in Article 42 or an LWRP. New York City received approval from the state for its LWRP in 1982. The LWRP is based on state and federal coastal policies and contains 12 policies relating to local issues in addition to guidelines for local application of the 44 state policies. The City Planning Commission, acting as the City Coastal Commission, is the decision making body for the local Waterfront Revitalization Program.

2.0 Project Description

Existing Charles Poletti Power Project Facility

The proposed Combined Cycle Project will be located on an approximate four-acre parcel located at NYPA's existing Charles Poletti Power Project. The Charles Poletti Power Project occupies approximately 47 acres adjacent to the Astoria Generating Station formerly owned by Con Edison. NYPA's existing facilities include the 825-megawatt (MW) Poletti Generating Station, an adjacent administration and warehouse building, an intake structure and discharge canal along the East River, a 1.0 million gallon water storage tank, and miscellaneous ancillary facilities (i.e., foam pump house, underground piping, etc.). NYPA's facilities also include a fuel oil tank farm consisting of six, 6.0 million-gallon oil storage tanks, located at the eastern end of NYPA's property. A large portion of the NYPA property appears open and either grassed or paved; but, in fact, portions of these areas are occupied by various underground piping. The paved area is fenced and is used for outdoor storage of miscellaneous equipment.

The Charles Poletti Power Project began commercial operation in 1977 and is capable of burning fuel oil or natural gas. Electricity generated by the Poletti Project is transmitted to Con Edison's 345 kV system.

Proposed NYPA Combined Cycle Project

The proposed NYPA Combined Cycle Project is a nominal 500 MW combined-cycle natural gas fired facility with low sulfur (0.05%) distillate as a backup fuel. The major components of the plant include two combustion turbine generators (CTG), two heat recovery steam generators (HRSG), one steam turbine generator (STG) with condenser, and the cooling system that includes a mechanical draft cooling tower and a water treatment facility with associated storage tanks.

The facility support systems and equipment will include the following:

- Water cooled condenser
- Circulating cooling water system using wet cooling towers with plume abatement
- East River intake fitted with a wedge wire screen
- Water treatment system including storage tank
- Selective catalytic reduction system
- Chemical storage and injection system
- Sanitary waste collection and discharge system
- Fire protection system
- Fire detection and alarm system

- Permanent plant communications system
- Domestic (potable) water system
- Wastewater collection, treatment and discharge systems, including neutralization tank
- Plant electrical distribution system

A detailed Project Description is provided in Section 3.0 of the project's Article X Application.

The proposed site for the new plant is paved and was previously used for contractor parking. The area is now used for outdoor storage of miscellaneous equipment and materials. The approximately four-acre project site is south of and adjacent to NYPA's existing oil storage tanks and west of an area occupied by several simple cycle combustion turbines recently acquired from Con Edison by NRG.

3.0 Consistency Statement

The proposed NYPA Combined Cycle Project will be constructed and operated in a manner that is consistent with the applicable NYSDOS CMP State Coastal Policies. It is also consistent with the City of New York LWRP. The following discussion identifies applicable coastal policies and describes the proposed Combined Cycle's Project's compliance with those policies.

Development Policies

Policy 1: Restore, Revitalize, And Redevelop Deteriorated And Underutilized Areas For Commercial, Industrial, Cultural, Recreational And Other Compatible Uses.

The project site is currently used for outdoor storage of miscellaneous equipment and materials and was formerly used for contractor parking. Therefore, the NYPA Combined Cycle Project will result in the development of an industrial use on currently underutilized property, which is consistent with this policy. However, this policy is not directly applicable to the facility as the project site is not in a state of disrepair or disuse.

New York City Policy A: Improve Urban Shorelines By Maintaining, Removing Or Recycling Waterfront Structures (Piers, Docks, Wharves, Etc.) In Accordance With Waterfront Development Policies And Plans. Identify Alternative Uses For Underutlized Waterfront Structures.

The proposed combined cycle facility is consistent with this policy. The proposed siting places the facility immediately adjacent to existing power station development that allows for the utilization of infrastructure attendant to the existing Charles Poletti Power Project, such as the existing facility's intake and discharge structures. This increased dependence on existing waterfront structures at the Charles Poletti Power Project will ensure that such facilities are properly maintained and do not fall into a state of disrepair

Policy 2: Facilitate The Siting Of Water-Dependent Uses And Facilities On Or Adjacent To Coastal Waters.

The use of water for cooling purposes has been defined as a "water-dependent use" in the Coastal Management Plan. Therefore, the operation of the NYPA Combined Cycle Project is a water-dependent use of the property as the withdrawal of water from the East River is required for project cooling operations. In addition the proposed facility is considered a water-dependent use under Section 62-211 of the New York City Zoning Resolution. Under the City zoning resolution, electric power or steam generating plants are included within "Use Group 18". Section 62-211 specifies that land uses in Group 18 "that ship or receive materials or products by water as evidenced by operational docking facilities" are water-dependent uses. The Charles Poletti Power Project has operational docking facilities to receive fuel oil, and therefore, is considered a water-dependent use under the zoning resolution.

New York City Policy B: Improve Channels As Necessary To Maintain And Stimulate Economic Development.

The proposed facility will not result in the alteration of any navigation channels and as such this policy is not applicable to the proposed action. The project, however, will contribute to the maintenance and stimulation of economic development within the Astoria area of Queens as well as the whole of New York City.

Policy 3: Further Develop The State's Major Ports Of Albany, Buffalo, New York, Ogdensburg, And Oswego As Centers Of Commerce And Industry, And Encourage The Siting, In These Port Areas, Including Those Under The Jurisdiction Of State Public Authorities, Of Land Use And Development Which Is Essential To, Or In Support Of, The Waterborne Transportation Of Cargo And People.

This policy is not applicable to the proposed NYPA Combine Cycle Project.

Policy 4: Strengthen The Economic Base Of Smaller Harbor Areas By Encouraging The Development And Enhancement Of Those Traditional Uses And Activities Which Have Provided Such Areas With Their Unique Maritime Identity.

This policy is not applicable to the proposed NYPA Combined Cycle Project.

Policy 5: Encourage The Location Of Development In Areas Where Public Services And Facilities Essential To Such Development Are Adequate.

The project site was selected by virtue of its current use, the available acreage, and the ability to utilize the infrastructure attendant to the existing power plants. The proposed siting places the facility immediately adjacent to existing power station development on previously disturbed land, thereby minimizing potential visual intrusion, eliminating visual impacts to greenfield areas, and minimizing the acreage of land required to be disturbed and associated impacts. Moreover, the proposed facility will not induce development in areas of the surrounding community not previously considered. Development of the project site for power generation is consistent with the land use previously considered for the project site as indicated by the site's industrial zoning designation, M3-1.

Additionally, the proposed project will provide electric generation and improve the reliability of power generation and supply within the region, an essential public service. Power demand within the region is rising faster than the ability of the region's power systems to generate and deliver it. During July, 1999, the three major power pools in the Northeastern United States (the New York Power Pool, the New England Power Pool, and the Pennsylvania-Jersey-Maryland Interconnection) set records for demand. The pools reported to have much less generating capacity in reserve than optimally desired. Such reserves are required to allow the power systems to absorb unexpected problems such as the loss of generating power or downed transmission lines without resorting to voltage reduction or rolling blackouts[1]. The proposed Combined Cycle Project will assist in addressing the situation and result in improved system reliability. The proposed facility, therefore, is considered consistent with this policy.

Policy 6: Expedite Permit Procedures in Order to Facilitate the Siting of Development Activities at Suitable Locations.

This policy is not applicable to the construction and operation of the proposed Combined Cycle Project.

Fish and Wildlife Policies

Policy 7: Significant Coastal Fish And Wildlife Habitats Will Be Protected, Preserved, And Where Practical, Restored So As To Maintain Their Viability As Habitats.

[1] New York Times, Utility Officials Sweat Out a Record Demand, Wednesday, July 7, 1999.

The project will not be located within or affect any areas designated as "Significant Coastal Fish and Wildlife Habitats. The nearest designated significant coastal habitat is North and South Brother Island located approximately 4,000 feet northeast of the proposed project site. Considering the distance between the proposed project site and the islands, no impacts are anticipated. The proposed facility, therefore, complies with this policy.

Policy 8: Protect Fish And Wildlife Resources In The Coastal Area From The Introduction Of Hazardous Wastes And Other Pollutants Which Bio-Accumulate In The Food Chain Or Which Cause Significant Sublethal Or Lethal Effect On Those Resources.

NYPA will not use chemical additives that contain constituents that will bio-accumulate in the State's coastal fish and wildlife resources at levels that cause mortality or create physiological or behavioral disorders. For those operations and maintenance activities at the facility that require use of hazardous materials, appropriate storage, transport, treatment and disposal will occur in accordance with federal, state and local ordinances. Discharges associated with the facility will comply with applicable water quality criteria.

Policy 9: Expand Recreational Use Of Fish And Wildlife Resources In Coastal Areas By Increasing Access To Existing Resources, Supplementing Existing Stocks, And Developing New Resources.

Section 62-41 of the New York City Zoning Resolution exempts proposed land uses in "Use Group 18", which includes electric power or steam generating plants, from the waterfront public access requirements of the zoning resolution. This policy, therefore, does not apply to the proposed Combined Cycle Project.

Policy 10: Further Develop Commercial Finfish, Shellfish and Crustacean Resources in the Coastal Area by Encouraging the Construction of New, or Improvement of Existing On-shore Commercial Fishing Facilities, Increasing Marketing of the State's Seafood Products, Maintaining Adequate Stocks, and Expanding Aquaculture Facilities.

This policy is not applicable to the construction or operation of the proposed Combined Cycle Project.

Flooding and Erosion Hazard Policies

Policy 11: Buildings And Other Structures Will Be Sited In The Coastal Area So As To Minimize Damage To Property And The Endangering Of Human Lives Caused By Flooding And Erosion.

The proposed Combined Cycle Project main generating building and cooling towers will be located approximately 400-feet from the east bank of the East River. This setback distance is similar to existing facilities on site, and is considered sufficient to minimize damage from coastal erosion and related hazards. Coastal erosion and flooding has not been a concern during the 23-year operation of the existing Charles Poletti Power Project and according to the New York City Comprehensive Waterfront Plan, the project site is not located within a designated Coastal Erosion Hazard Area.

The proposed NYPA Combined Cycle Project will comply with all federal, State, and local floodplain requirements described above. A significant portion of the project site lies within the 100-year floodplain of the East River, and as such, the facility will be designed to comply with the floodproofing standards of the Federal Emergency Management Agency (FEMA). FEMA requirements essentially ensure that the proposed development would not result in impedance of flood flows and that the structure itself can withstand flooding conditions. According to FEMA, the floodplain elevation in the vicinity of the project site is 13 feet above sea level (ASL). Any development under 13 ASL would be subject to flood proofing requirements. Preliminary designs for the proposed facility indicate that the project site is located at elevation 15 ASL and the proposed facility's ground floor elevation will be over 16 ASL. The proposed facility, therefore, is consistent with this policy.

New York City Policy C: Provide Shorefront protection against coastal erosion hazards where there is public benefit and public use along non-public shores.

Coastal erosion and flooding has not been a concern during the 23-year operation of the existing Charles Poletti Power Project and according to the New York City Comprehensive Waterfront Plan, the site is not located within a designated Coastal Erosion Hazard Area. Moreover, as public access to the existing Charles Poletti Power Project and proposed Combined Cycle Project would conflict with the operation of the facility and/or be detrimental to public welfare, there is no public use along the station's shorefront. Therefore, this policy is not applicable to the proposed NYPA Combined Cycle Project.

New York City Policy D: Provide technical assistance for the identification and evaluation of erosion problems, as well as the development of erosion control plans along privately-owned eroding shores.

The existing NYPA Charles Poletti Power Project relies on its private shorefront for the receipt of fueling oil. The existing facility's intake and discharge structures are also located on the shorefront. As such, NYPA is committed to the continued maintenance of its shoreline to ensure reliable operation of the existing facilities on site as well as the proposed combined cycle facility.

New York City Policy E: Implement Public and Private Structural Flood and Erosion Control Projects Only When:

- *Public Economic and Environmental Benefits Exceeds Public Economic and Environmental Costs;*
- *Non-Structural Solutions are Proven to be Ineffective and Cost Prohibitive;*
- *Projects are Compatible with Other Coastal Management Goals and Objectives, including aesthetics, access, and recreation;*
- *Adverse Environmental Impacts are Minimized;*
- *Natural Protective Features are not impaired; and*
- *Adjacent (downdrift) shorelines are not adversely affected.*

This policy is not applicable to the construction or operation of the proposed NYPA Combined Cycle Project.

Policy 12: Activities or Development in the Coastal Area Will be Undertaken So As to Minimize Damage to Natural Resources and Property from Flooding and Erosion by Protecting Natural Protective Features Including Beaches, Dunes, Barrier Islands and Bluffs.

The proposed NYPA Combined Cycle Project will be sited on property currently developed as a paved storage area for miscellaneous equipment. This policy, therefore, is not applicable to the construction or operation of the proposed facility.

Policy 13: The Construction or Reconstruction of Erosion Protection Structures Shall be Undertaken Only If They Have a Reasonable Probability of Controlling Erosion for at Least Thirty Years as Demonstrated in Design and Construction Standards and/or Assured Maintenance or Replacement Programs.

This policy is not applicable to the construction or operation of the proposed NYPA Combined Cycle Project.

Policy 14: Activities And Development, Including The Construction Or Reconstruction Of Erosion Protection Structures, Shall Be Undertaken So That There Will Be No Measurable Increase In Erosion Or Flooding At The Site Of Such Activities Or Development, Or At Other Locations.

Construction and operation of the proposed facility will not result in an increase in erosion or flooding of the project site and surrounding lands. As the project site is currently developed as a paved storage area for miscellaneous equipment, there will be no increase in impervious area at the site and post-development stormwater runoff will not exceed pre-development flow. Therefore, there will be no increase in peak discharge leaving the site as a result of proposed facility structures and increases in the potential for erosion and flooding will not occur.

Policy 15: Mining, Excavation Or Dredging In Coastal Waters Shall not Significantly Interfere With The Natural Coastal Processes Which Supply Beach Materials To Land Adjacent To Such Waters And Shall Be Undertaken In A Manner Which Will Not Cause An Increase In Erosion Of Such Land.

Dredging within coastal waters will not be required during the construction of the proposed facility. As such, this policy does not apply to the operation or construction of the NYPA Combined Cycle Project.

Policy 16: Public Funds Shall Only Be Used for Erosion Protective Structures Where Necessary to Protect Human Life, and New Development Which Requires a Location Within or Adjacent to an Erosion Hazard Area to be Able to Function, or Existing Development; and Only Where the Public Benefits Outweigh the Long Term Monetary and Other Costs Including the Potential for Increasing Erosion and Adverse Effects on Natural Protective Features.

This policy is not applicable to the operation or construction of the NYPA Combined Cycle Project.

Policy 17: Non-Structural Measures To Minimize Damage To Natural Resources And Property From Flooding And Erosion Shall Be Used Whenever Possible.

The siting of proposed NYPA Combined Cycle Project has considered non-structural measures to minimize potential flood damages. As indicated above, proposed setback distances to major structures from coastal waters are similar to existing facilities on site, and are considered sufficient to minimize damage from coastal erosion and flooding hazards. Coastal erosion and flooding has not been a concern over the 23-year operation of the existing Charles Poletti Power Project and the proposed project site is not located within a designated Coastal Erosion Hazard Area. Moreover, to ensure that flooding does not damage proposed site improvements, facility structures will be constructed at elevations greater than that required by the FEMA.

General Policy

Policy 18: To Safeguard The Vital Economic, Social And Environmental Interests Of The State And Of Its Citizens, Proposed Major Actions In The Coastal Area Must Give Full Consideration To Those Interests, And To The Safeguards Which The State Has Established To Protect Valuable Coastal Resource Areas.

The Article X process is a comprehensive siting process that takes into account many factors, including the economic, social and environmental impacts of a proposed facility. Under Article X Applications, applicants are required to obtain a "Certificate of Environmental Compatibility and Public Need" (certificate) prior to construction of a proposed facility. The grant of a certificate is predicated upon a finding that the facility is compatible with public health, safety and the environment; complies with State and local laws; and is in the public interest. By filing this Article X Application and obtaining a certificate, NYPA has complied with this policy.

Moreover, as described throughout this consistency assessment and the environmental analyses contained within the facility's Article X Application, the proposed facility has been sited and designed and will be constructed and operated in a manner that safeguards coastal resources and the environment. No dredging within the East River will be required. Economic interests within the river, such as navigation and transportation of goods and services, and recreational activities will not be affected by the proposed facility. Existing water quality within the East River will be maintained and aquatic resources will not be adversely affected. Existing land uses within the coastal zone will not be adversely affected . Cultural Resources, including historic structures and archaeological sites will not be impacted by the project. Threatened, endangered, or sensitive plant and wildlife species will not be impacted by the facility. For a more detailed discussion of the assessment of potential facility impacts see Sections 4.0 - Land Use, 7.0 - Surface Water Resources, 8.0 - Aquatic Resources, 9.0 - Vegetation and Wildlife, and 11.0 - Cultural Resources of the NYPA Combined Cycle Project Article X Application.

Public Access Policies

Policy 19: Protect, Maintain, And Increase The Level And Types Of Access To Public Water-Related Recreation Resources And Facilities.

The proposed facility will not adversely impact existing access to public water-related recreation resources and facilities in the vicinity of the site. All proposed development will be located on private lands owned by the Applicant. Access and use of existing waterfront parks will not be affected by the combined cycle facility.

Policy 20: Access To The Publicly-Owned Foreshore And To Lands Immediately Adjacent To The Foreshore Or The Waters Edge That Are Publicly-Owned Shall Be Provided And It Shall Be Provided In A Manner Compatible With Adjoining Uses.

As described above, the proposed facility will not result in a reduction in existing public access to the East River shorefront. Public access to the East River shorefront is currently offered at Astoria Park, located approximately one mile south of the project site. Access is also offered at the recreation facilities located on Randall's Island, approximately one-mile west of the project site.

Moreover, the proposed project is exempt from the from the waterfront public access requirements of the New York City Zoning Resolution as public access to the Combined Cycle Project site or existing Charles Poletti Project facilities would conflict with the operation of the existing and proposed facilities and/or be detrimental to public welfare. The proposed Combined Cycle Project, therefore, is considered to be consistent with this policy.

Policy 21: Water-Dependent And Water-Enhanced Recreation Will Be Encouraged And Facilitated, And Will Be Given Priority Over Non-Water-Related Used Along The Coast.

As previously described, the proposed Combined Cycle Project will not interfere with any existing water-related uses or recreational uses. Moreover, the use of water for cooling purposes has been defined as a "water-dependent use" in the New York State Coastal Management Plan. Therefore, the operation of the proposed NYPA Combined Cycle Project is a water-dependent use of the property as the withdrawal of water from the East River is required for project cooling operations.

The proposed facility is also considered a water-dependent use under Section 62-211 of the New York City *Zoning Resolution*. Under the City zoning resolution, electric power or steam generating plants are included within "Use Group 18". Section 62-211 specifies that land uses in Group 18 "that ship or receive materials or products by water as evidenced by operational docking facilities" are water-dependent uses. The NYPA Charles Poletti Power Project (including the proposed combined cycle facility) has operational docking facilities to receive fuel oil, and therefore, is considered a water-dependent use under the zoning resolution. The proposed combined cycle facility, therefore, is consistent with this policy.

New York City Policy F: Priority Shall be Given to the Development of Mapped Parklands and Appropriate Open Space Where the Opportunity Exists to Meet the Recreational Needs of:

- *Immobile User Groups; and*
- *Communities without adequate waterfront park space and/or facilities.*

This policy is not applicable to the proposed combined cycle facility. Public access to the East River shorefront is currently offered at Astoria Park, located approximately one mile south of the project site. Access is also offered at the recreation facilities located on Randall's Island, approximately one-mile west of the project site.

New York City Policy G: Maintain and Protect New York City Beaches to the Fullest Extent Possible.

This policy is not applicable to construction or operation of the proposed NYPA Combined Cycle Project.

Policy 22: Development, When Located Adjacent To The Shore, Will Provide For Water-Related Recreation, Whenever Such Use Is Compatible With Reasonably Anticipated Demand For Such Activities, And Is Compatible With The Primary Purpose Of The Development.

This policy is inapplicable to the NYPA Combined Cycle Project because the primary purpose of the development, the generation of electricity, is inherently incompatible with recreational use of the Project Site. Moreover, Section 62-41 of the New York City Zoning Resolution exempts proposed land uses in "Use Group 18", which includes electric power or steam generating plants, from the waterfront public access requirements of the zoning resolution.

Historic And Scenic Resources Policies

Policy 23: Protect, Enhance And Restore Structures, Districts, Areas Or Sites That Are Of Significance In The History, Architecture, Archaeology Or Culture Of The State, Its Communities, Or The Nation.

The Project will not significantly impact historic or cultural resources. According to historical maps, the actual project site was located beyond the natural shoreline prior to 1898. The coastline in this area was modified by construction of a pier and bulkheads, approved in the early 1900s, and the former Berrians Island became obscured by the filling of Berrian's Creek, which connected the island to mainland Astoria.

Shortly after 1900, the Astoria Light, Heat and Power Company located in Astoria at Lawrence Point. This was the first central plant located off Manhattan to supply New York City with gas and later electricity. The original 1905 powerhouse building remains near the proposed project site. According to historical Sanborn maps from 1915, a gas manufacturing plant was developed in the area south of the proposed plant site; this area is currently occupied by the Astoria West 138 kV substation, an extensive maintenance supply warehouse, and outdoor storage and parking areas. The proposed combined cycle facility site area was used for coal storage for the gas manufacturing plant.

Between 1936 and 1948, portions of the gas plant (i.e., inclined retort house and horizontal retort house) were demolished. A new coal-fired Astoria generating station was constructed in 1953 along the East River shoreline, west of the area formerly occupied by the gas plant, and additional units added between 1958 and 1960. The Astoria generating station was operated by Consolidated Edison. The original 1905 powerhouse was idled in the 1950s, and modifications were undertaken around 1960 to reuse the building as a sintering plant. This process used the coal ash by-product from the coal burned at the power plant to manufacture porous cellular nodules for concrete.

In 1975, NYPA acquired the partially built Astoria Plant # 6 from Con Edison and formally renamed it the Charles Poletti Power Project. This 825 MW plant remains operational. The proposed Combined Cycle Project site is currently paved and is used for contractor parking and outdoor storage for miscellaneous equipment and materials.

In December 1987, a literature review and cultural resource inventory (i.e., Phase 1A report) was prepared for the Poletti Power Project by Hartgen Archeological Associates, Inc. This report presented prehistoric and historic overviews of the Poletti Project site along with an assessment of archeological sensitivity. While the report identified a moderate sensitivity for intact prehistoric cultural resources in the vicinity of the project area, historic maps indicate that the area proposed for the combined cycle facility consists of made land that was beyond the natural shoreline prior to 1891.

Since the proposed project site was created by the placement of fill around the turn of the century, the site is considered to have no potential for prehistoric archeological resources. Historic archeological resources are also unlikely to be found at the proposed project site considering the distance from the sintering building and the absence of any documentation in the 1987 report to indicate prior use of the proposed site.

To supplement the 1987 report and verify the absence of any significant historic use of the proposed project site, historic Sanborn Fire Insurance Maps were obtained for the years 1898, 1915, 1936, 1948, 1967, 1976, 1985, and 1990. These maps indicated that extensive development of the NYPA/Con Edison parcel occurred between 1898 and 1915 with the construction of the sintering building and facilities associated with a manufactured gas plant during that time. The area of the proposed Combined Cycle Project site is clearly shown up through 1948 as being used for coal storage associated with the gas plant. By 1967, most of the facilities associated with the manufactured gas plant had been removed and the present facilities associated with Orion's Astoria project has been constructed. The proposed project site remained unoccupied by any structures throughout this period.

On September 30, 1999, a meeting was held with representatives from the Office of Parks, Recreation and Historic Preservation (OPRHP) to review the information known about the proposed project site and determine the need for any additional archeological investigations. At that meeting, it was agreed that the potential for any significant archeological resources was unlikely. It was requested by OPRHP that an addendum to the 1987 report be prepared to document the results of the planned geotechnical investigation and to summarize the additional mapped information. This report was submitted to OPRHP on June 27, 2000

As a result of this consultation with the OPRHP and subsequent submittal of June 2000, no further archeological investigations are warranted or planned.

New York City Policy H: Insure Ongoing Maintenance of all waterfront parks and beaches to promote full use of secure, clean areas with fully operable facilities.

This policy is not applicable to the proposed NYPA Combined Cycle Project.

Policy 24: Prevent Impairment Of Scenic Resources Of Statewide Significance.

Discussions with representatives of the NYSDOS have indicated that there are no designated scenic areas of statewide significance in the vicinity of the project site. This policy, therefore, is not applicable to the proposed NYPA Combined Cycle Project.

Policy 25: Protect, Restore Or Enhance Natural And Man-Made Resources Which Are Not Identified As Being Of Statewide Significance, But Which Contribute To The Overall Scenic Quality Of The Coastal Area.

A comprehensive assessment of project visibility and potential effect on visually sensitive resources was conducted for the NYPA Combined Cycle Project. In addition to local parks, the assessment evaluated potential impacts to state and national register sites, state parks, and designated scenic districts. The assessment considered the visual assessment criteria outlined in the New York City CEQR Technical Manual in addition to the criteria established in the coastal scenic evaluation method implemented by the NYSDOS. The visual assessment for the project concluded that the incremental visual change with the facility will not adversely affect the regional landscape quality nor impact any visually sensitive resources. The assessment of project visibility and potential effects are described in greater detail in Section 10.0 - Visual Resources of the project's Article X Application.

Policy 26: Conserve and Protect Agricultural Lands in the State's Coastal Area.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Energy and Ice Management Policies

Policy 27: Decisions On The Siting And Construction Of Major Energy Facilities In The Coastal Area Will Be Based On Public Energy Needs, Compatibility Of Such Facilities With The Environment, And The Facility's Need For A Shorefront Location.

Public Interest Considerations. The purpose of the proposed 500 MW NYPA Combined Cycle Project is to provide economical, reliable, efficient and environmentally safe electricity, an essential public service, to residents of New York Metropolitan Area and surrounding region. As previously described, power demand within the region is rising faster than the ability of the region's power systems to generate and deliver it. The proposed Combined Cycle Project will assist in addressing the situation and result in improved system reliability.

Compatibility with the Environment. As previously described under Policy 18, the NYPA Combined Cycle Project has been sited and designed and will be constructed and operated in a manner that safeguards coastal resources and the environment. Economic interests within the river and existing water quality, land uses, cultural resources and historic structures within the coastal zone will not be adversely affected. Threatened, endangered, or sensitive plant and wildlife species will not be impacted by the proposed facility.

Facility's Need for a Shorefront Location. As previously described under Policy 2, the use of water for cooling purposes has been defined as a "water-dependent use" in the New York State Coastal Management Plan. Therefore, the operation of the proposed facility is a water-dependent use of the property as the withdrawal of water from the East River is required for Project cooling operations.

In addition the proposed facility is considered a water-dependent use under Section 62-211 of the New York City Zoning Resolution. Under the City zoning resolution, electric power or steam generating plants are included within "Use Group 18. Section 62-211 specifies that land uses in Group 18 "that ship or receive materials or products by water as evidenced by operational docking facilities" are water-dependent uses. The NYPA Charles Poletti Power Project (including the proposed combined cycle facility) has operational docking facilities to receive fuel oil, and therefore, is also considered a water-dependent use under the city zoning resolution.

Policy 28: Ice Management Practices Shall Not Interfere With the Production of Hydroelectric Power, Damage Significant Fish and Wildlife and Their Habitats, or Increase Shoreline Erosion or Flooding.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Water and Air Resources Policies

Policy 29: Encourage the Development of Energy Resources on the Outer Continental Shelf, in Lake Erie and in Other Water Bodies, and Ensure the Environmental Safety of Such Activities.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Policy 30: Municipal, Industrial, And Commercial Discharge Of Pollutants, Including But Not Limited To, Toxic And Hazardous Substances, Into Coastal Waters Will Conform To State And National Water Quality Standards.

Discharge of process wastewater (i.e., cooling tower blowdown) will conform to state and federal water quality standards and will therefore be consistent with this policy. See section 7.0 of the project's Article X Application for demonstration of consistency.

Policy 31: State Coastal Area Policies and Management Objectives of Approved Local Waterfront Revitalization Programs Will Be Considered While Reviewing Coastal Water Classifications and While Modifying Water Quality Standards; However, Those Waters Already Over-burdened with Contaminants Will Be Recognized as Being a Developmental Constraint.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Policy 32: Encourage the Use of Alternative or Innovative Sanitary Waste Systems in Small Communities Where the Costs of Conventional Facilities are Unreasonably High, Given the Size of the Existing Tax Base of These Communities.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Policy 33: Best Management Practices Will Be Used To Ensure The Control Of Stormwater Runoff And Combined Sewer Overflows Draining Into Coastal Waters.

Existing stormwater management controls at the existing Charles Poletti Project will ensure that there will be no direct discharge of stormwater to coastal waters as a result of the construction or operation of the Combined Cycle Project. The topography at the proposed site is relatively flat with an average elevation approximately 15.0 feet above mean sea level. The predevelopment drainage at the project site consists of both sheet flow (the existing parking lot area) and overland flow with direct discharges from ditches and culverts to the discharge canal located on the East River.

Because nearly all of the proposed project site is currently paved and used for material storage and parking, the increase in impervious coverage is expected to be minimal with the proposed construction of the generation facility building, cooling tower, and associated site access drives. Nevertheless, stormwater management techniques will be implemented for the proposed facility to ensure that the amount and peak rate of runoff is no greater than current site conditions. The management of stormwater at the proposed facility will comply with the regulations of the NYSDEC and the NYCDEP. The integration of the proposed combined cycle facility with the existing Charles Poletti Power Project stormwater management plan will ensure that there will be no significant increase in peak discharge leaving the site as a result of facility structures and increases in the potential for flooding will not occur.

During construction, appropriate sediment and erosion control measures, including silt fences and hay bale barriers, will be implemented to ensure that runoff from construction areas is minimized and does not leave the project site or impact the East River.

Policy 34: Discharge of Waste Materials into Coastal Waters From Vessels Subject to State Jurisdiction into Coastal Waters Will be Limited so as to Protect Significant Fish and Wildlife Habitats, Recreational Areas and Water Supply Areas.

This policy is not applicable to the construction and operation of the proposed NYPA Combined Cycle Project.

Policy 35: Dredging and Dredge Spoil Disposal in Coastal Waters will be Undertaken in a Manner that Meets Existing State Dredging Permit Requirements, and Protects Significant Fish and Wildlife Habitats, Scenic Resources, Natural Protective Features, Important Agricultural Lands and Wetlands.

Dredging within coastal waters will not be required during the construction of the NYPA Combined Cycle Project. As such, this policy does not apply to the proposed facility.

Policy 36: Activities Related To The Shipment And Storage Of Petroleum And Other Hazardous Materials Will Be Conducted In A Manner That Will Prevent Or At Least Minimize Spills Into Coastal Waters; All Practicable Efforts Will Be Undertaken To Expedite The Cleanup Of Such Discharges; And Restitution For Damages Will Be Required When These Spills Occur.

The shipment and storage of petroleum, chemicals, and other hazardous materials used during the operation of the proposed facility will be handled in a manner consistent with the measures employed for the operation of the exist Charles Poletti Power Project, which has been in operation for the last 23-years. The existing Charles Poletti Power Project has the following plans in place to mitigate impacts to the environment: Storm Water Pollution Prevention Plan; Spill Prevention, Control, Countermeasure (SPCC) Plan; Groundwater Petroleum Spill Contingency Plan; Facility Response Plan; and a Hazardous Waste Contingency Plan. The proposed Combined Cycle Project will be designed in conformance with current regulatory guidelines and in conformance with the goals and objectives of the existing plans. These plans will be revised or supplemented to incorporate the proposed project prior to operation and submitted as a compliance filing. In addition, personnel at the proposed facility will be trained in the areas of plant safety, environmental systems and controls, security procedures, emergency response to hazardous materials and appropriate spill response procedures including initial containment and notification requirements.

Policy 37: Best Management Practices Will Be Utilized To Minimize The Non-Point Discharge Of Excess Nutrients, Organics And Eroded Soils Into Coastal Waters.

The proposed Combined Cycle Project will not result in the discharge or excess nutrients or organics into coastal waters. Implementation of best management practices as described in Policies 14, 15, 17, and 33 above, will ensure that sedimentation run-off from construction areas is minimized and does not leave the project site or impact on-site wetlands or coastal waterways.

Policy 38: The Quality And Quantity Of Surface Waters And Groundwater Supplies, Will Be Conserved And Protected, Particularly Where Such Waters Constitute The Primary Or Sole Source Of Water Supply.

The project site is not located in a sole source aquifer and will not derive any quantity of water from a sole source aquifer. Potable water supply for the proposed facility will be provided by the New York City water supply system. Therefore, this policy does not apply to the construction or operation of the proposed Combined Cycle Project.

Policy 39: The Transport, Storage, Treatment And Disposal Of Solid Wastes, Particularly Hazardous Wastes, Within Coastal Areas Will Be Conducted In Such A Manner So As To Protect Groundwater And Surface Water Supplies, Significant Fish And Wildlife Habitats, Recreation Areas, Important Agricultural Land, And Scenic Resources.

There are no significant fish and wildlife habitats, important agricultural lands, or designated scenic areas in the immediate vicinity of the proposed project site. To ensure that significant impacts to coastal waters do not occur as a result of the construction and operation of the proposed facility, the shipment and storage of petroleum, chemicals, and other hazardous materials used during the operation of the proposed facility will be handled in a manner consistent with the measures employed for the operation of the exist Charles Poletti Power Project, which has been in operation for the last 23-years. The existing Charles Poletti Power Project has the following plans in place to mitigate impacts to the environment: Storm Water Pollution Prevention Plan; Spill Prevention, Control, Countermeasure (SPCC) Plan; Groundwater Petroleum Spill Contingency Plan; Facility Response Plan; and a Hazardous Waste Contingency Plan. The proposed Combined Cycle Project will be designed in conformance with current regulatory guidelines and in conformance with the goals and objectives of the existing plans. These plans will be revised or supplemented to incorporate the proposed project prior to operation and submitted as a compliance filing. In addition, personnel at the proposed facility will be trained in the areas of plant safety, environmental systems and controls, security procedures, emergency response to hazardous materials and appropriate spill response procedures including initial containment and notification requirements.

Policy 40: Effluent Discharged From Major Steam Electric Generating And Industrial Facilities Into Coastal Waters Will Not Be Unduly Injurious To Fish And Wildlife And Shall Conform To State Water Quality Standards.

The NYPA Combined Cycle Project will not discharge pollutants in contravention of applicable water quality criteria. The discharge of process wastewater (i.e. cooling tower blowdown) will be directed to the discharge canal which serves the existing Charles Poletti Power Project and will be rapidly dissipated within a small mixing zone at the outfall. Therefore, the facility will be consistent with this policy and will ensure the protection of fish and wildlife.

Policy 41: Land Use Or Development In The Coastal Area Will Not Cause National Or State Air Quality Standards To Be Violated.

As described in Section 5, Air Quality, air emissions from the NYPA Combined Cycle Project will not cause a violation of National or New York State ambient air quality standards. Stringent emission control measures will be part of the project and will ensure that local air quality will not be affected. As a result of the proposed project, the existing Poletti boiler will see significantly reduced operation and the use of less residual oil. These changes, to be formalized in federally enforceable permit modifications, will result in a significant reduction in the emissions of most pollutants and will ensure further progress in the improvement in regional air quality is made. The proposed facility's impact on local air quality was assessed through the application of air quality dispersion models developed by the USEPA and endorsed by NYSDEC. The results of these studies showed that maximum plant impacts will be a small fraction of applicable air quality standards as to be considered insignificant by USEPA definition. See Section 5.0, Air Quality, of the project's Article X Application and the accompanying Prevention of Significant Deterioration of Air Quality Application for detailed information on air modeling methodology and results.

Policy 42: Coastal Management Policies Will Be Considered If the State Reclassifies Land Areas Pursuant to Prevention of Significant Deterioration Regulations of the Federal Clean Air Act.

This policy is not applicable to the construction and operation of the NYPA Combined Cycle Project.

Policy 43: Land Use Or Development In The Coastal Area Must Not Cause The Generation Of Significant Amounts Of Acid Rain Precursors: Nitrates And Sulfates.

The NYPA Combined Cycle Project will not cause the generation of significant amounts of acid rain precursors due to enacted Federal and State regulations, as well as certain features with respect to facility design and operation that will minimize the release of precursor pollutants. These elements are discussed in further detail below.

Specific to enacted legislation, the proposed facility will be affected by, and participate in, the Title IV Acid Rain program as well as the 6 NYCRR Part 204 NO_x Budget program. These programs provide for emission reductions through a "cap and trade" system. Under this system, emissions from the regulated group of facilities were capped at certain baseline levels with provisions to allow for the generation of emission "allowances" (an allowance being equal to 1 ton of emission) through unit shut down or over control. Periodic reductions in the emission cap through regulatory means provide for a gradual reduction in total pollutant emissions. Under the Acid Rain program, annual emissions of SO_2 from the Combined

Cycle Project will need to be offset on a one-to-one basis. The offsets required are in the form of allowances that were previously discussed. Likewise, the NO_x Budget program will require the purchase of allowances to offset "ozone season" (May 1 through September 30) NO_x emissions.

Emissions of NO_x, SO_2 and nitrates/sulfates from Combined Cycle Project will be minimized through the application of several operational and design features. The facility will utilize clean burning natural gas as the primary fuel and low sulfur distillate oil (0.04% sulfur) as the back-up fuel. Additionally, the use of Selective Catalytic Reduction (SCR) will be used to control NO_x emissions and the use of 0.04 sulfur distillate oil will minimize emissions of SO_2.

The PSD and Article X permit applications for the proposed project contain further detail on facility design and emissions.

Policy 44: Preserve And Protect Tidal And Freshwater Wetlands And Preserve The Benefits Derived From These Areas.

Wetlands regulated under the New York State Freshwater and Tidal Wetlands Acts have been mapped and classified by the NYSDEC. No state-regulated freshwater wetlands are present on the site or within the vicinity of the site based on the NYSDEC map of the area. The potential for tidal wetlands on site is precluded by existing bulkheads and rip rap along the shoreline in the vicinity of the project site. However, tidal wetland resources associated with the East River and Steinway Creek are located approximately 3,000 feet southeast of the proposed project site, as shown on the NYSDEC Tidal Wetland Map. The East River and Steinway Creek are identified as Littoral Zone while an area of Coastal Shoal, Bar and Flat is identified along the western shoreline of Steinway Creek.

A wetlands reconnaissance survey was conducted in the spring of 1999 to confirm the absence of wetlands as defined by the U.S. Army Corps of Engineers (1987 Wetlands Delineation Manual). The U.S. Army Corps of Engineers (ACOE) regulates the discharge of dredged or fill material into wetlands under Section 404 of the Clean Water Act. The ACOE defines wetlands as:

> Areas that are periodically or permanently inundated or saturated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs, and similar areas... Wetland boundaries are determined using a three parameter approach described in the current accepted Corps Manual for identifying and delineating jurisdictional wetlands..

The site survey conducted included areas proposed for construction, equipment laydown, and construction worker parking. No federally regulated wetlands were encountered on site. Therefore, no wetland impacts are anticipated as a result of the Combined Cycle Project.

Appendix 5A

Appendix 5A

APPENDIX 5A

Air Modeling Protocol:
New York Power Authority – Combined Cycle Project
Astoria, Queens, New York

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1.0 INTRODUCTION

The New York Power Authority (NYPA) is proposing to construct and operate a nominal 500-megawatt (MW) electric generating facility at its existing Charles A. Poletti Power Project Generating Station in Astoria, Queens. Known as the "NYPA Combined Cycle Facility" project, the facility will consist of two General Electric (GE) Frame 7FA combustion turbines, two unfired heat recovery steam generators (HRSGs) and a steam turbine. Steam created in the HRSG will be used to drive the steam turbine generator. Selective Catalytic Reduction (SCR) will be used to control nitrogen oxide (NO_x) emissions. In addition, an oxidation catalyst may be used to control emissions of carbon monoxide (CO) (depending upon the timing of the proposed re-designation of the CO non-attainment in the New York City area to attainment – see discussion in the following paragraph). Upon leaving the SCR, turbine exhaust gases will be directed to one dual-flue stack. A mechanical draft wet/dry cooling tower will be used to cool the plant's condenser.

Based on the results of a netting analysis, which is detailed in Section 4.2, the project will need to undergo New Source Review (NSR) for CO. The netting will allow the project to avoid Prevention of Significant Deterioration (PSD) review for sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate matter with an aerodynamic diameter less than 10μm (PM-10) emissions. Note that PM-10 emissions include both the filterable and condensable components. In addition, the netting will preclude NSR applicability to NO_x and volatile organic compound (VOC) emissions (as precursors to the non-attainment pollutant ozone). Note that the New York City area is being re-designated as in attainment for CO, however, not until sometime in the year 2001 (TRC, 2000). Since the air permit application is to be filed prior to the re-designation, but facility start-up will occur afterwards, all permitting work, including this protocol, will include an evaluation of impacts and regulatory applicability for both scenarios; CO attainment and non-attainment. This approach will allow for an easier transition in permitting when re-designation actually occurs as all possible impacts and requirements specific to CO will have been addressed.

The size of the project and related potential emissions necessitate the performance of air impact modeling to assess maximum ground level facility impacts for compliance with National and New York Ambient Air Quality Standards (NAAQS and NYAAQS). If modeling shows significant impacts, additional analyses, including a multi-source impact assessment and air quality benefit analysis of impacts from the existing source (used in the netting) and proposed source would be made. The air quality benefit analysis would be done to assure that any differences in impacts between the existing and proposed sources do not affect available increment and/or AAQS. This modeling protocol has been prepared to detail the techniques that are proposed to be used in completing the air quality evaluation of the proposed NYPA Combined Cycle Facility.

In addition to the required air quality evaluation, the New York State Department of Health (NYSDOH) requires that potential toxic air pollutant emissions from proposed sources be evaluated to ensure that maximum ambient air concentrations are less than the guideline concentrations presented in several published databases and approved by the NYSDOH. Potential toxic air pollutant emissions from all existing and proposed NYPA sources at the Poletti site will be modeled for comparison to the guideline concentrations.

As was previously indicated, the proposed NYPA combined cycle facility will include a mechanical draft cooling tower. In accordance with NYSDEC/New York State Public Service Commission (NYSPSC) policy, the cooling tower emissions will be modeled to assess potential fogging, icing and drift deposition impacts. An analysis will also include impacts from potential air concentrations of any toxic substances that may be contained in the East River tower make-up water. Finally, modeling will also be performed to evaluate the visibility of the water vapor plumes that will be emitted from the cooling tower and turbine stack.

On August 5, 1999, representatives from NYPA and TRC Environmental Corporation (TRC), NYPA's environmental consultants on the project, attended a pre-application meeting with representatives of the New York State Department of Environmental Conservation (NYSDEC) and the New York State Public Service Commission (NYCPSC) in Albany, New York. The meeting was held to discuss key issues related to the permitting of the proposed facility including modeling, monitoring, BACT/LAER (Best Available Control Technology/Lowest Achievable Emission Rate), and additional required analyses. Based upon guidance obtained at that meeting, a draft modeling protocol incorporating elements of the August 5, 1999 meeting, as well as established regulatory guidance specific to the performance of an impact assessment as described in the United States Environmental Protection Agency (U.S. EPA) Modeling Guidelines (U.S. EPA, 1999) and the NYSDEC's Air Guide series was prepared and submitted to NYSDEC and NYSPSC on October 29, 1999. Comments received on that protocol have been incorporated into this document.

2.0 AREA DESCRIPTION

Figure 2-1 shows the location of the NYPA Poletti Generating Station and the surrounding area on the U.S. Geological Survey (USGS) 7.5-minute topographic map (Central Park, New York, Quadrangle). The proposed NYPA Combined Cycle Facility will be located at NYPA's existing 825 MW Charles Poletti Power Project in Astoria, Queens Borough, New York, and will occupy approximately 4 acres of the 47-acre area owned by NYPA. The proposed site for the new plant is paved and was previously used for contractor parking. The area is now used for outdoor storage of miscellaneous equipment and materials. Other infrastructure associated with the existing generating station includes an administration and warehouse building, an intake structure and discharge canal along the East River, a 1.0 million gallon water storage tank, a fuel oil tank farm consisting of six, 6.0 million gallon fuel oil storage tanks and miscellaneous ancillary facilities (i.e., foam pump house, underground piping, etc.). To the east of the site is an area occupied by several simple cycle combustion turbines recently acquired from Con Edison by NRG. Immediately to the west of the site is the former Con Edison Astoria Generating Station now owned by Orion Power Holdings. Fenced areas restricting public access to the site are depicted on Figure 2-1.

The Charles Poletti Power Project began commercial operation in 1977 and is capable of burning No. 6 fuel oil or natural gas. The facility is also permitted to fire small amounts of spent oils that are generated on-site. The existing plant includes one 8,266 mmBtu/hr boiler and one auxiliary 217 mmBtu/hr boiler. Electricity generated by the Poletti Project is transmitted to Con Edison's 345 kV system. The proposed project will take advantage of the unique opportunities provided by the existing facilities and interconnections at the Charles Poletti Power Project including natural gas supply, electric transmission, fuel storage, and water intake and discharge facilities.

The project site is located along the East River in the Astoria section of Queens Borough. The elevation of the site is approximately 5 feet (ft) above mean sea level (MSL). To the west, across the Hell Gate channel, are Wards Island and then Manhattan Island. To the north are the south reaches of Bronx Borough. To the east are Rikers Island and LaGuardia Airport. Queens Borough lies to the east, southeast and south. Terrain within 6 kilometers of the site is generally rolling with elevations limited to 80 feet or less, with the exception of several higher hills to 140 feet in northern Manhattan. Beyond 6 kilometers, terrain remains below stack top (approximately 292.5 feet above sea level) throughout Brooklyn and Queens Counties.

It is not until the Hudson River is crossed that elevated terrain (above stack top) is first encountered in the Palisades region of New Jersey. Elevated terrain is first reached in the Palisades approximately 7.5 kilometers to the northwest of the project site. Thereafter, only in a 2-kilometer-wide band of terrain that is the Palisades does the terrain consistently exceed stack top. This band stretches from the west through north portions of the area at distances ranging from approximately 9 kilometers west of the site to 16 kilometers and beyond to the north. Peak terrain in this area reaches over 400 feet above sea level in an area approximately 23 kilometers north-northwest of the site. Another area of elevated terrain is noted 16 kilometers and beyond to the north and northeast in the areas of Mount Vernon, Yonkers and the northern Bronx.

The plant is located at approximately 40°47' 17" North Latitude, 73°54' 20" West Longitude. The approximate Universal Transverse Mercator (UTM) coordinates of the plant are: 592,328 meters east, 4,515,641 meters north, in the Zone 18.

New York Power Authority
500 MW Combined Cycle Facility
Astoria, Queens, NY

Figure 2-1. Site Location Map
Scale: 1" = 2000'

Source: USGS Topographical Survey Map
Central Park N.Y. - N.J. Quadrangle, Photorevised 1979

TRC

3.0 FACILITY DESCRIPTION

The information contained in this section provides an overview of the equipment, operations, stack parameters and emission rates for the proposed facility. There always exist the possibility of changes in these parameters through design considerations or via changes that result from comments or suggestions raised during the Article X public involvement process. Information presented in this section will be replicated in the PSD and Article X applications and any changes that have been made will be reflected in those applications. NYPA will also provide whatever information is needed to support the completion of the NYCDEP air permitting of non-exempt combustion equipment. In addition, greater detail specific to equipment description and manufacturer specifications will be provided in the PSD, Article X and NYCDEP applications. Therefore, the PSD, Article X and NYCDEP applications will be the means by which the following preliminary parameters are verified and presented as final.

3.1 Equipment/Fuels

The proposed combined cycle facility will consist of two GE Frame 7FA combustion turbines with a nominal net power output of 170 MW (each), two HRSGs and a steam turbine generator with a net power output of approximately 160 MW. The steam created in the HRSGs will be used to drive the steam turbine generator. The total nominal electrical power from the combined cycle facility will be approximately 500 MW. An auxiliary boiler is not planned for the 500 MW combined cycle plant.

The combustion turbines will be capable of burning either natural gas or low sulfur No. 2 distillate oil and will utilize dry low NO_x technology with water injection for NO_x control when firing low sulfur (0.04%) No. 2 distillate fuel oil. SCR will be used to further control NO_x emissions and an oxidation catalyst may be used to control CO emissions (as was previously indicated, pending changes in the CO non-attainment designation to attainment has necessitated the need to evaluate two CO control scenarios).

The maximum heat input for the GE Frame 7FA turbine at -5 degrees Fahrenheit (°F) ambient temperature is 2,028 mmBtu/hr, HHV while firing distillate fuel oil. Because turbine performance and emissions are affected by ambient temperature and since performance increases during lower temperatures, an evaporative cooler will be used to cool the inlet air during the warmer seasons.

Steam leaving the steam turbine will be returned to a condenser that uses a closed circulating water loop. The circulating water will be cooled in two mechanical draft (wet/dry evaporative) cooling towers consisting of five cells each. Make-up water for the towers will be drawn from the East River and the tower blowdown will be discharged back to the East River. Each cell in the towers will have its own fan. The cooling towers will be equipped with high efficiency drift eliminators to minimize water drift losses.

3.2 Operation

The plant will be dispatchable but will be designed to operate on a continuous basis. Due to the dispatchable nature of the plant operation, periods of part load operation and multiple startups/shutdowns per week could occur. It is anticipated that the proposed NYPA Combined Cycle Facility will operate at a "base load" exceeding 80% capacity. However, the turbine may operate at maximum capacity (100% load) and part load, as low as 50% capacity. Therefore, the load screening analysis for the turbine will determine impacts for the turbine operating at 50%, 75%, and 100% load conditions. These conditions represent the minimum, midpoint, and maximum operating loads. Additional operating scenarios are possible considering fuel type and evaporative cooler use. These scenarios are detailed below, along with estimated emission rates.

3.3 Stack Configuration and Emission Parameters

The combustion turbines/HRSGs will be ducted to one dual-flue individual stack. The stack will be constructed to the Good Engineering Practice (GEP) formula height. This height, as described in the following section, has been calculated to be 287.5 feet above grade level. The base elevation of the proposed plant will be 5 feet above mean sea level.

The diameter of each flue will be 18.5 feet and the maximum separation between the flues will be no more than 1 flue diameter. Figure 3-1 presents a plan view of the proposed stack.

As was previously indicated, the NYPA Combined Cycle Facility will utilize an evaporative cooler to cool turbine inlet air in order to maintain peak operating efficiency during the warmer months. Considering fuels, loads and evaporative cooler use, there are numerous operating scenarios to consider in evaluating potential facility emissions and ambient air quality impacts. The NYSDEC has developed guidelines for establishing minimum, average and maximum ambient temperature set-points for turbine performance. For a project located in New York City, NYSDEC guidance requires that the average annual temperature shall equal the climatological average (as specified in the local climatological database for the representative National Weather Service (NWS) office). The La Guardia Airport NWS station has been selected as representative (and agreed upon as so by NYSDEC during the pre-application meeting) of the project site. The annual average temperature for La Guardia, based on historical data, is 54.6°F. The NYSDEC-recommended maximum and minimum temperature set-points are –5°F and 100°F. The use of the evaporative cooler during warmer months will affect inlet air temperature. When the evaporative cooler is operating, the three set-point temperatures will be –5°F, 45°F (cooled from 54.6°F) and 73°F (cooled from 100°F).

Exhaust and emission parameters are presented for three (non-chilled) ambient temperatures (-5°F, 54.6°F and 100°F), three turbine loads (50%, 75%, 100%), the evaporative cooler operating at 54.6°F (cooled to 45°F) and 100°F (cooled to 73°F) and two fuels (natural gas and distillate oil) (a total of 22 operating scenarios). Preliminary exhaust characteristics for the turbine/heat recovery steam generator are provided in Table 3-1. Preliminary emission rates from the turbine/heat recovery steam generator combustion train are provided in Table 3-2. As was indicated in Section 1.0, all permitting is being performed considering the New York City area as attainment and non-attainment of the CO standards. Therefore, two sets of CO emissions are provided in Table 3-2. One set reflects the use of an oxidation catalyst, and the other reflects the use of no catalyst. Note that since PM-10 emissions are affected by the use of a catalyst, two sets of PM-10 emissions are also provided in the table.

Emission rates for VOC, NO_x, CO and PM-10 from the combustion turbines have been estimated for natural gas and distillate oil firing based upon vendor emission estimates. Control efficiencies for SCR NO_x reduction and CO oxidation catalyst reduction are based upon catalyst vendor guarantees. Worst-case SO_2 emission rates have been estimated based upon a worst-case mass balance of fuel sulfur loading (distillate oil containing 0.04% sulfur by weight) at -5°F. SO_2 emissions rates during natural gas firing are based on a fuel sulfur content of 0.20 grains per 100 standard cubic feet of natural gas. The PM-10 emissions (which include condensable particulates) include an allowance for ammonia salt formation due to reaction of excess ammonia (NH_3) with sulfur trioxide (SO_3.) Note that the sulfur assumed to subsequently react with NH_3 has not been subtracted from the SO_2 estimate (likewise with sulfuric acid (H_2SO_4) mist).

SCR control for NO_x involves the use of ammonia, which acts to remove NO_x through the use of a catalyst. Some of the ammonia does not react with the NO_x and ends up being emitted into the atmosphere. The emission of un-reacted ammonia from an SCR is known as "ammonia slip". The maximum emission of ammonia slip will not exceed 10 parts per million (ppm) and such emissions will be evaluated as discussed in Section 5.8 of this protocol.

Emissions of toxic air pollutants from the turbine/HRSG stack and cooling tower will also be assessed in the modeling analysis. In accordance with the DEC's suggestion at the August 5th 1999 pre-application meeting, the U.S. EPA's AP-42 emission factors will be used to estimate the toxic air pollutant emissions from the turbine/HRSG stack, and from the Charles Poletti Power Project stack, for gas and oil firing. Use of these factors is also consistent with the Athens Generating Project, which proposes to use turbine technology similar to the proposed NYPA combined cycle project. For the cooling tower, a water quality analysis will be used to determine the toxic substance (if any) content of the East River make-up water, and subsequently, the potential toxic air pollutant emission rates. Preliminary exhaust characteristics for each cell of the 10-cell cooling tower are the same and include an exhaust height of 40 ft (12.2 m) above grade, exhaust temperature of 100 °F (311 K), exhaust velocity of 32.5 ft/sec (9.9 m/sec) and an exhaust diameter of 28 feet (8.5 m).

At the present time, no combustion source auxiliary equipment, such as internal combustion engine emergency generators or fire pumps, are planned at the proposed NYPA Combined Cycle

Facility. Since the proposed project is being located at the existing Poletti Power Project Generating Station site, auxiliary equipment already in place may be utilized to serve the proposed facility. If additional auxiliary equipment is needed, such equipment will be identified and modeled, following the methodologies presented herein, with the results included in the PSD Air Permit and Article X applications.

3.4 Good Engineering Practice Stack Height

Section 123 of the Clean Air Act Amendments required U.S. EPA to promulgate regulations to assure that the control of any air pollutant under an applicable State Implementation Plan (SIP) was not affected by (1) stack heights that exceed Good Engineering Practice (GEP) or (2) any other dispersion technique. The U.S. EPA provides specific guidance for determining GEP stack height and for determining whether building downwash will occur in the Guidance for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations), (U.S. EPA-450/4-80-023R, June, 1985). GEP is defined as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes that may be created by the source itself, or nearby structures, or nearby terrain "obstacles".

The GEP definition is based on the observed phenomenon of atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) are avoided.

The U.S. EPA GEP stack height regulations specify that the GEP stack height is calculated in the following manner:

$$H_{GEP} = H_B + 1.5L$$

Where: H_B = the height of adjacent or nearby structures, and
L = the lesser dimension (height or projected width of the adjacent or nearby structures)

The proposed combined cycle facility will be located on the eastern-most portion of the NYPA Poletti Station property. This location is sufficiently distant from the existing Poletti Station boiler building as to not influence the GEP calculations for the combined cycle facility. Therefore, the controlling structure for the combined cycle facility is expected to be the proposed turbine building, which will define the formula GEP height. The turbine building will have a height of 115 feet above grade level and would result in a GEP stack height of 287.5 feet above grade level, which is the current design value. Being of GEP height, the stack also extends well above the cavity region (defined as 1.5 times the height of the controlling structure).

A detailed GEP analysis will be provided in the PSD and Article X applications, including all input and output files from U.S. EPA's Building Profile Input Program (BPIP, version 95086) used to calculate the GEP height and any necessary building downwash parameters for input to the air quality model(s). A detailed plot plan of the proposed facility is provided in Figure 3-1. Figure 3-1 shows major structures associated with the proposed project, as well as property lines. Because of the size of the Poletti site, the depiction of fence lines is shown in Figure 2-1. An elevation view of the proposed facility is presented in Figure 3-2.

TABLE 3-1
STACK PARAMETERS USED FOR MODELING
NYPA COMBINED CYCLE FACILITY

GE 7FA Combustion Turbine Exhaust Characteristics

Case	Turbine Load	Turbine Fuel Type	Ambient Temp (°F)	Exhaust Temp (K)	Exhaust Velocity (m/s)
Case 01	100	Gas	-5	356.1	19.6
Case 02	75	Gas	-5	352.8	15.8
Case 03	50	Gas	-5	351.1	13.0
Case 04	100	Gas	54.6	356.7	18.5
Case 05	75	Gas	54.6	352.8	15.0
Case 06	50	Gas	54.6	350.6	12.3
Case 07	100	Gas	45(2)	357.2	18.9
Case 08	100	Gas	100	358.9	16.8
Case 09	75	Gas	100	355.0	13.9
Case 10	50	Gas	100	352.8	11.8
Case 11	100	Gas	73(2)	360.6	18.0
Case 12	100	Oil	-5	401.7	20.8
Case 13	75	Oil	-5	398.3	17.7
Case 14	50	Oil	-5	396.7	14.5
Case 15	100	Oil	54.6	408.3	22.1
Case 16	75	Oil	54.6	398.3	17.1
Case 17	50	Oil	54.6	396.7	14.1
Case 18	100	Oil	45(2)	410.0	22.6
Case 19	100	Oil	100	410.0	19.8
Case 20	75	Oil	100	402.8	16.2
Case 21	50	Oil	100	397.2	13.5
Case 22	100	Oil	73(2)	412.8	21.5

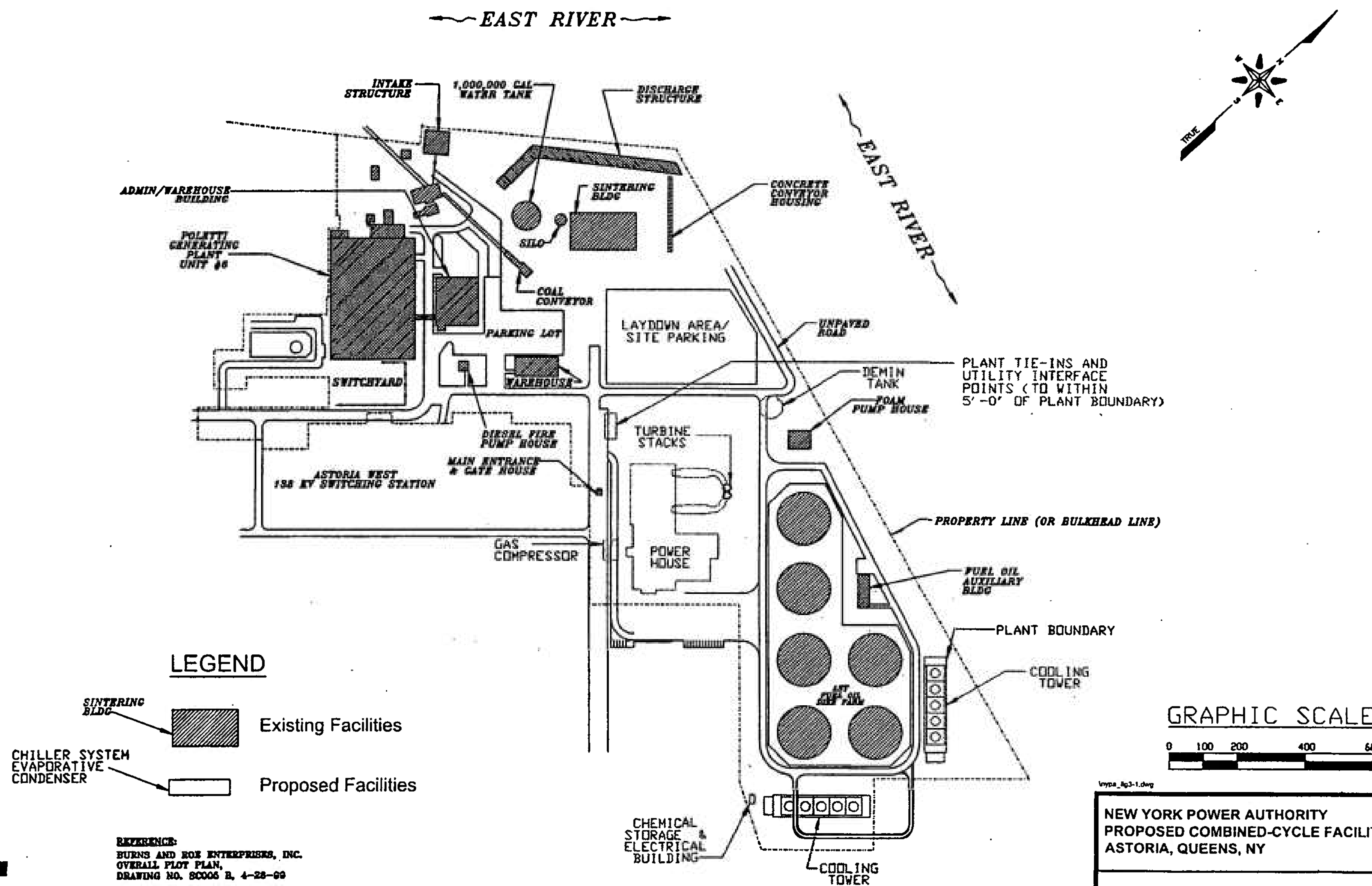
(1) Stack height is 287.5 feet above grade level, stack base is 5 feet above sea level, and the inner diameter of each flue is 18.5 feet.

(2) Temperature represents operations with the evaporative cooler active.

TABLE 3-2
TURBINE POTENTIAL EMISSION RATES
NYPA COMBINED CYCLE FACILITY

Modeled Source ID	Potential Emission Rate[1] (g/sec)			
	NO_x	CO [2]	PM-10 [3]	SO_2
Case 01	2.28	0.87 (3.91)	1.93 (1.89)	0.14
Case 02	1.82	0.70 (3.15)	1.93 (1.89)	0.12
Case 03	1.44	0.59 (2.65)	1.92 (1.89)	0.092
Case 04	2.07	0.81(3.65)	1.93 (1.89)	0.13
Case 05	1.68	0.67 (3.02)	1.92 (1.89)	0.11
Case 06	1.33	0.56 (2.52)	1.92 (1.89)	0.085
Case 07	2.10	0.84 (3.78)	1.93 (1.89)	0.13
Case 08	1.82	0.70 (3.15)	1.93 (1.89)	0.11
Case 09	1.51	0.59 (2.65)	1.92 (1.89)	0.10
Case 10	1.19	0.50 (2.27)	1.91 (1.89)	0.076
Case 11	2.00	0.76 (3.40)	1.93 (1.89)	0.12
Case 12	10.2	1.95 (7.81)	9.88 (6.43)	11.2
Case 13	8.19	1.70 (6.80)	8.87 (6.05)	9.11
Case 14	6.45	1.42 (5.67)	7.91 (5.67)	7.24
Case 15	9.69	2.05 (8.19)	9.59 (6.30)	10.6
Case 16	7.77	1.64 (6.55)	8.60 (5.92)	8.66
Case 17	6.12	1.35 (5.42)	7.80 (5.67)	6.90
Case 18	9.84	2.0 (8.32)	9.77 (6.43)	10.8
Case 19	8.52	1.80 (7.18)	8.94 (6.05)	9.34
Case 20	6.93	1.51 (6.05)	8.18 (5.80)	7.71
Case 21	5.43	1.29 (5.17)	7.31 (5.42)	6.11
Case 22	9.33	1.95 (7.81)	9.46 (6.30)	10.2

(1) Potential emission rates for a single GE Frame 7FA turbine.
(2) Values in (parenthesis) represent emissions without an oxidation catalyst.
(3) PM-10 emission rates with a catalyst reflect increased conversion of SO_2 to SO_3 and subsequently to ammonium bisulfate particulates. All PM-10 emission rates include condensable particulates.



TRC

REFERENCE:
BURNS AND ROE ENTERPRISES, INC.
OVERALL PLOT PLAN,
DRAWING NO. SC005 B, 4-28-99

SARGENT & LUNDY, LLC
SITE PLAN,
DRAWING NO. M005, REV 1, 5-25-00

NEW YORK POWER AUTHORITY
PROPOSED COMBINED-CYCLE FACILITY
ASTORIA, QUEENS, NY

Figure 3-1. Site Plan

Source: Burns and Roe; Sargent & Lundy

4.0 REGULATORY REQUIREMENTS

4.1 Attainment Status and Compliance with Air Quality Standards

The proposed location of the NYPA Combined Cycle Facility is an area currently designated as attainment for SO_2, NO_x, and PM-10. Therefore, for these pollutants, the facility is required to demonstrate compliance with the criteria pollutant NAAQS and NYAAQS shown in Table 4-1a and with the New York State non-criteria pollutant ambient standards in Table 4-1b. The area is designated as severe non-attainment for ozone. Therefore, facilities emitting more than 25 tons per year of NO_x or VOC are subject to NSR for these pollutants, which include the use of LAER controls, and emission offset requirements.

The metropolitan New York City area is currently a designated moderate non-attainment area for CO. NSR will be required since, even with the results of the netting (which is detailed in the following section), emissions of CO exceed 100 tons per year on a potential basis (assuming that modeled CO impacts are below significance, otherwise the major source threshold is 50 tons per year). At the present time, a request to re-designate the CO non-attainment area to attainment will likely be approved sometime within the year 2001 (TRC, 2000). As was previously discussed, since the PSD and Article X applications will be submitted prior to this time, yet the facility will become operational after re-designation, NYPA has decided to evaluate the impacts and regulatory applicability for both CO scenarios; attainment and non-attainment. None-the-less, if a LAER analysis is required for CO, due to a continuation of the CO non-attainment status, the application of an oxidation catalyst will result in potential CO emissions below the major source thresholds, thereby eliminating the need to obtain offsets and perform net benefit modeling. New York County is currently a designated moderate non-attainment area for PM-10. Although the project is located in Queens County, facility PM-10 impacts cannot exceed significant thresholds within the PM-10 non-attainment area (New York County defines a portion of the site's western property line).

4.2 Prevention of Significant Deterioration

NYPA's Poletti Power Project is an existing major PSD source. Modifications to existing major PSD sources that result in potential-to-emit increases exceeding PSD significant emission thresholds are subject to PSD review. PSD applicability is determined by counting the permitted emissions increases and decreases during the contemporaneous (i.e. previous five years) period. The applicability determination, also called a *PSD netting analysis* is used to determine the level of PSD review for each of the subject criteria pollutant emissions. Note that the existing Poletti Power Project and proposed NYPA Combined Cycle Facility will be located at adjacent or contiguous properties, be owned and operated by the same person and belong to a single major industrial grouping. These criteria allow for the consideration of the existing and proposed facilities as a single facility under Federal (PSD) and New York State (Part 200 and 201) rules and definitions.

The proposed NYPA Combined Cycle Facility will displace a portion of the required annual operation from the existing Poletti 8,266 mmBtu/hr gas/oil fired boiler. NYPA will request permanent, enforceable permit restrictions to account for this lower unit capacity. In addition, NYPA will pursue permit modifications to the existing Poletti boiler limiting the use of No. 6 (residual) fuel oil. Specifically, NYPA will modify the existing boiler permit to limit operations to 30% annual average capacity factor, of which 18% will represent natural gas operations and the remaining 12% will represent residual oil firing. As such, a netting analysis of proposed combined cycle facility emissions versus the reduction in annual emissions from the existing Poletti boiler shows a net decrease in emissions of NO_x, PM-10 and SO_2. VOC emissions will increase, but the increase will be below the NSR threshold of 25 tons per year. Since the existing boiler will see an increase in natural gas emissions to offset the reduced No. 6 fuel oil use, CO emissions show an overall increase with resulting applicability of NSR (assuming continuation of the area CO non-attainment status). Table 4-2 presents preliminary annual emission rates for the proposed plant in the absence of netting and Table 4-3 presents a preliminary netting analysis and comparison to PSD significant emission rates (SERs) and NSR thresholds.

A review of Table 4-3 reveals that PSD review and a BACT demonstration will not be required for any of the (currently) attainment pollutants. An air quality analysis will be required for NO_2, SO_2 and PM-10. The air quality analysis will be extended to CO for the scenario in which re-designation of the non-attainment status to attainment is assumed. PSD review, including possible air ambient air quality monitoring and a BACT demonstration, would be required for CO under the attainment scenario. Because of the netting, NSR is not required for NO_x and VOC. CO emissions will be controlled to the more stringent LAER emission levels, rather than BACT, for the scenario in which non-attainment status is assumed.

An NAAQS and NYAAQS analysis will be performed if the proposed source results in significant air quality impacts, and will include major sources within fifty kilometers of the proposed source's significant impact area. Note that fifty kilometers will be added to the maximum significant impact area and the resultant distance will be applied to all other pollutants that have lesser significant impacts areas. Major sources considered in such an analysis will be identified in the Article X and PSD Permit Applications.

If the proposed source is predicted to have significant impacts, an air quality benefit analysis will be performed to determine comparative impacts between the existing boiler (the operations of which will be altered via federally enforceable permit restrictions) and the proposed source to ensure that any differences in impacts (i.e., location and magnitude) do not negatively affect available increment or AAQS. Note that the proposed project is located in a PSD Class II area. The significant impact concentrations and PSD increments are presented in Table 4-4.

If the proposed plant is determined to have significant impacts for any pollutants, a separate protocol outlining the proposed major source inventory development and modeling methodology for conducting the NAAQS and PSD Increment analysis will be submitted to NYSDEC for review and approval prior to commencing the inventory development and modeling analysis.

4.2.1 Additional Impact Analyses

The major source status of the NYPA Combined Cycle Facility means that certain additional analyses are required as part of the modeling assessment. These include modeling to assess potential for impacts to soils and vegetation, and visibility in the area surrounding the proposed plant and at any Class I areas within 100 kilometers.

There are no Class I areas within 100 km of the proposed NYPA Combined Cycle Facility. The nearest Class I areas to the proposed project are the Edwin B. Forsythe National Wildlife Refuge (NWR) at Brigantine, New Jersey and the Lye Brook National Wilderness Area (NWA), in Vermont located approximately 120 kilometers to the south and approximately 275 kilometers to the north/northeast, respectively. Although these Class I areas are beyond 100 kilometers from the proposed facility, a Level-1 visibility screening analysis, as detailed in Section 5.9.1 will be performed for the Brigantine NWR.

4.2.2 Ambient Air Quality Monitoring

As discussed previously, PSD regulations require an applicant to perform an air quality analysis for those pollutants emitted in quantities exceeding the SERs shown in Tables 4-2 and 4-3. This analysis can include the collection of up to one year of ambient air quality monitoring data. Thus, based on the proposed plant netted emissions increases presented in Table 4-3, air quality monitoring could be required for CO (if re-designated as attainment) and H_2SO_4. (Note that ambient monitoring is not required for pollutants for which the area in which the facility is locating is non-attainment.) However, currently there are no monitoring techniques for H_2SO_4, thus monitoring could potentially be required for only CO and PM-10.

Pursuant to the PSD regulations, U.S. EPA may exempt a proposed PSD source, otherwise subject to the one-year pre-construction ambient monitoring requirement if the source can demonstrate, through dispersion modeling, that air quality impacts from the proposed facility will be below the significant monitoring concentrations established by U.S. EPA and included in the regulations.

TRC, on behalf of NYPA, has prepared and submitted a pre-construction monitoring exemption request to the U.S. EPA Region II, and the NYSDEC. At the time this request was submitted, netting was not proposed and emissions of all pollutants exceeded the SERs. U.S. EPA Region II can grant an exemption from the monitoring if: 1) the proposed source demonstrates that it will have maximum impacts below the pollutant specific monitoring *de minimis* levels or 2) representative, quality assured air quality data exists for those pollutants for which impacts are predicted to exceed the *de minimis* levels.

The monitoring exemption request demonstrated that the preliminary modeling results were less than the monitoring *de minimis* levels. These results were based upon modeling performed with five years (1991 to 1995) of La Guardia Airport surface data and upper air data from Brookhaven, Long Island National Laboratory and Atlantic City, New Jersey Airport. Moreover, the project is located in an area characterized by the operation of numerous ambient air quality monitoring stations. There is sufficient, local ambient air monitoring data that can be considered representative of the project site. For these reasons, NYPA proposed that ambient air quality monitoring not be required for the proposed construction. The U.S. EPA responded and, upon receipt of additionally requested information, approved the request for exemption in correspondence dated December 28, 1999.

4.3 New York State Requirements

In addition to the previously discussed Federal Requirements, the proposed plant will also be required to incorporate the New York State air quality requirements where applicable to the air quality assessment. These requirements are specified in:

- 6 NYCRR Part 225-1 Fuel Combustion and Use Sulfur Composition;
- 6 NYCRR Part 227-1 Stationary Combustion Installations;
- 6 NYCRR Part 227-2 NOx RACT;
- 6 NYCRR Part 231 New Source Review in Non-attainment Areas and Ozone;
- 6 NYCRR Part 257 Air Quality Standards;
- Air Guide - 12 Review of Major Sources (for PSD source review and increment consumption only);
- Air Guide-21 Compliance Determinations for 6 NYCRR Part 225;
- Air Guide-26 Guideline on Modeling Procedures for Source Impact Analyses;
- Air Guide-1 Guidelines for the Control of Toxic Ambient Air Contaminants;
- Air Guide-36 Emissions Inventory Development for Cumulative Air Quality Impact Analysis (applicable only if major source inventory is required); and
- Air Guide-39 Gas Turbine NO_x Policy.

4.4 New York City Requirements

The New York City Department of Environmental Protection (NYCDEP) has, under the Article X process, requested additional modeling analyses be performed as part of the air impact assessment. These additional analyses are to follow the City Environmental Quality Review (CEQR) Technical Manual (last updated December 1993). The additional analyses are discussed below.

4.4.1 Point-In-Space Flagpole Receptor Analysis

The NYCDEP is requiring an air impact analysis for the "point-in-space" (flagpole) receptors that characterize New York City (note: this is also a U.S. EPA/NYSDEC requirement). Unlike "elevated" ground receptors that are represented by a fixed latitude/longitude location and an actual terrain height, a point-in-space flagpole receptor can represent any point above a fixed ground based receptor where human exposure to air contaminants is possible. In New York City this includes the numerous high-rise buildings and associated windows (if they can be opened), rooftop balconies, air intake vents and walkout window balconies. There are two differences in the overall modeling approach for performing a point-in-space impact analysis; 1) the non-default (and regulatory option) gradual plume rise option is used (therefore requiring a separate modeling run from that performed for the ground based receptors, which uses final plume rise), and 2) with regard to the impact analysis under PSD, compliance with the NAAQS is to be demonstrated but an increment analysis is not required (pursuant to U.S. EPA policy).

The NYCDEP provides a list of flagpole receptors that are to be used in the point-in-space analysis. This list consists mainly of the landmark buildings in the New York City area. The NYCDEP expects the applicant to perform a local survey and add to the list any tall structures (apartment houses or newly constructed landmark buildings that are not on the NYCDEP's list). TRC Environmental performed such a survey and the area covered is discussed in Section 5.4.2. The field survey included the use of a digital camera to photograph those buildings requiring inclusion into the survey. An in-house review of the pictures allowed for the photogrammetric determination of the elevations of window, intake vent and rooftop point-in-space flagpole receptors. Transposition of the building location from a field map to the United States Geological Survey topographic map allowed for the determination of UTM coordinates and base elevations. A complete listing of all point-in-space flagpole receptors is contained in Appendix A.

4.4.2 Cumulative Impact Analysis

The NYCDEP requires the performance of a "cumulative impact assessment" as a means to gauge the impact of existing and proposed projects on the local air quality. The assessment is to be performed for ground based and point-in-space flagpole receptors; however, the analysis is limited to the AAQS and excludes a significant impact evaluation. The assessment involves the modeling of existing and proposed sources, whose impacts are added to background air quality for a total impact. The total impact is then compared against the pollutant-specific AAQS.

The CEQR manual provides details on required air quality analyses in Section "Q" for mobile and stationary sources, as well as construction activities. Section 220 of the CEQR manual is entitled "Stationary Sources" and defines those "Actions" that require an air impact analysis; included in the definition are "large emission sources [such as] cogeneration facilities [and] power generating facilities". Section 300 of the CEQR manual details source specific assessment methods; Section 312 covers stationary sources. The requirements for a "cumulative impact analysis" are detailed in Section 322.2 entitled "Detailed Analysis". Within the CEQR manual, this analysis is known as an "Extended Analysis".

Following the CEQR guidelines, an air impact assessment within a "study area" defined, as a 1,000-foot radius of the project site will be performed. NYPA was instructed by NYCDEP to compile a list of addresses of stationary sources with heat inputs greater than 2.8 mmBtu/hr (the threshold level for triggering NYCDEP stationary source permit applicability) and present them to the attention of NYCDEP with a request for permit information that would support the cumulative impact assessment (i.e., fuel type and limits, operations, unit size, stack and emission parameters). Normally, this list would be compiled after the performance of a field survey to visually ascertain the potential for any property to contain a threshold-sized stationary combustion installation. However, certain factors have precluded the need to perform such a survey. The proposed NYPA Combined Cycle Facility will be located well within the industrial area that is defined by the Orion Power Holdings (ex-Con Edison) Astoria Power Station, the NYPA Charles Poletti Power Project and the NRG Gas Turbine facility. Additionally, significant acreage is reserved in the area for equipment and mobile vehicles that support power transmission and distribution activities. Finally, the East River borders the west and north portion of the industrial area. These factors allow for a significant buffer of land between the proposed power plant and the property line that delineates the industrial area from the nearby industrial/commercial area (the nearest commercial/residential property is located in excess of 2,000 feet from the stack, well beyond the 1,000 foot study area delimiter).

As was previously indicated, and in keeping with the request made by NYCDEP for including existing or planned sources in the assessment, several large power plants within the immediate area have been identified. It is for these sources that NYPA has requested the information required to allow for the performance of a cumulative impact assessment. The identified sources are presented below:

1. Orion Power Holdings Astoria Facility (ex-Con Edison Astoria Facility);
2. NRG Energy Inc., Astoria Gas Turbine Facility;
3. Consolidated Edison Compressor Station at 332 Hunts Point Avenue, Bronx (consisting of a 37 mmBtu/hr turbine)

Because of their size, the information needed for the facilities listed above is likely contained in NYSDEC databases; therefore NYSDEC has been included in this request. However, since the NYCDEP and CEQR criteria for source inclusion is so low, 2.8 mmBtu/hr heat input, this request is also being sent to the NYCDEP to ensure inclusion of stationary combustion sources that would be too small to be listed in the NYSDEC database.

NYPA acknowledges the need to also include the existing emission points at their Charles Poletti Power Project in the cumulative impact assessment. NYPA will rely on the information contained in their Title V air permit in modeling the existing Poletti facility impacts.

4.4.3 Special Receptors

The NYCDEP is requiring the inclusion of "special receptors" as part of the modeling analysis. These receptors will include residences, hospitals, schools and other community facilities. Section 5.4.1 of this protocol, provides additional details on the special receptor analysis.

TABLE 4-1a
NYPA COMBINED CYCLE FACILITY
AMBIENT AIR QUALITY STANDARDS– NEW YORK STATE AND FEDERAL

		New York State Standards			Corresponding Federal Standards					
					Primary Standard			Secondary Standard		
Pollutant [1]	Avg. Period	Conc	Units	Statistic [2]	Conc	Units [3]	Statistic	Conc	Units	Statistic
Sulfur Dioxide	12 consecutive months	0.03	ppm	arithmetic mean	80	$\mu g/m^3$	arithmetic mean			
	24-hours	0.14	ppm	maximum	365	$\mu g/m^3$	maximum			
	3-hours	0.5	ppm	maximum				1,300	$\mu g/m^3$	maximum
Carbon Monoxide	8-hours	9	ppm	maximum	10	$\mu g/m^3$	maximum	10	$\mu g/m^3$	maximum
	1-hours	35	ppm	maximum	40	$\mu g/m^3$	maximum	40	$\mu g/m^3$	maximum
Ozone [4]	1-hours	0.12	ppm	maximum	235	$\mu g/m^3$	maximum	235	$\mu g/m^3$	maximum
Nitrogen Dioxide	12 consecutive months	0.05	ppm	maximum	100	$\mu g/m^3$	arithmetic mean	100	$\mu g/m^3$	arithmetic mean
Lead [5]	3 consecutive months				1.5	$\mu g/m^3$	maximum			
Inhalable Particulates (PM-10) [6]	12 consecutive months				50	$\mu g/m^3$	arithmetic mean	50	$\mu g/m^3$	arithmetic mean
	24-hours				150	$\mu g/m^3$	maximum	150	$\mu g/m^3$	maximum

NOTES:

(1) New York State also has standards for beryllium, fluorides, and hydrogen sulfide specified in Table 4-1b. Ambient monitoring for these pollutants is not currently conducted.
(2) All maximum values are concentrations not to be exceeded more than once per calendar year. (Federal Ozone Standard not to be exceeded more than three days in three calendar years).
(3) Gaseous concentrations for Federal standards are corrected to a reference temperature of 25°C and to a reference pressure of 760 millimeters of mercury.
(4) Former NYS Standard for ozone of 0.08 ppm was not officially revised via regulatory process to coincide with the Federal standard of 0.12 ppm, which is currently being applied by NYS to determine compliance status.
(5) Federal standard for lead not yet officially adopted by NYS, but is currently being applied to determine compliance status.
(6) Federal standard for PM-10 not yet officially adopted by NYS, but is currently being applied to determine compliance status.

Source: http://www.dec.state.ny.us/website/dar/reports/97annrpt/97ar_std.html

Table 4-1b
NYPA COMBINED CYCLE FACILITY
NEW YORK STATE NON-CRITERIA AMBIENT AIR QUALITY STANDARDS

Pollutant [1]	Averaging Period	Concentration	Units	Statistics
Fluorides	1-month	1.0	ppb	Not to exceed values referenced to 25 degrees Celsius and 760 mm Hg
	1-week	2.0	ppb	
	24-hour	3.5	ppb	
	1-hour	4.5	ppb	
Beryllium	1-month	0.01	$\mu g/m^3$	Maximum
Hydrogen Sulfide	1-hour	0.01	ppm	Not to exceed value referenced to 25 degrees Celsius and 760 mm Hg

NOTES:
(1) Ambient monitoring for these pollutants is not currently conducted.

Source: 6 NYCRR Part 257

TABLE 4-2
PSD SIGNIFICANT EMISSION RATE INCREASE LEVELS AND PRELIMINARY NYPA COMBINED CYCLE FACILITY EMISSION RATES IN THE ABSENCE OF NETTING
(Pursuant to 40 CFR 52.21 (b) (23) (i))

Pollutant	Significant Emission Rate Increase Levels (tpy)	Annual Facility Emissions [1] (tpy)
Carbon Monoxide (CO)	100/50 [2]	65 (286) [3]
Sulfur Dioxide (SO_2)	40	73
PM	25	185.9 [4]
PM-10	15	180 (157) [3]
Nitrogen Oxides (NO_x)	25	193
Ozone (VOC) [5]	25	29
Lead	0.6	0.0204
Fluorides	3	0
Sulfuric Acid Mist	7	16.7 (5.58)
Total Reduced Sulfur Compounds	10	0

(1) Preliminary emission rates do not include start-up emissions. Based on worst-case load hourly emissions assuming up to 30-days of oil firing, remainder of the year on gas firing.
(2) 100-tpy threshold if no modeled significant impacts for CO, otherwise threshold is 50 tpy.
(3) Number in parenthesis represents emissions without oxidation catalyst control.
(4) PM emissions include 5.9 tons of total particulates from cooling tower drift.
(5) VOC is a precursor to the formation of the photochemical pollutant-ozone. It does not require air quality modeling.

TABLE 4-3
PSD NETTING ANALYSIS BASED ON WORST-CASE PTE
NYPA COMBINED CYCLE EMISSION RATES

	Potential Emissions, Tons per Year				
	NO_x	CO	VOC	PM/ PM-10[d]	SO_2
PTE for Proposed 500 MW Project[a]	193	286	29	180	73
Contemporaneous Decreases[b]	533	-21[e]	16[e]	214	1,202
Net Change in Poletti Source Emissions[c]	**-340**	307	13	**-34**	**-1,129**
PSD NSR Significant Emission Rate	40	100	40	25 / 15	40
Non-Attainment NSR Threshold	25	100	25	NA	NA

(a) Worst case (maximum) PTE value of GE 7FA data presented above (CO emissions based on no catalyst, PM emissions based on catalyst use).
(b) Existing Actual minus Proposed Allowable.
(c) Existing boiler permit modification will limit operations to a 30% annual capacity factor, of which 18% will represent natural gas firing and 12% will represent residual oil firing.
(d) Does not include 5.9 tons of cooling tower drift PM emissions for proposed project.
(e) Increased use of natural gas in the existing Poletti boiler, offsetting the decreased use of No. 6 fuel oil, will result in an increase in CO emissions.

TABLE 4-4
NYPA COMBINED CYCLE FACILITY
PSD SIGNIFICANT IMPACT LEVELS AND INCREMENTS
($\mu g/m^3$)

Pollutant	Class I Significant Impact Level	Class I Increment	Class II Significant Impact Level	Class II Increment
SO_2				
Annual [a]	0.1	2	1	20
24-Hour [b]	0.2	5	5	91
3-Hour [b]	1.0	25	25	512
PM-10				
Annual [a]	0.2	4	1	17
24-Hour [b]	0.3	8	5	30
NO_2				
Annual [a]	0.1	2.5	1	25
CO [c]				
8- hour	-[d]	-	500	-
1-hour	-	-	2,000	-

Notes:
(a) Never to be exceeded.
(b) Not to be exceeded more than once per year.
(c) CO modeling performed to assess NSR threshold applicability.
(d) "-" denotes not applicable.

5.0 MODELING METHODOLOGY

Dispersion modeling will be performed consistent with the procedures found in the U.S. EPA documents; the Guideline on Air Quality Models (Revised) (U.S. EPA, 1999); Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (Revised) (U.S. EPA, 1992); and, New Source Review Workshop Manual [Draft] (U.S. EPA, 1990). The toxic air pollutant modeling analysis will be conducted following the method agreed to by the NYSDOH and the applicant, which is described below.

The following sections discuss the methodology for the proposed modeling analyses.

5.1 Dispersion Parameters

A land use classification analysis was performed to determine if urban or rural dispersion parameters should be used in quantifying ground-level concentrations. The analysis conformed to the procedures contained in the U.S. EPA Guideline on Air Quality Models (Revised) (U.S. EPA, 1999). This procedure involves determining the percentages of various industrial, commercial, residential, and agricultural/natural areas within a 3 km radius circle centered on the proposed site. Essentially, if more than 50 percent of the area within this circle is designated I1, I2, C1, R2 and R3 (industrial, light industrial, commercial, and two levels of compact residential), urban dispersion parameters should be used; otherwise, the modeling should use rural dispersion parameters.

The majority of urban land use in the 3 km circle surrounding the site is comprised of compact residential use (29%) followed by industrial/light industrial use (23%) and commercial usage (15%). These three urban uses comprise 67% of the total land usage. Rural uses total 33% and include water surfaces at 26%, metropolitan natural at 6% and undeveloped at 1%. Based on the results of the analysis, the land surrounding the proposed NYPA Combined Cycle Facility is determined to be urban and urban dispersion coefficients will be used for the air quality modeling analysis. The land use analysis is presented in more detail in Appendix B.

5.2 Dispersion Models

The Industrial Source Complex Short-Term (ISCST3) model (Version 99155) is proposed to be used to assess the air quality impact from the NYPA Combined Cycle Facility. The U.S. EPA Office of Air Quality Planning and Standards (OAQPS) made version 99155 available for general use on June 24, 1999. Throughout this modeling protocol, "ISCST3" refers to Version 99155 unless otherwise specified. The ISCST3 model will be applied in accordance with the recommendations made in U.S. EPA's Guideline on Air Quality Models (Revised) (U.S. EPA, 1999).

The ISCST3 model was designed for assessing pollutant concentrations from a wide variety of sources (point, area, and volume) associated with an industrial source complex. It has been designated by the U.S. EPA as a "preferred" model for use in rural or urban areas, flat or rolling terrain, transport distances less than 50 km, and one hour to annual averaging times (U.S. EPA, 1986a).

ISCST3 was developed for use in flat to gently rolling terrain, i.e., in terrain with elevations lower than stack height. It treats elevated terrain (elevations less than stack height) with the following considerations:

- The plume axis remains at constant elevation as it passes over elevated or depressed terrain; i.e., the effective plume height decreases as terrain height increases;
- The mixing height is terrain-following; i.e., it remains constant as the plume passes over elevated or depressed terrain; and
- The change in wind speed is a function of emission height above the anemometer height.

In intermediate and complex terrain, the Valley mode of Screen3 and, if need be CTSCREEN, will be used to assess pollutant impacts.

ISCST3 includes various input and output options. Additional options are available for specific methods to be used in plume model equations. The model will be applied using regulatory default (DFAULT keyword) options. These include the following:

- Stack Tip Downwash. U.S. EPA recommends this option for use in regulatory applications. When this option is implemented, a height increment is deducted from the physical stack height before computing plume rise, as recommended by Briggs (1974). The height increment to be deducted depends upon the ratio of stack exit velocity to wind speed and is equal to 2d [1.5 - v_s/u], where v_s is the stack exit velocity, u is the wind speed, and d is the inside stack diameter. If v_s/u is greater than 1.5, the height increment is zero.

- Final Plume Rise. With this option, final plume rise is used for calculating the plume height to be used in estimating ground-level concentrations at all receptors. The final plume rise option will be used for ground-level receptor impact assessment. For the point-in-space flagpole receptor analysis, the gradual plume rise option will be utilized. The selection of these options is consistent with U.S. EPA guidelines.

- Buoyancy-Induced Dispersion. This option causes modifications to the dispersion coefficient (σ_y and σ_z) calculations that account for enhanced dispersion due to turbulence caused by plume buoyancy (Pasquill, 1976). This results in a simulated plume with greater horizontal and vertical extent than would be simulated considering dispersion from ambient turbulence only. This option is applied only near the source, before the plume reaches its final height. It is a recommended option for regulatory applications and will be utilized for this analysis.

- Vertical Potential Temperature Gradient. The vertical potential temperature gradient is used to calculate the stability parameters used in plume rise equations for stable conditions. Unless site-specific potential temperature gradients are provided, ISCST3 uses the default values shown in Table 5-1. Since there are no site-specific values, those shown in Table 5-1 will be used.

- Wind Profile Exponents. ISCST3 uses a power-law extrapolation of wind speeds from measurement height to plume height. Unless site-specific values are provided, ISCST3 uses the default values also shown in Table 5-1. Since there are no site-specific values, those shown in Table 5-1 will be used.

- Decay. An exponential decay term may be included in ISCST3 modeling to simulate removal processes. The decay coefficient may be universally applied to all calculations or entered with meteorological data on an hourly basis. No decay will be applied in this analysis.

- Wake Effects. Building wake effects may be simulated using procedures suggested by Huber and Snyder (1976) and Huber (1977). When the stack height is less than the building height plus one half the lesser of the building height or width, wake effects are simulated using procedures suggested by Schulman and Hanna (1986) and based on the work of Scire and Schulman (1980). Since the NYPA Combined Cycle Facility will utilize a GEP stack, the use of direction-specific wake effects is not necessary.

- Calm Processing. When the calm processing option is implemented, calm conditions are handled according to methods developed by the U.S. EPA. When a calm is detected in the meteorological data, or the data are missing, the concentrations at all receptors are set to zero, and the number of hours being averaged is never less than 75 percent of the averaging time. Calm processing will be implemented for this analysis.

5.3 Meteorological Data

This section presents a discussion of the meteorological data proposed to be used in performing the full grid sequential analysis. Refined meteorological data will be used to determine air quality impacts using location specific dispersion conditions. For use in such an analysis, refined data must be representative of the dispersion characteristics of the area around the facility, be reliable and meet PSD quality assurance requirements.

La Guardia airport represents the closest National Weather Service station that could provide publicly available meteorological data for modeling purposes. La Guardia Airport is located in Queens County, New York City, south of the East River on the Long Island Sound and is situated 1.2 miles east-northeast of the project site. La Guardia Airport data is considered representative of site conditions as terrain features and proximity to major water bodies (which influence local climate) are nearly identical. A 5-year database, representing the years 1991 to 1995 will be used in the modeling. Note that manual data collection ended in 1995 at La Guardia Airport; data is currently collected using automated means which does not allow for the proper calculation of atmospheric stability.

Upper air data collected from the U.S. Department of Energy's Brookhaven National Laboratory site (NWS station 94703) and Atlantic City Airport (NWS station 93755) will also be used in the modeling assessment. Two stations are required to complete the 5-year record since data collection at Atlantic City, located approximately 103 miles south-southwest of the project site, was terminated in August 1994 with the Brookhaven Laboratory site assuming responsibility at that time. The Brookhaven Laboratory site is located approximately 55 miles to the east, in Suffolk County approximately midway between the north and south shores of Long Island. Brookhaven is the nearest location where upper air data is currently collected relative to the project site and is very much representative of upper air conditions at the project site as both are influenced by the same continental/coastal features. Based upon review of summarized mixing height data for 62 upper air stations in the United States, which was prepared by Holzworth (Holzworth, 1972), it was concluded that Brookhaven and Atlantic City mixing height data are both representative of site conditions.

5.4 Receptor Grid

The ISCST3 model requires receptor data consisting of location coordinates and ground-level elevations. The basic refined receptor grid consists of 1,426 polar receptors, which are based on the following distances:

100 meters to 2,000 meters at 100 meter spacing;
2,000 meters to 5,000 meters at 250 meter spacing; and,
5,000 meters to 15,000 meters at 1,000 meter spacing.

Terrain heights were determined from a U.S. Geological Survey 3-arc second digital elevation CDROM. Figures 5-1 and 5-2 graphically show the receptor grid relative to the proposed site. If the maximum-modeled impact occurs in an area of greater than 100-meter receptor intervals, a refined grid of 100-meter intervals will be placed around that point. Furthermore, if concentrations are increasing at the 15,000-meter ring, an additional ring will be added to determine the distance at which concentrations begin to decrease.

The existing Poletti Power project site has a fenced property line that precludes public access to the site and therefore to the proposed NYPA Combined Cycle Facility, which will be located within this fenced area. Ambient air is therefore defined as the area at and beyond the fence. The modeling receptor grid includes receptors spaced at 25-meter intervals along the entire fenceline.

5.4.1 Special Receptors

A list of special receptors was developed for inclusion in the modeling analysis. USGS topographic maps were reviewed for the area immediately surrounding the project site and noted special receptors (hospitals, schools and other community facilities) were identified. Information for these receptors included the name of the facility, elevation of the terrain above sea level, distance and direction from the proposed NYPA Combined Cycle Facility and UTM location. Table 5-2 identifies the special receptors selected for inclusion into the modeling as well as the receptor information obtained from the topographic maps (i.e., elevation, UTM location, etc.).

5.4.2 Point-In-Space Flagpole Receptors

Pursuant to the requirements of the NYCDEP (as discussed in Section 4.3.1), a list of point-in-space flagpole receptors was developed for inclusion into the modeling. The list includes those point-in-space flagpole receptors already established by the NYCDEP (i.e., landmark buildings such as the World Trace Center, United Nations Building, and Empire State Building) as well as those included as a result of a field survey conducted by the applicant. The field survey included the following areas:

- Randalls Island;
- East Side of Manhattan - east of 1st Avenue, south of 125th Street, north of Gracie Square;
- North Brother Island;
- Roosevelt Island;
- Southern Bronx - southeast of I-278 from East 132nd to East 141st Streets, Barry Road, Oak Point Avenue, and the area bounded by Tiffany, East Bay and Halleck; and
- Western Queens - north of Astoria Boulevard, west of 21stAvenue, north of I-278, west of 19th Street, north of Ditmars Boulevard, west of Steinway.

This area extends a minimum distance of approximately 2 km from the project area to an approximate maximum distance of 3.5 km from the project area. However, inclusion of the landmark receptors extends the maximum distance much farther. As was previously noted, modeling for these receptors will be performed using the non-regulatory default gradual plume rise option consistent with NYCDEP guidance.

5.5 Background Ambient Air Quality

The proposed NYPA Combined Cycle Facility will be located in Queens County, NYSDEC Region 2. The NYSDEC Bureau of Air Surveillance operates various air quality monitors for SO_2, NO_2, CO, PM, PM-10, O_3, lead (Pb), nitric oxides (NO_x), sulfates and nitrates. According to 40 CFR 81.333 (updated July 1, 1999) Queens County is "attainment" or "unclassified" for all criteria pollutants, except for ozone for which it is designated as severe non-attainment and CO for which it is designated as moderate non-attainment. New York County is a designated PM-10 non-attainment area, and as such, facility PM-10 impacts to this area cannot exceed U.S. EPA Significant Impact Concentrations (SICs). As was previously noted, the PSD air permit application will be assembled assuming a scenario where CO is in attainment and another scenario where CO is non-attainment. For the former scenario, background ambient air quality CO data will need to be addressed as part of the PSD review. Under the latter case, CO impacts cannot exceed the SICs.

A NAAQS/NYAAQS analysis is required if the maximum modeled concentrations of attainment pollutants result in maximum modeled concentrations greater than the PSD SICs presented in Table 4-4. PSD SICs have been developed for SO_2, NO_2, PM-10 and CO. As such, a NAAQS/NYAAQS analysis will be required if SO_2 and NO_x (as NO_2) emissions from the proposed facility result in maximum modeled concentrations greater than the PSD significant impact levels. A NAAQS/NYAAQS analysis will also be required if maximum modeled PM-10 impacts are greater than the PSD significant impact thresholds in the PM-10 attainment area (PM-10 impacts in the non-attainment area of New York County cannot exceed the significant impact levels). Part of the NAAQS/NYAAQS analysis is the inclusion of ambient background concentrations at the proposed facility with the modeled pollutant-specific concentrations for comparison to ambient standards.

SO_2 and PM-10 background data are proposed to be obtained from the NYSDEC monitor at the Intermediate School (I.S.) 155 in Bronx County, New York. The I.S. 155 monitor is located approximately 2.5 km north of the proposed NYPA Combined Cycle Facility in a compact residential area in center city. The nearest NYSDEC ambient background NO_2 and CO monitor is located at Public School (P.S.) 59 in New York County, New York, approximately 6 km southwest of the proposed facility. P.S. 59 is located in a highly urbanized area. These monitoring sites have been approved by the U.S. EPA Region II for use in any necessary NAAQS analysis for the proposed project.

Table 5-3 presents the maximum annual and second highest short-term concentrations recorded during the latest three years (1996-1998) at the above stations for the specific criteria pollutants, which are proposed as a representative background for the proposed NYPA Combined Cycle Facility. The proposed plant's modeled air quality concentrations will be added to representative background concentrations recorded at these stations and the sum will be compared to the NAAQS/NYAAQS, if necessary.

5.6 Load Screening

In order to assess the worst-case emission conditions for the turbine/HRSG, a load screening analysis will be performed using the ISCST3 model with five years of La Guardia meteorology. As discussed in Section 3, 22 combinations of fuel type, load conditions and ambient operating temperature (with and without the evaporative cooler) have been identified. Thus, a total of 22 cases will be assessed for the load screening modeling analysis. Note that the stack and pollutant emission parameters for the 22 operating cases are identified in Tables 3-1 and 3-2. Also note that there are two sets of numbers represented for CO and PM-10, reflecting the use and non-use of an oxidation catalyst. Rather than run the analysis twice, all modeling will be based on the worst-case CO emissions (i.e., no catalyst use) and the worst-case PM-10 emissions (i.e., use of a catalyst). The load screening analysis will be performed using the full receptor grid with terrain and the La Guardia meteorological data as identified in previous sections

The operating condition that results in the maximum ambient impacts (i.e., worst case operating scenario) will be modeled in any subsequent modeling analyses (e.g., PSD increment and NAAQS). As requested by the NYSDEC, if the worst case operating scenario is not a 100% turbine load operating case, the 100% turbine load operating scenario (i.e., fuel, ambient temperature) that yields the highest ambient (pollutant-specific) concentration(s) will also be modeled in any necessary subsequent modeling.

5.7 PSD Modeling Analysis

5.7.1 Determination of Significant Impacts

Refined modeling will be performed to determine if the facility emissions result in significant air quality impacts. ISCST3 will be used for modeling the facility with five years of representative meteorological data as detailed in Section 5.3. The highest concentrations at each receptor will be determined for each pollutant and compared to the PSD SICs presented in Table 4-4. Annual averages will be calculated using the annual concentrations for both gas and oil firing, prorated to reflect the expected amount of annual gas and oil usage. For example, the annual concentration for thirty days of oil firing with the balance of the year firing gas will be calculated by 335/365 (annual gas concentration) plus 30/365 (annual oil concentration).

If the proposed NYPA combined cycle facility is determined to have significant impacts (i.e., maximum modeled concentrations are greater than the SICs), then the area of impact will be determined for each pollutant/averaging period that is significant. The area of impact corresponds to the distance at which calculated concentrations fall below the SIC. If more than one pollutant shows a significant impact, or more than one averaging period for a single pollutant shows a significant impact, the greatest distance significant impact area from the multiple significant impact areas, plus 50 kilometers, will be used for all pollutants that have significant impacts. If a pollutant is significant for a given averaging time, then all averaging times for that pollutant will be addressed in the NAAQS and PSD Increment analyses.

All off-site existing major sources and proposed nearby sources will be included in any NAAQS and PSD increment analyses, respectively. The determination of "nearby" will be made in accordance with U.S. EPA modeling Guidelines, the NSR Workshop Manual and by Air Guide 26 procedures. In addition, all other proposed major electric generating facilities that have applications for a certificate filed with the Siting Board will be included provided that the application has been deemed, by the Chairman of the Siting Board, to comply with Section 164 of the Article X regulations, at the time NYSDEC approves the Project's final, verified nearby source inventory pursuant to NYSDEC Air Guide 36 requirements.

Pursuant to the requirements of Air Guide 26, a net benefit analysis will be performed, if needed, to demonstrate a net improvement in air quality as a result of the application of CO emission offsets. Any emission sources used in a net benefit analysis, or significant impact analysis for the PSD pollutants, will be verified following Air Guide 36, if the source information was received from the NYSDEC. Any source information received from the NYCDEP need not be verified as NYCDEP indicated that their inventory has been field verified.

5.7.2 Off-Site Sources

In the event NAAQS and PSD increment analyses are required, the NYSDEC will be consulted at that time. These discussions will be centered on the development of an off-site source emission inventory, and the procedures recommended to prepare a multiple source modeling analysis (i.e., Air Guide 36). The procedures to be used will be described in a separate multisource modeling protocol, which will be submitted to NYSDEC for approval.

5.7.3 NAAQS/NYAAQS Impact

The proposed facility will be assessed to determine the impact on the NAAQS/NYAAQS. A refined modeling analysis will be provided with the PSD Permit Application, which is anticipated to indicate that the facility will not have a significant air quality impact. Should a refined modeling analysis indicate the facility will have significant air quality impacts, then a multiple major source modeling analysis will be proposed and the terms for its preparation and demonstration of NAAQS/NYAAQS impact will be discussed at that time with the NYSDEC.

5.7.4 PSD Increment

Should a refined modeling analysis indicate the proposed facility will have significant air quality impacts, then a PSD increment modeling analysis will be proposed and the terms for its preparation and demonstration of PSD increment will be discussed at that time with the NYSDEC. The results of the refined single source analysis will be included in the PSD Permit Application.

5.8 Toxic Air Pollutant Analysis

The ground level concentrations of any toxic substance, which could potentially be emitted from the proposed facility, will be assessed using the methodology suggested by the NYSDOH. The assessment will be based upon modeling with the ISCST3 model and the 5-year representative meteorological database. The analysis will consider potential emissions of toxic pollutants from the facility stack and the cooling tower.

Potential toxic emissions from the turbine stack will be based upon an analysis of the proposed facility fuels (natural gas and light distillate oil) or emission factors from the most recent final version of AP-42. Estimates of potential cooling tower toxic emissions will be based upon cooling tower design parameters (e.g. drift rate), cooling system anti-fouling and pathogen growth control treatment additives and the laboratory analyses of cooling tower make-up water from the East River. These analyses have been performed for a list of substances prescribed by DOH, which includes metals and volatile organics and semi-volatiles and PCBs and other substances likely to be present in river water. Also included in the analysis will be an assessment of impacts associated with the ammonia slip that will result from the use of the SCR. A maximum of 10-ppm ammonia slip is expected from the turbine stack.

Modeling will be performed for the stack and cooling tower emissions for the proposed NYPA Combined Cycle Facility alone and for the combined cycle facility operating in conjunction with the existing Charles A. Poletti Power Project Generating Station. Calculated short and long-term average concentrations will be compared to appropriate health based guideline benchmarks that are presented in Table 5-4. In the event that maximum modeled concentrations of one or more non-criteria pollutants are equal or exceed a respective benchmark concentration, NYPA will consult with the DOH and NYSDEC staff to develop a protocol for performing a cumulative air impact analysis.

If the maximum modeled annual average ground level air concentration of a non-criteria pollutant exceeds one percent of the health risk based benchmark concentration of a persistent, bio-accumulative or toxic chemical (PBT) or ten percent of the benchmark concentration for any other chemical, the application will include an evaluation of the need to perform a mulitpathway risk assessment. In the event that a predicted maximum annual concentration of a PBT pollutant exceeds the one percent threshold, NYPA will investigate and document the potential for existing beef or dairy farms or areas that could reasonably be expected to support such uses, to be impacted at these levels. If it can be shown that no such uses or areas exist, then the 10 percent criterion will be used to assess the potential need for a multipathway risk assessment. Should the potential need for a multipathway risk assessment be identified, NYPA will consult with the DOH on the scope and approach to be used for any such study.

5.9 Additional Impacts Analysis

In addition to the PSD Increment and NAAQS analysis the PSD regulations require a demonstration that the proposed modification or new major facility will not cause a significant adverse impact on visibility, soils, vegetation and general growth within the study area. These regulations are codified in 40 CFR 52.21 (o), as follows:

(o) Additional impact analyses.

(1) The owner or operator shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial and other growth associated with the source or modification. The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.

5.9.1 Visibility Impact Assessment

The relative effect the proposed NYPA Combined Cycle Facility will have on regional visibility in the surrounding area will be assessed using the U.S. EPA VISCREEN model (Version 1.01). This model is identified and discussed in the Workbook for Plume Visual Impact Screening and Analysis, (EPA-450/4-88-015, September, 1988). The effect on visibility will be assessed using the screening procedure that involves calculation of three plume contrast coefficients using emissions of NO_2, PM/PM-10, and sulfates (i.e., H_2SO_4). The Level-1 screening procedure determines the light scattering impacts of particulates, including sulfates and nitrates, with a mean diameter of two micrometers with a standard deviation of two micrometers. The analysis will be run assuming that all emitted particulate is PM-10, which results in a conservative assessment of visibility impact.

The Level-1 screening analysis will be performed for the worst possible operating scenario. Because the proposed project is projected to have no area of impact, the visibility assessment will be performed for an observer at a distance of 30 kilometers from the project site with a conservative background visual range of 30 kilometers.

A Level-1 screening analysis will also be conducted for the nearest Class I area (Edwin B. Forsythe National Wildlife Refuge (NWR)) located in Brigantine, New Jersey. The Edwin B. Forsythe NWR is located approximately 120 kilometers from the proposed site. Therefore an observer distance of 120 kilometers will be used with the background visual range of 30 kilometers.

5.9.2 Soils and Vegetation Assessment

The proposed NYPA Combined Cycle Facility is designed to burn natural gas and light distillate fuel oil, which will have low emissions of sulfur dioxide and particulates. As such, the facility is expected to have little if any effect on surrounding soils and vegetation. However, the seven step screening procedure identified in A Screening Procedure for the Impacts of Air Pollutant Sources on Plants, Soils, and Animals (U.S. EPA 450/2-81-078, December 1980) will be applied to assess the potential impact to local and regional soils and vegetation. These steps are identified in Section 5.1 in the screening procedures manual. The following is a summary of the steps, which will be applied.

1. Estimate the maximum ambient concentrations.
2. Check the maximum from step 1 against corresponding screening concentrations or applicable standards, which ever is most restrictive.
3. Calculate deposition of trace metals to soil.
4. Compare increases of trace metal concentrations to existing endogenous concentrations.
5. Calculate the amount of trace element uptake by plants.
6. Compare concentrations from Steps 3 and 5 with corresponding screening concentrations.
7. Re-evaluate comparisons in Steps 4 and 6 using estimated solubilities of elements. In the event any of the compared concentrations in either soils or vegetation exceeds the screening concentrations, additional site specific information will be obtained to refine the analysis.

5.9.3 Assessment of Impact on Growth

The proposed NYPA Combined Cycle Facility will be reviewed to assess the potential for affecting local and regional industrial, commercial and residential growth. Factors that will be examined include the effects the transient working force will have during construction, which is anticipated to occur for approximately twenty-four months. If an increase in the permanent working force is required, the effects on the local growth will also be examined. Other effects to growth that will be examined include the air quality constraints the emissions from the proposed NYPA Combined Cycle Facility will have on precluding new growth, and the potential for drawing new industrial growth due to the electricity generated. In general, the effect on growth is expected to be negligible, however the PSD permit application will include a discussion explaining this assumption.

5.10 Construction Impacts

Potential impacts associated with the construction of the proposed facility include emissions from engines of heavy construction equipment and fugitive dust associated with excavation, grading and traffic on unpaved roads. The applicant will provide a discussion of the expected number and type of construction equipment on site and the potential for the emissions to result in unacceptable air quality impacts. A discussion of potential fugitive dust generating activities and mitigation measures to be employed will also be provided.

5.11 Acid Deposition

The New York State Acid Deposition Control Act requires that applicants quantify a proposed project's contribution to the New York State total deposition of sulfates and nitrates at eighteen defined receptors in New York State, New England and Canada. This analysis will performed using the procedure set forth in the March 4, 1993 memorandum from Leon Sedefian to IAM staff.

5.12 Accidental Releases

The proposed facility is currently not planning to utilize or store large quantities of extremely hazardous materials on site. In the event that the use and storage of such substances in quantities which exceed the substance specific thresholds provided in the U.S. EPA Risk Management Planning (RMP) regulations 40 CFR 68-Clean Air Act Section 112 (r), the modeling methods described in that regulation will be used to evaluate the offsite consequences of potential accidental releases of these substances.

5.13 Combustion Turbine Visible Plume Analysis

A major exhaust by-product of the combined cycle turbine combustion process is water vapor. With each pound of natural gas fired, over two pounds of water vapor are formed and exhausted to the atmosphere. Since the exhaust gas contains appreciably more water vapor than the ambient air, an analysis will be performed to determine if the exhaust plume could condense and become visible under normal atmospheric conditions. A visible plume formed under such conditions is called a mixed vapor plume. When hot humid exhaust gas is vented to a cooler humid atmosphere, the combination may be at or above the saturation level and a visible plume will form. This is similar to seeing one's breath on a cold morning. Likewise, condensation trails from high altitude aircraft are formed by the same mechanism.

The plume visibility analysis proposed for the NYPA Combined Cycle Facility will be performed using the exhaust conditions for two GE Frame 7FA combustion gas turbines in various operational configurations, and will be assessed using a plume visibility model developed by TRC.

5.13.1 TRC Visible Plume Model

TRC's plume visibility model is a post processor that is used with hourly concentration results from the widely recognized U.S. EPA ISCST3 atmospheric dispersion model. Water vapor is a non-reactive gas and when emitted by a combustion source at a temperature well above its dew point its downwind dispersion characteristics may be appropriately simulated using ISCST3. The ISCST3 model will be run using the five years of La Guardia surface data, and composite five years of upper air data from Atlantic City Airport/Brookhaven National Laboratory (see Section 5.3 for a detailed discussion on meteorological data selection). The meteorological data includes wind speed, direction, temperature, dew point, and stability parameters (sigma theta). Since the object of this study is to determine the potential total number of hours of visible plumes (independent of the direction of the viewer) the analysis will be simplified by using the same wind direction for each hour. In order to avoid plume reflection, the mixing heights will be set to 10 km. The transitional plume rise option will also be used. Additionally, all calms will be set to 1 meter per second and evaluated by the model. This is counter to regulatory modeling performed to ascertain air quality impacts. In such cases calms are ignored. However, in the plume visibility analysis, calm winds are considered very important since the vertical plume that occurs under light winds presents a high likelihood for visible plume formation.

Visible plume formation will be determined using a matrix of flagpole receptors elevated above the stacktop and downwind spaced at 25-meter increments. The hourly water vapor concentrations will be calculated and compared to actual meteorological observations and the calculated saturation deficit for each hour of the recorded meteorological data. The saturation deficit is a measure of the amount of additional water vapor that must be added to a volume of air to bring it to saturation (i.e., 100% humidity). The elevated exhaust temperature is a significant factor and a mixed plume temperature is also calculated. A condensed vapor plume will be assumed to occur if the water vapor concentration exceeds the saturation deficit for each specific location and hour modeled. Under these conditions, TRC's model assumes the vapor plume will condense to form a visible cloud.

The visible plume analysis will be performed to determine the total number of hours the water vapor in the combustion turbine plume condenses and forms a condensed vapor plume. This number will be used to determine the base line. The condensed vapor plume will be identified as "visible" if it will occur during conditions, which would allow it to be viewed by the general public. This definition excludes plumes being formed at night, and during periods of inclement weather (rain, snow, or fog) that obscure visibility. As such, the total number of hours that the plume is considered visible will be limited to the amount of hours during the daylight periods only (where daylight is defined as the period between ½ before sunrise until ½ hour after sunset). Additionally, the hours that have inclement weather or low visibility will also be identified. Weather obscuration is defined as an hour of inclement weather (indicated in the NCDC CD-144 meteorological data record as moderate rain or snow, or conditions where the horizontal visibility is reduced to less than ½ mile. The base case visible plume conditions will be all possible hours. A subsequent refinement of the base case (i.e. screening of the total number of hours) will be performed to determine those hours of visible plume that occur during daylight only. An additional refinement will determine the total number of visible plumes that occur during the daylight period, without weather obscuration. In this fashion, the DPS staff will be provided a "layered" analysis to determine the level of potential visual impact of the combustion turbine visible plumes.

5.13.2 Combustion Visible Plume Modeling Methodology

The visible plume modeling analysis will be performed for the following parameters:

- One dual-flue stack;
- Two GE Frame 7FA combustion turbines operating at 100% load on natural gas and distillate oil;
- One and two unit operation; and
- Five years of surface data from La Guardia Airport and five years of upper air data from Atlantic City Airport and Brookhaven National Laboratory.

The visible plume analysis for the combustion turbine plume will be assessed for several operational conditions. These conditions will consider operation with natural gas firing without additional water injection for NO_x suppression, and oil firing where water will be injected. The total water content of the plume is modeled, which includes the water vapor formed by the combustion process, and the additional water added during oil firing. Additional cases will examine the formation of visible plumes under part load operation, for both natural gas and oil firing.

The results of the visible plume analysis will be provided in tables summarizing the frequency distribution (i.e. number of hours and percent of hours) of visible plumes by height above the stack top and downwind distance by fuel and unit operation. Additionally, two-dimensional contour plots to show the distribution by height and downwind distance will be included as graphics. Two sets of figures will be presented. One will represent the potential for a combustion water vapor plume to occur as a percent of the total number of hours and the other will provide a similar analysis for daylight hours only. Typically, there exist approximately 5,100 hours/year when a visible plume may be observed if one forms. The meteorology recorded at La Guardia Airport is also proposed for the plume visibility study. This data is also proposed for the cooling tower visibility analysis (as discussed in detail in Section 5.14) and NYPA recommends the same data set be used for consistency between the stack plume and cooling tower plume visibility studies.

5.14 Cooling Tower Fogging, Icing, Mineral Deposition, and Visible Plume Analyses

The proposed NYPA Combined Cycle Facility will consider the use of a hybrid evaporative wet/dry cooling tower as part of the closed loop cooling cycle for condensing spent steam from the steam turbine. As part of the Article X environmental review process, the potential for cooling tower plume impacts will be assessed using a computer model developed by the Electric Power Research Institute (EPRI) known as the Seasonal/Annual Cooling Tower Impact (SACTI) model. The hybrid tower incorporates a dry section to mitigate plume formation.

The SACTI computer program is a mathematical model for the prediction of the seasonal/annual physical impacts of cooling tower plumes, drift, fogging, icing, and plume shadowing. The development of the model and user's guide is documented in the User's Manual: Cooling-Tower-Plume Prediction Code, (EPRI, 1984). The most important output is in the summary tables, and this information will be provided in both tabular format and summarized in high quality graphics.

The SACTI model is aimed at providing predictions that may be used in the licensing of power plants with cooling towers. The submodels are based on the Argonne National Laboratory (ANL) cooling tower model, and provide improvements in theory and performance compared to other existing cooling tower plume prediction methods. Validation with field and laboratory data has been performed for all situations where good quality data exist. The seasonal/annual methodology employs a technique, which reduces the available meteorological record at a site to approximately 45 categories that are considered to result in either a ground fog or an elevated plume. The plume submodels are then run once for a representative of each category and results are summed up to provide predictions for a season or a yearly average.

The SACTI code provides estimates of potential adverse impacts, which include:

- Occurrence (frequency) of ground fogging;
- Occurrence of rime icing;

- Frequency and extent plume shadowing and solar energy loss;
- Drift water deposition;
- Dissolved minerals (salt) deposition; and
- Plume length frequency.

A preliminary study indicated the maximum plume events may occur during the fall. Therefore, NYPA proposes to perform the cooling tower analysis for all four seasons plus the average annual conditions using the five years of available meteorological data discussed above. This analysis will be prepared for all hours of the meteorological data set to represent the base or worst case cooling tower impact scenario. Additional analyses will examine the wet tower configuration during daylight hours only. An alternative tower design will be assessed as discussed in Section 5.14.5.

The model calculates these impacts using a number of meteorological and operational parameters. Some of the more critical parameters include:

- Wind speed and direction;
- Stability or cloud cover for atmospheric stability estimates;
- Dry bulb temperature and dew point depression;
- Dry bulb and dew point temperature lapse rates;
- Tower exit diameter, velocity and mixing ratio;
- Tower heat rejection rating and mass of air flow;
- Tower dimensions and orientation; and
- Drift droplet distribution based on Marley Evaporative Tower with a 0.0005% drift rate.

The cooling tower design parameters have not been determined but will be included in the Application. These parameters will be provided for 100% load and a representative low load condition.

The SACTI code performs its calculations by numerically integrating a set of ordinary differential equations governing the tower plume properties such as mass flow rate, temperature and water vapor content, as a function of downwind distance along the plume trajectory. The diffusion of the plume in the atmosphere is assumed to be Gaussian in nature except where the plume is affected by the turbulence in the wake of the cooling tower structure itself. In the tower structure wake, the SACTI code employs the downwash entrainment methodology as presented by J. Halitsky, "Wake and Dispersion Models for the EBR-II Building Complex", Atmospheric Environment Volume II No. 7, pp- 577-596, 1977.

5.14.1 Meteorology

The SACTI model uses hourly meteorology to establish a plume category database on which to generate statistical summaries. Since SACTI is a statistical-based model, i.e., uses hourly data to create seasonal and annual summaries, the duration of the meteorological period is important for providing a good sample set. To this end, SACTI is usually run with more than one year of meteorological data, typically with two or more years. Using a longer duration for the meteorological data helps smooth out the year-to-year variations in meteorological parameters and provides a better statistical database for SACTI. Therefore, NYPA proposes to use five years (1991-1995) of meteorological data recorded at the LaGuardia airport with the SACTI model.

5.14.2 Ground Fog and Rime Ice

A cooling tower induced fog occurs when the condensed plume from the tower comes in contact with the ground. Since the tower outlet is elevated, the point where ground fogging may occur could be some distance downwind. SACTI also considers aerodynamic downwash caused by the tower structure, which may result in the plume reaching the ground close to the tower. Groundfog induced by downwash may cause a problem for structures at the facility, most notably causing flashover and arcing at the switchyard and transformers. Icing occurs when the ambient temperature is at or below 32°F, and the cooling tower plume comes in contact with the ground or ground based structure. This can occur as either glaze ice or rime ice. Glaze ice occurs when the cooling tower liquid drift droplets impact the ground or an object within the plume, which is at or below 32°F. The drift droplets freeze on contact forming an ice glaze. Rime ice and frost also may form on cold objects when the cooling tower plume is super-cooled (below freezing). The SACTI model does not address the occurrence of glaze ice. However, glaze ice formation is expected to be minimal due to the use of high efficiency drift eliminators and the fact that the drift droplets are not pure water; and therefore, have a freezing temperature below 32°F. Thus only summary tables and contour plots of the frequency of ground fog and rime ice will be provided. The contours of fog and ice frequency will be provided on base maps of the area surrounding the site which will identify parks, residential areas, major roadways, etc. The Surfer graphic program will be used for creating the contours. The contour plots will be overlayed on the USGS topographic map of the area.

Additionally, if periods of fogging or icing are predicted over highways or other sensitive areas the actual number of potential occurrences will be determined by identifying the meteorological conditions associated with such events. The frequency of meteorological conditions for low plume condition will then be provided in the application.

5.14.3 Mineral Deposition

Circulating water makeup will be drawn from the East River. The East River is tidal at the existing NYPA facility and experiences fluctuations in concentration of dissolved mineral (i.e., salt) content. NYPA has considerable data on the dissolved mineral content in the make up water. The assessment of mineral deposition will use the highest measured salt content to determine the maximum short-term deposition rate (i.e., in grams/square meter/day). Similarly, the highest annual average salt content will be used to estimate the annual mineral deposition (i.e., in grams/square meter/year). Summary tables and contour plots of deposition rates will be provided for the maximum short-term deposition rate and annual average deposition rate.

5.14.4 Elevated Visible Plumes

The SACTI model does not specifically provide summaries of the extent or duration of elevated visible plumes. However, summaries of plume height and width are provided, and an estimate of the size and height of the cooling tower plume can be inferred from these summary tables. Additionally, SACTI provides summaries of plume shadowing. The model provides summary tables based on the frequency of plume shadowing by direction and distance downwind. It is assumed that any plume that results in a measurable shadow will also be visible. Therefore, the plume shadowing distributions will be used to infer the frequency of visible plumes. The plume shadowing tables and contours will be presented to determine the frequency and estimate of the length of visible cooling tower plumes.

5.15 Environmental Justice Analysis

The applicant is currently reviewing the example Environmental Justice analyses previously forwarded by U.S. EPA. After completion of the review, the applicant will consult with U.S. EPA Region 2 staff to discuss this issue and finalize an analysis approach. The approach to be used in performing the Environmental Justice analysis, as well as the results of the analysis, will be presented in the PSD Air Permit application.

5.16 Submittal of Project Files

Certain copies of the PSD Air Permit applications will contain a CD-ROM of all project modeling files including input data (model set-up, receptor grids and special and point-in-space flagpole receptors, and meteorological data) as well as all pre- and post processed output files.

TABLE 5-1
NYPA COMBINED CYCLE FACILITY
WIND-PROFILE EXPONENTS AND
VERTICAL TEMPERATURE GRADIENTS USED IN ISCST3

Stability Class	Urban Wind Profile Exponent[a]	Vertical Potential Temperature Gradient[a] (°K/m)
A	0.15	0
B	0.15	0
C	0.20	0
D	0.25	0
E	0.30	0.02
F	0.30	0.035

(a) These values represent the standard default parameters as supplied by ISCST3.

Table 5-2
NYPA Poletti Combined Cycle Facility
Special Receptors

Receptor	UTM East (m)	UTM North (m)	Elevation (feet above sea level)
St. Lukes Hospital	588,000	4,517,250	120
Riverside Museum	587,000	4,517,000	95
Metro Hospital	589,000	4,515,000	15
Mt. Sinai Hospital	588,500	4,515,500	50
Brandeis HS	586,750	4,515,000	90
Guggenheim Museum	588,000	4,515,000	110
Schurz Park	589,250	4,513,500	30
Amer. Museum of Nat. History	586,750	4,514,750	90
Lenox Hill Hospital	587,750	4,514,000	60
School for Deaf	587,250	4,513,000	70
Cornell Univ. Medical Coll.	588,000	4,513,000	50
Aviation Trades HS	587,500	4,513,000	65
Chrysler Building	586,500	4,511,000	40
St. Mary's Park	592,000	4,518,000	50
Playground	592,000	4,519,250	30
PS #186	589,000	4,520,000	80
Hospital	589,000	4,519,500	100
Playground	590,000	4,519,000	15
City Univ. of New York	588,500	4,518,500	100
PS #119	589,000	4,518,250	20
Vocational HS	590,000	4,518,250	10
Harlem Hospital	589,500	4,518,000	15
Grant's Tomb	587,500	4,518,000	90
Sydenham Hospital	588,250	4,517,500	30
Library	589,000	4,517,250	25
Our Lady of Mt. Carmel School	590,000	4,516,250	5
City Prison	590,500	4,519,250	10
Hayes HS	590,750	4,519,000	50
Bronx Vocational HS	591,000	4,519,000	50
Dodge Vocational HS	592,000	4,519,000	30
St. Anslems School	592,250	4,518,750	50
Hospital	593,000	4,518,750	50
PS #25	592,250	4,518,000	40
Gompers Vocational HS	592,000	4,518,000	30
Lincoln Hospital	592,000	4,517,500	50
Pulaski Park	591,000	4,517,500	30
PS #49	591,000	4,518,000	30
PS #31	590,750	4,518,500	40
Dept. of Welfare	593,750	4,518,500	50
Corpus Christi Monastery	593,750	4,518,750	10
Sound View Park	594,500	4,519,000	20
Fire Station	593,750	4,519,000	30
PS #75	593,750	4,519,500	45
Church	593,500	4,520,000	40
PS #20	593,500	4,520,000	40
PS #150	593,250	4,520,000	50
Church	593,000	4,520,000	70
PS #23	592,750	4,520,000	80
PS #146	592,500	4,520,000	55

Table 5-2
NYPA Poletti Combined Cycle Facility
Special Receptors

Receptor	UTM East (m)	UTM North (m)	Elevation (feet above sea level)
PS #10	592,000	4,520,000	70
Fire Station	591,500	4,520,000	40
Yankee Stadium	590,500	4,520,000	20
St. Francis of Assisi School	592,750	4,513,750	50
PS #85	591,500	4,513,750	55
Master Christ HS	592,000	4,514,500	70
Playground	592,750	4,514,250	20
Radio Tower	595,000	4,515,500	75
Triboro Stadium	591,000	4,516,000	20
Riverside Hospital	593,000	4,517,000	15
Correction Hospital	588,500	4,512,500	202
Coler Mem. Hosp. and Home	589,000	4,513,500	15
St. Joan of Arc School	594,000	4,511,000	80
Corpus Christi School	592,750	4,512,000	50
Army Pictorial Center	590,750	4,512,000	40
St. Ritus School	589,500	4,512,500	25
Boulevard Hospital	591,500	4,512,250	70
Our Lady of Fatima School	593,750	4,512,750	25
Health Center	590,000	4,513,000	25
PS #17	591,000	4,513,000	35
Fire Station	592,000	4,513,000	65
Academy of Aeronautics	594,250	4,513,500	35

TABLE 5-3
NYPA COMBINED CYCLE FACILITY
BACKGROUND CONCENTRATIONS OF CRITERIA POLLUTANTS[a]
($\mu g/m^3$)

Pollutant	Averaging Period	1996 Background Concentration ($\mu g/m^3$)	1997 Background Concentration ($\mu g/m^3$)	1998 Background Concentration ($\mu g/m^3$)	Monitor Location
SO_2	3-Hour	286	194	165	I.S. 155, Bronx County
	24-Hour	157	113	97	
	Annual	24	21	24	
PM-10	24-Hour	45	75	50	I.S. 155, Bronx County
	Annual	23	25	23	
NO_2	Annual	79	75	75	P.S. 59, New York County
CO	1-Hour	5,840	5,150	5,040	
	8-Hour	4,465	3,665	4,465	

(a) Highest second-highest short-term (1-, 3-, 8-, and 24-hour) and maximum annual average concentrations presented.

TABLE 5-4
NYPA COMBINED CYCLE FACILITY
HEALTH BASED GUIDELINE BENCHMARKS FOR NON-CRITERIA POLLUTANTS
($\mu g/m^3$)

Pollutant	1-Hour NYSDEC Short-term Guideline Concentrations[1,2] mg/m^3	24-Hour NYSDEC Standard[2] mg/m^3	Annual NYSDEC Standard[1,2] mg/m^3	Annual Risk-Based Air Concentration mg/m^3	
1,1,1-Trichloroethane	560,000	-	-	1,000	{5}
2-Methylnaphthalene	-	-	-	3	{1,13}
3-Methylnaphthalene	-	-	-	3	{1,13}
7,12-Dimethylbenz(a)anthracene	-	-	-	100	{1,15}
1,3-Butadiene	440	-	3.60E-03	4.00E-03	{4}
Acenaphthene	-	-	-	220	{5}
Acenaphthyene	-	-	-	220	{1,14}
Acetaldehyde	4,500	-	110	5.00E-01	{4}
Acrolein	23	-	2.00E-02	2.00E-02	{4}
Ammonia	4,000	-	100	100	{4}
Anthracene	-	-	0.02	1,100	{5}
Antimony	120	-	1.2	1.4	{3}
Arsenic	0.2	-	0.00023	2.0E-04	{4,11}
Barium	120	-	0.5	0.5	{5,11}
Benz[a]anthracene	-	-	2.00E-02	8.6E-03	{5,11}
Benzene	32	-	0.12	0.13	{4}
Benzo(g,h,I)perylene	-	-	-	100	{1,15}
Benzo[a]pyrene	-	-	2.00E-03	2.0E-03	{5,11}
Benzo[b]fluoranthene	-	-	-	8.6E-03	{5,11}
Benzo[k]fluoranthene	-	-	-	0.086	{5,11}
Beryllium	0.05	0.01	0.0004	4.0E-04	{3,4,11}
Butane	450,000	-	45,000	4,524	{7}
Cadmium	0.2	-	0.0005	5.00E-04	{11,16}
Chromium	120	-	0.1	0.1	{16}
Chrysene	-	-	2.00E-02	0.2	{1,11}
Cobalt	4.8	-	0.048	220	{5,6}
Copper	48	-	0.48	150	{5,6}
Dibenz[a,h]anthracene	-	-	7.10E-05	8.6E-04	{5,11}
Dichlorobenzene	14,000	-	700	2.8E-01	{5}
Ethane	-	-	9,999,999	-	{9}
Ethylbenzene	100,000	-	1,000	1,000	{3,4}
Fluoranthene	-	-	-	150	{5}
Fluoride	7.1	-	0.4	0.8	{17}
Formaldehyde	30	-	0.06	0.06	{16}
Indeno[1,2,3-cd]pyrene	-	-	-	8.6E-03	{5,11}
Lead	12	-	0.75	0.20	{11,12}
Manganese	48	-	0.05	0.05	{4}
Mercury	6	-	3.00E-01	0.3	{4,11}
Molybdenum	380	-	12	18	{5}
Naphthalene	12,000	-	120	3.00	{3,4}
n-Hexane	42,000	-	240	200	{3,4}
Nickel	5	-	0.004	4.2E-03	{4,11}
Octachloro-Dibenzodioxins (OCDD)	-	-	-	1.53E-08	{7}
Pentane	83,000	-	830	45,000	{3,7}
Phenanthene	-	-	2.00E-02	100	{15}
Phosphorus	-	-	-	1,375	{3}
Propane	-	-	9,999,999	-	{9}
Propylene Oxide	11,000	-	0.3	0.3	{4}
Pyrene	-	-	2.00E-02	110	{3,4,6}
Selenium	48	-	0.48	18	{3,4,6,11}
Sulfuric Acid	240	-	2.4	2.38	{3,7}
Toluene	45,000	-	400	400	{3,4}

TABLE 5-4
NYPA COMBINED CYCLE FACILITY
HEALTH BASED GUIDELINE BENCHMARKS FOR NON-CRITERIA POLLUTANTS
($\mu g/m^3$)

Pollutant	1-Hour NYSDEC Short-term Guideline Concentrations[1,2] mg/m³	24-Hour NYSDEC Standard[2] mg/m³	Annual NYSDEC Standard[1,2] mg/m³	Annual Risk-Based Air Concentration mg/m³	
Vanadium	100	-	0.2	0.2	{16}
o-Xylene	100,000	-	300	300	{18}
Zinc	-	-	50	50	{11,16}

Does not include pollutants from cooling tower

1) From NYSDEC's Benchmark Air Concentration Table
2) From NYSDEC Air Guide-1, Appendix C (Dated 10/6/95)
3) To convert from mg/m^3 to mg/m^3:
   mg/m^3 = (RfC in mg/m^3) x (1000 mg/mg)
   To convert from mg/kg-dy to mg/m^3:
   mg/m^3 = (RfC in mg/kg-dy) x (1000 mg/mg) x (70 kg) / (20 m^3/dy)
   To convert from $(mg/m^3)^{-1}$ to mg/m^3:
   $mg/m^3 = (1x10^{-6})$ / (UR in $(mg/mg)^{-1}$) (at a $1x10^{-6}$ risk level)
   To convert from $(mg/kg\text{-}dy)^{-1}$ to mg/m^3:
   $mg/m^3 = (1x10^{-6})$ x (1000 mg/mg) x (70 kg) / [(SF in $(mg/kg\text{-}dy)^{-1}$) x (20 m^3/day)]
   (at a 1x10-6 risk level)
4) From USEPA's Integrated Risk Information System (IRIS) (accessed 2/4/2000)
5) From USEPA's Region III Risk-Based Concentration (RBC) Table, NCEA Provisional Value (dated 10/7/99)
6) Oral RfD; inhalation RfD not available
7) Calculated by dividing the TLV by 420
8) One tenth of the Recommended Daily Allowance for an infant (National Academy of Sciencs; 1989)
   mg/kg-dy = (RDA in mg/dy) / (70 kg)
   mg/m^3 = (RfC in mg/kg-dy) x (1000 mg/mg) x (70 kg) / (20 m^3/dy)
9) Simple asphyxiant ("inert" gases or vapors) no TLV recommended since limiting factor is the amount of oxygen available
10) IRIS indicates no data available at this time, pollutant not found in other databases
11) Highly persistent and bioaccumulate in the environment, according to the North Carolina Protocol for Performing Indirect Exposrue Risk Assessments for Hazardous Waste Combustion Units, Table 4-1 (January 1997)
12) EPA's 1994 Hazardous Waste Combustion Guidance
13) Based on naphthalene
14) Based on acenaphthene
15) Based on pyrene
16) New York State Department of Health. Ambient Air Criteria Document for Cadmium, Chromium, Formaldehyde, Vanadium and Zinc. Albany, NY: Bureau of Toxic Substance Assessment.
17) NYSDEC, 1972. Ambient Air Quality Standards - Fluorides. DEC, 6 NYCRR (New York Code of Rules and Regulations), Subpart 257-8.
18) United States Environmental Protection Agency. 1991. Health Effects Summary Table. FY-1991 Annual. Washington, DC: Office of Research and Development. Office of Emergency and remedial Response. OERR 9200.6-303 (91-1).

FIGURE 5-1
NYPA COMBINED CYCLE FACILITY
PROPOSED MODELING RECEPTOR GRID (FULL GRID)

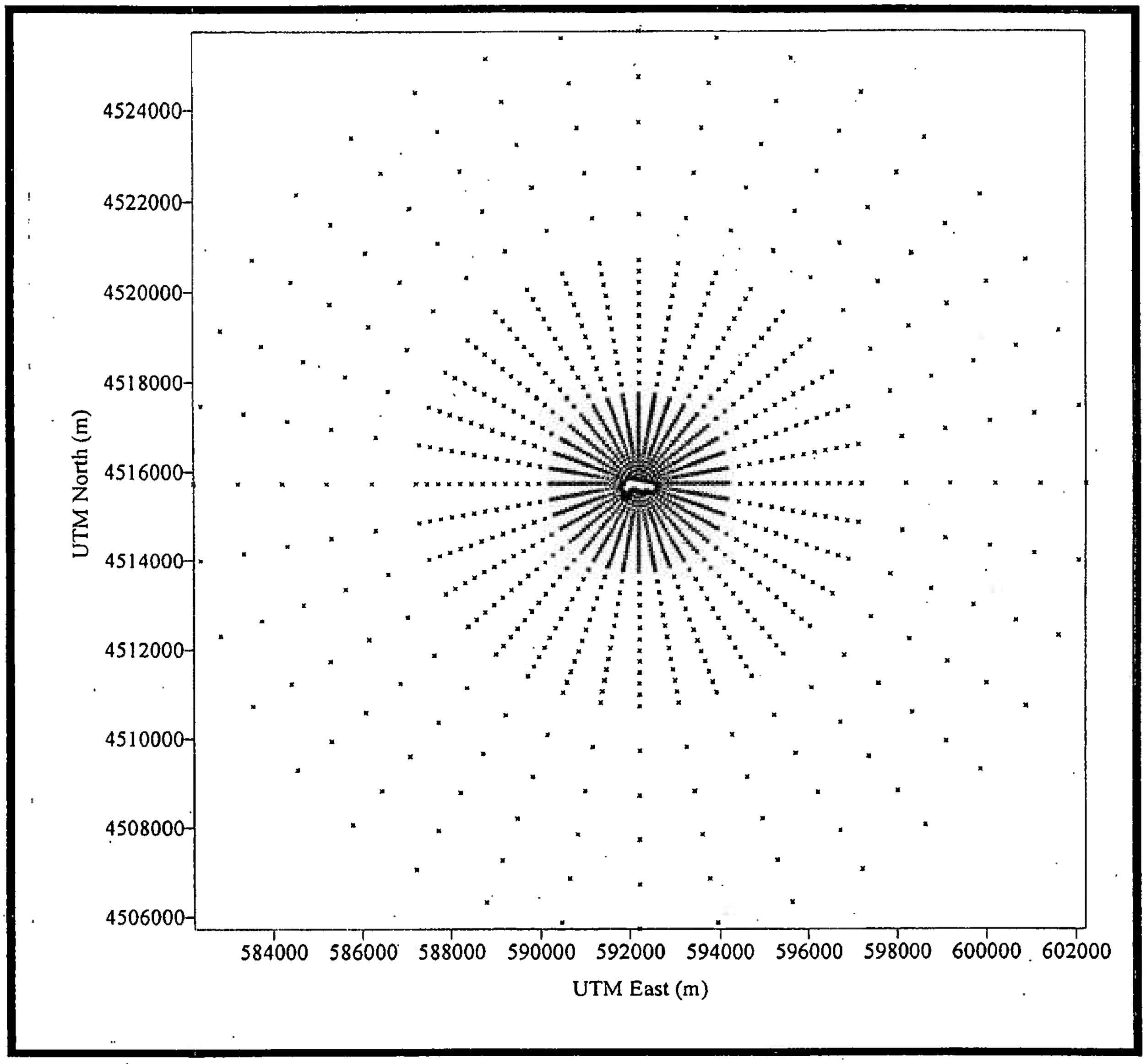
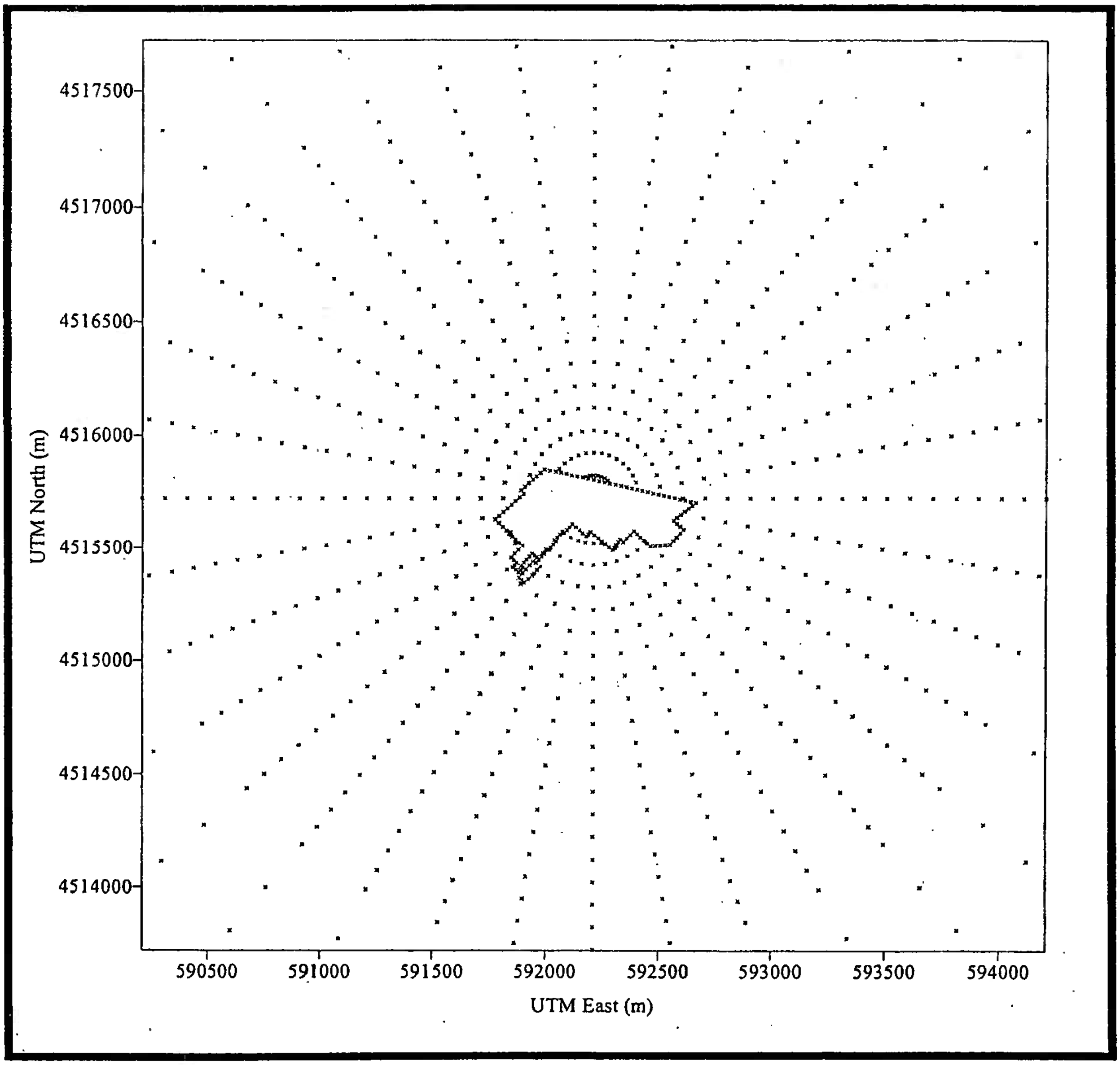


FIGURE 5-2
NYPA COMBINED CYCLE FACILITY
PROPOSED MODELING RECEPTOR GRID (NEAR GRID)



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APPENDIX A
POINT-IN-SPACE FLAGPOLE RECEPTORS

Appendix A
NYPA Poletti Combined Cycle Facility
Proposed New York City Elevated Receptors (i.e., Buildings)

Building No.	UTM East (m)	UTM North (m)	Elevation (m)	Approximate Height of Building (m)
B1	590,337	4,515,714	6	67.4
B2	590,386	4,515,667	6	67.4
B3	590,386	4,515,833	6	67.4
B4	590,410	4,515,405	9	30.5
B5	592,952	4,514,679	6	24.4
B6	591,750	4,515,595	2	31.7
B7	590,560	4,514,714	0	36.6
B8	590,548	4,514,262	5	63.4
B9	590,547	4,514,380	9	24.4
B10	591,976	4,516,893	3	19.8
B11	592,036	4,516,976	4	24.4
B12	592,964	4,517,060	0	47.5
B13	592,333	4,517,381	3	24.4
B14	593,405	4,517,893	3	21.3
B15	594,548	4,517,405	3	28.3
B16	594,274	4,517,976	5	19.8
B17	589,476	4,517,476	7	43.6
B18	589,964	4,517,238	4	19.8
B19	589,869	4,517,095	4	142.6
B20	589,976	4,517,286	4	19.8
B21	589,929	4,517,143	4	63.4
B22	589,869	4,517,071	4	150.6
B23	589,786	4,516,929	6	19.8
B24	590,000	4,517,000	3	63.4
B25	590,095	4,516,833	3	63.4
B26	589,952	4,516,726	3	24.4
B27	589,929	4,516,702	3	24.4
B28	590,286	4,516,798	2	63.4
B29	590,310	4,516,714	3	27.7
B30	590,167	4,516,571	3	19.8
B31	590,202	4,516,357	3	19.8
B32	589,619	4,515,667	2	79.2
B33	589,615	4,515,631	2	79.2
B34	589,536	4,515,667	2	79.2
B35	589,452	4,515,833	3	79.2
B36	588,952	4,515,464	6	55.5
B37	588,833	4,515,238	6	138.7

Appendix A
NYPA Poletti Combined Cycle Facility
Proposed New York City Elevated Receptors (i.e., Buildings)

Building No.	UTM East (m)	UTM North (m)	Elevation (m)	Approximate Height of Building (m)
B38	588,952	4,515,071	2	99.1
B39	589,025	4,515,143	1	55.5
B40	588,738	4,515,036	6	150.6
B41	588,690	4,514,952	6	178.3
B42	588,714	4,515,025	6	126.8
B43	588,952	4,514,929	4	99.1
B44	588,595	4,514,774	11	19.8
B45	588,631	4,514,714	11	158.5
B46	588,429	4,514,405	20	142.6
B47	588,476	4,514,500	18	99.1
B48	588,809	4,514,286	24	158.5
B49	588,857	4,514,214	13	79.2
B50	588,798	4,514,238	6	138.7
B51	588,200	4,513,195	12	115
B52	588,200	4,513,297	12	97
B53	588,300	4,513,395	12	98
B54	588,300	4,513,395	12	98
B55	588,500	4,513,598	12	97
B56	588,700	4,513,895	12	95
B57	587,800	4,512,797	12	103
B58	588,100	4,513,297	12	92
B59	587,400	4,514,000	12	96
B60	587,100	4,512,098	12	94
B61	587,400	4,512,395	12	124
B62	587,700	4,512,895	12	130
B63	587,900	4,513,195	12	98
B64	588,000	4,513,500	12	105
B65	588,000	4,513,589	12	93
B66	588,000	4,513,797	12	110
B67	587,900	4,513,195	12	98
B68	586,800	4,511,895	12	152
B69	587,300	4,512,695	12	97
B70	587,600	4,513,500	12	94
B71	587,600	4,511,797	12	101
B72	587,600	4,512,000	12	105
B73	587,500	4,513,297	12	96
B74	588,800	4,514,098	12	104
B75	587,700	4,512,297	12	128

Appendix A
NYPA Poletti Combined Cycle Facility
Proposed New York City Elevated Receptors (i.e., Buildings)

Building No.	UTM East (m)	UTM North (m)	Elevation (m)	Approximate Height of Building (m)
B76	587,700	4,512,750	12	43
B77	589,000	4,514,797	12	43
B78	587,000	4,513,500	12	30
B79	587,500	4,513,000	12	46
B80	587,500	4,512,750	12	49
B81	587,200	4,513,297	12	46
B82	587,300	4,513,395	12	55
B83	587,600	4,513,195	12	55
B84	587,100	4,511,797	12	18
B85	589,300	4,513,695	12	24
B86 (Empire State Building)	585,600	4,511,098	12	381
B87	583,800	4,506,395	8	259
B88	584,200	4,507,297	8	185
B89	585,600	4,510,297	12	206
B90	585,200	4,511,395	12	229
B91	584,500	4,508,297	8	123
B92	584,800	4,507,797	8	121
B93 (Lincoln)	586,200	4,511,598	12	205
B94 (Pan Am)	586,500	4,511,797	12	246
B95	586,400	4,512,195	12	177
B96 (Chrysler)	586,400	4,511,395	12	277
B97 (Waldorf)	586,600	4,512,000	12	191
B98	586,900	4,511,695	12	202
B99	585,400	4,511,695	12	177
B100	585,800	4,512,695	12	202
B101	586,200	4,512,797	12	197
B102	585,700	4,512,598	12	204
B103	586,100	4,513,098	12	185
B104	586,500	4,512,797	12	221
B105 (RCA)	586,000	4,512,395	12	259
B106	587,700	4,513,098	12	130
B107 (GE)	586,700	4,512,098	12	197
B108 (Citicorp)	586,900	4,512,297	12	279
B109	587,100	4,512,395	12	189
B110 (The Excelsior)	587,300	4,512,395	12	124
B111	587,400	4,512,098	12	110
B112	587,600	4,512,195	12	128

Appendix A
NYPA Poletti Combined Cycle Facility
Proposed New York City Elevated Receptors (i.e., Buildings)

Building No.	UTM East (m)	UTM North (m)	Elevation (m)	Approximate Height of Building (m)
B113	585,900	4,513,395	12	207
B114	585,800	4,513,695	12	115
B115	588,400	4,514,895	12	115
B116	588,700	4,514,797	12	130
B117	588,800	4,513,797	12	121
B118	585,500	4,512,195	12	218
B119	584,800	4,512,500	12	126
B120	586,000	4,511,797	12	212
B121 (World Trade Center)	583,300	4,507,000	6	404
B122 (Galleria)	586,900	4,512,695	12	176
B123	588,700	4,519,300	12	30
B124	592,400	4,520,450	12	21
B125	586,800	4,513,300	12	15
B126	585,700	4,509,400	12	8
B127	588,800	4,509,400	12	3
B128	591,800	4,513,310	12	6
B129	599,800	4,510,000	12	30
B130	589,900	4,493,900	12	2
B131	574,000	4,516,800	12	90
B132	570,600	4,495,500	12	9
B133	590,000	4,516,800	12	3
B134	583,600	4,506,350	6	226
B135	583,600	4,506,750	8	226
B136	586,100	4,512,400	12	204
B137	586,200	4,512,100	12	144
B138	586,300	4,511,500	12	207
B139	586,800	4,513,000	12	156
B140 (Trump Towers)	586,500	4,512,500	12	200
B141	586,300	4,512,500	12	166
B142 (Wall St. Tower)	583,600	4,506,450	8	283
B143 (Exxon)	586,200	4,512,550	12	229
B144 (GM)	586,700	4,512,800	12	155
B145	587,100	4,503,600	20	105
B146 (Williamsburg Savings)	588,800	4,508,000	15	155
B147 (NY Telephone)	585,500	4,505,000	15	101
B148	584,700	4,505,880	20	140
B149 (Met Life)	590,300	4,506,860	8	173
B150 (Met Life)	590,200	4,507,400	8	128

Appendix A
NYPA Poletti Combined Cycle Facility
Proposed New York City Elevated Receptors (i.e., Buildings)

Building No.	UTM East (m)	UTM North (m)	Elevation (m)	Approximate Height of Building (m)
B151	590,300	4,507,900	8	125
B152	590,200	4,506,840	8	113
B153 (Chase)	590,300	4,506,860	8	228
B154 (Federal Building)	590,400	4,506,890	8	273
B155	583,700	4,506,300	8	152
B156	584,000	4,506,830	8	113
B157	583,700	4,506,910	8	183
B158	583,700	4,506,910	8	144
B159	583,700	4,506,300	8	150
B160	583,600	4,506,300	8	191
B161	583,700	4,506,910	8	119
B162	583,500	4,506,300	8	113
B163	583,600	4,506,930	8	145
B164	583,700	4,506,910	8	160
B165	583,400	4,507,280	8	143
B166	583,400	4,506,960	6	405
B167	583,800	4,507,500	8	210
B168 (Woolworth)	583,700	4,507,500	8	237
B169	584,300	4,506,900	8	174
B170	583,900	4,506,300	8	202
B171	587,290	4,506,485	11	65
B172	587,275	4,506,425	11	65
B173	587,100	4,506,570	6	48
B174	587,510	4,506,410	15	55
B175	587,550	4,506,340	15	55
B176	587,440	4,506,390	15	55
B177	587,475	4,506,310	15	55
B178	587,390	4,506,310	15	55
B179	587,440	4,506,250	15	55
B180	587,275	4,506,360	12	17
B181	587,310	4,506,290	12	35
B182	587,325	4,506,240	12	23
B183	587,400	4,506,220	12	30
B184	587,420	4,506,160	11	23
B185	587,450	4,506,150	11	35

APPENDIX B
URBAN/RURAL LAND USE ANALYSIS

A land use classification analysis was performed to determine whether urban or rural dispersion parameters should be used in quantifying ground-level concentrations. The analysis conformed to the procedures contained in the A.H. Auer paper "Correlation of Land Use and Cover with Meteorological Anomalies" (Auer, 1978). The Auer method identifies the amount of land covered by structures and pavement versus the amount of land covered by grass or vegetation within a 3 km radius around the proposed site. The Auer land use types are provided below in Table B-1.

Table B-1
Auer Land Use Types

Urban Land Use Types	Rural Land Use Types
Industrial (I1)	Common Residential (R1)
Light Industrial (I2)	Metropolitan Natural (A1)
Commercial (C1)	Undeveloped (A3)
Compact Residential (R2)	Water Surfaces (A5)
Compact Residential (R3)	

The Auer method, in agreement with the U.S. EPA, defines an urban area as an area whose land usage within the 3 km radial study area is more than 50% urban; otherwise, Auer defines the area as rural.

Figure B-1 depicts the 3 km radial study area surrounding the site. For this study area, the land use types were identified according to the land use types defined in Table B-1 above. After the land use types were identified, their respective percent areas were estimated.

Table B-2
Percent Area Land Use

Urban	Percent	Rural	Percent
Industrial (I1), Light Industrial (I2)	23%	Common Residential (R1)	0%
Commercial (C1)	15%	Undeveloped (A3)	1%
Compact Residential (R2/R3)	29%	Metropolitan Natural (A1)	6%
		Water Surfaces (A5)	26%
Total Urban	**67%**	**Total Rural**	**33%**

The majority of urban land use in the 3 km circle surrounding the site is comprised of compact residential use (29%) followed by industrial/light industrial use (23%) and commercial usage (15%). These three urban uses comprise 67% of the total land usage. Rural uses total 33% and include water surfaces at 26%, metropolitan natural at 6% and undeveloped at 1%. The following generalizations can be made for the primary land uses:

- Manhattan Island (located west of the site), the Steinway and Astoria sections of Queens Borough and the South Bronx area in the vicinity of Hunts Point make up the majority of the R2/R3 areas;

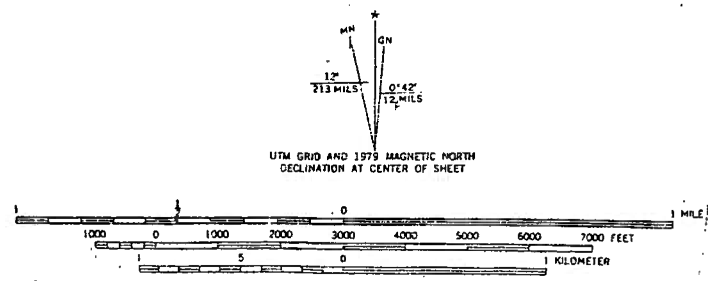
- St. Mary's Park, located in the South Bronx, the northwestern and extreme southern areas of Randalls Island and several pocket parks and cemeteries comprise the A1 usage;

- The area is crossed in numerous locations by major highways (i.e., the Bruckner, Grand Central) related interchanges, bridges/toll plazas as well as subway lines. These uses, plus several large hospitals, comprise the commercial (C) usage; and

- The majority of the I1/I2 areas include the NYPA Poletti and Orion Holdings generating stations as well as the NRG peaking turbines, all located adjacent to the project site, a sewerage treatment plant and La Guardia Airport located further east, Rikers Island, the Hunts Point section of the Bronx, and a thin strip of activity located south of the Queensboro Bridge.

There are also other commercial zones present throughout the study area along the major roadways and railroads.

Based on this analysis, approximately 67% of the land usage is urban and, as such, modeling will be performed using urban dispersion coefficients.



KEY

C	Commercial
I1/I2	Industrial/Light Industrial
R2/R3	Compact Residential
A1	Natural Metropolitan
A3	Undeveloped
A5	Water Surfaces

FIGURE B-1
LAND USE CLASSIFICATION IN A 3 KM RADIUS SURROUNDING THE PROPOSED NYPA COMBINED CYCLE FACILITY

TRC Environmental Corporation
1200 Wall Street West, 2nd Floor
Lyndhurst, New Jersey 07071