INTENTIONALLY OMITTED

SEE TAB 25

Appendix B

Operational Noise Data Inputs – NYSDEC Staff Proposal *(TRC)*

Operation Noise Impacts

Basis for Analysis

Potential operation related noise impacts were also addressed through a noise modeling analysis. The calculated operation noise levels were evaluated against existing ambient conditions and against the Village of Buchanan Noise Ordinance.

Assumptions

- CadnaA noise model incorporated favorable noise propagation conditions under ISO-9613-2 were included (e.g., moderate downwind or atmospheric inversion).
- Existing topographic features were included.
- Modeling assumed a partially acoustically absorptive ground cover, except for the Hudson River, which was modeled as acoustically reflective. No tree cover was included.
- Major existing IPEC buildings and structures were included
- Operational noise emissions data for each cooling tower cell were developed by utilizing the 100 meter sound levels presented in the Tetra Tech report for each array, the number of cooling tower cells per array, and the physical dimensions of the proposed cooling towers.

Table C-1: NYSDEC Proposed ClearSky™ Cooling Towers Specifications

Cells Per Array	44 (22 back to back)
Inlet Height Above Grade	26 Feet
Outlet Height Above Grade	91 Feet
Finished Grade of Cooling Towers	52.5 Feet MSL
Cooling Tower Cell Length (per cell)	64 Feet
Cooling Tower Cell Width (per cell)	75.5 Feet
Cooling Tower Cell Height (per cell)	91 Feet
Source: Tetra Tech, 2013	

Table C-2: NYSDEC Proposed ClearSky™ Cooling Tower Operation Noise Source Data - CadnaA Model

Name	ID	Type	Oktave Spectrum (dB)									
			63	125	250	500	1000	2000	4000	8000	A	lin
air outlet	outlet	Lw	116	116	112	105	97	85.5	81	81.5	107.3	120
air inlet	inlet	Lw	116	114	114	105	99	96.5	96	100.5	109.3	119.8

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell outlet	cs1	107.3	107.3	107.3	Lw	outlet	0	27.7	587495.94	4568987	43.7
clearsky tower cell outlet	cs2	107.3	107.3	107.3	Lw	outlet	0	27.7	587515.19	4568989	43.7
clearsky tower cell outlet	cs3	107.3	107.3	107.3	Lw	outlet	0	27.7	587535.09	4568991	43.7
clearsky tower cell outlet	cs4	107.3	107.3	107.3	Lw	outlet	0	27.7	587554.24	4568993	43.7
clearsky tower cell outlet	cs5	107.3	107.3	107.3	Lw	outlet	0	27.7	587573.53	4568995	43.7
clearsky tower cell outlet	cs6	107.3	107.3	107.3	Lw	outlet	0	27.7	587593.69	4568997	43.7
clearsky tower cell outlet	cs7	107.3	107.3	107.3	Lw	outlet	0	27.7	587614.48	4569000	43.7
clearsky tower cell outlet	cs8	107.3	107.3	107.3	Lw	outlet	0	27.7	587633.55	4569002	43.7
clearsky tower cell outlet	cs9	107.3	107.3	107.3	Lw	outlet	0	27.7	587653.34	4569004	43.7
clearsky tower cell outlet	cs10	107.3	107.3	107.3	Lw	outlet	0	27.7	587673.13	4569006	43.7
clearsky tower cell outlet	cs11	107.3	107.3	107.3	Lw	outlet	0	27.7	587692.24	4569008	43.7
clearsky tower cell outlet	cs12	107.3	107.3	107.3	Lw	outlet	0	27.7	587711.48	4569010	43.7
clearsky tower cell outlet	cs13	107.3	107.3	107.3	Lw	outlet	0	27.7	587731.38	4569012	43.7
clearsky tower cell outlet	cs14	107.3	107.3	107.3	Lw	outlet	0	27.7	587751.26	4569015	43.7
clearsky tower cell outlet	cs15	107.3	107.3	107.3	Lw	outlet	0	27.7	587770.73	4569017	43.7
clearsky tower cell outlet	cs16	107.3	107.3	107.3	Lw	outlet	0	27.7	587790.45	4569019	43.7
clearsky tower cell outlet	cs17	107.3	107.3	107.3	Lw	outlet	0	27.7	587810.58	4569021	43.7
clearsky tower cell outlet	cs18	107.3	107.3	107.3	Lw	outlet	0	27.7	587829.83	4569023	43.7
clearsky tower cell outlet	cs19	107.3	107.3	107.3	Lw	outlet	0	27.7	587848.87	4569025	43.7
clearsky tower cell outlet	cs20	107.3	107.3	107.3	Lw	outlet	0	27.7	587868.44	4569027	43.7
clearsky tower cell outlet	cs21	107.3	107.3	107.3	Lw	outlet	0	27.7	587888.1	4569029	43.7
clearsky tower cell outlet	cs22	107.3	107.3	107.3	Lw	outlet	0	27.7	587906	4569031	43.7

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell inlet	cs1	109.3	109.3	109.3	Lw	inlet	0	7.9	587495.94	4568987	23.9
clearsky tower cell inlet	cs2	109.3	109.3	109.3	Lw	inlet	0	7.9	587515.19	4568989	23.9
clearsky tower cell inlet	cs3	109.3	109.3	109.3	Lw	inlet	0	7.9	587535.09	4568991	23.9
clearsky tower cell inlet	cs4	109.3	109.3	109.3	Lw	inlet	0	7.9	587554.24	4568993	23.9
clearsky tower cell inlet	cs5	109.3	109.3	109.3	Lw	inlet	0	7.9	587573.53	4568995	23.9
clearsky tower cell inlet	cs6	109.3	109.3	109.3	Lw	inlet	0	7.9	587593.69	4568997	23.9
clearsky tower cell inlet	cs7	109.3	109.3	109.3	Lw	inlet	0	7.9	587614.48	4569000	23.9
clearsky tower cell inlet	cs8	109.3	109.3	109.3	Lw	inlet	0	7.9	587633.55	4569002	23.9
clearsky tower cell inlet	cs9	109.3	109.3	109.3	Lw	inlet	0	7.9	587653.34	4569004	23.9
clearsky tower cell inlet	cs10	109.3	109.3	109.3	Lw	inlet	0	7.9	587673.13	4569006	23.9
clearsky tower cell inlet	cs11	109.3	109.3	109.3	Lw	inlet	0	7.9	587692.24	4569008	23.9
clearsky tower cell inlet	cs12	109.3	109.3	109.3	Lw	inlet	0	7.9	587711.48	4569010	23.9
clearsky tower cell inlet	cs13	109.3	109.3	109.3	Lw	inlet	0	7.9	587731.38	4569012	23.9
clearsky tower cell inlet	cs14	109.3	109.3	109.3	Lw	inlet	0	7.9	587751.26	4569015	23.9
clearsky tower cell inlet	cs15	109.3	109.3	109.3	Lw	inlet	0	7.9	587770.73	4569017	23.9
clearsky tower cell inlet	cs16	109.3	109.3	109.3	Lw	inlet	0	7.9	587790.45	4569019	23.9
clearsky tower cell inlet	cs17	109.3	109.3	109.3	Lw	inlet	0	7.9	587810.58	4569021	23.9
clearsky tower cell inlet	cs18	109.3	109.3	109.3	Lw	inlet	0	7.9	587829.83	4569023	23.9
clearsky tower cell inlet	cs19	109.3	109.3	109.3	Lw	inlet	0	7.9	587848.87	4569025	23.9
clearsky tower cell inlet	cs20	109.3	109.3	109.3	Lw	inlet	0	7.9	587868.44	4569027	23.9
clearsky tower cell inlet	cs21	109.3	109.3	109.3	Lw	inlet	0	7.9	587888.1	4569029	23.9
clearsky tower cell inlet	cs22	109.3	109.3	109.3	Lw	inlet	0	7.9	587906	4569031	23.9
clearsky tower cell outlet	cs1	107.3	107.3	107.3	Lw	outlet	0	27.7	587500.04	4568964	43.7

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell outlet	cs2	107.3	107.3	107.3	Lw	outlet	0	27.7	587519.29	4568966	43.7
clearsky tower cell outlet	cs3	107.3	107.3	107.3	Lw	outlet	0	27.7	587539.19	4568969	43.7
clearsky tower cell outlet	cs4	107.3	107.3	107.3	Lw	outlet	0	27.7	587558.34	4568971	43.7
clearsky tower cell outlet	cs5	107.3	107.3	107.3	Lw	outlet	0	27.7	587577.63	4568973	43.7
clearsky tower cell outlet	cs6	107.3	107.3	107.3	Lw	outlet	0	27.7	587597.79	4568975	43.7
clearsky tower cell outlet	cs7	107.3	107.3	107.3	Lw	outlet	0	27.7	587618.58	4568978	43.7
clearsky tower cell outlet	cs8	107.3	107.3	107.3	Lw	outlet	0	27.7	587637.65	4568979	43.7
clearsky tower cell outlet	cs9	107.3	107.3	107.3	Lw	outlet	0	27.7	587657.44	4568982	43.7
clearsky tower cell outlet	cs10	107.3	107.3	107.3	Lw	outlet	0	27.7	587677.23	4568984	43.7
clearsky tower cell outlet	cs11	107.3	107.3	107.3	Lw	outlet	0	27.7	587696.34	4568986	43.7
clearsky tower cell outlet	cs12	107.3	107.3	107.3	Lw	outlet	0	27.7	587715.58	4568988	43.7
clearsky tower cell outlet	cs13	107.3	107.3	107.3	Lw	outlet	0	27.7	587735.48	4568990	43.7
clearsky tower cell outlet	cs14	107.3	107.3	107.3	Lw	outlet	0	27.7	587755.36	4568992	43.7
clearsky tower cell outlet	cs15	107.3	107.3	107.3	Lw	outlet	0	27.7	587774.83	4568994	43.7
clearsky tower cell outlet	cs16	107.3	107.3	107.3	Lw	outlet	0	27.7	587794.55	4568996	43.7
clearsky tower cell outlet	cs17	107.3	107.3	107.3	Lw	outlet	0	27.7	587814.68	4568999	43.7
clearsky tower cell outlet	cs18	107.3	107.3	107.3	Lw	outlet	0	27.7	587833.93	4569001	43.7
clearsky tower cell outlet	cs19	107.3	107.3	107.3	Lw	outlet	0	27.7	587852.97	4569003	43.7
clearsky tower cell outlet	cs20	107.3	107.3	107.3	Lw	outlet	0	27.7	587872.54	4569005	43.7
clearsky tower cell outlet	cs21	107.3	107.3	107.3	Lw	outlet	0	27.7	587892.2	4569007	43.7
clearsky tower cell outlet	cs22	107.3	107.3	107.3	Lw	outlet	0	27.7	587910.1	4569009	43.7
clearsky tower cell inlet	cs1	109.3	109.3	109.3	Lw	inlet	0	7.9	587500.04	4568964	23.9
clearsky tower cell inlet	cs2	109.3	109.3	109.3	Lw	inlet	0	7.9	587519.29	4568966	23.9

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell inlet	cs3	109.3	109.3	109.3	Lw	inlet	0	7.9	587539.19	4568969	23.9
clearsky tower cell inlet	cs4	109.3	109.3	109.3	Lw	inlet	0	7.9	587558.34	4568971	23.9
clearsky tower cell inlet	cs5	109.3	109.3	109.3	Lw	inlet	0	7.9	587577.63	4568973	23.9
clearsky tower cell inlet	cs6	109.3	109.3	109.3	Lw	inlet	0	7.9	587597.79	4568975	23.9
clearsky tower cell inlet	cs7	109.3	109.3	109.3	Lw	inlet	0	7.9	587618.58	4568978	23.9
clearsky tower cell inlet	cs8	109.3	109.3	109.3	Lw	inlet	0	7.9	587637.65	4568979	23.9
clearsky tower cell inlet	cs9	109.3	109.3	109.3	Lw	inlet	0	7.9	587657.44	4568982	23.9
clearsky tower cell inlet	cs10	109.3	109.3	109.3	Lw	inlet	0	7.9	587677.23	4568984	23.9
clearsky tower cell inlet	cs11	109.3	109.3	109.3	Lw	inlet	0	7.9	587696.34	4568986	23.9
clearsky tower cell inlet	cs12	109.3	109.3	109.3	Lw	inlet	0	7.9	587715.58	4568988	23.9
clearsky tower cell inlet	cs13	109.3	109.3	109.3	Lw	inlet	0	7.9	587735.48	4568990	23.9
clearsky tower cell inlet	cs14	109.3	109.3	109.3	Lw	inlet	0	7.9	587755.36	4568992	23.9
clearsky tower cell inlet	cs15	109.3	109.3	109.3	Lw	inlet	0	7.9	587774.83	4568994	23.9
clearsky tower cell inlet	cs16	109.3	109.3	109.3	Lw	inlet	0	7.9	587794.55	4568996	23.9
clearsky tower cell inlet	cs17	109.3	109.3	109.3	Lw	inlet	0	7.9	587814.68	4568999	23.9
clearsky tower cell inlet	cs18	109.3	109.3	109.3	Lw	inlet	0	7.9	587833.93	4569001	23.9
clearsky tower cell inlet	cs19	109.3	109.3	109.3	Lw	inlet	0	7.9	587852.97	4569003	23.9
clearsky tower cell inlet	cs20	109.3	109.3	109.3	Lw	inlet	0	7.9	587872.54	4569005	23.9
clearsky tower cell inlet	cs21	109.3	109.3	109.3	Lw	inlet	0	7.9	587892.2	4569007	23.9
clearsky tower cell inlet	cs22	109.3	109.3	109.3	Lw	inlet	0	7.9	587910.1	4569009	23.9
clearsky tower cell outlet	cs1	107.3	107.3	107.3	Lw	outlet	0	27.7	587980.98	4569389	43.7
clearsky tower cell outlet	cs2	107.3	107.3	107.3	Lw	outlet	0	27.7	587993.03	4569405	43.7
clearsky tower cell outlet	cs3	107.3	107.3	107.3	Lw	outlet	0	27.7	588005.35	4569421	43.7

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell outlet	cs4	107.3	107.3	107.3	Lw	outlet	0	27.7	588017.61	4569436	43.7
clearsky tower cell outlet	cs5	107.3	107.3	107.3	Lw	outlet	0	27.7	588029.64	4569451	43.7
clearsky tower cell outlet	cs6	107.3	107.3	107.3	Lw	outlet	0	27.7	588042.5	4569467	43.7
clearsky tower cell outlet	cs7	107.3	107.3	107.3	Lw	outlet	0	27.7	588055.44	4569483	43.7
clearsky tower cell outlet	cs8	107.3	107.3	107.3	Lw	outlet	0	27.7	588067.6	4569498	43.7
clearsky tower cell outlet	cs9	107.3	107.3	107.3	Lw	outlet	0	27.7	588080.01	4569514	43.7
clearsky tower cell outlet	cs10	107.3	107.3	107.3	Lw	outlet	0	27.7	588092.48	4569530	43.7
clearsky tower cell outlet	cs11	107.3	107.3	107.3	Lw	outlet	0	27.7	588104.55	4569545	43.7
clearsky tower cell outlet	cs12	107.3	107.3	107.3	Lw	outlet	0	27.7	588116.74	4569560	43.7
clearsky tower cell outlet	cs13	107.3	107.3	107.3	Lw	outlet	0	27.7	588129.35	4569576	43.7
clearsky tower cell outlet	cs14	107.3	107.3	107.3	Lw	outlet	0	27.7	588141.89	4569591	43.7
clearsky tower cell outlet	cs15	107.3	107.3	107.3	Lw	outlet	0	27.7	588154.17	4569607	43.7
clearsky tower cell outlet	cs16	107.3	107.3	107.3	Lw	outlet	0	27.7	588166.73	4569622	43.7
clearsky tower cell outlet	cs17	107.3	107.3	107.3	Lw	outlet	0	27.7	588179.4	4569638	43.7
clearsky tower cell outlet	cs18	107.3	107.3	107.3	Lw	outlet	0	27.7	588191.59	4569653	43.7
clearsky tower cell outlet	cs19	107.3	107.3	107.3	Lw	outlet	0	27.7	588203.6	4569668	43.7
clearsky tower cell outlet	cs20	107.3	107.3	107.3	Lw	outlet	0	27.7	588216.01	4569684	43.7
clearsky tower cell outlet	cs21	107.3	107.3	107.3	Lw	outlet	0	27.7	588228.36	4569699	43.7
clearsky tower cell outlet	cs22	107.3	107.3	107.3	Lw	outlet	0	27.7	588239.6	4569714	43.7
clearsky tower cell inlet	cs1	109.3	109.3	109.3	Lw	inlet	0	7.9	587980.98	4569389	23.9
clearsky tower cell inlet	cs2	109.3	109.3	109.3	Lw	inlet	0	7.9	587993.03	4569405	23.9
clearsky tower cell inlet	cs3	109.3	109.3	109.3	Lw	inlet	0	7.9	588005.35	4569421	23.9
clearsky tower cell inlet	cs4	109.3	109.3	109.3	Lw	inlet	0	7.9	588017.61	4569436	23.9

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell inlet	cs5	109.3	109.3	109.3	Lw	inlet	0	7.9	588029.64	4569451	23.9
clearsky tower cell inlet	cs6	109.3	109.3	109.3	Lw	inlet	0	7.9	588042.5	4569467	23.9
clearsky tower cell inlet	cs7	109.3	109.3	109.3	Lw	inlet	0	7.9	588055.44	4569483	23.9
clearsky tower cell inlet	cs8	109.3	109.3	109.3	Lw	inlet	0	7.9	588067.6	4569498	23.9
clearsky tower cell inlet	cs9	109.3	109.3	109.3	Lw	inlet	0	7.9	588080.01	4569514	23.9
clearsky tower cell inlet	cs10	109.3	109.3	109.3	Lw	inlet	0	7.9	588092.48	4569530	23.9
clearsky tower cell inlet	cs11	109.3	109.3	109.3	Lw	inlet	0	7.9	588104.55	4569545	23.9
clearsky tower cell inlet	cs12	109.3	109.3	109.3	Lw	inlet	0	7.9	588116.74	4569560	23.9
clearsky tower cell inlet	cs13	109.3	109.3	109.3	Lw	inlet	0	7.9	588129.35	4569576	23.9
clearsky tower cell inlet	cs14	109.3	109.3	109.3	Lw	inlet	0	7.9	588141.89	4569591	23.9
clearsky tower cell inlet	cs15	109.3	109.3	109.3	Lw	inlet	0	7.9	588154.17	4569607	23.9
clearsky tower cell inlet	cs16	109.3	109.3	109.3	Lw	inlet	0	7.9	588166.73	4569622	23.9
clearsky tower cell inlet	cs17	109.3	109.3	109.3	Lw	inlet	0	7.9	588179.4	4569638	23.9
clearsky tower cell inlet	cs18	109.3	109.3	109.3	Lw	inlet	0	7.9	588191.59	4569653	23.9
clearsky tower cell inlet	cs19	109.3	109.3	109.3	Lw	inlet	0	7.9	588203.6	4569668	23.9
clearsky tower cell inlet	cs20	109.3	109.3	109.3	Lw	inlet	0	7.9	588216.01	4569684	23.9
clearsky tower cell inlet	cs21	109.3	109.3	109.3	Lw	inlet	0	7.9	588228.36	4569699	23.9
clearsky tower cell inlet	cs22	109.3	109.3	109.3	Lw	inlet	0	7.9	588239.6	4569714	23.9
clearsky tower cell outlet	cs1	107.3	107.3	107.3	Lw	outlet	0	27.7	587999.79	4569376	43.7
clearsky tower cell outlet	cs2	107.3	107.3	107.3	Lw	outlet	0	27.7	588011.84	4569392	43.7
clearsky tower cell outlet	cs3	107.3	107.3	107.3	Lw	outlet	0	27.7	588024.15	4569408	43.7
clearsky tower cell outlet	cs4	107.3	107.3	107.3	Lw	outlet	0	27.7	588036.42	4569423	43.7
clearsky tower cell outlet	cs5	107.3	107.3	107.3	Lw	outlet	0	27.7	588048.45	4569438	43.7

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell outlet	cs6	107.3	107.3	107.3	Lw	outlet	0	27.7	588061.31	4569454	43.7
clearsky tower cell outlet	cs7	107.3	107.3	107.3	Lw	outlet	0	27.7	588074.25	4569471	43.7
clearsky tower cell outlet	cs8	107.3	107.3	107.3	Lw	outlet	0	27.7	588086.41	4569485	43.7
clearsky tower cell outlet	cs9	107.3	107.3	107.3	Lw	outlet	0	27.7	588098.82	4569501	43.7
clearsky tower cell outlet	cs10	107.3	107.3	107.3	Lw	outlet	0	27.7	588111.29	4569517	43.7
clearsky tower cell outlet	cs11	107.3	107.3	107.3	Lw	outlet	0	27.7	588123.36	4569532	43.7
clearsky tower cell outlet	cs12	107.3	107.3	107.3	Lw	outlet	0	27.7	588135.55	4569547	43.7
clearsky tower cell outlet	cs13	107.3	107.3	107.3	Lw	outlet	0	27.7	588148.15	4569563	43.7
clearsky tower cell outlet	cs14	107.3	107.3	107.3	Lw	outlet	0	27.7	588160.7	4569579	43.7
clearsky tower cell outlet	cs15	107.3	107.3	107.3	Lw	outlet	0	27.7	588172.98	4569594	43.7
clearsky tower cell outlet	cs16	107.3	107.3	107.3	Lw	outlet	0	27.7	588185.54	4569609	43.7
clearsky tower cell outlet	cs17	107.3	107.3	107.3	Lw	outlet	0	27.7	588198.21	4569625	43.7
clearsky tower cell outlet	cs18	107.3	107.3	107.3	Lw	outlet	0	27.7	588210.4	4569641	43.7
clearsky tower cell outlet	cs19	107.3	107.3	107.3	Lw	outlet	0	27.7	588222.41	4569656	43.7
clearsky tower cell outlet	cs20	107.3	107.3	107.3	Lw	outlet	0	27.7	588234.82	4569671	43.7
clearsky tower cell outlet	cs21	107.3	107.3	107.3	Lw	outlet	0	27.7	588247.17	4569687	43.7
clearsky tower cell outlet	cs22	107.3	107.3	107.3	Lw	outlet	0	27.7	588258.41	4569701	43.7
clearsky tower cell inlet	cs1	109.3	109.3	109.3	Lw	inlet	0	7.9	587999.79	4569376	23.9
clearsky tower cell inlet	cs2	109.3	109.3	109.3	Lw	inlet	0	7.9	588011.84	4569392	23.9
clearsky tower cell inlet	cs3	109.3	109.3	109.3	Lw	inlet	0	7.9	588024.15	4569408	23.9
clearsky tower cell inlet	cs4	109.3	109.3	109.3	Lw	inlet	0	7.9	588036.42	4569423	23.9
clearsky tower cell inlet	cs5	109.3	109.3	109.3	Lw	inlet	0	7.9	588048.45	4569438	23.9
clearsky tower cell inlet	cs6	109.3	109.3	109.3	Lw	inlet	0	7.9	588061.31	4569454	23.9

Table C-3 ClearSky™ Cooling Tower Operation Noise Input Data Listing – CadnaA Model

Name	ID	Result. PWL			Lw / Li	Value	K0	Height	Coordinates		
		Day	Evening	Night	Type				X	Y	Z
		(dBA)	(dBA)	(dBA)			(dB)	(m)	(m)	(m)	(m)
clearsky tower cell inlet	cs7	109.3	109.3	109.3	Lw	inlet	0	7.9	588074.25	4569471	23.9
clearsky tower cell inlet	cs8	109.3	109.3	109.3	Lw	inlet	0	7.9	588086.41	4569485	23.9
clearsky tower cell inlet	cs9	109.3	109.3	109.3	Lw	inlet	0	7.9	588098.82	4569501	23.9
clearsky tower cell inlet	cs10	109.3	109.3	109.3	Lw	inlet	0	7.9	588111.29	4569517	23.9
clearsky tower cell inlet	cs11	109.3	109.3	109.3	Lw	inlet	0	7.9	588123.36	4569532	23.9
clearsky tower cell inlet	cs12	109.3	109.3	109.3	Lw	inlet	0	7.9	588135.55	4569547	23.9
clearsky tower cell inlet	cs13	109.3	109.3	109.3	Lw	inlet	0	7.9	588148.15	4569563	23.9
clearsky tower cell inlet	cs14	109.3	109.3	109.3	Lw	inlet	0	7.9	588160.7	4569579	23.9
clearsky tower cell inlet	cs15	109.3	109.3	109.3	Lw	inlet	0	7.9	588172.98	4569594	23.9
clearsky tower cell inlet	cs16	109.3	109.3	109.3	Lw	inlet	0	7.9	588185.54	4569609	23.9
clearsky tower cell inlet	cs17	109.3	109.3	109.3	Lw	inlet	0	7.9	588198.21	4569625	23.9
clearsky tower cell inlet	cs18	109.3	109.3	109.3	Lw	inlet	0	7.9	588210.4	4569641	23.9
clearsky tower cell inlet	cs19	109.3	109.3	109.3	Lw	inlet	0	7.9	588222.41	4569656	23.9
clearsky tower cell inlet	cs20	109.3	109.3	109.3	Lw	inlet	0	7.9	588234.82	4569671	23.9
clearsky tower cell inlet	cs21	109.3	109.3	109.3	Lw	inlet	0	7.9	588247.17	4569687	23.9
clearsky tower cell inlet	cs22	109.3	109.3	109.3	Lw	inlet	0	7.9	588258.41	4569701	23.9

Table C-4: NYSDEC Proposed ClearSky™ Cooling Tower Operational Noise – CadnaA Model Output

Receiver			Octave Bands								Coordinates		
Name	ID	Total	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	X-easting	Y-northing	Z-height
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	m	m	m
St. Patrick's Church	REC1	49.6	63.5	57.3	54.9	47.2	37.8	24.9	-5.8	-106.2	587080.5	4567850	26.8
Sixteenth Street	REC2	51.8	65.4	59.7	56.8	49.5	40.2	27.2	-0.7	-91.4	587715.6	4567882.8	36.5
Pheasant's Run	REC3	49.5	63.8	58	54.4	47	37	21	-11	-99.7	587879.4	4567961.6	16.5
Town Hall	REC4	52.1	65.9	60.2	57.1	49.8	40.2	26.1	-6.8	-113.4	588818.2	4568304	15.2
Bleakley Ave.	REC5	60	71.7	67.5	64.3	58.2	50.5	41.8	29.5	-7.3	588442.2	4569147.2	14.4
Across Water	REC6	52.2	65.4	60.4	57.5	49.5	39.4	23.5	-19.9	-164.2	586160.2	4570083.8	7.6
School	REC8	50.7	64.8	59	55.7	48.4	38.7	24	-5.8	-85.2	588247.6	4568185.8	21.3
Broadway	REC9	52.6	65.9	60.1	57.7	50.3	41.5	30.3	7.7	-63.4	587649.3	4568120.2	33.9
China Pier	REC10	56.3	67.2	63.1	61	54.8	46.5	37.2	17.5	-42.7	588726.8	4570266	6
Lents Cove Park	REC11	60.7	73.7	69.7	64.8	57.6	51.8	44.3	34.1	5.4	588549.5	4569415.6	5.2
Lents Cove Park property line with IPEC	REC12	62.5	75.3	72	66.4	59.5	53.5	45.3	36.7	16.6	588477.4	4569497.6	4.6

Appendix C

Analysis of Municipal and County Permitting for Closed-Cycle Cooling System Retrofit at Indian Point
(Young/Sommer LLC)

ANALYSIS OF MUNICIPAL AND COUNTY PERMITTING FOR CLOSED-CYCLE COOLING SYSTEM RETROFIT AT INDIAN POINT

December 13, 2013

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SECTION 1: INTRODUCTION

As part of the administrative proceeding regarding the New York State Department of Environmental Conservation's ("NYSDEC") proposed modification of the Indian Point Energy Center's ("IPEC" or "facility") State Pollutant Discharge Elimination System ("SPDES") permit, NYSDEC and Riverkeeper are proposing a closed-cycle cooling ("CCC") system as the "best technology available" ("BTA") to satisfy 6 NYCRR § 704.5. This memorandum: (1) identifies the local and county permits and approvals reasonably likely to be required to construct and operate CCC as proposed at Indian Point; (2) assesses the likelihood of obtaining those approvals based on the information provided in the report prepared by NYSDEC's consultant, Tetra Tech, Inc., entitled *Indian Point Closed-Cycle Cooling System Retrofit Evaluation* (June 2013) (hereinafter "Tetra Tech Report"), the report prepared by Riverkeeper's consultant, Powers Engineering, entitled *Revised Closed Cycle Cooling Feasibility Assessment for Indian Point Energy Center Unit 2 and Unit 3 for Best Technology Available Report* (Oct. 24, 2012) (hereinafter "Powers Report"), the Response Document prepared by TRC Environmental Corp. on behalf of Entergy, entitled *New York State Environmental Quality Review Act, Entergy Response Document to the Tetra Tech Report and Powers Engineering Report* (Dec. 13, 2013) (hereinafter "Entergy Response Document"), and best professional judgment; and (3) outlines a schedule for obtaining the local/county permits and approvals, assuming NYSDEC issues the final Supplemental Environmental Impact Statement ("SEIS") in conjunction with the identification of closed-cycle cooling as BTA in accordance with the procedure outlined in NYSDEC's August 13, 2008 Interim Decision in this action (hereinafter "Interim Decision").

As set forth in greater detail below, construction and operation of the CCC project at the Indian Point facility will require numerous permits and approvals from the Village of Buchanan ("Village"). However, the potential environmental, community and other impacts of the project will make obtaining these permits and approvals difficult. As a preliminary matter, the cooling towers are arguably barred either because they are "water towers or water tanks" or because the extensive excavation required to construct the towers constitutes quarrying/mining – both prohibited uses under the Village of Buchanan's Zoning Code ("Village Zoning Code"). Assuming this obstacle can be overcome, the CCC project would likely be barred based on evidence showing that the cooling towers will violate key performance standards contained in the Village Zoning Code relating to noise and, potentially, air pollution. Also, the cooling towers identified in both the NYSDEC and Riverkeeper proposals significantly exceed applicable height restrictions under the Village Zoning Code; in addition, the NYSDEC proposal exceeds the Village's lot coverage requirement. As a result, both projects will require an area variance from the Village Zoning Board of Appeals ("ZBA") before construction can commence. Obtaining such a variance is unlikely given that: (1) the variation in height is significant relative to the zoning requirement; (2) the scale of the cooling towers is enormous both in absolute terms and relative to the surrounding community; and (3) the project will have significant adverse aesthetic, environmental and other impacts on the property and surrounding area. Construction of the CCC project also will require site plan approval, which compels the Planning Board to consider the health, safety and welfare of the public in general and the residents of the immediate neighborhood, a review that includes an assessment of the environmental and aesthetic impacts of the project as well as its conformance with the Village's 2005 Master Plan. Based on these considerations, the Planning Board is likely to deny site plan approval.

The CCC project will require various other permits and approvals from the Village, including: (1) a soil disturbance and excavation permit; (2) a steep slopes permit; (3) a stormwater pollution prevention plan; and (4) building permits. Obtaining these and other permits and approvals will likely pose a significant challenge in light of the scope of the project and its proximity to an active nuclear power plant. The project also may require approvals from Westchester County.

The Village of Buchanan has actively opposed cooling towers since the 1970's when the previous owner of the Indian Point facility proposed to construct a cooling tower at Indian Point Unit 2. Based on evidence concerning the adverse environmental, aesthetic and other impacts of the cooling towers set forth below, it is reasonable to expect that any proposal to construct cooling towers will again be opposed by the Village, leading to denial of the required area variance and site plan approval, among other local permits and approvals. Given the expected strength of opposition to cooling towers, the Village can be expected to vigorously defend these denials in court, leading to years of litigation. In the event that the Village grants the needed approvals, it is reasonable to expect Village residents potentially affected by the project to litigate the decision. As a result, even if the CCC project is eventually approved, the local permitting process can be expected to take a decade or more.

SECTION 2: BACKGROUND

The Indian Point facility is located in the Village of Buchanan along the Hudson River south of the City of Peekskill and within the Town of Cortlandt. The facility occupies a 239-acre site between Broadway and the Hudson River, south of Lents Cove and abutting Lents Cove Park. Approximately 128 acres of the property have been developed leaving approximately 110 acres largely undisturbed. Of the 128 developed acres, approximately 25 are occupied by the main power block, consisting of the containment structures, turbine buildings and auxiliary buildings. The remaining developed land is comprised of parking lots, administrative buildings and support services. The largest area of undisturbed land on the property is 65 acres of contiguous wooded area extending from Broadway to the Hudson River between Lents Cove Park and the main facility. Another smaller undisturbed area is located south of Unit 3 alongside the Algonquin Pipeline.

The facility currently maintains independent once-through cooling systems for Units 2 and 3. In conjunction with the assessment of BTA at the facility, NYSDEC retained Tetra Tech to evaluate the feasibility of retrofitting Units 2 and 3 with a closed-cycle cooling system. The resulting Tetra Tech Report recommends installing a CCC system utilizing ClearSky™ cooling towers, a proprietary plume-abatement technology developed by SPX/Marley that uses PVC heat exchanger packs in the tower plenum to re-condense moisture in the exhaust stream prior to exiting the tower. According to the Tetra Tech Report, the chief advantage of this technology is that the individual cells can be installed in a back-to-back configuration, making the design more compact than conventional mechanical draft cooling towers; also, Tetra Tech asserts that the technology has lower capital and maintenance costs than other cooling tower designs.

The Tetra Tech Report calls for installing individual towers for each generating unit. Key elements of the project as described in the Tetra Tech Report that are relevant to the analysis of local and county permits and approvals are summarized below.

- Each tower consists of 44 cells arranged in a back-to-back configuration (22 cells per row) above a cold water collection basin. The individual cells are 64 feet by 75.5 feet and rise to 91 feet above grade, for a total tower footprint of 1,408 feet by 151 feet (approximately 5 acres each). At completion, the cooling towers will rise 144 feet above mean sea level. Cooling Tower 2 will be located in the 65-acre wooded area along the lower third of the parcel, running roughly parallel to the River. Cooling Tower 3 will be located south of Unit 3.[1] According to the Tetra Tech Report, the project will result in the permanent disturbance of approximately 20 additional acres of land, for a total of 148 acres of disturbed land on the 239-acre site.
- The project will require installation of weirs in the discharge canal upstream of the Unit 3 discharge tunnel and downstream of Unit 3 prior to the diffusers. In addition, the existing canal will need to be excavated in places to accommodate new pump submergence requirements.

[1] Tetra Tech considered placing the Unit 3 cooling tower between the Unit 2 tower and Broadway but concluded that it would be "very close" to Lents Cove Park and that the noise and visual impacts would be "significant". Tetra Tech Report, p. 14.

- New pump houses must be constructed for each cooling tower. The Cooling Tower 2 pump house will be located near the Unit 1 turbine building while the Cooling Tower 3 pump house will be constructed south of the main facility adjacent to the discharge canal.
- The proposed CCC system configuration requires extensive piperuns to circulate water to the condenser and back to each cooling tower. Each of the four rows of 22 cooling tower cells will be served by one 144-inch return line (tower to condenser) and one 120-inch supply line (condenser to tower).[2]
- Contaminated areas along the riverfront must be excavated to install the Unit 2 return pipes. Contaminated spoils will be treated and/or transported to an approved disposal facility. If an acceptable disposal method cannot be found, the Report indicates that the proposed Unit 2 retrofit would be infeasible, unless an alternative solution (*e.g.*, routing pipes offshore or placing pipes aboveground on pipe racks) is approved. However, "[n]either alternative is as straightforward as the proposed method (underground installation) and would require considerable effort to develop a workable, and more costly, solution." Tetra Tech Report, p. 29. In addition, according to the Tetra Tech Report, "[l]imited options are available to treat the tritium-contaminated groundwater produced during construction." *Id.* at 27.
- The Algonquin Pipeline will need to be relocated to allow for construction and blasting for Cooling Tower 3.[3]
- The Tetra Tech Report estimates that the project will require extensive blasting, generating a "massive volume of blasting spoils, approximately 2 million cubic yards." Tetra Tech Report, p. 33. However, the report includes no details regarding how the blasting will be conducted.
- The Tetra Tech Report indicates that the preferred method for delivering heavy equipment and removing spoils is by barge. However, even if barging is an option, access to the pier will be restricted once construction begins in the waterfront area. During this phase of construction, haul trucks instead of barges will be used. The Tetra Tech Report estimates that over the course of the project, 1,215 barge loads will be required to accommodate the estimated spoil volume. No information is provided regarding barge trips to deliver/remove heavy equipment. In addition, approximately 9,000 truck trips will be required to remove the remaining spoils. Material will be moved from the blasting site to the pier for offloading to barges by conveyors with a 48-inch wide belt. The conveyors will be covered to mitigate dust emissions, with high efficiency baghouses installed at all transfer points.
- If the project is unable to offload spoils by barge, the material will be removed by a fleet of 30 cubic yard capacity haul trucks containing at most 18 cubic yards of spoils. According to the Tetra Tech Report, removal of the spoil material will require approximately 110,000 truck trips during the 3 to 4 year blasting and excavation period, with an average of 235 truck trips to and from the disposal site per day. "Noise and dust

[2] For a discussion of the siting conflicts posed by the NYSDEC and Riverkeeper Proposals, *see* Entergy Response Document, Chapter 2.0 and Appendix A.

[3] The *Engineering Feasibility Study for the Implementation of Closed-loop Cooling Using Plume Abatement Cooling Towers at Indian Point Units 2 and 3* (Dec. 18, 2012), prepared by Hatch and included with the Tetra Tech Report as Appendix A (hereinafter "Hatch Report") states that "[i]nstallation of the Unit 3 cooling tower necessitates a relocation of the Algonquin natural gas pipelines." *Hatch Report*, § 3.2.

emissions could be notable." Tetra Tech Report, p. 33. To accommodate the project, upgrades may be required to various intersections along the transport route. Finally, as many as 600 laborers will require access to the site during the construction period.

- The Tetra Tech Report includes no discussion of stormwater management during construction.
- The Tetra Tech Report states that "the project would require excavation of some steep slopes (over 15%)." Tetra Tech Report, p. 97. However, the Report does not include any details concerning the extent of steep slope disturbance nor does it address the grade of the disturbed areas.
- The Tetra Tech Report references the Village of Buchanan's construction noise ordinance but includes no information about whether the construction activities required to implement the CCC project will be audible beyond the boundaries of the facility. Tetra Tech Report, p. 24.

Once constructed, the CCC system will have the following long-term impacts identified in the Tetra Tech Report.

- The new wet cooling tower retrofit will create a new source of particulate emissions in an area designated nonattainment for fine particulate matter ($PM_{2.5}$). However, the Tetra Tech Report contains no analysis of potential air impacts; instead, an analysis is to be conducted by NYSDEC. Tetra Tech Report, p. 27.
- The Tetra Tech Report contains a brief analysis of non-construction noise based on operation of low noise fans and splash attenuation. The Report indicates that baseline cooling tower sound pressure levels will exceed Buchanan noise restrictions at the property line. However, the Report goes on to provide the "levels are provided as references only and should not be considered definitive for the conceptual design. A design-specific analysis will account for additional noise attenuation to be gained from topography and vegetation." Tetra Tech Report, p. 31.
- The cooling towers will be more than 4½ football fields long and 91 feet high. According to the Tetra Tech Report, the towers would be visible from various parks and would particularly impact views from Lents Cove Park; the towers also would be visible from locations along the Hudson River. The adverse visual impacts would significantly increase when condensation plumes form, creating two quarter-mile-long walls of steam.

Also, the Tetra Tech Report indicates that the CCC project is inconsistent with the Village of Buchanan Comprehensive Master Plan issued in 2005, which calls for preserving the undeveloped portions of the Indian Point property south of Lents Cove Park as open space and for the development of trails, river access and possible expansion of the park. Tetra Tech Report, p. 97.

Like the Tetra Tech Report, the Powers Report calls for installation of plume-abated back-to-back mechanical draft cooling towers to replace Indian Point's current once-through cooling system. The Report discusses the availability of the ClearSky™ technology recommended by Tetra Tech but does not directly endorse it. Instead, the Powers Report cites a study prepared by URS for GenOn of the cooling tower retrofit options for the Ormond Beach Generating Station ("OBGS") steam boiler plant in California. That report considers two options for plume abatement technology: the conventional "hybrid" type tower and the "Clear Sky" type of cooling tower. In assessing the relative merits of the two technologies, the URS report notes that:

> Hybrid towers would require installation of costly titanium heating coils, which would require frequent, extensive maintenance. For these reasons, only the Clear Sky technology would be practical for a [salt water cooling tower] application. . . . It is important to note, however, that there has been no full-scale commercial application of a Clear Sky cooling tower to date. While there is a significant technological feasibility question regarding the full-scale commercial application of the Clear Sky product, for the purpose of assessing feasibility at the OBGS, this analysis assumed it would be available and effective commercially.

Powers Report, p. 21 (quoting GenOn West, L.P., *Ormond Beach Generating Station Implementation Plan for the Statewide Water Quality Control Policy on the use of Coastal and Estuarine Waters for Power Plant Cooling,* Apr. 1, 2011, pp 19-21).

The Powers Report proposes a series of alternative cooling tower configurations for Units 2 and 3 as follows:

Unit 2

- Install two plume-abated back-to-back mechanical draft cooling towers consisting of 28 cooling cells each located along the northeast edge of the developed portion of the property adjacent to the IPEC administration building in an area currently occupied primarily by the IPEC upper parking lot. The 28-cell tower would consist of two 7-cell by 2-cell sections measuring 337 feet by 109 feet each. As an alternative, the Powers Report concludes that there is "sufficient space to construct a plume abated inline 28-cell cooling tower for Unit 2 in and adjacent to the IPEC upper parking lots." Powers Report, p. 26.
- Install a single 44-cell tower in the forested area immediately adjacent to the eastern edge of the developed portion of the site. The 44-cell tower would consist of three sections, two 7-cell by 2-cell sections measuring 337 feet by 109 feet and a third 8-cell by 2-cell section measuring 385 feet by 109 feet.

Unit 3

- Install two plume-abated back-to-back mechanical draft cooling towers consisting of 28 cooling cells each located in the open area immediately south of Unit 3 and north of the Algonquin Pipeline. The 28-cell tower would consist of two 7-cell by 2-cell sections measuring 337 feet by 109 feet each. As an alternative, the Report concludes that there is "sufficient space in the area just south of Unit 3 and north of the Algonquin pipeline to locate 28 plume-abated in-line cooling tower cells in four sections." Powers Report, p. 33.
- Install a single 44-cell cooling tower south of the Algonquin Pipeline in the vicinity of the IPEC training center. The 44-cell tower would consist of three sections, two 7-cell by 2-cell sections measuring 337 feet by 109 feet and a third 8-cell by 2-cell section

> measuring 385 feet by 109 feet. A bridge would be installed over the pipeline right-of-way to avoid the need to relocate the pipeline.[4]

Each tower will be approximately 100 feet tall. Powers Report, p. 50. While conceding that certain options will require "substantial excavation," the Powers Report contains no details concerning the logistics of the construction process. In particular, it includes no meaningful discussion of issues such as blasting and noise, and no discussion whatsoever of the issues associated with stormwater management and transporting spoils off-site for disposal. It also contains no discussion of the aesthetic impact of the CCC towers.

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[4] By Memorandum dated November 13, 2012, Administrative Law Judge Maria Villa required Riverkeeper to limit its presentation at the BTA hearing on the CCC proposals to two proposed configurations, one for Cooling Tower 2 and one for Cooling Tower 3. By letter dated November 22, 2013, Mark Lucas, Riverkeeper's Hudson River Program Staff Attorney, responded to the ALJ's order and identified various configurations for review ("Riverkeeper Configurations"). The Riverkeeper Configurations are generally consistent with the CCC configurations from the Powers Report that are discussed in this report.

SECTION 3: ZONING REVIEW/APPROVAL AND OPERATING REQUIREMENTS

In order to construct and operate closed-cycle cooling at Indian Point, the CCC project requires approvals from the Village of Buchanan under the Village Zoning Code. As set forth in greater detail below, although Indian Point is located in an M-2 district which authorizes the "peaceful use of atomic energy," the Village Zoning Code also expressly prohibits freestanding water towers within the Village. Even if the cooling towers were not prohibited as freestanding water towers, the operation of the towers may be prohibited as a nuisance use, particularly given the adverse noise and air pollution impacts associated with operating the towers. The CCC project will require a height and lot coverage variance from the Village and, therefore, must satisfy the stringent conditions necessary for issuance of variances. Finally, the Village must grant site plan approval to the CCC project, a process that also focuses on the adverse impacts of the CCC project on the Village community. Each of these items presents a significant obstacle to construction and operation of the cooling towers.

I. Authorized/Prohibited Uses Under the Village Zoning Code

The Indian Point facility is located in an M-2 Zoning District under the Village Zoning Code. This zone allows as of right the "peaceful use of atomic energy." Village Zoning Code § 211-10, Schedule of Use Regulations. The Village Zoning Code does not spell out precisely what types of activities or structures fall within the scope of the "peaceful use of atomic energy." Since the production of nuclear energy typically requires a source of water for cooling and condensing steam, the permitted use arguably contemplates construction of some type of cooling water intake structure. However, whether the Village would authorize the use of large cooling towers is informed by other sections of the Village Zoning Code discussed below, including an express prohibition on the use of freestanding water towers within the Village.

Section 211-11 of the Village Zoning Code lists the uses prohibited in the Village. In particular, it provides:

> All uses not specifically listed in 211-10 as permitted are prohibited in all locations within the Village of Buchanan. The following specifically prohibited uses included within this section are for enumeration and not limitation. Prohibited uses shall include but not be limited to the following ...

The section goes on to list a variety of specifically prohibited uses. Under Village Zoning Code § 211-39.A(6), "[n]o use variance shall be granted permitting a use prohibited by § 211-11 or permitting a use not listed in § 211-10 as a permitted use within the Village of Buchanan." Accordingly, if the cooling towers are a prohibited use, the Village is barred from issuing a variance to allow their construction and operation.

A. Freestanding Water Towers and Water Tanks

The list of prohibited uses in the Village includes "[f]reestanding water towers and freestanding water tanks, located below, on or above the ground." Village Zoning Code § 211-

11.J. The terms "water tower" and "water tank" are not defined in the Village Zoning Code and our research uncovered no standardized definition of these terms in a zoning context. However, the breadth of the term suggests an intent to prohibit construction of all types of large-scale structures for containing water.

As discussed below, the New York State Court of Appeals thwarted an effort by the Village to bar construction of a cooling tower by denying the then-owner, Con Edison, a needed variance (including a potential use variance). *Consolidated Edison Co. v. Hoffman*, 43 N.Y.2d 598, 403 N.Y.S.2d 193 (1978). At that time, the Village Zoning Code did not include a list of prohibitions comparable to that found in the current code, including the ban on water towers. The Village added the ban in 1989 as part of a larger amendment of the Zoning Code that included the addition of the list of prohibitions now found in Zoning Code § 211-11. Given the intervening amendment to the Village Zoning Code, the holding of *Hoffman* is not instructive on the question of whether cooling towers are presently banned in the Village. The sequence of events suggests that the Village may have enacted the ban on water towers to prohibit the construction of, among other things, cooling towers.

Under these circumstances, the Village could reasonably interpret the Village Zoning Code to provide that cooling towers are freestanding water towers and/or water tanks and so are prohibited altogether under the Village Zoning Code. Pursuant to Village Zoning Code § 211-39.A(6), if the cooling towers are a prohibited use under § 211-11, the Village is barred from granting them a use variance.

B. Quarrying/Mining and Crushing Operations

As previously noted, under Village Zoning Code § 211-11, "[a]ll uses not specifically listed in 211-10 as permitted are prohibited in all locations within the Village of Buchanan." Per the terms of § 211-11, the specific list of prohibited uses was included "for enumeration and not limitation." Thus, any use not specifically authorized in the Village Code is prohibited.

As noted above, the CCC project described in the Tetra Tech Report calls for the removal of approximately 2 million cubic yards of rock over a 3 to 4-year period. Although the Tetra Tech Report does not specifically address the issue, the material handling and processing at the site will necessitate the use of several rock crushers. The Village may rationally determine that the disturbance of 20 acres by excavation, blasting, crushing, conveying, loading and transferring of over 2 million cubic yards of rock for off-site sale or disposal[5] for a period of 3 to 4 years constitutes mining/quarrying and is, therefore, a prohibited use under § 211-11.

[5] Tetra Tech notes that the volume of marble to be removed would be significantly greater than potential market capacity, indicating that some quantity would be sold while the remainder would be disposed at a to-be-determined location. *See* Tetra Tech Report, p. 34, n.7.

C. General Prohibition of Nuisance Uses

In addition to the uses specifically listed in Village Zoning Code § 211-11, the Code prohibits:

> Any other use, whether specified above or not, that is of such a nature as to be detrimental to neighboring properties by reason of emission of odor, dust, refuse matter, garbage, smoke, vibration, gas, radiation, noise or any other factor that is dangerous to the comfort, peace, enjoyment, health or safety of the area or the community.

As discussed in Section 3.II.A below, the Tetra Tech Report and the Entergy Response Document indicate that the CCC project will exceed Village noise standards once it begins operation. Moreover, the project will result in significant aesthetic and air pollution impacts as well as dust and vibration impacts relating to blasting and material transport activities. These significant impacts provide a reasonable basis for the Village to conclude that the CCC project is a prohibited use under the Village Zoning Code and, therefore, to deny the necessary zoning approvals.

D. Procedure for Determining Whether a Proposed Use is Prohibited

The CCC project will likely require an interpretation from the ZBA concerning whether the use is prohibited as a water tower/tank and/or as an unlawful mining activity. Also, the ZBA may be called upon to determine whether the CCC project violates the prohibition against noise or other impacts spelled out in Village Zoning Code § 211-11.I. *See id.* § 211-38.B(2)(b) (declaring that the ZBA is authorized to "[i]nterpret the meaning and requirement of any portion of this chapter," *i.e.*, the Village Zoning Code). The Village Zoning Code does not specify when such interpretations must be sought. Although a request for interpretation could presumably be made at any time, it is our opinion that the request should be consolidated with the request for a variance from the Village height and lot coverage standards discussed in Section 3.III.A below. Among other things, waiting until the variance request is submitted will ensure that the ZBA has the information necessary to properly characterize the project. The ZBA's interpretation of its zoning ordinance is entitled to great deference and judicial review is generally limited to ascertaining whether the action was illegal, arbitrary and capricious or an abuse of discretion. *See, e.g., Putter v. Zoning Board of Appeals of Village of South Nyack,* 101 A.D.3d 1127, 1128, 956 N.Y.S.2d 541 (2d Dept. 2012) (citations omitted).

II. Performance Standards; Nuisances

Under Village Zoning Code § 211-23.A, all nonresidential uses are subject to performance standards. In particular, any application for a building permit is subject to specific nuisance-related performance standards and must be accompanied by a sworn statement by the owner of the property that it will be operated in accordance with the performance standards. The general provision relating to the regulation of nuisance elements states:

> No land or building in any district, used or occupied for any purposes, shall be operated in such a manner as to create any dangerous, injurious, noxious or otherwise objectionable fire, explosive or other hazard; noise or vibration, smoke, dust, dirt or other form of air pollution; electrical or other disturbance; glare; or other substance, condition or element in such amount as to adversely affect the surrounding area or premises (referred to herein as "dangerous or objectionable elements"), provided that any use permitted by this chapter may be undertaken and maintained if it conforms to the regulations of this subsection limiting dangerous and objectionable elements at the specified point or points of the determination of their existence.

Village Zoning Code § 211-23.B.

A. Noise

All nonresidential uses are subject to the standards for noise spelled out in Village Zoning Code § 211-23.C(3). Under this section,

> At the points of measurement specified [*i.e.*, the property line], the maximum sound-pressure level radiated in each standard octave band by any use or facility, other than transportation facilities or temporary construction work, shall not exceed the values for octave bands lying within the several frequency limits given in Table 1 after applying the corrections shown in Table II.

The corrections must be applied if the noise is not smooth and continuous and is not radiated between the hours of 10:00 p.m. and 7:00 a.m.

The Powers Report contains no discussion whatsoever of the noise impacts of the CCC project during operation. The Tetra Tech Report contains a preliminary noise analysis based on a conceptual design that includes low noise fans and splash attenuation to reduce noise levels. The analysis includes a table containing the Buchanan noise restrictions, together with a table showing baseline cooling tower sound pressure levels (in decibels) for different frequency ranges (in hertz) measured at 50 and 100 meters. When these tables are compared, they show that the sound pressure level will exceed allowable Village of Buchanan noise limits at all frequency ranges specified in the Village Zoning Code, even at 100 meters. Tetra Tech Report, p. 31. An accompanying illustration entitled "Indian Point Cooling Tower Graduated Distance Buffers" shows that proposed Cooling Tower 2 would be located less than 100 meters from Lents Cove Park; in addition, Cooling Tower 3 would be located approximately 100 meters from the Lafarge gypsum plant and even closer to the Hudson River. Accordingly, the Tetra Tech Report indicates that the project will exceed Village of Buchanan noise standards in Lents Cove Park and may exceed them at the Lafarge plant and on the River. Under the circumstances outlined in the Tetra Tech Report, the project does not comply with the performance standards for noise and is, therefore, a prohibited use under Village Zoning Code § 211-23.C(3).

Also, the Tetra Tech Report contains no analysis of sound levels at a range beyond 100 meters. However, the Graduated Distance Buffers diagram shows that approximately half of Lents Cove Park is located within 200 meters of the proposed location of Cooling Tower 2. Accordingly, the noise impacts of the project may be more extensive than those described in the Tetra Tech Report, strengthening the argument that the CCC project fails to meet the performance standards for noise and is a prohibited use under the Village Zoning Code.

The conclusion that the CCC project will violate the Village of Buchanan's noise prohibition is further supported by the Entergy Response Document prepared by TRC.[6] As noted in that document, the Tetra Tech Report does not include noise emission data for the ClearSky™ cooling towers. To assess the noise impact, TRC back calculated the noise levels for the cooling towers based on the following factors: sound levels presented by Tetra Tech, the distances that those levels were calculated for, the physical dimensions of the towers, and the number of cells per tower. The assessment allowed TRC to determine sound levels as a function of distance from the towers with credit taken for a partially absorptive ground cover over the area. According to the Entergy Response Document,

> The data . . . reveal that increases in noise over existing conditions due to operation of the ClearSky™ cooling towers would be as high as 18 dBA at residential locations, well above the NYSDEC impact criterion of six (6) dBA. Therefore, operation of the ClearSky™ cooling towers would likely result in LARGE (significant) noise impacts.[7]

Entergy Response Document, § 3.5.5.1. The Entergy Response Document goes on to compare the estimated noise levels from the cooling towers to the Village of Buchanan noise ordinance limits in Village Zoning Code § 211-23. This analysis shows that levels "would exceed the Village Code (Chapter 211) performance standards, with exceedances of up to 17 decibels in some octave bands." *Id.* at § 3.5.5.2. Moreover, the points measured are at specific receptor locations, many of which are well beyond the point of compliance (*i.e.*, the Indian Point property line). *See* Village Zoning Code, § 211-23.B(2)(b) (determinations for enforcement of performance standards for noise are made at the property lines of the use creating the noise). The exceedances would be even greater measured at the property line, such as at the northern boundary at Lents Cove. Based on the information contained in both the Tetra Tech Report and the Entergy Response Document, we believe the Village is likely to conclude that noise from the CCC project will violate the prohibition in Village Zoning Code § 211-23, justifying denial of a building permit for the project.

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6 For an analysis of noise impacts associated with the NYSDEC and Riverkeeper Proposals, *see* Entergy Response Document, Chapter 3.5.

7 The impact level categories for environmental and other impacts – NONE (NO IMPACT), SMALL, MODERATE and LARGE – are defined in Section 3.1.2 of the Entergy Response Document.

B. Air Pollution

As previously noted, Village Zoning Code § 211-23.B prohibits operation of buildings in a manner that creates "any dangerous, injurious, noxious or otherwise objectionable . . . smoke, dust, dirt or other form of air pollution." The Tetra Tech Report contains no discussion whatsoever of the air pollution impacts of the CCC project proposed by NYSDEC. The Report states only: "A wet cooling tower retrofit will create a new source of particulate emissions in an area designated as non-attainment for $PM_{2.5}$. NYSDEC is conducting a separate analysis of potential air emissions impacts." *Id.* at 27. It is therefore impossible to assess based on the Tetra Tech Report whether the air pollution impacts of the project will violate the prohibition on nuisance air pollution in the Village Zoning Code.

The Powers Report is similarly unhelpful in addressing the air pollution implications of Riverkeeper's alternative CCC proposal. The entire discussion of air emissions in the Report consists of the following:

> Cooling towers emit trace amounts of particulate as cooling tower drift (droplets) that pass through the cooling tower drift eliminators and evaporate to a particulate residue. The estimated $PM_{2.5}$ fraction for cooling tower particulate drift, for a cooling tower using a state-of-the-art 0.0005 percent drift eliminator and a circulating water total dissolved solids concentration of 9,000 ppm, is 15 percent.

Powers Report, pp. 56-57 (citations omitted)

The Entergy Response Document identifies several deficiencies in the Tetra Tech and Powers Reports with respect to the air quality impacts of their respective proposals. In particular, the Entergy Response Document notes the following:

- Each proposal involves substantial new sources of air pollution, including particulate matter, which are likely to be major sources under applicable NYSDEC permitting requirements.
- Neither the Tetra Tech Report nor the Powers Report demonstrates that anticipated emissions from the cooling towers can be permitted under NYSDEC's air pollution control program.
- The Tetra Tech Report fails to examine situations in which the salinity of the Hudson River exceeds historic average levels and so could potentially underestimate the impact of total dissolved solids on PM emissions.
- The Tetra Tech Report does not address the impact of construction – including truck and barge traffic, construction vehicles and equipment, and blasting – on air quality.

See Entergy Response Document, § 3.4 (Air Quality). A critical issue for the Village will be whether air pollution associated with cooling towers satisfy applicable performance standards prohibiting nuisance conditions. If the impacts to air quality are significant, consistent with prior analyses by TRC, *see id.*, we believe that the Village could reasonably conclude that air pollution from the CCC project violates the prohibition against nuisance air pollution in Village Zoning Code § 211-23.B and deny a building permit for the project on that basis.

The Tetra Tech and Powers reports also do not assess the risk of Legionnaires' disease and Pontiac fever (collectively, "legionellosis") associated with improperly disinfected cooling towers. As noted in the Entergy Response Document, "[t]he Reports fail address and assess the significant potential human health risks from inadequately disinfected cooling towers." Entergy Response Document, § 3.3.5. These risks also could prompt the Village to conclude that the CCC project will violate the prohibition against nuisance air pollution under the Village Zoning Code.

III. Dimensional (*i.e.*, Bulk) Regulations

A. Village Zoning Code Standards

The dimensional limitations applicable to uses in the M-2 zoning district are set forth at Village Zoning Code § 211-15, Table of Bulk Regulations. These bulk regulations establish standards regarding acceptable lots and structures under the Village Zoning Code, addressing minimum lot area, minimum lot width, minimum lot frontage at street line, minimum lot depth, minimum front yard, minimum side yard, minimum rear yard, maximum building height, and maximum lot coverage. Each of the key terms is defined in Village Zoning Code § 211-5. That section defines "lot" as:

> A piece or parcel of land occupied or intended to be occupied by a principal building or a group of such buildings and accessory buildings or utilized for a principal use and uses accessory or incidental to the operation thereof, together with such open spaces as required by this chapter, and having required lot frontage on a street. A lot may be composed of one or more tax lots, but it may not be subdivided unless each new lot conforms to all the requirements of the district in which it is located.

The phrase "lot lines" meanwhile, is defined as the "property lines bounding the lot."

Where a parcel cannot satisfy the bulk requirements, the owner must obtain a variance from the Village. Under Village Zoning Code § 211-39.B, the ZBA may grant a variance from the requirements because of "practical difficulty". In making its determination, the Board must make each and every one of the following findings under § 211-39.B:

(1) That the variation requested is not substantial in relation to the requirement.
(2) That the effect of any increased population density which may thus be produced upon the available services and facilities is not significant.
(3) That a substantial change in the character of the neighborhood or a substantial detriment to adjoining properties will not be created.

(4) That the difficulty cannot be alleviated by some method feasible for the applicant to pursue other than a variance.
(5) That the variation would not cause adverse aesthetic, environmental or ecological impacts on the property or on surrounding areas.
(6) That the requested variance is the minimum variance necessary to afford relief.
(7) That, in view of the manner in which the difficulty arose and considering all of the above factors, the interests of justice will be served by allowing the variance.

The Indian Point property consists of two parcels which are owned by separate entities – Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC. However, Westchester County's online tax parcel viewer depicts Indian Point as a single parcel. Consistent with the Village Zoning Code § 211-5 definition of "lot", the Indian Point property is a parcel of land occupied by "a group of such buildings and accessory buildings or utilized for a principal use and uses accessory or incidental to the operation thereof, together with such open spaces as required by this chapter, and having required lot frontage on a street." We have therefore assumed that the two parcels are a single lot for zoning purposes.

As described in the Tetra Tech Report, the proposed project will require a variance from the Village's bulk regulations as they relate to height and lot coverage. Under the Village Zoning Code, the term "building height" is defined as the "vertical distance measured from the mean level of the ground surrounding the building to the highest point of a flat or mansard roof or to a point equidistant between the highest and lowest points of a pitched, gabled, hip or gambrel roof." Village Zoning Code § 211-5. The cooling towers proposed by NYSDEC in the Tetra Tech Report will rise to 91 feet above grade; at completion, they will be 144 feet above mean sea level. By comparison, the height limit for buildings in an M-2 district is 2½ stories or 35 feet, whichever is less.

With respect to lot coverage, the Village Zoning Code limits lot coverage in an M-2 district to 40%, with "lot coverage" defined as:

> [t]he proportion of all ground floor areas and structures upon a lot to total area of the lot, expressed as a percentage. . . . Structures, for the purposes of "lot coverage," shall include swimming pools, paved walkways and, whether constructed of pervious materials or not, patios, decks and driveways and parking areas.

Village Zoning Code § 211-5. In the present case, the Tetra Tech Report specifies that approximately 128 acres of the 239-acre Indian Point lot already have been developed for an estimated lot coverage of approximately 54%. However, the Report goes on to state that the cooling towers proposed by NYSDEC would "result in disturbance of an estimated 20 acres of land in addition to disturbed areas associated with the existing facility," for a total disturbed area of 148 acres or approximately 62% once the project is completed. Tetra Tech Report, p. 93. By comparison, the maximum lot coverage allowed under the Village Zoning Code in an

M-2 zone is 40%. Accordingly, the project will require a variance from the Village's bulk regulation relating to lot coverage.[8]

The Powers Report effectively concedes that the cooling towers will require a height variance from the Village; however, it does not address site coverage concerns. In concluding that obtaining the variance will not prove difficult, the Powers Report notes: (1) the Village has granted the owner of IPEC a variance from applicable height restrictions in the past and that the site already has structures that exceed the height restrictions; (2) the *Con Edison* decision, discussed below, makes it more likely that Entergy would be granted a height variance; and (3) the height limit would prevent the facility from converting to closed-cycle cooling and thus from complying with the federal Clean Water Act, raising a "practical difficulty" with strict compliance with the height restriction and justifying the granting of a variance. Powers Report, pp. 49-50.[9]

After reviewing these considerations, it is our opinion that it would be reasonable for the Village ZBA to deny the variances necessary to construct the CCC project as proposed by NYSDEC in the Tetra Tech Report. The grounds for denying the variance arise under factors (1), (3), (4) and (5) listed above, any one of which would be sufficient to deny the variances.

Factor (1): The cooling towers are more than 2½ times the height authorized in the Village Zoning Code making the variation requested substantial relative to the requirement. In assessing the likelihood of obtaining the required height variance, the Tetra Tech Report notes that:

> Although Board approval is not guaranteed, Tetra Tech notes that the proposed tower height (91 feet) is less than the existing containment structures (250 feet) and turbine buildings (174 feet). . . . At final construction, the proposed cooling towers will rise 144 above msl and be roughly equivalent to the turbine buildings' roof line. *Id.* at 33.

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8 The Tetra Tech Report estimates lot coverage at "53 percent of both IPEC parcels." Tetra Tech Report. p. 97. This figure corresponds to the estimate of currently disturbed land relative to the total area of the site contained in the Report (128 acres of the 239-acre site). However, it does not take into account the approximately 20 acres of land that will be disturbed by construction of the cooling towers. If this acreage is taken into account, the total site coverage increases to approximately 62%. In any event, Tetra Tech acknowledges that a lot coverage variance will be required for its CCC proposal. *Id.*

9 While the Village Zoning Code authorizes the ZBA to grant a variance from the zoning requirements because of "practical difficulty," the Powers Report's discussion of the area variance requirement does not reflect the current state of New York law on this issue. In 1991, the New York legislature adopted a series of laws articulating a multifactor test for cities, towns and villages deciding variance requests; these factors were incorporated into the Village of Buchanan's Zoning Code. In the wake of that legislation, the New York Court of Appeals concluded that these laws require the zoning board "to engage in a balancing test, weighing 'the benefit to the applicant' against 'the detriment to the health, safety and welfare of the neighborhood or community' if the area variance is granted." *Sasso v. Osgood,* 86 N.Y.2d 374, 384, 633 N.Y.S.2d 259 (1995).

However, this analysis focuses on the comparative height of the proposed cooling tower structures relative to the other structures on the site while ignoring their tremendous size. According to the Tetra Tech Report, each tower will be 1408 feet long – in other words, over 4½ football fields long – with a total footprint of approximately 5 acres each. Also, as noted in the Entergy Response Document, the cooling towers will be substantially taller than the surrounding vegetation, dominating the landscape. *See* Entergy Response Document, § 3.6.3.3. The massiveness of the structures and their impact on their surroundings will likely factor into any decision by the Village (and the courts on appeal) concerning whether to allow a variance for height or lot coverage.

Factor (3): As described elsewhere in this document, the cooling towers will likely have significant adverse impacts on the neighborhood and adjoining properties in the form of impacts from blasting, excavation, and traffic; aesthetic impacts; air pollution; and noise. These and other impacts create a substantial detriment to the adjoining properties, reasonably justifying denial of the variance under this factor.

Factor (4): With respect to Factor 4 ("the difficulty cannot be alleviated by some method feasible for the applicant to pursue other than the variance"), Entergy has offered an alternative to the cooling towers that, it believes, would protect the environment with significantly fewer collateral environmental impacts, all of which will be evident to the Village upon its review of the SEQRA record.

Factor (5): As noted in response to Factor (3) above, evidence shows that the towers will have significant adverse environmental impacts, justifying denial of the variance on grounds that it will cause "adverse aesthetic, environmental or ecological impacts on the property or on surrounding areas."

While the environmental impacts of Riverkeeper's proposal are not discussed in any detail in the Powers Report, we nevertheless believe that they are likely significant enough to cause the Village to deny any requests for an area variance to install cooling towers for the same reasons discussed above.

The conclusion that the Village of Buchanan will likely deny a request for an area variance needed to construct cooling towers at Indian Point is consistent with the past actions and statements of the Village of Buchanan relating to cooling towers. As discussed in Section 3.III.B below, in the 1970s, the Village of Buchanan denied a request for an area and use variance to construct a cooling tower for Unit 2 that was sought by Con Edison, the previous owner of the Indian Point facility. More recently, the mayor of the Village of Buchanan, in testimony on renewal and modification of the facility's SPDES permit in 2004, declared that "I and the other citizens of Buchanan and also surrounding areas categorically oppose the proposal to require cooling towers at Indian Point." *In the Matter of the Application of Entergy Indian Point 2, LLC and Entergy Indian Point 3, LLC, for Renewal and Modification of SPDES Permit,* Transcript of January 29, 2004 Hearing, p. 242. He went on to declare: "Let there be no mistake that the Village of Buchanan will enforce its zoning laws and other land use laws to prevent cooling towers from devastating the environment and economy of Buchanan and surrounding areas." *Id.* at 250-51. Although the Village has a different mayor now, we have no reason to believe that local opinions about cooling towers have changed given the documented adverse aesthetic and other community/environmental impacts associated with the NYSDEC and Riverkeeper proposals.

In the event that the Village of Buchanan grants the required area variance, it is reasonable to expect the owners of nearby properties to oppose the decision and commence an Article 78 action challenging it. Thus, the ZBA's decision on the area variance will likely be litigated regardless of whether the variance is granted. Consistent with the discussion in Section 6 below, obtaining the required area variance can reasonably be expected to take approximately 5 years from the time the application is submitted to the ZBA until the decision is returned to the ZBA following judicial review.

B. Special Standard for Review of Public Utility Variance Requests

As a general rule, a court will not set aside a zoning board's decision regarding an area variance unless it is illegal, arbitrary or an abuse of discretion. *See, e.g., Cowan v. Kern,* 41 N.Y.2d 591, 598, 394 N.Y.S.2d 579 (1977) (citations omitted); *Ifrah v. Utschig,* 98 N.Y.2d 304, 308, 746 N.Y.S.2d 667 (2002) (citations omitted); *Kaufman v. Incorporated Village of Kings Point,* 52 A.D.3d 604, 608, 860 N.Y.S.2d 573 (2d Dept. 2008). The board's determination will be sustained if it has a rational basis and is supported by substantial evidence. *See, e.g., Sasso v. Osgood,* 86 N.Y.2d 374, 385, n.2, 633 N.Y.S.2d 259 (1995). As the New York Court of Appeals noted in *Consolidated Edison Co. v. Hoffman,* 43 N.Y.2d 598, 403 N.Y.S.2d 193 (1978), the same limited standard of review extends to utilities. However, the court in *Con Edison* held that, when applying that standard to a utility, municipalities must weigh public necessity more heavily than other factors in deciding whether to grant a variance. Specifically, the court declared that local concerns, although important to the balancing of factors, are not the sole criteria for granting a variance to a utility and that the municipality must take account of broader public considerations. In closing, the court concluded that where an application involves the modification of an existing facility owned by a public utility,

> the utility must show that modification is a public necessity in that it is required to render safe and adequate service, and that there are compelling reasons, economic or otherwise, which make it more feasible to modify the plant than to use alternative sources of power such as may be provided by other facilities. However, where the intrusion or burden on the community is minimal, the showing required by the utility should be correspondingly reduced.

Id. at 610 (citations omitted). In the years since the *Con Edison* case was decided, the courts have considered other cases addressing the alternative standard for granting variances to utilities, most of which involve the construction of telecommunications equipment, such as cell towers. *See Cellular Telephone Co. v. Rosenberg,* 82 N.Y.2d 364, 604 N.Y.S.2d 895 (1993) (extending *Con Edison* decision to cell phone towers). Courts faced with challenges to the denial of variances for communications towers have reached varying results depending largely on their weighing of the burdens to the community relative to the need for the service and the availability of alternatives. *See, e.g., Omnipoint Communications, Inc. v. City of White*

Plains, 430 F.3d 529 (2d Cir. 2005); *United States Transmission Systems, Inc. v. Schoepflin*, 63 A.D.2d 970, 405 N.Y.S.2d 764 (2d Dept. 1978) (upholding local board's denial of permission to install communications/cell tower); *Cellular Telephone Co. v. Meyer*, 200 A.D.2d 743, 607 N.Y.S.2d 81 (2d Dept. 1994); *Nextel Partners, Inc. v. Town of Fort Ann*, 1 A.D.3d 89, 766 N.Y.S.2d 712 (3d Dept. 2003) (finding local board's denial of application to install cell tower was arbitrary and capricious). As these decisions make clear, municipalities retain the power to deny variances in the wake of *Con Edison*, even to public utilities, provided the requisite fact-specific balancing of factors is performed.

Moreover, since the Court of Appeals decision in *Con Edison* the structure of the power generation and supply industry has changed significantly. Among other things, the electricity market has been deregulated with the goal of increasing competition – that is, electricity generating plants are no longer owned by public utilities but, instead, are owned by private companies that participate in an electricity generation market. In this new, deregulated environment Entergy, unlike Con Edison at the time of the *Con Edison* decision, has no direct service obligations in New York, no retail customers and, therefore, is only "lightly regulated" by the Public Service Commission ("PSC"). *See* PSC, *Order Providing for Lightened Regulation of Nuclear Generating Facilities*, Case 01-E-0113 and 00-E-1225, p. 9 (Aug. 31, 2001) (declaring that Entergy, with respect to its ownership and operation of the nuclear generating facilities at Indian Point, is a wholesale generator – *i.e.*, a market participant, not a public utility – and so should be subject to the same lightened regulation as other wholesale generators). As the above summary indicates, the Indian Point Units function as wholesale generators – not an electric utility – and are regulated less stringently than traditional utilities by the PSC. Thus, the application of the *Con Edison* standard to an application by Entergy for a variance is less likely under the current circumstances.

Conversely, the local adverse impacts of the proposed CCC projects proposed by NYSDEC and Riverkeeper are significant. As noted above, the project described by the Tetra Tech Report involves: at least 3 to 4 years of blasting and excavation; the removal of approximately 2 million cubic yards of rock from the facility; either 110,000 haul truck trips during the 3 to 4-year blasting period (an average of approximately 235 truck trips per day) or approximately 1,215 barge loads and approximately 9,000 haul truck trips; noise impacts at Lents Cove Park and elsewhere; and significant visual impacts. The Entergy Response Document indicates that the adverse impacts of the CCC project may be even greater than those identified by Tetra Tech. In light of the changes in the utility industry and the significant impacts of the CCC project, we believe a court could reasonably find that a decision by the Village to deny an area variance for the proposed cooling towers was justified, even if a court applied the variance standard articulated in the *Con Edison* decision.

C. Timing/Procedure for Issuing an Area Variance

As discussed in Section 5.I below, under the 2008 Interim Decision issued in this matter, NYSDEC must first determine the appropriate BTA technology. Once the BTA determination is made, the proposed technology must be reviewed in accordance with the State Environmental Quality Review Act ("SEQRA"). At the close of the adjudicatory hearing, the administrative law judge's hearing report, including the transcript and documents admitted into evidence, will constitute the draft SEIS. That draft will be reviewed and finalized in accordance with SEQRA and NYSDEC, as lead agency, will eventually issue the required SEQRA findings statement. The Village cannot act on a request for an area variance until NYSDEC completes the SEIS and issues its findings statement and the Village issues its own findings statement. *See* 6 NYCRR § 617.11(a), (c) (barring involved agency from making final decision to approve an action that has been the subject of a final EIS until that agency has made a written findings statement).

Either the application for site plan approval and/or a request for an interpretation of the Village Zoning Code with respect to whether the cooling towers are a prohibited use will trigger a referral to the ZBA. The ZBA is authorized to grant variances from the specific application of lot area or other dimensional requirements of the Village Zoning Code. Village Zoning Code § 211-39.B. Under § 211-40.A-B, an appeal or application, including a request for a variance, must be made within 30 days of the order or decision appealed from by filing a notice of appeal with the official/agency from whom the appeal is taken and the ZBA. That section goes on to specify what information must be included in the ZBA application/appeal. The ZBA must hold a public hearing on any variance request "within a reasonable time of the date any appeal is taken or an application or request is made to the Board." *Id.* § 211-40.D. The ZBA must decide an application for a variance within 62 days of the hearing, although the time may be extended by mutual consent of the ZBA and applicant. N.Y. Village Law § 7-712-a.8. The final decision must be filed with the clerk of the municipality within five days after it is rendered. *Id.* § 7-712-a.9. Proceedings challenging the ZBA decision in court must be instituted no later than 30 days thereafter. *Id.* § 7-712-c; Village Zoning Code § 211-40.H.

D. Article 78 Proceeding – Prohibited Use Interpretation and Area Variance Denial

Given the anticipated adverse community, noise, aesthetic and other environmental impacts associated with the proposed cooling towers, it is reasonable to expect the ZBA to issue a determination that the towers are a prohibited use, particularly in light of changes to the Village Zoning Code since the *Con Edison* decision, including the prohibition on uses that fail to satisfy specific performance standards. Again, given the anticipated impacts referenced above, it is also reasonable to expect the ZBA to deny the area variance for height and lot coverage needed to construct the towers. For the project to proceed, Entergy will therefore be required to bring a petition under Article 78 of the Civil Practice Law and Rules ("CPLR") challenging the denial of these requested authorizations. In the event that the Village grants the required area variance, it is reasonable to expect Village residents or other third parties to bring an Article 78 action challenging the decision.

IV. Site Plan Review and Approval

A. Standards of Review

Under § 211-25 of the Village Zoning Code, the building inspector may not issue a building permit for the construction or alteration of any structure or for the use of any land in the Village until the Planning Board has approved a final site development plan, with certain limited exceptions. In considering approval of the plan, the Planning Board shall "take into consideration the public health, safety and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood in particular and shall make appropriate conditions and safeguards in harmony with the general purpose and intent of this chapter and, particularly, in regard to achieving" general standards relating to design, access, utilities, environment, and conformance. *Id.* § 211-26. Among other things, the Planning Board will consider "[h]armonious relationships of principal and accessory structures and uses with the site, with each other and with adjacent properties and streets." *Id.* § 211-26.A. The Board also will take into consideration the "avoidance or minimization of disturbance to wetlands and floodplains, air and water pollution and other potential environmental, engineering or aesthetic impacts" and "[c]onformance of the proposed site development plan with the Master Plan and Official Map of the Village, with all applicable provisions of this chapter [*i.e.*, the Village Zoning Code] and with all other regulations and statutes governing the development of the proposed site." *Id.* § 211-26.D-E. The contents of the plan are spelled out in Village Zoning Code § 211-27.

In deciding whether to grant or deny a site plan, the planning board must consider the standards specified in its regulations in relation to the project. Any denial must be based on reasons reasonably related to health, safety and the general welfare of the community. In general, courts hearing appeals from site plan decisions pursuant to Article 78 will not substitute their judgment for that of the planning board. Thus, where substantial evidence exists to support the planning board's decision, it will be upheld. *See, e.g., Home Depot, USA, Inc. v. Town of Mount Pleasant*, 293 A.D.2d 677, 741 N.Y.S.2d 274 (2d Dept. 2002) (upholding town's denial of site plan approval where evidence showed project was not in keeping with surrounding area and would bring noticeable change in area's visible character) (citations omitted); *Holy Family Ukrainian Catholic Church v. O'Connell*, 270 A.D.2d 265, 704 N.Y.S.2d 852 (2d Dept. 2000) (upholding denial of site plan approval where reasons stated by planning board were supported by substantial evidence in the record) (citations omitted). *See generally* Patricia Salkind, *New York Zoning Law and Practice* § 25:20 (4th ed. 2013).

As discussed above, the site development plan review process is largely intended to ensure that projects are consistent with the surrounding community. Village Zoning Code § 211-26 specifically requires the Planning Board to "take into consideration the public health, safety and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood in particular."

The Tetra Tech Report contains a brief summary of the site plan review requirements of the Village Zoning Code and lists the criteria for review (*e.g.*, design, access, utilities, environment, and conformance). Tetra Tech Report pp. 85-86. The Report's assessment of the likelihood of receiving site plan approval from the Planning Board is limited to the following statement:

> Assuming that the project would not have significant impacts on air or water quality, the primary issues that the Board could use to deny the project would be the aesthetic impacts and compatibility with the plan discussed above [*i.e.*, the Village of Buchanan Comprehensive Master Plan]. Proposed mitigation measures to develop recreational facilities and access to the river across the

> IPEC property, however, would increase the project's compatibility with the Master Plan, enabling the community to implement the intent of one of their major planning objectives. The project would also need to comply with the village performance standards for noise, which would require a detailed noise analysis.

Tetra Tech Report, p. 97. The Tetra Tech Report does not state that the CCC project will likely obtain site plan approval. However, many of the factors identified in its brief discussion of the site plan review process argue against approval. For example, as discussed in Section 3.II.A above, both the Tetra Tech Report and the Entergy Response Document indicate that the ClearSky™ cooling towers will have noise impacts beyond the facility. Also, the project raises significant aesthetic concerns associated both with the massive size of the towers and with the plumes expected to be emitted, particularly during the winter months. Finally, as discussed in Section 3.VI below, the CCC project is inconsistent with the Village's Comprehensive Master Plan, which, among other things, seeks to preserve the forested area identified as the location for Cooling Tower 2. We believe these factors will reasonably lead the Village Planning Board to deny site plan approval for the CCC project.

With respect to the issue of site plan review, the Powers Report cites Village Zoning Code § 211-25.B(4), which provides that no site development plan is required for the "installation, construction or operation of any safety/security improvement." According to the Powers Report, the installation of cooling towers would qualify as a "safety/security improvement" under local law, exempting the CCC project from the site plan approval process. Powers Report, p. 51. However, this conclusion is contrary to the plain terms of the Village Zoning Code. Section 211-5 defines "safety/security improvement" as "[a]ny structure installed, constructed or operated for the purpose of protecting, shielding, containing, storing, cooling, handling or otherwise making safe and secure any radiological material. . . ." Radiological material, in turn, is defined as: "[a]ny radioactive material including source, by-product or special nuclear material (as such terms are defined in 42 U.S.C. § 2014), low-level radioactive waste, high-level radioactive waste, and spent nuclear fuel (as such terms are defined in 42 U.S.C. § 10101), and spent fuel (as such term is defined in 10 CFR 72.3). The cooling towers at issue are being installed to cool water not "radiological material" and so are not subject to this exemption.

If a site plan is required, the Powers Report goes on to note that the Planning Board has the authority to modify or waive any of the requirements or procedures for the site development plan if it concludes that any part is inappropriate or unnecessary or that strict compliance may cause unnecessary hardships. Powers Report, p. 52. However, this conclusion assumes that the Village *wants* to modify its procedures. Given the anticipated adverse community, noise, aesthetic and other environmental impacts associated with construction and operation of the proposed cooling towers, the Village Planning Board is likely to demand strict adherence to all site plan approval requirements.

B. Procedure for Granting Site Plan Approval

The site development plan approval process cannot officially commence until after the ZBA has granted the area variance discussed above. The following steps must be followed to obtain site plan approval: (1) the applicant must submit a preliminary site development plan and other required information to the Secretary of the Planning Board at least 14 days in advance of the Planning Board meeting; (2) the Planning Board must call a public hearing within 60 days of receipt of the preliminary application; (3) the Planning Board must issue a decision on the preliminary application within 60 days after close of the public hearing; and (4) the applicant must submit an application for the final site development plan and the Board must approve the final plan in accordance with the schedule for the draft plan. The final application must include proof of application to all federal, state and county agencies for any required approvals. The building permit must be obtained within one year of the date of the Board's decision; the project must be completed within three years unless the conditions of approval specify a longer period. Village Zoning Code § 211-29.

Any decision by the Planning Board denying site plan approval may be appealed to the Zoning Board of Appeals. Village Zoning Code § 211-31. The appeal must be filed with the ZBA within 30 days from the decision denying site plan approval. *Id.* § 211-40.A. The ZBA must hold a public hearing on the appeal within a "reasonable time" of the date an appeal is taken. *Id.* § 211-40.D. The ZBA must issue its decision within 62 days of the hearing and must file its decision with the Village clerk within five days after it is rendered. N.Y. Village Law § 7-712-a.8, 9. Appeals of the ZBA decision to the court must be instituted no later than 30 days after the final ZBA determination is filed with the Village clerk. *Id.* § 211-40.H; N.Y. Village Law § 7-712-c.1.

C. Article 78 Proceeding – Denial of Site Plan Approval

Given the requirements of the Village Zoning Code and the severity of the impacts associated with the NYSDEC and Riverkeeper proposals, it is reasonable to expect that the Planning Board will deny site plan approval and that this decision will be upheld by the ZBA. For the project to proceed, Entergy will therefore be required to bring an Article 78 petition challenging the denial. In the event the Village grants site plan approval, the project is nevertheless likely to be challenged by neighbors or other third parties opposed to the construction of cooling towers at the site. Consistent with the discussion in Section 6.III.B below, obtaining site plan approval can reasonably be expected to take approximately 3 to 6 years, measured from the time the ZBA grants the area variance and litigation concerning that variance is completed.

V. Relationship Between SEQRA Process and Review under Local Zoning Laws

The Interim Decision in this matter requires NYSDEC to identify BTA, issue an SEIS and make SEQRA findings. NYSDEC's completion of the SEQRA process and issuance of SEQRA findings does not preclude the Village in this case from exercising its independent authority under its zoning law to deny the required area variance, site plan approval or excavation permit (discussed below) based on its assessment of the impacts of the CCC project. Part 617 declares that SEQRA "does not change the existing jurisdiction of agencies nor the jurisdiction between or among state and local agencies." 6 NYCRR § 617.3(b). In other words, "SEQRA neither preempts nor interferes with local zoning ordinances." *WEOK Broadcasting Corp. v. Planning Board of Town of Lloyd,* 165 A.D.2d 578, 581, 568 N.Y.S.2d 974 (3d Dept. 1991), aff'd, 79 N.Y.2d 373, 583 N.Y.S.2d 170 (1993) (citations omitted).

Thus, while a lead agency's SEQRA determination may be used to guide local zoning decisions, it does not necessarily dictate the result. *See, e.g., Troy Sand & Gravel Co. v. Town of Nassau,* 101 A.D.3d 1505, 1507, 957 N.Y.S.2d 444 (3d Dept. 2012) (NYSDEC's SEQRA determination on mining permit application "did not supplant the Town's zoning regulations governing review of special use permit applications, nor did it predetermine the Town's decision on plaintiff's permit application") (citations omitted). Thus, while a local government may be restricted to the lead agency's SEQRA record and, in the case of a negative declaration, bound by the lead agency's SEQRA determination, it is nevertheless entitled to independently review an application under the criteria spelled out in its local zoning law. This determination is subject to CPLR Article 78 review and should be reversed only if it is arbitrary and capricious and/or unsupported by substantial evidence. *Id.*

The area variance, site plan approval, and excavation and steep slope permits (discussed below) required from the Village to undertake the CCC project are each subject to an environmental review under the terms of the relevant Village Laws. For example, to issue a variance from the Village's bulk requirements, the ZBA must make seven specific findings, including "[t]hat the variation would not cause adverse aesthetic, environmental or ecological impacts on the property or on surrounding areas." Village Zoning Code § 211-39.B(5). Similarly, in considering whether to grant site plan approval, the Planning Board must "take into consideration the public health, safety and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood in particular," including various environmental impacts. *Id.* § 211-26. Thus, even if NYSDEC issues SEQRA findings supporting its determination that closed-cycle cooling towers are BTA, the Village could deny the variance, site plan approval and/or excavation and steep slope permits under the standards set forth in the applicable Village zoning and other laws based on the record developed in the NYSDEC permit proceedings.

VI. Consistency with Village Master Plan

The Village of Buchanan adopted the Village of Buchanan Comprehensive Master Plan in 2005 (hereinafter "Master Plan") to provide guidance on the general direction the Village envisions for its future. Although the Master Plan is not enforceable in and of itself, consistency with the Master Plan is a factor in deciding whether the Village should issue site plan approval or grant a steep slope permit. *See* Village Code § 165-6.F; Village Zoning Code § 211-26.E. The Master Plan includes the following planning objectives/recommendations relevant to the CCC project:

- Preserve the remaining 45 acres of undeveloped, forested property between Lents Cove Park and the plant (including about one-half mile of Hudson River waterfront) as open space. *Id.* at IIB-11 to -12.
- Improve and increase access and use of the undeveloped property for passive trails and park as a logical extension of Lents Cove Park and a component of the proposed Hudson River Walk Greenway Trail, which is proposed to run along Broadway. *Id.* at IIB-12.
- Protect and encourage wildlife and habitat diversity. *Id.* at IIF-8.

- Protect scenic resources and sensitive environmental features, such as water bodies, wetlands, floodplains, steep slopes, and stream corridors, to the maximum degree possible. *Id.* at IIF-2.
- Preserve, protect and enhance important viewsheds, including those of the Hudson River. *Id.*
- Ensure that additional development occurs at a scale that is appropriate to the area. *Id.* at IIB-3.

The Powers Report does not address the consistency of Riverkeeper's CCC proposal with the Village Master Plan. In support of NYSDEC's CCC proposal, the Tetra Tech Report concludes, among other things, that while the project's height is comparable to other industrial facilities in the Village, the cooling towers' footprints are larger than other industrial facilities in the vicinity. However, the Report goes on to find that the towers would not be visible from Buchanan's neighborhoods and that only a relatively small portion of the total project would be visible from Lents Cove. However, the Report concedes that the cooling towers would be visible from the Hudson River, Lents Cove Park, Fleishman's Pier and the cove itself but suggests that this portion of the viewshed is already industrial and that any plumes would be visible only for a short time. Tetra Tech Report, pp. 96-97. With respect to the Master Plan's goal of increasing river access through the Indian Point property, the Tetra Tech Report suggests that the potential trails and river access lost because of the CCC project could perhaps be made up by other trails/access around the structures.

The Tetra Tech Report significantly downplays the impacts of the CCC project in an attempt to show that the cooling towers are consistent with the Village Master Plan. As illustrated in the diagrams included with the Tetra Tech Report, Cooling Tower 2 would effectively block all potential access to the Hudson River across the remaining forested areas of the Indian Point property. As currently designed, Cooling Tower 2 would be located within approximately 100 meters of the boundary with Lents Cove Park. However, the developed area associated with the tower would be even closer. Any trails around the tower would bring users within a very short distance of the noise and vibrations associated with the tower. Thus, contrary to Tetra Tech's assertions, the potential loss of access to this forested area cannot readily be mitigated. Also, even assuming Tetra Tech is correct in its conclusion that plumes from the towers would be visible only for a short time, each plume will be more than a quarter of a mile long, significantly affecting the Village's ability to "preserve and enhance its viewsheds." For these and other reasons, we believe the Village is likely to conclude that the towers are inconsistent with the Master Plan when it decides whether to grant a steep slope permit or issue the required site development plan approval.

VII. Aesthetics

The Village Zoning Code does not directly regulate aesthetics, except in certain narrow areas. However, aesthetic concerns are relevant to the Village Planning Board's decision whether to grant site plan approval and to the ZBA's decision whether to grant an area variance. Also, aesthetic concerns are addressed in some detail in the Village Master Plan.

The Powers Report contains no information whatsoever concerning the potential impact of Riverkeeper's CCC proposal on the visual resources in the region. Although the Tetra Tech Report includes a visual impact assessment of the operational impacts of NYSDEC's proposal, the Entergy Response Document concludes that the analysis is "incomplete and deficient in many ways . . . and does not provide sufficient information for regulatory decision-makers and the general public to understand the visual characteristics of the regional and local landscape setting, and the resultant impact on scenic resources." Entergy Response Document, § 3.6.3. Among other things, the Entergy Response Document concludes that the Tetra Tech Report fails to:

- Fully identify and assess construction-related impacts including, but not limited to removal of existing vegetation, site excavation, size and placement of construction cranes, construction of site roads, contractor parking, lay down areas and dust generation.
- Provide a basis for concluding visible plumes would occur infrequently.
- Consider plume formation under non-plume abated operating conditions.
- Provide baseline photographs of sufficient quality for accurate review of photo simulations.
- Provide photo simulations from vantage points beyond five (5) miles.
- Adequately describe the physical scale and visual dominance of the ClearSky™ cooling towers.
- Address visual impact from key scenic resources of statewide significance.
- Consider plume visibility from distances beyond ten (10) miles.
- Address the effect of site lighting on nighttime plume visibility.
- Evaluate the consistency of the NYSDEC Staff Proposal with Coastal Zone Policies #24 and #25 as required by SEQRA.

Id. at § 3.6.1. The Entergy Response Document also assesses the visual impact of the NYSDEC project in relation to the New York Department of State's Coastal Zone Management Area policy and NYSDEC's Visual Policy. After completing this review, the Entergy Response Document concludes that:

> The cooling towers of the NYSDEC Staff Proposal would be unprecedented in scale and scope in the Hudson Valley, would affect an unusually large number of visual resources of statewide and national significance, would be incompatible with [Coastal Management Plan] Policy, and could not be mitigated to a meaningful degree. Under these conditions construction and operation of the visual impact of the NYSDEC Staff Proposal at IPEC can be characterized as LARGE (significant).

Id. at § 3.6.6. The Entergy Response Document reaches a similar conclusion regarding the adverse visual impacts of the Riverkeeper CCC proposal outlined in the Powers Report. *Id.* at § 3.6.7.

SECTION 4: CONSTRUCTION-RELATED REQUIREMENTS, PERMITS AND APPROVALS

This section summarizes the construction-related requirements, permits and approvals potentially applicable to the CCC project under the Village of Buchanan Code ("Village Code"). The summary provides an overview of the Village Code requirements, an assessment of the information contained in the Powers and Tetra Tech Reports concerning these requirements, and an evaluation of whether the CCC project can meet those requirements and obtain necessary permits/approvals.

I. Soil Disturbance and Excavation Permit

Under Chapter 159 of the Village Code, prior to commencing any non-exempt excavation, the owner or his/her duly constituted agent, must obtain a soil and excavation permit from the Village Building Inspector. The application must include detailed information about the project, a certificate from the applicant's engineer that the proposed operation will not interfere with drainage or cause erosion or other problems, and a certificate of insurance from the owner and/or contractor establishing the extent of liability of the applicant or contractor. Village Code § 159-8. The applicant also must specify how long the work will take to complete; per the Village Code, the completion time for the excavation authorized under the permit cannot exceed two years. The building inspector must issue a decision within 30 days after filing, subject to prior review and approval by the Planning Board.

In support of its permit application, the applicant must meet various standards spelled out in the Village Code. Among other things, the applicant must show that the project: will not interfere with surface drainage or endanger streets, highways or adjoining properties; "will not cause substantial traffic hazards, vibrations, noise, dust or sand;" and operations in connection with any use "shall not be more objectionable to nearby properties by reason of noises, fumes, vibration or lights than would be the operations of any use permitted by right." The applicant also must show that the period of time and the methods for completion of the work are reasonable. Village Code § 159-8.C. Permits granted by the Village Code Enforcement Officer may contain various conditions relating to the conduct of the excavation, including execution of a payment and performance bond or cash deposit to secure site rehabilitation and/or guarantee faithful performance of work. Village Code § 159-8.D(10).

Section 159-6.A(4) of the Village Code exempts the following soil excavation-related activity from the above-referenced permit requirement:

> Any excavating operation in which fill or other material is removed from the premises, where a building permit shall have been duly issued, provided that the excavation is limited in area and bulk to that strictly essential for and limited to the extent of the foundation, walls and basement of such building or for the construction of a wall, driveway, sidewalk, swimming pool, service connections or other structure or underground tank, and which, excluding from consideration soil removed which is actually replaced by a basement foundation, wall, swimming

> pool, tank or other underground structure, does not involve any change in the existing grade and contour.

In other words, the Village Code exempts from the soil disturbance and excavation permit requirement any excavation in which soil and other material is excavated in aid of a construction project authorized under a building permit provided the only soil used on-site for grading is the soil replaced by the tank or underground structure. If the project involves any change in grading and contours other than that associated with the actual excavation, then it is not subject to the exemption and a permit is required from the Village.

The Tetra Tech Report contains no discussion of the Village soil disturbance and excavation permitting requirement and only a brief reference to the blasting/excavation impacts of NYSDEC's proposed CCC project. In conjunction with a discussion of the final cooling tower elevation, the Report states: "Blasting and excavation requirements, while still significant, would be reasonable given the scale of the proposed project." Tetra Tech Report, p. 15. Later, in conjunction with the discussion of site construction, the Report states: "A massive volume of blasting spoils, approximately 2 million cubic yards, will need to be removed from the site." *Id.* at 33. The Powers Report notes generally that "substantial excavation" will be required to complete Riverkeeper's CCC proposal but provides no details as to what that excavation would entail, nor does it mention the Village's excavation permit requirement. Powers Report, p. 38.

As a preliminary matter, an attempt could be made to invoke the exemption in Village Code § 159-6.A(4) to avoid the requirement to obtain an excavation permit from the Village. However, this exemption is available only if the excavation "does not involve any change in the existing grade and contour." Although the Powers and Tetra Tech Reports contain few, if any, details concerning the excavation process, Figure 02 of the Tetra Tech Report shows substantial grade changes in the areas surrounding the proposed cooling tower locations. As a result, the project will require an excavation permit from the Village.

Also, the law only authorizes issuance of an excavation permit for at most two years and contains no provisions for renewal. Village Code § 159-8.B(9) (requiring permit application to specify period of time to complete work "which in no event shall exceed two years"). By comparison, the Tetra Tech Report estimates that blasting and excavation work associated with the NYSDEC's proposed CCC project will take between three and four years to complete. Tetra Tech Report, p. 33. The Village could cite to this provision as grounds for denying an excavation permit.

In addition, the law requires a "certificate of insurance establishing the extent of liability of the applicant or contractor." Village Code § 159-8.B(10). Given (1) the scope of the excavation (2 million cubic yards); (2) the fact that a percentage of the excavated material may be contaminated with radionuclides; and (3) the proximity of the project to an active nuclear power plant, Entergy may have difficulty obtaining the certificate of insurance necessary to proceed with NYSDEC's proposed CCC project. The Tetra Tech Report includes no mention of the insurance requirement contained in the Village Code, let alone any assessment of the feasibility of obtaining such insurance. However, the 2010 Enercon Report addressing conversion of Units 2 and 3 to a closed-loop cooling water configuration concluded that "[o]btaining blasting insurance for the project is not assured." 2010 Enercon Report, Attachment 7, Precision Blasting and Rock Removal, p. 52. Even if Entergy obtains a certificate, the Village could conclude that the certificate is inadequate and deny Entergy's application.

Moreover, Entergy must satisfy the building inspector and Planning Board that the non-exempt excavation meets the standards for approval. In particular, the applicant must show that the project: will not interfere with surface drainage or endanger streets or highways; "will not cause substantial traffic hazards, vibrations, noise, dust or sand;" and "[o]perations in connection with any use shall not be more objectionable to nearby properties by reason of noises, fumes, vibration or lights than would be the operations of any use permitted by right." Village Code § 159-8.C. As previously noted, the Tetra Tech Report does not discuss the impacts of NYSDEC's proposed CCC project in relation to the Village's soil disturbance and excavation permit. However, key aspects of that proposed CCC project necessarily run afoul of these standards. As noted above, if the project is unable to offload spoils by barge, the project will require approximately 110,000 heavy-duty truck trips during the 3 to 4 year blasting and excavation period, with an average of 235 truck trips to and from the disposal site per day, forcing Tetra Tech to concede that "[n]oise and dust emissions could be notable." Tetra Tech Report, p. 33. To accommodate the project, Tetra Tech concludes that upgrades may be required to various intersections along the transport route. *Id.* at 33-34. Even if barging is an option, Tetra Tech estimates that over the course of the project, 1,215 barge loads and approximately 9,000 truck trips will be required. The work thus will result in "substantial traffic hazards, vibrations, noise, dust or sand," violating the standards of Village Code § 159-8.C. Also, the Village must find that the "period of time and methods for the completion of the work are reasonable" and that "[o]perations in connection with any use shall not be more objectionable to nearby properties by reason of noise, fumes, vibration or lights than would be the operations of any use permitted by right." *Id.* In light of these considerations, it is unlikely that the Village will issue an excavation permit for the CCC proposals under Village Code Chapter 159.

Finally, independent of its decision whether to grant an excavation permit, the Village can consider the impacts of excavation in deciding whether to grant site plan approval. As discussed in Section 3.IV.A above, the Planning Board must "take into consideration the public health, safety, and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood in particular and shall make any appropriate conditions and safeguards in harmony with the general purpose and intent of this chapter and, particularly, in regard to achieving" general standards relating to design, access, utilities, environment, and conformance. Village Zoning Code § 211-26. If the Village concludes that the extensive excavation activity threatens public safety, health and general welfare, it will likely deny site plan approval.

II. Blasting

To remove the stone required to install the cooling towers and related equipment, the CCC project will require extensive blasting, an activity regulated under Village Code Chapter 143, Quarrying and Blasting. The law specifies the acceptable hours of operation and imposes ground and air blast standards designed to minimize the noise and vibrations associated with the blasting activities. In particular, the law allows blasting only between the hours of 8:00 a.m. and 7:00 p.m. weekdays; blasting is prohibited altogether on weekends and public holidays. Village Code § 143-3. Any blasting must comply with standards set forth in Village Code § 143-4, which states:

> During the hours when blasting is permitted, peak particle velocity and overpressure produced by any blast at a distance measured by the distance from the blast to the closest structure or building not owned or used by the entity conducting the blast shall not exceed 0.75 inch per second for frequencies less than 40 hertz (Hz) or 2.0 inches per second for frequencies of 40 hertz or more. In addition, air pressure levels emanating from such blasts shall not exceed 131 decibels (dB) for a high pass filter of 0.1 hertz or 128 decibels for a high pass filter of two hertz, or 125 decibels for a high pass filter of six hertz.

The law goes on to require persons engaged in blasting to monitor blasts and keep extensive records verifying the place, date, time and amount of charge set for each blast as well as the measurements obtained during blast monitoring.

The Powers Report contains no details whatsoever concerning the impact of the Village's blasting restrictions on Riverkeeper's proposed CCC project. The Tetra Tech Report contains few details concerning the extent of blasting required to complete NYSDEC's proposed CCC project. As a result, it is impossible to determine whether the blasting required to remove Tetra Tech's estimated 2 million cubic yards of rock from the site will comply with the standards established by the Village. To adequately assess whether either proposed CCC project can be completed in compliance with the Village blasting standards, a detailed blasting feasibility study must be prepared that considers, among other things: the vibration levels generated by the expected blasting; the potential impact of blasting on sensitive equipment and on operation of the nuclear plant generally; and scheduling concerns, including the coordination of the project with the plant's operating needs and scheduled downtime. Without such a study, the reports lack a sufficient basis to conclude that the Village blasting standards can be satisfied.

From a local permitting/approval perspective, the Planning Board will consider the impacts of the blasting operation in deciding whether to grant site plan approval to the CCC project. If the Planning Board finds consistent with Village Zoning Code § 211-26 that "the public health, safety and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood" will be adversely affected by the blasting activities, they will likely deny the project site plan approval.

III. Steep Slopes Permit

Under Village Code Chapter 165, the Village of Buchanan requires a permit to disturb steep slopes, which is defined as: "[g]round areas with a slope greater than 15%, with a minimum area of 500 square feet which possesses one dimension of a minimum of 10 feet. Measurements shall be made along a horizontal plane." Village Code § 165-3.[10] The approval authority differs depending on what other approvals are required. The most "senior" village entity responsible for issuing approvals to a project is also responsible for issuing the steep slope permit. Accordingly, if an approval is required by the Village Board under another ordinance, then the Village Board also is responsible for issuing the steep slope permit, even if permits/approvals also must be obtained from the Planning Board or Zoning Board of Appeals. All regulated activities that do not require approval from the Village Board, Planning Board or Zoning Board of Appeals can be approved by the building inspector. Village Code § 165-5.

The standards for approving a steep slope permit are spelled out in Village Code § 165-6. In deciding whether to grant a steep slope permit, the permitting authority must consider, among other things: (1) whether the disturbance of trees or topography of the steep slopes conforms to other applicable Village regulations; (2) whether the activity will result in creep, sudden slope failure or additional erosion; (3) whether the activity is consistent with the most recent Master Plan of the Village; and (4) whether "the proposed activity constitutes the minimum disturbance necessary to allow the property owner a reasonable use of the property." Village Code § 165-6.A to G. In addition, disturbance of steep slopes must conform to a list of 19 criteria contained in Village Code § 165-6.H relating to the actual performance of the steep slope disturbance. In assessing steep slope disturbance projects:

> (1) The presumption in all cases shall be that no disturbance or alteration of any steep slope shall be approved by the approval authority. The applicant shall in all cases have the burden of proof of demonstrating, by clear and convincing evidence, that the proposed activity is fully consistent with each of the findings set forth in § 165-2 and that each of the standards for approval set forth in Subsections A through G above have been fully and completely met.
>
> (2) With respect to applications involving proposed disturbance or alteration of any steep slope with a grade of 30% or greater, the applicant shall have the additional burden of demonstrating, again by clear and convincing evidence, that the applicant's circumstances are compelling and exceptional, including, at a minimum, demonstrating by clear and convincing evidence that no

[10] The only exemption is for "customary landscaping not involving regrading". A permit also is required to cut any tree with a diameter greater than four inches when measured 1½ feet from ground level on any steep slope other than an exempt activity. Village Code § 165-4.

> reasonable use of the site, lot or parcel is possible without disturbance to a steep slope area having a grade of 30% or greater.

Village Code § 165-6.I.

The requirements for a steep slope permit application are spelled out in Village Code § 165-7, which addresses both the content of the permit application and the procedure and timeframes for obtaining approval. Steep slope permits are valid for two years from the date of approval (or for the period of any other permit issued by the approval authority); they may be renewed for an additional two years. *Id.* § 165-8. In granting the permit, the Village can require security "in an amount and with surety and conditions satisfactory to it" to ensure compliance with the permit. *Id.* § 165-9. The Village also can require the applicant to submit a detailed monitoring program as well as periodic written status reports. *Id.* § 165-10.

The Powers Report contains no information whatsoever about the impact of Riverkeeper's CCC proposal on steep slopes. The Tetra Tech Report, by comparison, states that "the project would require excavation of some steep slopes (over 15%)" but includes no details concerning the extent of steep slope disturbance nor does it address the grade of the disturbed areas – in particular, whether the project will disturb steep slopes of 30% or more. Tetra Tech Report, p. 97. Moreover, neither report mentions the Village steep slope permit requirement. The Tetra Tech and Powers Reports thus lack the information necessary to determine the impact of the CCC project on steep slopes and whether the Village is likely to issue the required steep slope permit.

The Westchester County GIS map service confirms the presence of steep slopes at various locations on the Indian Point property, including the areas likely to be disturbed by NYSDEC's proposed CCC project.[11] A comparison of cooling tower locations indicated in the Tetra Tech Report with the steep slopes identified by the Westchester County GIS map service indicates that the project may disturb steep slopes greater than 25%, in addition to those over 15%.[12] As a result, the project not only requires a steep slope permit from the Village but may have to satisfy the stricter burden of proof spelled out in Village Code § 165-6.I(2) applicable to steep slopes of 30% or more.

Applying the standards for approval spelled out in Village Code § 165-6, the Village has grounds for denying the required steep slope permit. As set forth in Section 3.VI above, the proposed project is inconsistent with the Village Master Plan. Moreover, the proposed project arguably does not "constitute the minimum disturbance necessary to allow the property owner a reasonable use of the property" since a reasonable alternative to the cooling towers (cylindrical wedgewire screens) has been proposed. Under these circumstances, it is

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[11] The Westchester County GIS map service showing the presence of steep slopes can be accessed at: http://giswww.westchestergov.com/gismap/default.aspx?.

[12] The Westchester County GIS map service distinguishes between steep slopes between 15% and 25% and those over 25%. As a result, it is impossible to determine from the maps alone whether construction of the proposed cooling towers will disturb slopes of 30% or more.

reasonably likely that the required steep slope permit will not be issued, particularly if further analysis shows that it will result in the disturbance of slopes over 30%.[13]

IV. Flood Damage Prevention Permit

The Village of Buchanan has adopted laws addressing construction in areas prone to flooding and erosion. Chapter 97 of the Village Code, Flood Damage Prevention, requires a permit for all construction and other development to be undertaken in "areas of a special flood hazard," defined as:

> The land in the floodplain within a community subject to a one-percent or greater chance of flooding in any given year. This area may be designated as Zone A, AE, AH, AO, A1-A30, A99, V, VO, VE, or V1-V30. It is also commonly referred to as the "base floodplain" or "one-hundred-year floodplain." For purposes of this chapter, the term "special flood hazard area (SFHA)" is synonymous in meaning with the phrase "area of special flood hazard." Village Code § 97-4.

The areas of special flood hazard in the Village (Community No. 360168) are identified in specific documents prepared by the Federal Emergency Management Agency ("FEMA") and in a report entitled *Flood Insurance Study, Westchester County, New York, All Jurisdictions* (Sept. 28, 2007). Village Code § 97-6.

The permit application must be submitted to the "local administrator"[14] on forms supplied by the administrator. The information required to be included in the permit application is spelled out in Village Code § 97-12. The local administrator must review the application for completeness and for compliance with the requirements of Chapter 97 and other requirements, including confirming that all necessary federal and state permits have been obtained. In addition, the applicant cannot occupy or use the structure until the local administrator issues a certificate of compliance stating that the building or land conforms to

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[13] The Village of Buchanan regulates construction activity in wetlands under Village Code Chapter 203, Wetlands, with the stated purpose of implementing New York's Freshwater Wetlands Act. Village Code § 203-2. Persons proposing to conduct an activity that requires a wetland permit must file an application with the Planning Board that includes information and documents spelled out in Village Code § 203-6.A(1)-(3) and satisfy public hearing and neighbor notification requirements. Village Code § 203-6. A review of the map of the Village of Buchanan found on NYSDEC's online Environmental Resource Mapper showed no state-mapped freshwater wetlands on the Indian Point property. *See* http://www.dec.ny.gov/imsmaps/ERM/viewer.htm. In conjunction with an earlier security upgrade project at the facility, a Village-designated wetland was identified in the northeast corner of the property. Neither the Tetra Tech Report nor the Powers Report addresses whether this wetland will be affected by their respective proposals.

[14] "Local administrator" is defined as the "person appointed by the community to administer and implement this chapter [*i.e.*, Chapter 97] by granting or denying development permits in accordance with its provisions. This person is often the Building Inspector, Code Enforcement Officer, or employee of an engineering department." Village Code § 97-4.

the requirements of the Chapter. Village Code § 97-13. The relevant construction standards are spelled out in Village Code §§ 97-14 (General Standards), 97-15 (Standards for All Structures), and 97-17 (Nonresidential Structures). Allegations that the local administrator made an error in implementing the permit program and/or requests for variances must be directed to the ZBA, which will consider factors spelled out in Village Code §§ 97-19 (appeals) and 97-20 (variances).

The Westchester County GIS map service indicates that the entire shoreline of the Indian Point plant is part of a 100-year floodplain and so is potentially subject to the flood damage prevention permit requirements.[15] However, the Tetra Tech and Powers Reports contain no discussion of floodplain-related issues nor do they mention the permit requirements spelled out in Village Code Chapter 97.

V. Stormwater Management and Erosion and Sediment Control

The Village has included in its Zoning Code a law addressing stormwater management activities associated with "land development activity," which is defined as "[c]onstruction activity, including clearing, grading, excavating, soil disturbance or placement of fill, that results in land disturbance of equal to or greater than one acre, or activities disturbing less than one acre of total land area that is part of a larger common plan of development or sale." Village Zoning Code § 211-87. Under this law, all land development activities that require site plan review are subject to stormwater review under Article XIV of the Village Zoning Code. Pursuant to Village Zoning Code § 211-91, "[n]o application for approval of a land development activity shall be reviewed until the appropriate board has received a stormwater pollution prevention plan (SWPPP) prepared in accordance with the specifications in this article."

The contents of the SWPPP are spelled out in Village Zoning Code § 211-92. Among other things, the SWPPP must include: background information about the project; a site map/construction drawings; a construction phasing plan describing the intended sequence of construction activities addressing all activities requiring soil disturbance; a description of the pollution prevention measures to be used; a description of the construction and waste materials expected to be stored on-site; temporary and permanent structural and vegetative measures to be used for soil stabilization, runoff control, and sediment control for each stage of the project; site map/construction drawings showing each erosion and sediment control practice; and dimensions, material specifications and installation details for all erosion and sediment control practices, among other information/documents. In addition, where land development activities will disturb five acres or more, the applicant also must include post-construction stormwater controls. As a condition of approval, the SWPPP is subject to the performance bond and other requirements spelled out in Village Zoning Code § 211-28. Finally, the law requires compliance with provisions relating to contractor certification, performance and design criteria, and maintenance and repair of stormwater management facilities, among other requirements. Village Code §§ 211-94 to -102.[16]

[15] The map service can be accessed at: http://giswww.westchestergov.com/gismap/default.aspx?

[16] Chapter 166 of the Village Code regulates discharges to the Village's municipal separate storm sewer system ("MS4") for purposes of achieving compliance with the SPDES general permit for stormwater discharges to

Although not clearly spelled out in the Village Zoning Code, the stormwater regulations are part of a larger stormwater permit process administered by NYSDEC. NYSDEC has established a general permit governing stormwater discharges from construction activities disturbing one acre or more (GP-0-10-001) that requires individuals seeking coverage under the general permit to prepare a SWPPP and submit a notice of intent ("NOI") form to the State. When the project is located in a municipality, such as the Village of Buchanan, that is regulated under NYSDEC's municipal separate storm sewer system general permit (GP-0-10-002), the MS4 municipality must review and approve the SWPPP before the applicant can submit its NOI to the state requesting coverage under the construction general permit. The MS4 thus can effectively veto coverage under the general permit by refusing to approve the SWPPP. In that case, the applicant must either appeal the decision to deny SWPPP approval or request that NYSDEC issue an individual SPDES permit for the project's construction-related stormwater discharges. Even if the SWPPP is approved by the municipality, NYSDEC always has the option of denying coverage and requiring an individual SPDES permit.

The Powers Report contains no details whatsoever concerning the extent of land likely to be disturbed by Riverkeeper's proposed CCC project, making it difficult to assess the full extent of the proposal's likely stormwater impacts. The Tetra Tech Report indicates that NYSDEC's proposed CCC project will result in the disturbance of approximately 20 acres of land on the 239-acre site. Tetra Tech Report, p. 93. It also provides that "[c]onstruction of the proposed cooling towers will require clearing and blasting a significant area of the IPEC site, creating the potential for increased stormwater runoff. The exposed surface will be bedrock and is highly impermeable." *Id.* at 35. The Report then offers a one-page analysis of the proper sizing of stormwater controls for the site. *Id.* at 35-36. However, these statements appear to focus on the stormwater implications of the completed project. The Tetra Tech Report contains no analysis whatsoever of the stormwater implications of construction of the project which, among other things, entails the blasting and removal of approximately 2 million cubic yards of rock in close proximity to the Hudson River and an active nuclear power plant. The Tetra Tech Report thus lacks sufficient information to assess the construction-related impacts of the NYSDEC's proposed CCC project from a stormwater perspective. Given the scale and complexity of the excavation and site preparation activities involved, the Village may be reluctant to approve the SWPPP.

VI. Building Codes and Building Permit

The Village of Buchanan requires a building permit prior to erecting, constructing, enlarging, structurally altering or moving any building or structure. Village Code § 67-10.B.

MS4s. The law is targeted at preventing the discharge of non-stormwater flows to the Village's MS4. The only provision which is arguably relevant to the CCC project is Village Code § 166-11, which requires persons subject to the construction activity SPDES permit to comply with the provisions of that permit. It goes on to provide that: "Proof of compliance with said permit may be required in a form acceptable to the municipality prior to the allowing of discharges to the MS4." The Tetra Tech and Powers Reports do not address whether the proposals will result in discharges to the MS4.

See N.Y. Building Code §§ 101.2 and 202 (applying code to buildings and structures of all types); Village Code § 67-5 (defining "building" to include all structures of any kind regardless of similarity to buildings). Village Code Chapter 67, Building Construction, is designed to ensure that structures meet certain minimum standards and adopts and recognizes the New York State Uniform Fire Prevention and Building Code in effect on January 1, 1984, as amended, as the Official Building Construction Code of the Village of Buchanan. Village Code § 67-7. Any other permits, including variances, issued by the Village must comply with the Building Code. Village Code § 67-8.B.

Building permits are issued by the Code Enforcement Officer and/or Building Inspector (referred to in the Village Code as the "building inspector"). Where, as here, the nonresidential use is subject to the performance standards for noise, air pollution and other environmental impacts spelled out in Village Zoning Code § 211-23 and discussed in Section 3.II above, the building permit application must be accompanied by a sworn statement by the owner of the property that the use will be operated in accordance with those performance standards. Village Zoning Code § 211-23.A(1). Under § 67-10.A of the Village Code, building permits "shall be granted only in conformance with regulations. No building permit shall be issued unless the proposed construction or use is in conformance with all of the provisions of this Article and other applicable laws, rules and regulations." Under § 67-10.C(5), the building inspector "shall examine or cause to be examined all applications for permits and the plans, specifications and documents filed therewith" and "shall approve or disapprove of the application within one month from the receipt of the completed application accompanied by all appropriate documents and fees." The permit will expire one year from the date of issuance, although it may be extended an additional six months if construction has been commenced but not completed. A new building permit is required if the work is not completed within the time prescribed in the permit. Village Code § 67-10.D. A denial of a building permit is appealable to the Village Trustees. Village Code § 67-13. However, the Village Code contains no details concerning the timing/procedures for the appeal process.

As a general rule, if an applicant submits the required information and satisfies the applicable provisions of the building code and other relevant standards, the inspector must issue the building permit. Whether issuance of a building permit is a ministerial act depends on whether the particular statute vests the building inspector or other administrating official with any discretion in his/her decision-making process. *Compare Charter Land Development Corp. v Hartmann,* 170 A.D.2d 600, 601, 566 N.Y.S.2d 375 (2d Dept. 1991) (where ZBA issued required variance it lacked further discretion to act and was obliged to issue building permit) and *Pius v. Bletsch,* 70 N.Y.2d 920, 922, 524 N.Y.S.2d 395 (1987) (in conjunction with building permit, if building inspector is "empowered to vary or request modifications in the qualifying criteria, that function would not be deemed ministerial"). When deciding whether to issue the permit, the inspector may not consider matters outside the scope of his/her authority. *See, e.g., Plander v. Koehler,* 150 N.Y.S.2d 879 (Nassau Co. Sup. Ct. 1956) (citations omitted).

As previously noted, the Village's Building and Construction Code applies to "structures," a broad term that appears to encompass all types of things that are constructed on land and over water. Given this broad definition, local authorities will likely conclude, at minimum, that the new pump houses called for in the Tetra Tech Report require building permits. However, the Village also is likely to conclude that the cooling towers are "structures" that require building permits. *Compare Town of Parishville v. Contore Co.,* 215 A.D.2d 932, 626 N.Y.S.2d 582 (3d Dept. 1995) (bioremediation cell, including storage bins, is a structure requiring a building permit) and *Custom Topsoil, Inc. v City of Buffalo,* 12 A.D.3d 1162, 785 N.Y.S.2d 634 (4th Dept. 2004) (no building permit required to operate rock crusher).

While issuance of a building permit is frequently a ministerial matter, the significant impacts associated with the CCC project will likely complicate issuance of the building permit in this case. As previously noted, the project is subject to the performance standards for noise, air pollution and other environmental impacts spelled out in Village Zoning Code § 211-23. As a result, the building permit application must be accompanied by a sworn statement by the owner of the property that the use will be operated in accordance with those performance standards. Village Zoning Code § 211-23.A(1). Based upon the information provided in the Tetra Tech Report, Powers Report, and Entergy Response Document, it may not be possible for a person to sign the necessary sworn statement that these standards will be met. Moreover, the Village Zoning Code bars the Building Inspector from issuing a building permit unless s/he concludes that project conforms "with all of the provisions of this Article and other applicable laws, rules and regulations." *Id.* § 67-10.A. As a result, the Village will be barred from issuing the required building permit if the project does not conform to all provisions of the Village Zoning Code, including these performance standards.

VII. Noise

Village Code § 119-5 prohibits construction noise audible beyond the boundaries of an owner's property between the hours of 7:00 p.m. and 8:00 a.m. except in the event of an emergency requiring immediate construction or demolition. The Tetra Tech Report notes this prohibition but includes no information about whether the construction activities required to implement the CCC project will be audible beyond the boundaries of the Indian Point facility. The Tetra Tech Report also notes that if the blasting debris must be removed by truck that "[n]oise . . . could be notable." *Id.* at 33. However, the Report makes no attempt to quantify that impact. The Powers Report notes the existence of the noise restriction but declines to "speculate as to whether all construction activities would need to be suspended as of 7:00 p.m. each day." *Id.* at 50.

The Entergy Response Document reviewed the limited information in the Tetra Tech Report, together with general reference information concerning the noise levels associated with different types of construction equipment, in an effort to assess the potential noise impacts of the project. The Entergy Response Document concluded that "[c]onsidering the scope, extent and duration of the activities necessary to construct the NYSDEC Staff Proposal – i.e., blasting, excavation, trucking, and use of heavy equipment – construction of the Proposal would appear to have the potential to result in MODERATE to LARGE (significant) noise impacts, particularly if the bulk of the blast spoils are moved by truck." Entergy Response Document, § 3.5.2.

VIII. Traffic

Traffic associated with the construction of the CCC project will be a consideration in the Village's site plan review. As discussed in Section 3.IV.A above, Village Zoning Code § 211-26 requires the Planning Board to "take into consideration the public health, safety and general welfare and the comfort and convenience of the public in general and the residents of the immediate neighborhood in particular." In addition, the Board must take into consideration the avoidance or minimization of air pollution and other environmental, engineering or aesthetic impacts. Moreover, traffic impacts will be a consideration in deciding whether to grant the required variance for height and lot coverage. *See* Section 3.III.A above. Finally, traffic impacts associated with the CCC project will be a factor in the Village's SEQRA findings.

As previously discussed, NYSDEC's CCC project will have significant traffic impacts. With respect to the NYSDEC proposal, one alternative calls for removing the 2 million cubic yards of soil and rock generated during blasting by barge. Under this scenario, the Tetra Tech Report estimates that the project will require 1,215 barge loads and 9,000 truck trips over a 3 to 4-year period. If the project is unable to offload spoils by barge, the material will be removed by a fleet of 30-ton capacity haul trucks, a task involving approximately 110,000 truck trips over a 3 to 4 year period or an average of 235 truck trips to and from the disposal site per day. The Tetra Tech Report declares that this activity would result in a "steady stream of heavy equipment traffic along the route between IPEC and Route 9" and that "[n]oise and dust emissions could be notable." *Id.* at 33. The Powers Report contains no discussion whatsoever of the traffic impacts associated with construction of Riverkeeper's proposed CCC project.

The Entergy Response Document reviews and expands on the analysis of construction-related traffic impacts identified in the Tetra Tech Report. Among other things, the Entergy Response Document notes that: (1) the Tetra Tech Report indicates that off-site roadway improvements at four locations may be needed but provides no supporting analyses regarding the technical feasibility or state and local permitting implications of the possible changes; (2) the Tetra Tech Report does not adequately address options for replacing the approximately 800 parking spaces estimated to be lost during construction; and (3) the Tetra Tech Report does not mention the number of additional trucks, aside from spoils removal, that would be needed for construction, even if barges are used to remove spoils. Entergy Response Document, § 3.10.1. In conclusion, the Entergy Response Document declares that potential traffic impacts would occur in light of the duration of construction and the increased volume of vehicles. "Should the use of barges be limited and truck use maximized, construction traffic impacts would likely be MODERATE to LARGE. Under the scenario where truck use is limited and barge use is maximized, construction traffic impacts associated with the NYSDEC Staff Proposal would suggest a range from SMALL to MODERATE." *Id.*

SECTION 5: VILLAGE SEQRA REVIEW

I. Special SEQRA Process for Indian Point Project

In December 1999, the owners and operators of three steam electric generating facilities located along the Hudson River, including Indian Point Stations 2 and 3, submitted a draft environmental impact statement under SEQRA in conjunction with the renewal of SPDES permits for the three facilities. The final EIS ("FEIS") was prepared by NYSDEC staff and adopted on June 25, 2003. According to the Interim Decision, the FEIS "expressly contemplated further scrutiny of the environmental impacts associated with the site-specific BTA chosen for the Stations." Interim Decision, p. 38.

Under the Interim Decision, DEC must first determine the appropriate BTA technology using a four-step BTA analysis that focuses on the adverse impact of the cooling technology on aquatic resources, *i.e.*, entrainment and impingement.[17] "Once the BTA determination is made, the proposed BTA technology must then be reviewed in accordance with SEQRA." Interim Decision, p. 20. The Interim Decision contemplates reviewing the environmental impacts of the selected BTA at this location under SEQRA through preparation by NYSDEC of a Supplemental EIS that examines the specific impacts of close-cycle cooling as BTA, considering such issues as the potential impact of closed-cycle cooling on air quality (particulate and other emissions), aesthetics (visual impact of cooling towers and any associated plumes), and electric system reliability (construction-related impacts, permit-required outages, energy provision, use/conservation of energy) as well as other significant adverse environmental impacts such as noise, icing and fogging, deposition on vegetation, blasting during construction, and other impacts. Interim Decision, p. 39. However, rather than remand development of the SEIS to the staff, the Interim Decision calls for using the adjudicatory proceeding to develop the draft SEIS and address the environmental impacts.

At the conclusion of the adjudicatory hearing, the ALJ's hearing report will constitute the draft SEIS and the process "shall be completed in accordance with the procedures established by 6 NYCRR Part 617," *i.e.*, SEQRA. Interim Decision, p. 40. After the public comment period and hearings, NYSDEC staff will prepare a response to comments for the ALJ's review and the ALJ will issue a supplemental hearing report, which, together with the draft SEIS, the comments and response to comments, becomes the final SEIS. After the ALJ issues the final SEIS, the Commissioner's designee may issue a decision. The decision will

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[17] The four-step analysis involves the following determinations:

(1) whether the facility's cooling water intake structure may result in adverse environmental impact;
(2) if so, whether the location, design, construction and capacity of the cooling water intake structure reflect BTA for minimizing adverse environmental impact;
(3) whether practicable alternate technologies are available to minimize the adverse environmental effects; and
(4) whether the costs of practicable technologies are wholly disproportionate to the environmental benefits conferred by such measures.

Interim Decision, p. 9.

include the required SEQRA findings statement for the technology that is identified as BTA for the units. Under SEQRA, findings must:

> (1) consider the relevant environmental impacts, facts and conclusions disclosed in the final EIS;
> (2) weigh and balance relevant environmental impacts with social, economic and other considerations;
> (3) provide a rationale for the agency's decision;
> (4) certify that the requirements of [SEQRA] have been met; and
> (5) certify that consistent with social, economic and other essential considerations from among the reasonable alternatives available, the action is one that avoids or minimizes adverse environmental impacts to the maximum extent practicable, and that adverse environmental impacts will be avoided or minimized to the maximum extent practicable by incorporating as conditions to the decision those mitigative measures that were identified as practicable.

6 NYCRR § 617.11(d).

II. Role of Village as Involved Agency under SEQRA

A. Obligation of Village Agencies to Make Their Own SEQRA Findings

Under the SEQRA regulations, the Village Planning Board, Village ZBA, and potentially the code enforcement officer and Village Board (hereinafter "Village Involved Agencies") are all considered "involved agencies," *i.e.*, "agenc[ies] that ha[ve] jurisdiction by law to . . . approve . . . an action." 6 NYCRR § 617.2(s). Involved agencies are expected to participate in the SEQRA process and eventually issue their own SEQRA findings in conjunction with the permits/approvals the agencies are required to issue. 6 NYCRR § 617.11(a)-(c). In making these findings, the involved agency must choose, among all practical and feasible alternatives, the alternative that minimizes or avoids adverse environmental impacts to the maximum extent practicable. In particular, ECL § 8-0109(1) states:

> Agencies shall use all practicable means to realize the policies and goals set forth in this article, and shall act and choose alternatives which, consistent with social, economic and other essential considerations, to the maximum extent practicable, minimize or avoid adverse environmental effects, including effects revealed in the environmental impact statement process.

Although the involved agency's findings must be based on the SEQRA record, each agency is expected to perform its own assessment of the record before issuing its SEQRA findings. If the involved agency concludes that the environmental review conducted/overseen by the lead agency was inadequate and/or that the lead agency failed adequately to balance the competing environmental, social and economic impacts, the involved agency can issue its own negative

SEQRA findings and deny the permits/approvals under its jurisdiction. *See, e.g., Ardizzone v. Elliott,* 141 A.D.2d 632, 529 N.Y.S.2d 368 (2d Dept. 1988), rev'd on other grounds, 75 N.Y.2d 150, 551 N.Y.S.2d 457 (1989) (town board was not required to accept zoning board of appeals' SEQRA findings where zoning board of appeals was lead agency) (citation omitted);[18] *In Matter of Application of E. Tetz & Sons, Inc.,* DEC No. 3-3352-00255/00001, 2003 WL 1736444, *5 (N.Y. Dept. of Env. Conserv. 2003) (declaring that "[a]n agency's independent findings are not binding on other agencies' findings") (citing *Ardizzone*).[19] If one agency prepares positive findings and another prepares negative findings, the action cannot go forward until the conflict is resolved. In addition to issuing negative SEQRA findings, the involved agency also can file suit challenging the sufficiency of the final EIS.

In the present case, although the procedure for creating a site-specific SEIS for Indian Point is somewhat unusual, the SEQRA process of reviewing and approving it is not. As previously noted, once the adjudicatory hearing on BTA is complete, the ALJ will prepare a hearing report that constitutes the draft SEIS. At that point, NYSDEC will complete the SEQRA process in accordance with the procedures in 6 NYCRR Part 617 and issue its own findings statement. The Village Involved Agencies, together with other agencies, must issue permits/approvals before the project can proceed and thus are involved agencies under SEQRA. By virtue of this status, each Village Involved Agency must publish its own SEQRA findings based on the NYSDEC's SEQRA record before issuing any permits/approvals/variances. In particular, the Zoning Board of Appeals must make SEQRA findings before issuing a height/lot coverage variance from the Village Zoning Code's bulk requirements. Also, the Planning Board must make SEQRA findings before granting site plan approval. Finally, various Village entities must make SEQRA findings prior to issuing key discretionary permits/approvals, including the soil disturbance and excavation permit and steep slope permit.[20]

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[18] In *Ardizzone*, the petitioner applied for and received a special use permit to construct a commercial greenhouse from the zoning board of appeals, which was acting as lead agency under SEQRA. However, the town board denied petitioner's request for a wetlands permit after concluding that the project would have a deleterious effect on the general welfare of the community. The court upheld the town board's decision after concluding that it had a rational basis and was supported by substantial evidence. It went on to find that the town board "was not required to accept the zoning board's SEQRA findings." 141 A.D.2d at 634.

[19] Any suggestion that the lead agency's findings bind involved agencies runs afoul of the requirement that involved agencies issue findings. If involved agencies were required to follow the lead agency's findings, there would be no reason to require involved agencies to issue their own findings. Instead, their role would be limited to coordinating with the lead agency on the SEQRA review process and offering input on the EIS. The requirement that each involved agency issue its own SEQRA findings evidences a desire to require each agency to weigh the impacts of a project and make its own judgment based on the SEQRA record assembled by the lead agency.

[20] SEQRA review is required only in conjunction with discretionary actions. Based on our review of the various local permits required by the Village, we believe that the excavation and steep slope permits are most likely to require a SEQRA finding prior to issuance. However, other permits issued by the Village have a discretionary component and could potentially be subject to SEQRA. *See, e.g., Pius v. Bletsch*, 70 N.Y.2d 920, 524 N.Y.S.2d 395 (1987) (where local official had delegated site plan approval powers, coupled with authority to make case-by-case decisions on site plan design and construction materials, issuance of building permit was "action" under SEQRA).

This scheme means that each of the Village entities responsible for granting discretionary permits/approvals for the Indian Point project must issue a findings statement in which it considers the relevant environmental impacts, weighs and balances those impacts with social, economic and other considerations, and certifies that the requirements for SEQRA have been met. In the present case, the process outlined in the Interim Decision contemplates that the administrative law judge will select BTA and then prepare a draft SEIS assessing that technology. However, the selection process is ultimately an administrative one – in essence, the ALJ is deciding which among the various technological alternatives best meets the definition of BTA consistent with the mandates of SEQRA. While the Village entities must rely on the SEQRA record in assessing the BTA option selected, they are compelled by the SEQRA findings requirement to "certify that consistent with the social, economic and other essential considerations from among the reasonable alternatives available, the action is one that avoids or minimizes adverse environmental impacts to the maximum extent practicable." 6 NYCRR § 617.11(d). If, after completing their review of the SEQRA record, the Village entities conclude that CCC does not avoid or minimize environmental impacts to the maximum extent practicable, they are free to issue negative SEQRA findings. If such findings are issued, the Village must deny the variance, site development plan approval, and/or excavation and steep slope permits required to construct the towers.

Under this scenario, the Village and NYSDEC could reach different findings on the merits of the planned cooling towers. For example, NYSDEC may find that cooling towers selected as BTA are, in fact, the proper technology consistent with SEQRA after considering aesthetic, air quality, electric system, and other impacts under SEQRA while the Village, reviewing the same SEQRA record, may find that cooling towers do ***not*** meet the mitigation standards in SEQRA (*i.e.*, there are other alternatives that provide proper treatment with less environmental impact). This dispute will be resolved by the courts pursuant to CPLR Article 78.

Article 78 proceedings are used to challenge action (or inaction) by agencies and officers of state and local government, including SEQRA findings. Although the typical statute of limitations applicable to lawsuits challenging a government action is four months, appeals of decisions by a ZBA or any officer, department, board or bureau of a village must be commenced within 30 days after the filing of a decision in the office of the village clerk. N.Y. Village Law § 7-712-c.1. Among the questions that may be raised in an Article 78 proceeding are "whether a determination was made in violation of lawful procedures, was affected by an error of law or was arbitrary and capricious or an abuse of discretion . . . or . . . whether a determination made as a result of a hearing held, and at which evidence was taken, pursuant to direction by law is, on the entire record, supported by substantial evidence." CPLR § 7803.3, .4.

A court reviewing an agency's SEQRA determination must decide whether the agency took a "hard look" at the "relevant areas of environmental concern" and made a "reasoned elaboration" of the basis for its determination based on the record. *See Jackson v. New York State Urban Dev. Corp.*, 67 N.Y.2d 400, 417, 503 N.Y.S.2d 298 (1986) (citations omitted). The court's review is limited to whether the agency followed lawful procedure or whether its determination was arbitrary and capricious or an abuse of discretion. *See Friends of the Shawangunks, Inc. v. Zoning Bd. of Town of Gardner*, 56 A.D.3d 883, 867 N.Y.S.2d 238 (3d

Dept. 2008). It is well settled that a court is not supposed to substitute its judgment for that of an involved agency or second guess the agency's choice. Consistent with that principle, it is not the role of the courts to "weigh the desirability of any action or choice among alternatives." *See Jackson* 67 N.Y.2d at 416. The court can annul the decision only if it is arbitrary and capricious or unsupported by substantial evidence.

Under this review standard, it is possible that conflicting SEQRA findings could be sustained upon review. In other words, the Village's determination that the adverse environmental and community impacts from closed-cycle cooling outweigh the additional protection it provides to aquatic life could be found to be a rational conclusion supported by the record. Likewise, NYSDEC's findings that the additional protection to aquatic life provided by closed-cycle cooling offsets the other adverse environmental and socio-economic impacts also could be found to be a rational conclusion supported by the record. The provisions of SEQRA contemplate a balancing by agencies of environmental concerns. As part of that balancing, SEQRA requires that impacts be mitigated and involved agencies are authorized to impose conditions that are reasonably related to minimizing the impacts identified in the EIS. *See* 6 NYCRR § 617.11(d). To this end, SEQRA provides agencies with considerable latitude in the exercise of discretion when making substantive environmental decisions. *See Lucas v. Planning Bd. of Town of LaGrange*, 7 F. Supp. 2d 310, 322-23 (S.D.N.Y. 1998). In fulfilling their roles under SEQRA, each agency is required to perform the requisite "balancing" and SEQRA does not place any greater weight on the recommendations of the lead agency versus any involved agency or require an involved agency to give deference to the lead agency's findings. *See Nash Metalware Co. v. Council of the City of New York,* 14 Misc. 3d 1211(A), 2006 WL 3849065, *6 (Sup. Ct. N.Y. Co. 2006) ("[w]here more than one agency is required to participate in a decision involving an EIS, the law does not differentiate for this purpose between the agency (or agencies) which take the laboring oar and those whose participation is lesser"). This balancing may lead different agencies to issue opposite SEQRA findings based on the same SEQRA record.

B. The Order of Permit Decisions Does Not Alter the Obligation to Issue SEQRA Findings

In all complex projects, there are multiple involved agencies making multiple permit decisions. The order in which those permit decisions are made does not alter or restrict the other involved agencies' obligation to weigh or balance the "reasonable alternatives available" identified in the SEQRA record. The first agency to issue a permit decision may choose and permit an alternative among the "reasonable alternatives available." The other involved agencies must issue their own SEQRA findings based on the SEQRA record after weighing and balancing the reasonable alternatives available. The initial permit decision does not reduce the "reasonable alternatives available." Here, NYSDEC will make a determination as part of the SPDES permit modification proceeding which technology qualifies as BTA and satisfies the SEQRA criteria. In making that determination, NYSDEC will make a finding that the selected technology is reasonably likely to obtain the necessary approvals under local law. If that technology is later determined by the Village not to be a permissible technology under local law at this location, the applicant and/or the Village could seek a permit modification under 6 NYCRR §§ 621.11, 621.13(a)(4), (b) to substitute an alternative technology based on new information. In making SEQRA findings whether to allow certain technology at this location, the Village Agencies must also compare the positive and negative impacts of the selected technology to the no action alternative – *i.e.*, they must weigh the magnitude and duration of the benefits to aquatic life from the selected technology to the negative impacts, duration and cost of constructing and implementing the technology selected by NYSDEC as BTA.

In *Jackson v. New York State Urban Development Corp.*, 67 N.Y.2d 400, 503 N.Y.S.2d 298 (1986), the New York Court of Appeals stated:

> SEQRA makes environmental protection, a concern of every agency . . . [and] insures that agency decision-makers—enlightened by public comment where appropriate—will identify and focus attention on any environmental impact of proposed action, that they will balance those consequences against other relevant social and economic considerations, minimize adverse environmental effects to the maximum extent practicable, and then articulate the basis for their choices. . . . Moreover, unlike its federal counterpart and model, [NEPA], . . . SEQRA is not merely a disclosure statute; it "imposes far more 'action-forcing' or 'substantive' requirements on state and local decision-makers than NEPA imposes on their federal counterparts."

67 N.Y.2d at 414-15 (quoting P. Gitlen, *Substantive Impact of SEQRA,* 46 Alb. L. Rev. 1241, 1248). A well-known SEQRA treatise notes: "The view has been expressed by a highly placed DEC official that possibly the 'main effect of SEQRA [is] to screen out environmentally unsound proposals by modifying them to reduce environmental impacts or by deterring agencies and developers from proposing projects which would be environmentally unsound or controversial.'" *Environmental Impact Review in New York,* Section 1.03[2], p. 1-22.

SECTION 6: SCHEDULE FOR OBTAINING LOCAL PERMITS/APPROVALS

As discussed above, to construct the cooling towers proposed by NYSDEC and Riverkeeper as BTA, the State must complete its BTA assessment, develop a SEIS that evaluates the environmental impacts associated with that technology, and issue a findings statement. To commence construction of the CCC project, Entergy must seek various approvals from the Village Involved Agencies that trigger local SEQRA findings. At various stages in the process, the decisions of the local officials are subject to judicial review. Below is our assessment and opinion of the time likely to be required to obtain the key local permits/approvals, together with any associated judicial review.

I. Assumptions Underlying the Opinion

In attempting to estimate the length of time required to obtain local permits/approvals needed to commence construction of cooling towers at Indian Point, we have made the following assumptions regarding the process:

- DEC concludes that closed-cycle cooling (and construction of cooling towers) is BTA and that the other environmental impacts (air emissions, aesthetic, etc.) do not justify denial of NYSDEC's proposed SPDES permit modification under SEQRA.
- The applicant (Entergy) proceeds with all due diligence in pursuit of necessary local approvals.
- The Village Boards (ZBA and Planning Board) deny the required area variance and site plan approval and/or find that cooling towers are a prohibited use.
- Both parties litigate the denials, taking full advantage of all potential appeals.
- All parties pursue the appeals with due diligence (no party intentionally attempts to delay the proceedings).
- None of the Village Involved Agencies makes a determination that, due to the passage of time and newly discovered or developed information about the CCC project, there were significant environmental impacts that were not addressed or were inadequately addressed in the SEIS, triggering the need for another SEIS.
- Each court decides the case before it in accordance with the timeframes typically associated with past zoning decisions, taking into account the complex and controversial nature of the current matter.
- The courts eventually require issuance of the approvals.
- All parties to the litigation vigorously defend their positions throughout the litigation.

In the unlikely event the Village grants the required area variance and site plan approval, it is reasonable to expect Village residents to challenge each decision in court. As a result, the timeframe for completing the local permit review and approval process (including judicial challenges) will likely be the same regardless of the whether the Village grants or denies the needed approvals.

II. Basis for the Opinion

In developing an anticipated timeframe for obtaining the local approvals needed to construct cooling towers at Indian Point, we considered the following information, documents, and resources:

- **Applicable laws/regulations:** The Village Zoning Code and New York Village Law contain specific deadlines associated with the issuance of various local approvals. Moreover, to the extent various local determinations are appealed to the courts, the judicial review and decision-making process also is subject to specific deadlines and timeframes. These timeframes have been incorporated into the schedule below as appropriate.
- **Past experience:** Young/Sommer LLC is an environmental law firm with an extensive background in environmental and land use issues. Since its founding, the firm has commenced and defended dozens of Article 78 proceedings involving zoning and other similar challenges. Moreover, many of the firm's attorneys were involved in Article 78 proceedings prior to their arrival at the firm. Young/Sommer has drawn upon this experience in estimating the timeframes associated with obtaining the approvals needed to construct the cooling towers.
- **Published court data:** In preparing this document, Young/Sommer reviewed reports issued by the New York State Unified Court System, Office of Court Administration and New York Court of Appeals containing analyses of the timeframes for judicial review in various courts in the New York State court system.
- **Special analyses:** The firm reviewed decisions in zoning-related Article 78 cases heard by the Appellate Division, Second Department during the past three years to determine the average and range of timeframes for deciding zoning cases measured from the date of the original agency determination through issuance of the decision by the Second Department.

In developing this opinion, Young/Sommer used these resources and applied its best professional judgment to develop the anticipated schedule for obtaining the local permits/approvals required to construct the cooling towers at Indian Point. In any such assessment, however, it is difficult, if not impossible, to anticipate all contingencies that might arise in the course of the permit review/approval and litigation process. Such difficulties are particularly significant where, as here, the project is both controversial and technically complex.

III. Schedule for Obtaining Required Local Approvals

Below is a summary of the timeframes required to obtain the local approvals necessary to construct cooling towers at Indian Point. The analysis is divided into three sections: (1) time for obtaining an area variance from the ZBA; (2) time for obtaining site plan approval from the Planning Board; and (3) time for obtaining the soil disturbance and excavation permit, steep slope permit, building permit, and stormwater permit.

The schedule below represents the time periods for a given action that could reasonably be expected to elapse based on the factors and assumptions listed above and the history/complexity of the project. The schedule contains two alternative time estimates to establish a lower bound and a more realistic estimate. The first number represents the lower bound and is based on the assumption that no unforeseen contingencies or delays occur and that all parties proceed expeditiously through the litigation. Given the circumstances, we believe it would be unreasonable to expect final approval quicker than the estimated time period represented by this lower bound. The second estimate reflects timeframes based on historical time periods with the litigation proceeding at a reasonable pace. Given the assumptions, the second schedule is a more realistic estimate of the time required to obtain the final approvals needed to construct the cooling towers. A more detailed analysis of the time frames provided below is contained in Appendix A. Each entry in Appendix A includes the following information, as appropriate/necessary: (1) the action item (*i.e.*, a description of the action/event associated with the review process) and any applicable citations: (2) interim action steps (interim steps likely to occur with respect to the action item and the time period associated with the interim action item, where appropriate); (3) the lower bound estimate; (4) the reasonable estimate; (5) point of measurement; and (6) notes (information/items relevant to understanding the action item and schedule).

The scheduling analysis below begins after NYSDEC has: (1) issued its Interim Decision constituting the draft SEIS; (2) completed the public review and comment period; (3) prepared its response and issued a supplemental hearing report; (4) issued its final BTA determination, SEQRA findings and modified SPDES permit, and after any judicial review of the BTA/SEQRA determination is concluded.

A. Final Decision on Area Variance by Village ZBA

The discussion below summarizes the major steps to be completed in conjunction with issuance of an area variance by the Village ZBA. Once the BTA/SEQRA determinations are final and binding, Entergy will be required to prepare a site plan and design documents that are sufficiently detailed to proceed with the approval process. For a project of this complexity, that step will likely take between 12 and 24 months. In addition, the Village will be required to retain a team of engineers, planners and lawyers to assist the ZBA in its review of the proposed CCC project. That step will most likely require requests for proposal, response periods, selection, Board approval and contract and escrow agreements for the permittee to fund the review and will likely take an additional 4 to 6 months to complete. Once the steps are complete, the ZBA's review team can begin formal project review.

Action	Lower Bound Estimate	Realistic Estimate	Point of Measurement
ZBA processes application for area variance	6 mos.	14 mos.	Date measured from receipt of application
Article 78 proceeding to Supreme Court challenging SEQRA findings and variance denial	1 mo.	1 mo.	Date measured from filing of ZBA decision with Village clerk
Supreme Court issues decision on Article 78 petition	6 mos.	16 mos.	Date measured from filing of Article 78 petition with Supreme Court
Appellant files Notice of Appeal to Appellate Division, Second Department	1 mo.	1 mo.	Date measured from service of notice of entry of judgment or order appealed from
Appellate Division issues ruling	12 mos.	18 mos.	Date measured from date of filing notice of appeal
Move to appeal to Court of Appeals	1.5 mos.	1.5 mos.	Date measured from filing of Appellate Division decision
Court of Appeals issues ruling	3.5 mos. (10.5 mos. if appeal granted)	3.5 mos. (10.5 mos. if appeal granted)	The longer time period applies if the Court of Appeals grants leave and hears the case
Matter remanded to ZBA to issue SEQRA findings and decision/interpretation consistent with final court ruling	1 mo.	4 mos.	Date measured from date final decision entered by Court of Appeals

Based on the above, a Village decision to deny the required area variance, together with judicial review of that decision and remand back to the ZBA, will take between 32 and 59 months to complete. If the Court of Appeals agrees to review the decision, the process will take approximately 7 additional months. This estimate does not include the 12 to 24 months required to prepare the application once the BTA/SEQRA determinations are final and binding.

B. Final Decision on Site Plan Approval by Planning Board

The discussion below summarizes the major steps that must be completed in conjunction with obtaining site plan approval by the Village Planning Board for construction of the cooling towers. As a preliminary matter, an applicant cannot obtain site plan approval unless it can show that the project complies with local zoning laws. *See* Village Zoning Code § 211-26.E (planning board must consider conformance with "all applicable provisions of this chapter and with all other regulations and statutes governing the development of the proposed site"); *id.* § 211-27.A(6) (requiring site development plan to include the plan's proposed compliance with minimum zoning requirements). Accordingly, the applicant cannot obtain site plan approval until it receives all required variances from the ZBA and any determination that the proposed project is a permitted use under the existing Village Zoning Code, assuming one is sought. For purposes of this analysis, we are assuming that the Planning Board will retain the same review team as the ZBA and, thus, that there will be no need for additional requests for proposal. We are also assuming that Entergy has its site plan application ready for submission.

Action	Lower Bound Estimate	Realistic Estimate	Point of Measurement
Complete site development plan review and obtain decision from Planning Board	8 mos.	18 mos.	Date measured from final ZBA action granting area variance, including any judicial review
Appeal decision denying site plan approval to ZBA	4 mos.	8 mos.	Date measured from denial of Planning Board approval
Judicial review of ZBA denial of site plan approval	25 mos. (32 mos. if Court of Appeals reviews case)	41 mos. (48 mos. if Court of Appeals reviews case)	Date measured ZBA's decision denying site development plan approval. The judicial review schedule duplicates that for review of area variance above.
Matter remanded to Planning Board to issue SEQRA findings and site plan approval consistent with court's decision	1 mo.	4 mos.	Date measured from date final decision entered by Court of Appeals

Based on the timeframes above, a Village decision to deny the required site plan approval, together with judicial review of that decision and remand back to the Planning Board, will take between 38 and 71 months to complete. If the Court of Appeals agrees to review the decision, the process will take approximately 7 additional months.

In theory, the applicant could attempt to accelerate the review schedule by submitting its application for site plan approval at the same time it submits its application for the required variance. The Planning Board could then grant site plan approval conditional on the applicant receiving its variance. However, this process will accelerate review only if the ZBA grants the variance. In that circumstance, the Planning Board could immediately grant site plan approval and any judicial challenges to the variance and site plan approval could be brought simultaneously. Where the ZBA denies the required variance, however, the court must overturn the decision and return the matter to the ZBA with a mandate to issue the variance before the Planning Board can issue site plan approval. *See, e.g., Laidlaw Waste Systems, Inc. v. Planning Board of Town of Islip*, 305 A.D.2d 413, 758 N.Y.S.2d 504 (2d Dept. 2003) (concluding "denial by the Planning Board of the Town of Islip of the application for site plan approval and an area variance was rationally based on substantial evidence found in the record where approval of the site plan would have required a variance from [the] Islip Town Code").

As previously noted, the Village of Buchanan has consistently opposed the construction of cooling towers at Indian Point. Given the significant adverse community, noise, aesthetic and other environmental impacts associated with the NYSDEC and Riverkeeper proposals, it is reasonable to assume that the Planning Board will deny any request to issue site plan approval conditional on receipt of the required area variance, thus thwarting any effort to facilitate simultaneous review of the project by the Planning Board and ZBA. Equally important, for the reasons outlined above, it is reasonable to assume that the ZBA will deny the required area variance, effectively putting the local review process on hold until the court resolves the dispute.

C. Other Permits

As previously noted, Entergy must obtain various other local permits/approvals before commencing construction of the cooling towers, including a soil disturbance and excavation permit, steep slope permit, and building permit, among others. Those permit applications will require detailed engineering design based on the final site plan approval and SEQRA findings. The stormwater permit applications (state and local) will have to wait until the site plan is approved and detailed engineering is complete because the SWPPP must be specific to the construction practices being implemented at the site. The code enforcement officer or other permit issuing entity will need to retain outside experts to review the applications. Notwithstanding the above considerations, for purposes of this schedule, we are assuming that the ZBA and code enforcement officer will grant the approvals with reasonable due diligence and without the need for extensive additional judicial intervention.

Action	Lower Bound	Realistic Estimate	Point of Measurement
Obtain miscellaneous local permits (soil disturbance and excavation permit, steep slope permit, building permit, etc.)	15 mos.	36 mos.	Date measured from filing of final site development plan approval

D. Conclusion/Opinion

The Village of Buchanan cannot issue local approvals until NYSDEC issues its final BTA decision and SEQRA findings and any judicial review of those decisions is complete. Based on the above analysis, the shortest time period before the applicant, using all due diligence, can expect to complete the local permitting process and begin construction is approximately 85 months (*i.e.*, 7.1 years) after NYSDEC's BTA/SEQRA process and any judicial review of that process is complete. Given the complexity of the project, the more realistic time frame is approximately 166 months (*i.e.*, 13.8 years), assuming the Court of Appeals does not accept review of the matter. As noted above, these estimates do not include the time required to prepare the applications for submission to the Village. This schedule assumes that the Village denies both the area variance and site plan approval and that the decisions are appealed to the courts. Given the significant adverse community, aesthetic and other environmental impacts associated with the NYSDEC and Riverkeeper proposals and the Village's long-standing opposition to cooling towers, such an assumption is reasonable. In fact, an assumption to the contrary would be unrealistic. As previously noted, however, even if the Village grants the required approvals, Village residents can reasonably be expected to challenge those decisions, leading to extensive delays.

The Tetra Tech Report contains only a brief discussion of the timing issues associated with obtaining the necessary approvals for the CCC project. Key language is set forth below:

> The permitting process for any closed-cycle retrofit project is likely to be contentious and involve multiple local, state, and federal agencies. The design process can run somewhat concurrently with the permitting effort, although the significant agency and public involvement would be expected to provoke numerous design iterations prior to final approval. It is not unreasonable to assume the permitting effort alone will take 3 to 5 years, while the final design effort required to produce construction-level plans and drawings could easily lag behind final approval by 1 year or more. Tetra Tech has based this estimate on previous projects with similar scope and complexity, and further notes that the uniqueness of a closed-cycle retrofit on an active nuclear facility makes it problematic to draw direct comparisons with other retrofit projects (e.g., Brayton Point). *Id.* at 27.

The report goes on to provide:

> IPEC is a high profile facility given its proximity to New York City. Numerous public interest groups (e.g., Riverkeeper, Natural Resources Defense Council, Clearwater) and public officials, including the current governor, have publicly stated their desire to see IPEC cease operation when the operating licenses expire. It is not unreasonable to expect that most, if not all, required permits and approvals would be vigorously contested by IPEC's opponents, up to and including litigation. *Id.*

With respect to timing, the Powers Report provides sample timelines for other cooling tower projects, focusing solely on the length of time between project approval and the completion of construction. However, it provides no information/estimates on the timeframes associated with obtaining the necessary approvals. More important, it contains no information/estimates relating specifically to the construction of cooling towers at Indian Point.

We believe the Tetra Tech Report understates both the obstacles to obtaining the required approvals and the sequencing for obtaining approvals unique to the Village of Buchanan and New York State. In addressing public involvement, the Tetra Tech Report notes the existence of opposition to the IPEC facility from environmental groups and the governor. However, the Report fails to mention past opposition to cooling towers from the Village of Buchanan or the potential for opposition from Village residents or businesses. For the reasons given above, the Village has ample grounds to decide, on the basis of evidence, that the required height/site coverage variance, site plan approval, negative SEQRA findings, and key construction-related permits should be denied. Given the Village's historic opposition to cooling towers, there is no reason to believe the Village will disregard the evidence of the anticipated impacts and grant the require variance, permits and approvals. Because of the nature of the zoning process, each of these denials will likely result in years of litigation-related delays. These delays arise on top of the time associated with completing the BTA identification process and issuing the required SEIS, as well as any judicial appeals – a process that can itself be expected to take several years.

IV. Limitations on Conclusions

The conclusion and schedule above is subject to the following limitations:

- The Interim Decision establishes a process for completing a final SEIS in conjunction with the Department-initiated SPDES permit modification. The process outlined in the decision varies somewhat from that set forth in 6 NYCRR Part 617. Whatever final EIS is issued (consisting of the 2003 EIS and final SEIS), it must be sufficient for all involved agencies to make the requisite SEQRA findings. In other words, the record must be sufficient to enable each involved agency to determine how to mitigate potential significant adverse impacts to cultural resources, wildlife, endangered species, air pollution, construction-related impacts, noise, blasting, community and other impacts. It is not clear that the process contemplated by the Interim Decision will provide a sufficient record to enable NYSDEC and the other involved agencies to make the requisite findings. As the project progresses, there will be changes to the design and anticipated environmental impacts, updated estimates of the expected useful life of the facility, and other new information. Project opponents may demand that the Planning Board and/or code enforcement officer seek to establish themselves as lead agency under 6 NYCRR § 617.6(b)(6) and demand a supplemental EIS based on changes to the project, new information and/or changed circumstances related to the project. *See* 6 NYCRR § 617.9(a)(7). SEISs are particularly common in Westchester and Putnam Counties. Requiring an additional SEIS for the CCC project could add one to three years to the schedule.
- Construction and operation of the CCC technology will likely result in a significant increase in particulate matter emissions from the Indian Point facility, potentially triggering the requirement to obtain an air permit under the nonattainment New Source Review or Prevention of Significant Deterioration programs. Any obligation to obtain this or other permits from NYSDEC could affect the schedule for obtaining final approvals to complete the project.
- Large construction projects that are not consistent with local land use regulations and are opposed by local officials are generally difficult to permit in New York State. The primary tool used by local municipalities to stop controversial projects is delay. For purposes of this analysis, we assumed that the applicant would continue to pursue the

local approvals until it was successful and that the applicant would be successful through judicial challenges.

SECTION 7: WESTCHESTER COUNTY PERMITS AND APPROVALS

The Village of Buchanan is located in Westchester County. New York's General Municipal Law authorizes county planning boards to review certain local zoning actions. Finally, Westchester County has adopted various county laws addressing air emissions, construction and other activities. Key provisions are summarized below.

I. Consultation with County Planning Board Regarding Zoning Actions

Section 239-c of the New York General Municipal Law ("GML") allows county legislatures to authorize county planning boards to review certain types of planning and zoning actions by cities, towns or villages within the county. In particular, GML § 239-m requires various zoning actions to be referred to the county planning agency or regional planning council (if there is no county agency). Actions subject to referral include, among others, issuance of special use permits, approval of site plans, and granting of use or area variances. GML § 239-m.3(a). However, such referrals are necessary only if the action involves real property within 500 feet of the boundary of any city, village or town or the right-of-way of any existing or proposed county or state road, among other criteria. GML § 239-m.3(b). The county planning board must review the proposed action to assess its inter-community or county-wide impacts as spelled out in GML § 239-l. These impacts include compatibility of land uses with one another, traffic, impact on county uses, protection of community character, drainage, community facilities, official municipal/county development policies as expressed in comprehensive plans and other similar documents, and other matters relating to public convenience, governmental efficiency, and community environment. The county must review the action referred within 30 days of receipt (longer if agreed upon by the county and local government) and report its recommendations to the referring body, together with a statement of the reasons for those recommendations. If the county fails to report within such period, the local government can take action without the report. If the county recommends modification or disapproval, the referring local planning board may approve its original proposal by a vote of a majority plus one of all its members.[21] Within 30 days of the vote, the referring local government must file a report of its final action with the county planning agency; if the referring local government acts contrary to a recommendation of modification or disapproval, the reasons for that decision must be set out in the report.

In the present case, the Indian Point facility is potentially within 500 feet of the Town of Cortlandt. If so, any site plan approval or area variance will need to be referred to the Westchester County Department of Planning for approval in accordance with GML § 239-m above.[22]

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[21] In addition, "any county planning agency or regional planning council report received after thirty days or such longer period as may have been agreed upon, but two or more days prior to final action by the referring body, shall be subject to the provisions of subdivision five of this section" (*i.e.*, the extraordinary vote upon recommendation of modification or disapproval). GML § 239-m.4(b) .

[22] Details about zoning and planning referrals, including applicable forms and instructions, can be found on the Westchester County Department of Planning's website at: http://planning.westchestergov.com/land-use-&-development/zoning-referrals.

As noted above, we believe it is very likely that the Village will deny site plan approval and an area variance to the CCC project. As a result, the referral provisions of GML § 239-m will not be invoked during the initial review process since referral is necessary only if a municipality issues a variance or approves a site plan. In the unlikely event the necessary approvals and variances are issued, we believe that the county has a rational basis for modifying or disapproving the project in light of its significant regional impacts. To the extent objections are raised, the Village Planning Board may uphold its original decision by the vote of a majority of its members plus one. Since the Village Planning Board and the ZBA consist of five members, they will need four out of five members to approve a site plan and/or area variance, respectively, if those approvals are rejected by the County Planning Board.

The Tetra Tech Report does not address the implications of the General Municipal Law referral process to the project. Although the report briefly discusses Westchester County's Comprehensive Land Use Plan, it notes only that "the county reviews and comments on all applications in respect to their compatibility with the county plan." *Id.* at 84. The Report goes on to briefly discuss the County's adoption of the Hudson River Trailway RiverWalk Plan as well as County efforts relating to preservation of historic resources. However, it does not discuss the impact of the CCC project from a county perspective both generally or in relation to GML § 239-m.[23]

II. County Air Permitting Regulations

Westchester County has adopted a county air permit program that is largely independent of the NYSDEC program. The air permit program law is set forth in Westchester County Law, Chapter 873, Article XIII, Air Quality (hereinafter "Sanitary Code"). The law prohibits any air contamination source to produce "air pollution" and requires "[a]ny person responsible for a new, existing or modified source of air pollution [to] provide pertinent data concerning emissions, equipment and operations." Sanitary Code § 873.1302. The law defines "air pollution" as "the presence in the outdoor atmosphere of one or more air contaminants in quantities, of characteristics and of a duration which are or may be injurious to human, plant or animal life or to property or which unreasonable [sic] interferes with the comfortable enjoyment of life and property throughout the county or throughout such areas of the county as shall be affected thereby." *Id.* § 873.1301.5. Proposed new or modified air contamination sources must obtain written approval to construct from the Westchester County Department of Health ("WCDOH"). *Id.* § 873.1303. The County does not impose its own emission limits on process sources but instead relies on standards imposed by the NYSDEC. In particular, Sanitary Code § 873.1311 provides that "[n]o person shall cause, permit, or allow the emission of air contaminants from an emission source resulting from an operation which exceeds the permissible emission rates or standards certified for that emission source by the Department of Environmental Conservation of the State of New York." A policy issued by WCDOH clarifies that EPA will rely on the latest issue of New York State Air Guide 1,

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[23] The County has adopted other planning-related laws, including a provision pursuant to GML-f that requires referral of certain building permits to the County Department of Public Works. A summary of these requirements is included as Appendix B.

Guidelines for the Control of Toxic Ambient Air Contaminants for purposes of determining the permissible emissions from sources of air contamination characterized by Sections 873.1311 and 873.1319.10.[24] If NYSDEC conducts an Air Guide 1 analysis and concludes that PM emissions from the cooling towers meet the relevant thresholds, it will be difficult for WCDOH to deviate from that finding and impose County-specific PM emission limits.

Note, however, that Sanitary Code § 873.1312 provides that "[n]o person shall operate or maintain any air contamination source so as to cause, suffer or allow air contaminants to escape or be discharged into the atmosphere in quantities that may possibly endanger public health, safety or welfare." To the extent the County is concerned about legionella or other air-related impacts associated with the cooling towers, it could cite this provision as a basis for prohibiting the construction of the cooling towers or imposing conditions on their operation. The County also could cite this provision as grounds for denying a permit based on the aesthetic impacts of the cooling tower plumes on the ground that the plumes endanger the "public welfare" of the citizens of the County.

Neither the Powers Report nor the Tetra Tech Report contain any discussion of the Westchester County air permit and pollution control requirements. As previously noted, the Tetra Tech Report defers all discussion of air impacts to NYSDEC, which is "conducting a separate analysis of potential air emissions impacts." Tetra Tech Report, p. 27. The Powers Report's analysis of the air pollution implications of Riverkeeper's proposed CCC project consists solely of a two-sentence discussion of $PM_{2.5}$ from the cooling towers. These discussions are insufficient to assess the impact of the CCC project on the Village or the surrounding region.

[24] WCDOH, *Air Quality Commissioner's Rules and Regulations,* Policy No. AQ 3-87 (May 28, 1987).

APPENDIX A
SUMMARY OF SCHEDULE FOR APPROVAL AND JUDICIAL REVIEW OF CCC PROJECT

FINAL DECISION ON AREA VARIANCE BY VILLAGE ZBA

Action	Interim Steps	Lower Bound Estimate	Realistic Estimate	Point of Measurement	Notes
ZBA processes application for area variance Citation: Village Zoning Code § 211-40; N.Y. Village Law § 7-712-a	• Review application • Obtain Planning Board comments • Hold public hearing (within "reasonable time") • Issue final decision (within 62 days of hearing) and file decision with Village clerk (within 5 days after decision rendered)	6 mos.	14 mos.	Date measured from receipt of application	• Variance request must be made within 30 days of order or decision appealed from • As a practical matter, the ZBA review process is iterative. The applicant typically appears before the ZBA at several meetings and provides additional information as requested
Article 78 proceeding brought in Supreme Court challenging SEQRA findings and variance denial Citation: Village Zoning Code § 211-40; N.Y. Village Law § 7-712-c	N/A	1 mo.	1 mo.	Date measured from filing of ZBA decision with Village clerk	• Appeal must be filed in Supreme Court within 30 days after Village files decision

Action	Interim Steps	Lower Bound Estimate	Realistic Estimate	Point of Measurement	Notes
Supreme Court issues decision on Article 78 petition Citations: CPLR Article 78 generally; CPLR § 7804(g) (transfer to Appellate Division); CPLR § 4213(c) (60-day decision deadline)	N/A	6 mos.	16 mos.	Date measured from filing of Article 78 petition with Supreme Court	• Action often begins with motion to dismiss, which typically takes 5 to 6 months to resolve • Generally no discovery is allowed in Article 78 proceedings • Judge is supposed to make decision within 60 days of submission of all papers. In the past 3 years, the average time for supreme courts in the Second Department to issue decisions in zoning cases was 12.8 months (measured from the date of the ZBA or Planning Board decision to the date of the supreme court judgment); the median was 9.3 months. • The supreme court may transfer Article 78 matters to the Appellate Division in certain circumstances.
Appellant files notice of appeal to Appellate Division Citation: CPLR § 5513(a), (b)	N/A	1 mo.	1 mo.	Date measured from service of notice of entry of judgment or order appealed from	• Appellant has 30 days to file notice of appeal

Action	Interim Steps	Lower Bound Estimate	Realistic Estimate	Point of Measurement	Notes
Appellate Division issues ruling Citation: 22 NYCRR § 670.8(b), (d), (e)(1)	• Appellant perfects appeal • Papers submitted on appeal • Court conducts oral argument • Court issues decision	12 mos.	18 mos.	Date measured from filing of notice of appeal	• In civil cases, appeal must be perfected within 6 months of the date of the notice of appeal or order granting leave; a party may request additional time • Respondent must file answering brief within 30 days after service of appellant's brief; reply papers are due within 10 days of receipt of respondent's answering brief; periods may be extended based on method of service and/or parties' agreement and court approval • Over the past 3 years, the average time for the Second Department to issue decisions in zoning cases was 16.9 months (measured from the date of the Supreme Court judgment); the median was 16.7 months.
Move to appeal to Court of Appeals Citation: CPLR § 5513(b)	• Submit motion papers • Respondent submits reply	1.5 mos.	1.5 mos.	Date measured from filing of Appellate Division decision	• Motion for leave must be filed within 30 days of service of notice of entry of order appealed from

Action	Interim Steps	Lower Bound Estimate	Realistic Estimate	Point of Measurement	Notes
Court of Appeals issues ruling	N/A	3.5 mos. (10.5 mos. if appeal granted)	3.5 mos. (10.5 mos. if appeal granted)		• Need dissent or permission from court to appeal to the Court of Appeals • Per a recent Court of Appeals report, the average length of time from filing a notice of appeal or order granting leave to appeal to release of decision was 368 days • Over the past 3 years, the average time for the Court of Appeals to grant or deny leave to appeal in Second Department zoning cases was approximately 5 months measured from the date the Second Department issued its decision.
Matter remanded to ZBA to issue SEQRA findings and decision/interpretation consistent with final court ruling	N/A	1 mo.	4 mos.	Date measured from date final decision entered by Court of Appeals	
TOTAL		**32 mos. (39 mos. if appeal granted)**	**59 mos. (66 mos. if appeal granted)**		

FINAL DECISION ON SITE DEVELOPMENT PLAN APPROVAL BY PLANNING BOARD

Action	Interim Steps	Lower Bound Estimate	Realistic Estimate	Point of Measurement	Notes
Complete site development plan review and obtain decision from Planning Board Citation: Village Zoning Code § 211-29	• Review preliminary site plan • Hold public hearing (within 60 days of receipt of preliminary plan) • Issue decision on preliminary plan (within 60 days of public hearing) • Submit application for final plan • Hold public hearing (within 60 days of receipt of final plan) • Act on final plan (with 60 days of public hearing)	8 mos.	18 mos.	Date measured from final ZBA action granting area variance, including any judicial review	• A project this size will require several submissions in order to develop an application that the Planning Board will be able to deem complete • As a practical matter, the site plan review process is iterative. The applicant typically appears before the Planning Board at several meetings and provides additional information as requested
Appeal decision denying site plan approval to ZBA Citation: Village Zoning Code § 211-31	• Appeal process follows the steps for review of an area variance outlined above.	4 mos.	8 mos.	Date measured from filing of denial of site plan approval with Village clerk	• The estimated time frames for the ZBA review are shorter than those for the variance on the assumption that the record is likely to be more complete.
Article 78 proceeding in Supreme Court, Appellate Division, and Court of Appeals challenging denial of site plan approval	Schedule duplicates that for review of zoning variance request summarized above.	25 mos. (32 mos. if Court of Appeals reviews case)	41 mos. (48 mos. if Court of Appeals reviews case)	Date measured from ZBA's decision denying site plan approval	
Matter remanded to Planning Board to issue SEQRA findings and site plan approval consistent with court's decision.	N/A	1 mo.	4 mos.	Date measured from date final decision entered by Court of Appeals	
TOTAL		**38 mos. (45 mos. if appeal granted)**	**71 mos. (78 mos. if appeal granted)**		

OTHER LOCAL PERMITS

Action	Interim Steps	Best Case Estimate	Realistic Estimate	Point of Measurement	Notes
Obtain building permit, soil disturbance and excavation permit, steep slope permit and other local permits/approvals	N/A	15 mos.	36 mos.	Date measured from filing of final site development plan approval	• Applications for local permits cannot be completed until the site plan approval is final • The remaining permits will likely be processed simultaneously • Although the detailed engineering for the applications can be started prior to final site plan approval, it will take many months to complete the final plans and coordinate among the firms participating in the design • The Lower Bound Estimate assumes that the Village Code Enforcement Officer cooperates and processes applications with due diligence and obtains assistance from outside consultants to help with review. The estimate assumes that litigation is not necessary to obtain the permits. • The Realistic Estimate assumes that the complexity of the documents and potential construction impacts result in disputes that are resolved through litigation. The litigation will be less intense than earlier litigation and the courts will be familiar with the underlying facts

APPENDIX B

SUMMARY OF OTHER POTENTIALLY RELEVANT COUNTY LAWS/REGULATIONS

I. Consultation with County Department of Public Works Regarding Buildings and Structures

General Municipal Law ("GML") § 239-f (formerly § 239-k) requires the county superintendent of highways or the commissioner of public works to adopt regulations requiring the approval of certain building permits by the county. The law applies to proposed structures, proposed new streets, or proposed buildings which may have frontage on, access to or be otherwise directly related to any existing or proposed right of way or site shown on the official county map. Upon receipt of an application for a building permit subject to the law, the municipal building inspector must notify the county superintendent of highways or commissioner of public works who, in turn, notifies affected federal or state agencies. The county superintendent of highways or commissioner of public works must review the building permit within 10 working days and report to the municipality his/her approval, disapproval or approval subject to conditions. The county forfeits its right to suspend action if it fails to act within 10 days. Federal/state agencies have 10 working days to file their objections. In making its report, the county superintendent/commissioner must take into account various factors relating to the prospective character of the development and its impacts on access, traffic, and drainage. The building permit must be issued consistent with the report; however, the local board of appeals or other authorized board may vary the requirements of the report by a two-thirds vote of all the members.

Chapter 803 of the Westchester County Regulations ("WCR") establishes special procedures for issuing building permits for buildings that have frontage on, access to, or are otherwise directly related to any existing or proposed county road. These procedures implement General Municipal Law § 239-k (currently § 239-f discussed above). Although the regulation refers solely to county roads, the state statute being implemented applies to any "existing or proposed right-of-way or site shown on the official county map." GML § 239-f. This broader scope is reflected on the County Department of Public Works website, which provides: "The county requires building permits prior to any construction project on or adjacent to county property."[25]

Based on our review of Westchester County Department of Planning maps, it appears that the Indian Point plant is not located on any county roads nor is it adjacent to any county property.[26] However, a county road (County Route 156) may dead end at the northeast corner of the plant site. Even if County Route 156 dead-ends at the plant boundary, the structures associated with the project do not have frontage on, access to or otherwise directly relate to

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[25] Information about the county's building and road permit program can be accessed at: http://publicworks.westchestergov.com/building-and-road-permits.

[26] See map located at: http://planning.westchestergov.com/images/stories/MapPDFS/CountyStateRoadsParks.pdf.

the county road. As a result, no consultation with the County Department of Public Works is likely required under WCR Chapter 803.

II. Stream Control Law

Westchester County has adopted a stream control law, set forth at WCAC Art. III, § 241.121 to .151. The law is implemented via County Public Works Stream Control Ordinance No. 1, which is codified at WCR Chap. 842. The law is designed to alleviate recurrent floods by authorizing the County Commissioner of Public Works and Transportation to establish channel lines and issue/withhold permits for channel obstructions. In particular, activities involving the construction/maintenance of channel obstructions, changes to the location of any established channel lines or the construction/maintenance of structures within 100 feet from any established channel line require a permit from the Commissioner. WCR § 842.31. The procedures for obtaining permits are spelled out in WCR §§ 842.41 to .101.

The County Stream Control Law does not apply to the Hudson River itself. WCAC Art. III, § 241.141. As a result, the law is relevant to the CCC project only if activity on land will disturb any established channels (i.e., designated streams or watercourses). The Westchester County GIS map service indicates the presence of streams that discharge to the Hudson River at various locations on the Indian Point property, including along or near the shore of the Hudson River.[27] However, none of these streams are identified on the County Department of Public Works website as requiring a permit prior to construction.[28] Accordingly, work in or near these minor streams probably would not require a permit under the county's Stream Control Law.

III. Critical Environmental Areas

Consistent with 6 NYCRR § 617.4(h) of New York's SEQRA regulations, Westchester County has adopted an ordinance designating specific parts of the county as critical environmental areas ("CEAs") to ensure that actions taking place in or adjacent to those areas are considered Type I environmental actions that are subject to full SEQRA review. WCR Ch. 694. The list of CEAs covered by the law includes "[t]he Hudson River, its islands and underwater land and all shore lands within the cultural boundaries of its shoreline as depicted in the September 1989 report of the Westchester County Department of Planning." WCR § 694.11.L. However, because the CCC project is already subject to a full SEQRA review in the SPDES proceeding, the River's designation as a CEA is irrelevant for purposes of this review.

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[27] The Westchester County GIS map service showing the presence of streams can be accessed at: http://giswww.westchestergov.com/gismap/default.aspx?. The map depicts streams as thin blue lines.

[28] See the County Department of Public Works Stream/Stormwater Connection web page for a list of established channel lines that require permits: http://publicworks.westchestergov.com/permits-and-programs/stream-permits.

INTENTIONALLY
OMITTED

SEE TAB 3

INTENTIONALLY
OMITTED

SEE TAB 2

Appendix F

Legionnaires' Disease Risk
(Laura C. Green, Ph.D., D.A.B.T., CDM Smith)

CDM Smith
50 Hampshire Street
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Legionnaires' Disease Risk

December 12, 2013

Laura C. Green, Ph.D., D.A.B.T.

Water-borne pathogens subject to air dispersal, including through cooling towers, are a well-recognized health concern. Chief among these pathogens is *Legionella pneumophila*, which, when inhaled, can cause a potentially lethal form of pneumonia, Legionnaires' Disease (Fraser *et al*., 1977; McDade *et al*., 1979; Hoge & Breiman, 1991).

This report provides background on Legionnaire's Disease and its potential impacts on populations near cooling towers, as a means of better understanding the cooling tower water treatment regime for the TetraTech and Powers Reports prepared by Puckorious & Associates, Inc. This Report also accounts for the information provided in the Enercon Report, including attributes of the ClearSky towers that may exacerbate the risks associated with water-borne pathogens subject to air dispersal.

Background on Legionnaires' Disease

Legionnaires' Disease is a potentially lethal form of pneumonia caused by inhaling aerosols that contain the pathogen, *Legionella pneumophila* (Fraser *et al*., 1977; McDade *et al*., 1979; Hoge & Breiman, 1991). It is so named because the first recognized outbreak occurred (in 1976) at a convention of American Legionnaires. This outbreak involved 182 cases, 29 of which (that is, 16%) were fatal. Shortly thereafter, a previously uncharacterized outbreak of severe respiratory disease that had occurred in 1965 at a Washington, D.C. hospital was retrospectively identified as having been caused by *Legionella*. This earlier outbreak had involved at least 81 cases, including 14 deaths (giving a fatality rate of 17%; Thacker *et al*., 1978).

Since then, numerous outbreaks (as well as isolated cases) of Legionnaires' Disease, and a more mild disease-form, Pontiac Fever (collectively, these diseases are termed legionellosis), have been reported (White *et al*., 2012; Walser *et al*., 2013). The sources of many of these outbreaks have been cooling towers, as determined by epidemiology combined with serological testing; and *Legionella* have been measured in the drift from cooling towers (Tyndall, 1983).

Investigation of an outbreak of Legionnaires' Disease in Pas-de-Calais, France, indicated that pathogenic *Legionella* released from a cooling tower can infect people located as far as 6 kilometers from the source (Nguyen *et al*., 2006). The source of this outbreak was a

CDM Smith

"powerful industrial cooling tower" at a petrochemical plant, which infected at least 86 members of the surrounding communities, of whom 18 (that is, 21% of the confirmed cases) died.

Implications for Cooling Tower Analysis and Management

Despite considerable knowledge regarding control of the outgrowth of *Legionella* in cooling towers (see, for example, WHO, 2007; Cooling Technology Institute, 2008), outbreaks due to insufficiently disinfected cooling towers continue to occur. For example, in July through September of 2012, in Quebec City, Quebec, Canada, emissions from a five-story office building cooling tower caused Legionnaires' Disease in at least 180 people, of whom 13 died (CBC News, 2012, available at http://www.cbc.ca/news/canada/montreal/new-legionnaires-cases-in-quebec-city-raise-total-to-180-1.1143198).

As another recent example, White *et al.* (2012) described 19 cases of Legionnaires' Disease, including three deaths, from *Legionella pneumophila* (serogroup 1) that had emanated from a cooling tower in Christchurch, New Zealand.

White and colleagues (2012) note that Legionnaires' Disease:

> . . . has an important impact on population health accounting for 2–15% of community-acquired pneumonia hospitalizations per year [Stout & Yu, 1997; Holst et al., 1980]. The United Kingdom Health Protection Agency estimate a 10–15% case-fatality risk [Joseph, 2002] whereas the United States Centers for Disease Control and Prevention estimates 5–30% [Marston *et al.*, 1994], rising to 80% for the most at risk groups [Dierderen, 2008].

German researchers Walser and colleagues (2013) add:

> Despite mandatory reporting for legionellosis in several countries, the true number of cases is probably highly underestimated. For instance, approximately 600 infections are annually reported in Germany. However, the actual number of community-acquired cases of pneumonia caused by Legionella infections per year is estimated at 15,000–30,000 by CAPNETZ (network of excellence for the Community Acquired Pneumonia) calculations (Robert-Koch-Institut, 2012; vonBaum and Lück, 2011). Thus, 4% of pneumonia cases in Germany, which were not acquired in the hospital, are caused by Legionella infection and up to 80% of these by *Legionella pneumophila* (vonBaum et al., 2008). The problem of underestimation is also known from other European countries (ECDC, 2010) and other continents (Center for Disease Control and Prevention, 2011).

Summaries of some relatively recently published outbreak-investigations are tabulated below. In each tabulated case, the outbreaks were tied to emissions from wet cooling towers, and in 16 of these 19 outbreaks, the association was confirmed by serotyping and/or molecular subtyping of *Legionella* bacteria from patients and from the water in the cooling towers.

Published studies on outbreaks of legionellosis tied to cooling tower emissions (2001 through 2012). Adapted from Walser *et al*., 2013.

City/County (Country) Year	Confirmed Cases	Lethality Rate (%)	Reference
Alcoy (Spain) 1999-2000	177	6%	Fernández et al., 2002
Melbourne (Australia) 2000	125	3%	Greig et al., 2004
Barcelona (Spain) 2000	54	6%	Jansá et al., 2002
Murcia (Spain) 2001	449	1%	Garcia-Fulgueiras et al., 2003
Cerdanyola (Spain) 2002	113	2%	Sabria et al., 2006
Hereford (Great Britain) 2003	28	7%	Kirrage et al., 2007
Rome (Italy) 2003	15	7%	Rota et al., 2005
Pas-de-Calais (France) 2003/2004	86	21%	Nguyen et al., 2006
Lidköping (Sweden) 2004	30	7%	Hugosson et al., 2007

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Cherokee County, Georgia (USA) 2004	7	29%	Phares et al., 2007
Christchurch (New Zealand) 2005	19	16%	White et al., 2013
Sarpsborg (Norway) 2005	56	6%	Nygard et al., 2008
Ontario (Canada) 2005	82	28%	Gilmour et al., 2007
Vic-Gurb (Spain) 2005	55	6%	Sal Ferré et al., 2009
Pamplona (Spain) 2006	146	0%	Castilla et al., 2008
Amsterdam (Netherlands) 2006	31	10%	Sonders et al., 2008
Rhymney/Cynon Valley (Great Britain) 2010	22	7%	Keramarou and Evans, 2010
Ulm, Neu-Ulm (Germany) 2010	64	8%	Freudenmann, et al., 2011
Edinburgh (Great Britain) 2012	50	4%	McCormick, et al., 2012

The Tetra Tech and Powers Reports fail to address and assess the significant, well known, potential human health risks from inadequately disinfected cooling towers. The Tetra Tech and Powers Reports also fail to address the potential environmental injustice of introducing this health risk to the surrounding communities.

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Appendix G

Water Treatment for Cooling Towers
(Puckorius & Associates, Inc.)

Water Treatment for Cooling Towers

COOLING TOWER WATER SYSTEMS-ITEMS NOT ADDRESSED IN COOLING TOWER REPORTS BY TETRA TECH AND RIVER KEEPER FOR PROPOSED COOLING TOWERS AT ENTERGY NUCLEAR INDIAN POINT FACILITY

Prepared by Paul Puckorius
Puckorius & Associates, Inc.
Water Treatment Consultants

December 13, 2013

BACKGROUND

The operation of cooling towers employed in closed-cycle cooling systems requires careful attention to the chemistry and biological content of the water circulating through the towers. If not managed properly, cooling water constituents – such as suspended and dissolved solids, iron, and organic materials – can adversely impact system performance, result in deposits or degradation of system components, plugging of cooling tower fill material, and also support the growth of water-borne pathogens that can be dispersed to the atmosphere during tower operations. To address these well-known and commonly encountered issues, water treatment protocols must be developed to assure efficient system performance and proper management of potential risks to human health and the environment, such as the dispersal of *Legionella pneumophila* in air as discussed in greater detail by Dr. Green (CDM Smith 2013).

No large scale industrial cooling towers using saline or turbid raw river water operate without a water treatment program. This includes deposit, corrosion and biological control chemicals to minimize these problems.

The need for chemical treatment to avoid health-related impacts and to assure proper system protection and function also presents challenges with respect to the discharge of treated cooling water to the environment. For example, the use of chlorine (or bleach) to manage the growth of water-borne pathogens typically will raise concentrations of Total Residual Chlorine above levels generally acceptable for discharge to the environment. For chlorine and perhaps other cooling water constituents, additional treatment may be required to reduce or remove, where possible, the concentrations of such constituents to meet applicable effluent limitations or water quality standards. Systems for implementing chemical treatment protocols are not a trivial matter, particularly for very large cooling towers, and treating cooling tower blowdown prior to discharge to the environment could require significant water treatment facilities – again, more challenging with large cooling towers circulating several hundreds of thousands of gallons per minute through the cooling system.

Both NYSDEC Staff and Riverkeeper, Inc. ("Riverkeeper") have proposed the construction and operation of a new cooling system at Indian Point utilizing cooling towers. *See* Indian Point Closed-Cycle Cooling System Retrofit Evaluation (June 2013) (the "Tetra Tech Report" and Revised Closed Cycle Cooling Feasibility Assessment for Indian Point Energy Center Unit 2 and Unit 3 for Best Technology Available Report (Oct. 24, 2012) (the "Powers Report"). I performed a detailed review of both the Tetra Tech and Powers Reports to evaluate any water treatment protocols contained therein and to evaluate potential impacts to water quality associated with the cooling system proposals contained in each Report. As further discussed below, neither the Tetra Tech Report nor the Powers Report provides an adequate description or explanation of important water quality issues.

ITEMS NOT FULLY ADDRESSED IN REPORTS BY TETRATECH AND RIVERKEEPER

After a detailed review of the Tetra Tech and Powers Reports I find at least four (4) items that are not adequately addressed from the stand point of the raw water quality and the water treatments that will be needed to maintain cooling tower operation and manage potential risks to the environment. They are:

1- Raw river water ingredients.
2- The impact of raw water ingredients being concentrated in the cooling tower water.
3- The impact of the water treatment chemicals on the drift (i.e., the quantity and quality of the water droplets exiting the tower).
4- The impact of the water treatment chemicals on the blowdown to the Hudson River.

RAW WATER INGREDIENTS

The raw Hudson River water ingredients addressed in both reports only mention salinity or total dissolved solids as it might limit cooling tower cycles of concentration. However, the raw river water also has high levels of suspended solids, iron, nutrients, and biological organisms (both macro and micro organisms) plus any upstream discharges of wastewater containing wetting agents or surfactants. All of these raw water ingredients impose practical limits on the number of cycles of concentration and require the use of water treatment chemicals to minimize their impact on the cooling tower (i.e. film fill, drift eliminators and sediment accumulation in the cooling tower basin.), cooling water contacted equipment, such as the condensers, heat exchangers, and piping systems, and public health.

RAW WATER INGREDIENTS CONCENTRATED IN COOLING TOWER WATER

All of the raw water ingredients and contaminants will be concentrated in the cooling tower water as the water is evaporated leaving a multiple of these raw water ingredients and contaminants in the concentrated cooling tower water. Neither report discusses all of these ingredients or contaminants. The Tetra Tech Report, Section 2.2.4, suggests cooling tower operation at 3 cycles of concentration and only addresses total dissolved solids to a maximum of 7,200 ppm (7.2 psu) (p. 13). Applied Science Associates, Inc. ("ASA") examined Hudson River salinity in the vicinity of the IPEC cooling water intake structure over a ten- (10-) year period (ENERCON 2010a, Appendix F). The salinity report indicates that the total dissolved solids would periodically approach 24,000 ppm at 3 cycles of concentration and approach 11,000 ppm at 1.5 cycles. SPX (Marley), the cooling tower manufacturer, suggests a limit of 5,000 ppm in the concentrated cooling tower water – substantially below these levels.

The Reports do not address the presence of suspended solids in the raw water when concentrated, which periodically will approach 420 ppm at 3 cycles and 210 ppm at 1.5 cycles. This level of suspended solids will accumulate a substantial amount of deposits in the cooling tower basins requiring frequent cleaning as well as possible abrasion of cooling tower PVC fill and plugging of cooling tower fill resulting in early fill replacement and loss of cooling efficiency. SPX (Marley) indicates that cooling tower water quality should be less than 250 ppm in their PVC low fouling film fill. It should be noted that neither report addresses the level of suspended solids that will originate from air borne dust and dirt which will add to that of the river water.

The presence of iron is not addressed by either Report and this would also contribute to deposits in the cooling tower piping, film fill, condenser, heat exchangers and cooling tower basins. The raw river water does have in the past, a periodic maximum level of 5.8 ppm iron (United Water of New York 2012) and at 3 cycles would be 17.4 ppm and at 1.5 cycles 8.7 ppm. SPX (Marley) suggests that a maximum of 3 ppm iron is their cooling tower water limit – again, substantially below these levels (SPX 2009).

Neither Report addresses the nutrients coming in with the raw river water. These include organics from decaying vegetation, aquatic life based materials, phosphates and ammonia from surface runoff of fertilizer treated soil and discharge of wastewater treatment plants up stream of the raw water intake for Indian Point. These nutrients will concentrate in the cooling tower water and contribute to microbiological growth in the cooling tower fill and cooling water contacted equipment, including cooling tower surfaces wetted by cooling tower drift. As a result, even surfaces located above the cooling tower film fill are subject to sediment fouling and biological growth, including growth of waterborne pathogens. Because cooling towers provide a warm water environment suitable for biological growth, cooling towers are also well-known sources of waterborne pathogens, such as *Legionella pneumophila*, and their subsequent dispersal in air. The presence of nutrients will also increase the need for additional microbiological control chemicals by at least 2 or 3 times that needed with clean (i.e., potable) makeup water and possibly require the addition of bio-mass dispersants to minimize any bio-deposition.

WATER TREATMENT CHEMICALS IMPACT ON THE COOLING TOWER DRIFT

Neither Report addresses the impact of water treatment chemicals on the cooling tower drift. Due to the presence of raw water ingredients being concentrated in the cooling tower water, there will be a need to prevent mineral and microbiological deposits in the cooling tower fill and all cooling water contacted equipment so the use of dispersants, surfactants, and microbiocides will be required. The use of these water treatment chemicals has not been addressed in either Report; however, SPX (Marley) indicates that their presence will negate the cooling tower drift guarantee of 0.0005% (SPX 2009). This means that a greater amount of drift will be released into the environment. It is well known that these types of water treatment chemicals do increase the drift substantially (SPX 2009, CTI ATC-140 1994).

WATER TREATMENT CHEMICALS AND THEIR IMPACT ON THE BLOWDOWN EFFLUENT

Neither Report addresses how the presence of cooling tower water chemicals in the blowdown impacts on the NYSDEC SPDES permit for the Indian Point facility. Currently there is a limit on the amount of total chlorine that can be discharged with once through cooling water operation, which is a maximum of 0.2 ppm total residual chlorine (TRC) for no more than 9 hours per week for both units. Also, only one unit can be chlorinated at one time. We expect that these restrictions will also apply if cooling towers are employed. This level of chlorination will not be sufficient to control general biological levels in the cooling tower water, nor would it be sufficient for the control of Legionella bacteria. The levels of nutrients and microbiological organisms being concentrated in the cooling tower water at 1.5 and 3.0 cycles are expected to need at least twice or possibly three times this level for general microbiological control and more for the control of pathogens, such as Legionella (CTI 2008).

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The result of higher chlorination needed would require installation of a dechlorination system to reduce the Total Residual Chlorine to acceptable levels for discharge. This system uses a reducing chemical, such as sodium bisulfite or sulfur dioxide, to be added into the blowdown water prior to discharge that reacts with and destroys the chlorine residual. This system utilizes an Oxidation Reduction Potential (ORP) monitoring and chemical feed control system to feed the proper level of reducing agent. Whether such a system can be implemented at Indian Point, and the cost of any such system, is not addressed in either Report.

The NYSDEC may list additional limitations that must be observed, such as for total suspended solids, that would require further treatment of the blowdown prior to discharge, the feasibility and added cost of which are not considered in either Report.

WATER TREATMENT REQUIREMENTS FOR COOLING TOWER WATER SYSTEM

The development of a water treatment program requires the selection and maintenance of chemicals needed to prevent deterioration, inefficient operation and excessive maintenance of all cooling water contacted equipment from corrosion, deposition, and biological contamination from the water used in the cooling system.

It also requires prevention of contamination of the environment from pathogenic bacteria such as *Legionella* as well as any chemicals in the blowdown water returning to the river.
The water added to the cooling tower water system and the final concentration of the water ingredients in the system caused by evaporation must be either analyzed or predicted to determine what chemicals are needed and how much of those chemicals are necessary to control corrosion, deposition, and biological contamination. To be effective, the chemical water treatment program must consider the maximum levels of water contaminants that are expected in the concentrated cooling tower water.

The following discussion identifies the water treatment requirements that likely would accompany the operation of a cooling system utilizing cooling towers at the Indian Point facility, as well as the river water quality as identified in several reports including that by Enercon Services (ENERCON 2010a Appendix F).

WATER TREATMENT REQUIREMENTS

1- The chemicals needed for use in the cooling tower water system are identified along with their function and estimated dosages needed as well as their possible impact on the cooling tower drift rate.

2- It is important to determine if any of these chemicals will exceed the New York State water discharge limits as they will be present in the cooling tower blowdown returning to the River.

3- Suspended solids control- Use of chemical dispersants can substantially reduce the potential for sediment fouling. The chemical needed is a water soluble polymer such as sodium polyacrylate with a molecular weight of 1,000-3,000 and continuously maintained in the cooling tower water at dosages of 5 to 10 ppm of active polymer. This chemical is a dispersant and has some surfactant properties, which will cause the drift rate to increase (SPX 2009, CTI ATC-140 1994).

4- Iron oxide control- The chemical needed is a specialty water soluble copolymer such as sodium sulfonated styrene maleic anhydride and used at continous dosages of 3 to 5 ppm but may be as high as 10-20 ppm if iron levels exceed 15 ppm. This chemical is a dispersant and has some surfactant properties, which will cause the drift to increase (SPX 2009, CTI ATC-140 1994).

5- Microbiological Deposit control – The chemical needed is a liquid sodium hypochlorite water solution of about 12% active chlorine, also known as bleach, and used when the cooling tower water pH is 7.5 or less. If the cooling water pH is above 7.5 the desirable biocide is often a liquid solution of sodium hypobromite of about 15% active bromite. These chemicals are often applied to provide 0.2-0.4 ppm of free halogen residual for several hours per day for general microbiological control. However, to manage the concern of possible greater levels of bacteria presence from the river water, the dosages needed would be 0.5-1.0 ppm free halogen continuously or 1.0 to 2.0 ppm for no less than 1 hour per day (CTI 2008). These levels of halogen will exceed the discharge limits of an oxidant in the cooling tower blowdown and would require the addition of de-halogenation of the blowdown. These oxidants do have some surfactant properties and will cause the drift to increase.

6- Monitoring and chemical feed systems- In order to assure that the proper levels of water treatment chemicals are maintained in the cooling tower water, specific control equipment and instruments are needed that currently are not needed with once through cooling water operation. This equipment will need to be able to adjust the chemical dosage levels in the cooling tower water with the variation of the raw river water ingredients so that any deposits and microbiological levels are controlled. This

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equipment involves computerized control and monitoring systems for the cooling tower water ingredients as well as the water treatment chemical residuals.

Performance of the water treatment chemicals also needs to be monitored to determine if any formation of deposits and microbiological organisms is occurring prior to causing equipment malfunction. This means that the cooling tower film fill needs to be monitored, and potential impacts to condenser performance from deposits and plugging must also be monitored.

Extensive water testing of cooling water quality and the water treatment levels must be done at a frequency of at least twice per 8-hour shift to assure that the water treatment program is being administered correctly and effectively. This is far more intensive than is necessary for the current once through cooling operation. The costs associated with this increased level of effort have not been addressed.

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Appendix B - Noise

Table C-4: NYSDEC Proposed ClearSkyTM Cooling Tower Operational Noise - CadnaA Model Output

Receiver			Octave Bands								Coordinates		
Name	ID	Total	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	X-easting	Y-northing	Z-height
		dBA	dB	dB	dB	dB	dB	dB	dB	dB	m	m	m
St. Patrick's Church	REC1	49.5	63.4	57.2	54.7	47	37.6	24.6	-6	-105.7	587080.5	4567850.0	26.8
Sixteenth Street	REC2	51.8	65.4	59.7	56.8	49.5	40.1	27	-0.8	-90.8	587715.6	4567882.8	36.5
Pheasant's Run	REC3	49.4	63.7	57.9	54.4	47	37	20.8	-10.8	-98.6	587879.4	4567961.6	16.5
Town Hall	REC4	52	65.8	60.2	57	49.7	40	25.7	-7.6	-113.4	588818.2	4568304.0	15.2
Bleakley Ave.	REC5	59.6	71.4	67.1	63.9	57.7	50	41.2	28.4	-10.1	588442.2	4569147.2	14.4
Across Water	REC6	52.2	65.5	60.5	57.6	49.6	39.5	23.6	-20.2	-166.1	586160.2	4570083.8	7.6
School	REC8	50.7	64.7	59	55.6	48.3	38.7	23.8	-5.9	-84.2	588247.6	4568185.8	21.3
Broadway	REC9	52.5	65.8	60.1	57.5	50.2	41.4	29.9	7.2	-63.2	587649.3	4568120.2	33.9
China Pier	REC10	56.3	67.3	63.1	61	54.7	46.4	37	17	-44.1	588726.8	4570266.0	6
Lents Cove Park	REC11	59.8	72.9	68.9	63.9	56.7	50.7	42.7	32	0.7	588549.5	4569415.6	5.2
Lents Cove Park property line with IPEC	REC12	61.6	74.6	71.1	65.6	58.6	52.5	43.6	33.7	9.8	588477.4	4569497.6	4.6
Marina	REC13	66.1	75.4	73.9	71.4	63.2	55.6	49	42.5	27.3	588424.7	4569818.7	1.5

Table 3.5-5 ClearSky™ Cooling Towers - Operational Noise Levels and Increases Over Existing Conditions (dBA)				
Location	**Calculated ClearSky™ Noise Levels**	**Existing Late Night Leq[1]**	**Combined Future Late Night Leq**	**Increase over Existing Nighttime Leq**
1. St. Patrick's Church	50	46	51	5
2. 16th Street / Broadway	52	45	53	8
3. Pheasant's Run	49	42	50	8
4. Buchanan Town Hall	52	46	53	7
5. Bleakley Avenue / Broadway	60	42	60	18
6. Buchanan-Verplanck Elementary School	51	36[2]	51	15
7. Residence on Broadway	53	40[2]	53	13
8. China Pier[3]	56	54	58	2
9. Lents Cove Park	60	N/A[4]	N/A	N/A
10. Charles Point Marina	66	N/A[5]	N/A	N/A

Notes:

N/A: Data not available.

[1] Daytime ambient data used for the Buchanan-Verplanck Elementary School location.

[2] Leq data not available. Noise level is the L_{90}.

[3] Noise monitoring was not conducted at night at this site as there is no nighttime use of this facility.

[4] Ambient data were not available for this location. Potential noise impacts at this location, which is noted in the Tetra Tech Report to be a location where cooling tower noise could potentially be audible (p. 94), could therefore not be quantitatively evaluated.

[5] Ambient data were not available for this location.

Table 3.5-6 Operational Noise Levels Compared to Village Code (Chapter 211)							
Location	**Octave Band Center Frequency (Hz)**						
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**
Village Code (Chapter 211)	**61**	**53**	**48**	**43**	**40**	**38**	**34**
1. St. Patrick's Church	63	57	55	47	38	25	0
dB Exceeded By	**2**	**4**	**7**	**4**	**---**	**---**	**---**
2. 16th Street / Broadway	65	60	57	50	40	27	0
dB Exceeded By	**4**	**7**	**9**	**7**	**---**	**---**	**---**
3. Pheasant's Run	64	58	54	47	37	21	0
dB Exceeded By	**3**	**5**	**6**	**4**	**---**	**---**	**---**
4. Buchanan Town Hall	66	60	57	50	40	26	0
dB Exceeded By	**5**	**7**	**9**	**7**	**---**	**---**	**---**
5. Bleakley Avenue / Broadway	71	67	64	58	50	41	28
dB Exceeded By	**10**	**14**	**16**	**15**	**10**	**3**	**---**
6. Buchanan-Verplanck Elementary School	65	59	56	48	39	24	0
dB Exceeded By	**4**	**6**	**8**	**5**	**---**	**---**	**---**
7. Residence on Broadway	66	60	58	50	41	30	7
dB Exceeded By	**5**	**7**	**10**	**7**	**1**	**---**	**---**
8. China Pier	67	63	61	55	46	37	17
dB Exceeded By	**6**	**10**	**13**	**12**	**6**	**---**	**---**
9. Lents Cove Park	73	69	64	57	51	43	32
dB Exceeded By	**12**	**16**	**16**	**14**	**11**	**5**	**---**

Cooling Tower Impact Analysis

for the

Entergy
Indian Point Energy Center

Westchester County, New York

prepared for

Entergy Nuclear Indian Point 2, LLC
Entergy Nuclear Indian Point 3, LLC

prepared by

TRC
Lyndhurst, New Jersey
as a subcontractor to:
Enercon Services, Inc.
Kennesaw, GA

September 1, 2009

TRC

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1.0 EXECUTIVE SUMMARY

Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC (collectively, "Entergy") have submitted a timely and complete renewal application for a State Pollutant Discharge Elimination System ("SPDES") permit for the Indian Point Entergy Center ("IPEC") nuclear powered electric generating stations 2 and 3 (individually, "Unit 2" and "Unit 3," and collectively, the "Stations"). TRC Environmental Corporation ("TRC") understands that the New York State Department of Environmental Conservation ("NYSDEC" or "Department") staff has proposed modifications in IPEC's draft SPDES permit including possible construction and operation of two large counter-flow, forced draft, plume abated hybrid cooling towers, with their associated water vapor and particulate drift plumes, to be located on the eastern shoreline of the Hudson River at the IPEC site in Westchester County, New York (the "Project"). TRC also understands that consideration of the NYSDEC-directed Project is subject to certain feasibility (including air quality impacts) and alternative technologies assessments, as directed by the NYSDEC Assistant Commissioner's August 13, 2008 Interim Decision.

1.1 Description of Project

As part of this feasibility analysis for the Project, Entergy retained TRC (as a subcontractor to Enercon Services, Inc. ["Enercon"]) to prepare a cooling tower plume assessment to evaluate objectively the potential air quality impacts of that Project on the surrounding community consistent with applicable state and local law and policy. TRC evaluated the Project, which is identified by Entergy's consultant Enercon to consist of two hybrid circular mechanical draft cooling towers, one for each steam turbine condenser at IPEC. The purpose of the Project cooling towers is to dissipate heat generated by the stations. In order to do so, the Project cooling towers draw in a significant amount of water from the Hudson River and circulate it through the cooling system. The water drawn in contains the same dissolved solids concentration as the river. The predominant mineral in this intake water is common salt. In order to reduce the amount of water used, the circulating water in the cooling towers is recycled. This results in increased dissolved mineral concentration because the dissolved solids remain as water evaporates. In addition to the concentrated salt and minerals, the circulating water contains additives such as biocides and anti-scaling chemicals. During operation, a portion of the recycled circulating water is discharged from the towers in the form of very small water droplets or spray drift. The spray drift, like the circulating water, contains an appreciable concentration of dissolved minerals and additives. These dissolved solids in the spray drift form a fine particulate matter ("PM") with an aerodynamic diameter less than 2.5 micrometers ("PM-2.5"),[1] which is emitted from the towers as the drift droplets evaporate. As such, these Project

[1] Aerodynamic diameter is the diameter of a spherical particle having a density of 1 gm/cm^3 that has the same inertial properties (i.e., terminal settling velocity in a gas) as the particle of interest which may be irregular in shape.

towers, individually and collectively, will result in particulate matter emissions. Thus, the primary environmental considerations, which include the air quality impact and permitting requirements, are the impacts from the particulate matter emissions resulting from spray drift of the circulating water.

TRC has been informed by Enercon that the Project cooling towers under consideration may operate in both wet and plume abated modes. A hybrid cooling tower is the combination of a wet cooling tower with a dry heat exchanger (i.e., a device which transfers heat from one medium to another). The wet section of the cooling tower is always in operation, and cools the circulating water by passing ambient air through the circulating water as it is cascades through the cooling tower. As discussed in more detail in Section 4, as the evaporated water condenses in the atmosphere, a visible plume may form. The dry heat exchanger section is utilized to warm the cooling tower plume above its visibility point. As a result there are two modes of operating a hybrid cooling tower: 1) wet mode, where the dry heat exchanger is not utilized, and 2) plume abated mode, where the dry heat exchanger is utilized.

1.2 Regulatory Standard

Enercon and TRC have calculated that the Project will have potential annual particulate emissions in excess of 100 tons, the "major source" emission threshold under Part 201. Thus, the Project will be determined under 6 NYCRR Part 201, Permits and Regulations, to be a new "major source" of air contaminants. Moreover, Westchester County presently is not achieving the PM-2.5 National Ambient Air Quality Standard ("NAAQS") and any additional fine particulate emitted by a major source in excess of 100 tons per year would cause the source to be subject to Part 231 New Source Review (in Westchester County, a "non-attainment review") for particulate emissions. Together, Parts 201 and 231 would require Entergy to obtain a permit to construct and operate the Project cooling towers, as discussed in more detail in Section 2.[2] The purpose of this analysis is to determine whether the project cooling towers can be permitted under Parts 201 and 231.

1.3 Description of Study

As explained above, Part 231 New Source Review would be triggered by the emissions increase resulting from the Project cooling towers. Accordingly, TRC examined the air quality impact resulting from the emissions of PM-10 and PM-2.5, as originating from the spray drift, from the towers. To do so, TRC used hourly meteorological data recorded at IPEC and processed (by

[2] New York State's Environmental Quality Review Act ("SEQRA") generally applies to large-scale projects such as the proposed construction and operation of cooling towers at IPEC. TRC has been informed by Entergy's legal counsel that there will be a SEQRA assessment phase later in this proceeding and that, accordingly, SEQRA issues need not be addressed in this report.

TRC) into a format suitable for use by the United States Environmental Protection Agency ("EPA") and NYSDEC approved air quality model – AERMOD. The IPEC on-site meteorological data set provided a high quality, long term data base for which AERMOD was able to accurately simulate the dispersion conditions within the study area around facility.

TRC assessed the potential ground level concentrations of the fine particulate emitted from the Project cooling towers and determined, that under various operating scenarios for the cooling towers, the concentrations of particulate alone, as well as when added to a representative background concentration of particulate in the atmosphere, would exceed the NAAQS for PM-10 and PM-2.5. Specifically, TRC concluded that PM concentration resulting from the spray drift will not satisfy applicable siting criteria and therefore, likely would prohibit siting of closed cycle cooling.

TRC also assessed potential impacts resulting from condensed vapor plumes and salt deposition resulting from the Project by using the Seasonal/Annual Cooling Tower Impacts ("SACTI") model. Although the spray drift droplets evaporate leaving fine particulates, the evaporated water from the Project cooling towers condenses in the atmosphere to form a visible plume, which under some atmospheric conditions may either impact upon the ground, or extend for a long distance downwind. (Visual aesthetics were not addressed in this study, but were assessed by Saratoga Associates in a separate report.) TRC concludes that, since the Project cooling towers include plume abatement, the potential impacts due to the condensed water vapor plume(s) impinging upon the ground around IPEC would not likely prohibit siting of closed cycle cooling.

Similarly, cooling tower spray drift can also result in salt deposition when salt is present in the intake water drawn into the towers and larger drift droplets strike vegetation and equipment prior to evaporation. Salt deposition, unlike airborne inhalable particulate emissions which pose a significant human health threat, can cause damage to vegetation and equipment if in sufficiently large quantities. TRC examined the potential for excessive salt deposition from the cooling tower spray drift, and determined that the maximum quantities of salt deposition were below recognized thresholds for vegetation or material damage. Thus, TRC also concludes that salt deposition would not likely prohibit siting of closed cycle cooling.

Finally, TRC examined mitigation measures that could reduce the adverse impact of the Project cooling towers through a reduction in particulate emissions. First, TRC analyzed higher efficiency (0.0005%) drift eliminators, which further reduce the quantity of entrained water droplets from leaving the tower (when compared to 0.001% drift eliminators) and thereby reduce the total particulate emissions. As discussed further in Section 3, TRC determined that even with use of these higher efficiency drift eliminators, particulate emissions from the Project cooling towers would exceed ambient standards for fine particulates. Second, TRC analyzed the feasibility of reducing the dissolved solids content of the circulating water, which would reduce particulate emissions. As discussed further in Section 3, TRC concluded that in order to achieve ambient standards for fine particulates, the dissolved solids content in the circulating water would have to approach that of drinking water, which is not feasible given the quantity of water demanded by the Project cooling towers. Thus, TRC concluded that mitigation measures do not sufficiently eliminate the adverse impact.

1.4 Conclusion

The Project's closed cycle cooling towers would emit particulates in excess of 100 tons per year, the regulatory threshold for requiring the Project to undergo a major new source review for particulate emissions, triggering a state requirement for obtaining an air quality construction and operating permit under 6 NYCRR Parts 201 and 231. TRC assessed the impact of the fine particulate on the local and surrounding communities and determined that it posed a significant adverse threat to the ambient air quality. TRC further concluded that mitigation measures that could reduce the adverse impact, such higher efficiency drift eliminators or reductions in the dissolved solids content of the circulating water, do not sufficiently eliminate the adverse impact.

In conclusion, TRC's AERMOD analysis demonstrates that the particulate emissions from the Project cooling towers will cause an adverse air quality impact to the surrounding community such that obtaining a required construction and operating air emissions permit pursuant to 6 NYCRR Part 201 and 231 would not be possible.

2.0 INTRODUCTION

2.1 Description of Project Being Studied

The Project would be sited on the existing IPEC site located in Westchester County, New York.[3] IPEC consists of three generating units. Unit 1, currently owned by Entergy, ceased operating in the mid-1970s. Units 2 and 3, initially licensed in the mid 1970s, are nuclear powered steam electric generating plants owned by Entergy and operated by Entergy Nuclear Operations, Inc. The cooling system currently in use at IPEC requires no external cooling tower structure and does not result in particulate emissions. Figure 2-1 provides an aerial view of IPEC, while Figure 2-2 provides a site location map of the station.

2.2 Use of Closed Cycle Cooling

The Project being evaluated involves the construction and operation of counter-flow, forced draft, plume abated, hybrid closed cycle cooling towers. Entergy retained TRC (as a subcontractor to Enercon) to evaluate the feasibility of the Project in terms of compliance with state and local air quality regulations, excluding aesthetics.[4]

This report focuses on the emissions of particulates, water vapor, and salt deposition as a result of the Project. The Project cooling towers dissipate heat generated by the Stations. In order to do so, the Project cooling towers draw in a significant amount of water from the Hudson River and circulate it through the cooling system. The water drawn in contains the same dissolved solids concentration as the river. In order to reduce the amount of water used, the circulating water in the cooling towers is recycled. This results in increased dissolved mineral concentration because the dissolved solids remain as water evaporates. In addition to the concentrated solids, the circulating water contains additives such as biocides and anti-scaling chemicals. To facilitate the evaporative cooling of the circulation water, which thereby removes heat from the system, large fans blow air through the towers. Circulating water droplets that are entrained in the air stream generated by these fans are known as spray drift. The spray drift, like the circulating water, contains an appreciable concentration of dissolved minerals and additives. These dissolved solids in the spray drift form a fine particulate matter, which is emitted from the towers as the drift droplets evaporate. As such, these Project towers, individually and collectively, will result in particulate matter emissions.

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[3] The Project cooling towers would be located approximately at 41° 16' 01" North Latitude, 73° 57' 18" West Longitude and 41° 16' 21" North Latitude, 73° 56' 57" West Longitude, respectively, in the North American Datum 1983 ("NAD83"). The approximate Universal Transverse Mercator coordinates of the proposed cooling towers are 587,533 meters Easting, 4,568,929 meters Northing and 588,005 meters Easting, 4,569,540 meters Northing, respectively, in Zone 18, NAD83.

[4] TRC understands that the aesthetic impact of the Project was addressed in a report prepared by Saratoga Associates dated September 1, 2009.

In addition to particulate emissions, water vapor is evaporated from the circulating water as a byproduct of each Project tower's cooling process, and during certain atmospheric conditions, the water vapor condenses into a visible plume which can be seen from the surrounding area. During sub-freezing temperatures, the droplets in the plume (droplets that are condensed from the vapor and droplets carried out as spray drift) can freeze on contact with cold surfaces such as elevated structures and power lines. Finally, cooling tower spray drift can also result in salt deposition when salt is present in the intake water drawn into the towers. Salt deposition, unlike airborne inhalable particulate emissions which pose a significant human health threat, can cause damage to vegetation and equipment if in sufficiently large quantities.

2.3 Regulatory Context

Particulate emissions are regulated as criteria pollutants, specifically PM-10 and PM-2.5. Studies have shown inhalable particulates (those smaller than 10 micrometers ("PM-10")) to present a health hazard, and EPA has promulgated National Ambient Air Quality Standards ("NAAQS") for PM-10 and PM-2.5.[5] This discussion considers the regulatory context of particulate matter emissions from the Project cooling towers.

The Clean Air Act ("CAA"), passed in 1970, is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law requires EPA to establish NAAQS to protect public health (primary standards) and public welfare (secondary standards). The NAAQS are based on scientific studies of the effects of air pollutants and are designed to protect the health of the most sensitive individuals in the general population with an adequate margin of safety to ensure against direct adverse health consequences. Once a NAAQS is promulgated by EPA, it is subject to periodic review and revision based on the results of additional scientific studies as recommended by the Clean Air Scientific Advisory Committee, the body of scientists and educators that provides independent advice to the EPA Administrator on the technical bases for EPA's NAAQS. In the initial promulgation of NAAQS, EPA established standards for what it then called Total Suspended Particulate ("TSP"), one of the criteria pollutants.

In 1987, in response to the results of continued scientific research, EPA replaced the earlier TSP standard with a PM-10 standard. The standard focuses on smaller particles that are likely responsible for adverse human health effects because of their ability to reach the lower regions of the human respiratory tract. The PM-10 standard includes particles with a diameter of 10 micrometers or less (0.0004 inches or one-seventh the width of a human hair). EPA's health-based national air quality standard for PM-10 is 150 micrograms/cubic meter ("ug/m^3"), measured as a daily concentration. Major concerns for human health from exposure to PM-10 include: effects on breathing and respiratory systems, damage to lung tissue, cancer, and

[5] The water vapor which is evaporated from the water circulating through the cooling tower is the byproduct of the towers' cooling process and is not regulated.

premature death. The elderly, children, and people with chronic lung disease, influenza, or asthma, are especially susceptible to the effects of particulate matter. Recent scientific research studies suggested that fine particles (smaller than 2.5 micrometers in diameter, i.e., PM-2.5) may be even more likely to cause serious adverse human health effects. As a result, on October 17, 2006, EPA set new NAAQS for PM-2.5 which are 35 ug/m^3 measured as a daily concentration (the 24-hour PM-2.5 concentration), and 15 ug/m^3 measured as an annual concentration (i.e., the average of 365 daily concentrations, or the annual PM-2.5).

Once the new PM-2.5 NAAQS were in place, EPA designated areas of the country as either not attaining (non-attainment) or as achieving (attainment) the PM-2.5 ambient standards. Non-attainment of the PM-2.5 standard occurs when the existing ambient background concentrations of PM-2.5 are shown through ambient monitoring to exceed the standard repeatedly. A State Implementation Plan ("SIP") is an enforceable plan developed at the state level that explains how the state will comply with air quality standards according to the CAA. A SIP must be submitted by the state government of any state that has areas that are designated in nonattainment of federal air quality standards. For expediency with developing SIPs to attain compliance, non-attainment areas are geographically assigned at the county level by EPA.

IPEC is located in Westchester County, which is in NYSDEC Region 3, Metropolitan Air Quality Control Region. Westchester County is classified as in attainment for PM-10, but as in non-attainment for PM-2.5. TRC understands that NYSDEC has submitted information to EPA Region II indicating that Westchester County expects to demonstrate compliance with the NAAQS for PM-2.5 in the year 2010. However, in order for an area to be officially reclassified to attainment, NYSDEC must submit a reclassification request and maintenance plan to the EPA for approval. Approval of such reclassification requests ordinarily takes several years. In the interim (pending redesignation by EPA of Westchecter County as in attainment for PM-2.5), the Project cooling towers must be evaluated under a non-attainment review.

In these non-attainment counties, which include Westchester and Rockland counties, New York is required by EPA to implement measures to reduce the high background concentrations of PM-2.5 such that the ambient standard will be achieved. This places an especially large burden on new major sources of PM-2.5 emissions planning to locate in this area. New major sources of PM-2.5, i.e. those sources having a PM-2.5 emission rate greater than 100 tons per year, locating in a PM-2.5 non-attainment area must demonstrate that their particulate emissions will not result in contravention of the PM-2.5 ambient standards or significantly contribute to a PM-2.5 non-attainment area. This demonstration is made through a NYSDEC-approved air quality modeling analysis as part of the Part 201 Air Permitting process. TRC's evaluation of the PM air quality impacts from the Project cooling towers represents just such a permitting analysis that would be required by NYSDEC.

In addition, in accordance with the CAA, new sources must take other appropriate actions, including applying lowest achievable emission rate ("LAER"). LAER is required on major new or modified sources in non-attainment areas.[6] TRC consulted the RACT-BACT-LAER Clearinghouse ("RBLC"), an EPA database that contains case specific information on air pollution technologies that EPA and states have mandated to reduce the emission of air pollutants from stationary sources, like the Project cooling towers.[7] The RBLC cites drift eliminators as the most commonly used control technique for PM emissions from cooling towers. Drift droplet eliminators prevent spray drift from leaving the tower and therefore reduce the total particulate emissions from the tower. However, as detailed in Section 3, their success/ability to eliminate all spray drift, and therefore all particulate emissions, is limited.

Drift eliminators only eliminate a portion of the drift droplets and therefore only a fraction of particulate materials. Thus, the drift eliminator may be more appropriately called a "drift reducer." The RBLC identifies 0.0005% as the lowest drift eliminator rate for cooling towers. See Appendix B. TRC has been informed by Enercon that the vendor for the Project cooling towers has guaranteed a drift eliminator rate of 0.001%, which would theoretically lead to two times the particulate emissions of a tower equipped with a drift rate of 0.0005%. Although drift eliminators that can achieve 0.0005% are available for smaller mechanical draft towers, round hybrid cooling towers – such as those being evaluated for the IPEC site – are not typically constructed with this reduced drift rate. Moreover, any confirmation of a 0.0005% drift rate could not occur until post-construction. Despite these constraints, and as discussed further in Section 3, TRC analyzed particulate emissions assuming drift rates of both 0.001% and 0.0005%. In both cases, TRC concluded that ambient standards would be exceeded.

As discussed further in Section 3, the only other mechanism for reducing particulate emissions would be to reduce the solids content of the circulating water, either by water treatment or by reducing the cycles of concentration,[8] which would respectively increase the circulating water discharge and makeup water requirements of the tower. In order to reduce particulate emissions, the circulating water dissolved solids concentration would have to approach drinking water levels. Due to the quantity of water demanded by the Project cooling towers, TRC concluded that this is not feasible.

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[6] By contrast, Reasonably Available Control Technology ("RACT") and Best Available Control Technology ("BACT") are CAA air pollution requirements that are not implicated here. RACT is required on existing, i.e. not modified, sources in non-attainment areas. BACT is required on major new or modified sources in attainment areas.

[7] RACT-BACT-LEAR Clearinghouse, available at http://cfpub1.epa.gov/rblc/htm/bl02.cfm (last visited on August 29, 2009); http://www.epa.gov/ttn/catc/rblc/htm/rbxplain.html (last visited on August 29, 2009).

[8] Cycles of concentration is a term used in calculating and determining the amount of circulating water that is discharged as a waste-water stream.

2.4 NYSDEC Air Permitting Process

NYSDEC implements the provisions of the CAA through its own state mandated regulatory process. The New York State air quality regulations are codified in New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York ("NYCRR") Chapter 3 – Air Resources Parts 200-317. Part 201 (Permits and Registrations) codifies the air permitting process by which a new major source of air contaminants or a major modification to an existing source is required to follow to obtain a construction and operating permit for the Project. Part 231 (New Source Review for New and Modified Facilities) further codifies the permitting requirements for major sources in non-attainment areas. Subpart 231-12 (Ambient Air Quality Impact Analysis) specifically defines EPA-established numerical standards called significant impact levels ("SILs"), which are thresholds for determining whether a new major source has the potential to *cause or contribute to a violation of a national ambient air quality standard.* If the maximum modeled concentrations from a new major source exceed the SILs, these modeled concentrations must be added to the measured ambient air concentrations of the pollutant (background). The sum of the modeled concentrations plus the background concentration is then compared to the NAAQS. If this sum exceeds the NAAQS, the proposed facility would not be able to obtain an air permit.

With respect to PM-10, Section 231-12.6, Significant Impact Levels in Nonattainment Areas states:

> *For the purposes of Subparts 231-5 and 231-6 of this Part, a new or modified facility will be considered to cause or contribute to a violation of a national ambient air quality standard when such new or modified facility would, at a minimum, exceed the following significant impact levels (SILs) at any locality that does not or would not meet the applicable national standard:*
>
> *PM-10: 1 microgram/cubic meter (annual average); 5 micrograms/cubic meter (24-hour average).*[9]

EPA has not promulgated SILs for PM-2.5 and has offered three possible values as the 24-hour PM-2.5 SIL: 5 ug/m^3, 4 ug/m^3, and 1.2 ug/m^3. Thus, there is no definitive threshold for determining whether a new major source has the potential to cause or contribute to a violation of the PM-2.5 NAAQS. The Northeast States for Coordinated Air Use Management ("NESCAUM") recommends that New York's 24-hour average PM-2.5 SIL be lowered to 1.2 ug/m^3. This value is considered conservative, and the final SIL value will be decided by EPA when the PM-2.5 rule is issued, anticipated first quarter 2010. In the absence of a national SIL for PM-2.5, EPA has issued guidance memoranda specifying that the PM-10 SILs are to be used

[9] Currently there is a 24-hour average NAAQS for PM-2.5 and an annual NAAQS for PM-2.5.

as a surrogate for assessing PM-2.5 compliance in designated PM-2.5 non-attainment areas (which currently are 5 ug/m3 for the 24-hour period and, 1 ug/m3 for the annual period).[10]

Subsequently, on December 29, 2003, NYSDEC Commissioner Erin M. Crotty issued Commissioner Policy 33 ("CP-33") Assessing and Mitigating Impacts of Fine Particulate Matter Emissions to direct NYSDEC staff to evaluate the potential for significant adverse impacts resulting from the emission of fine particulate matter during the operation of a proposed project, such as the one evaluated by TRC. CP-33 is a policy which is addressed by SEQRA, and requires major sources subject to environmental review to examine the air quality impact of PM-2.5. The policy provides interim direction to NYSDEC staff, pending promulgation of a PM-2.5 SIL by EPA, for evaluating the impacts of PM-2.5 emissions from proposed facilities that require one or more permits from the Department. CP-33 further defined SILs for PM-2.5 emissions from a new major source to be 5 ug/m3 for a 24-hour average, and 0.3 ug/m3 for an annual average. While a SEQRA review of the Project cooling towers is not required for this report, a SEQRA assessment will be required later in the proceedings and CP-33 will provide the framework upon which the PM-2.5 impacts from the Project would be evaluated. It should be noted that due to the low annual average SIL mandated by CP-33 to determine compliance with the PM-2.5 standard (i.e. 0.3 ug/m3), achieving compliance in PM-2.5 non-attainment areas, such as Westchester County may prove problematic for some new sources, like the Project cooling towers.

If the proposed new source cannot demonstrate:

- its PM-2.5 emissions are less than 100 tons per year;
- its PM-2.5 impact is less than the SIL; and
- its PM-2.5 impact when added to the existing background concentration is less than the NAAQS

then the proposed new source would be denied an air permit under NYSDEC's air quality regulations.

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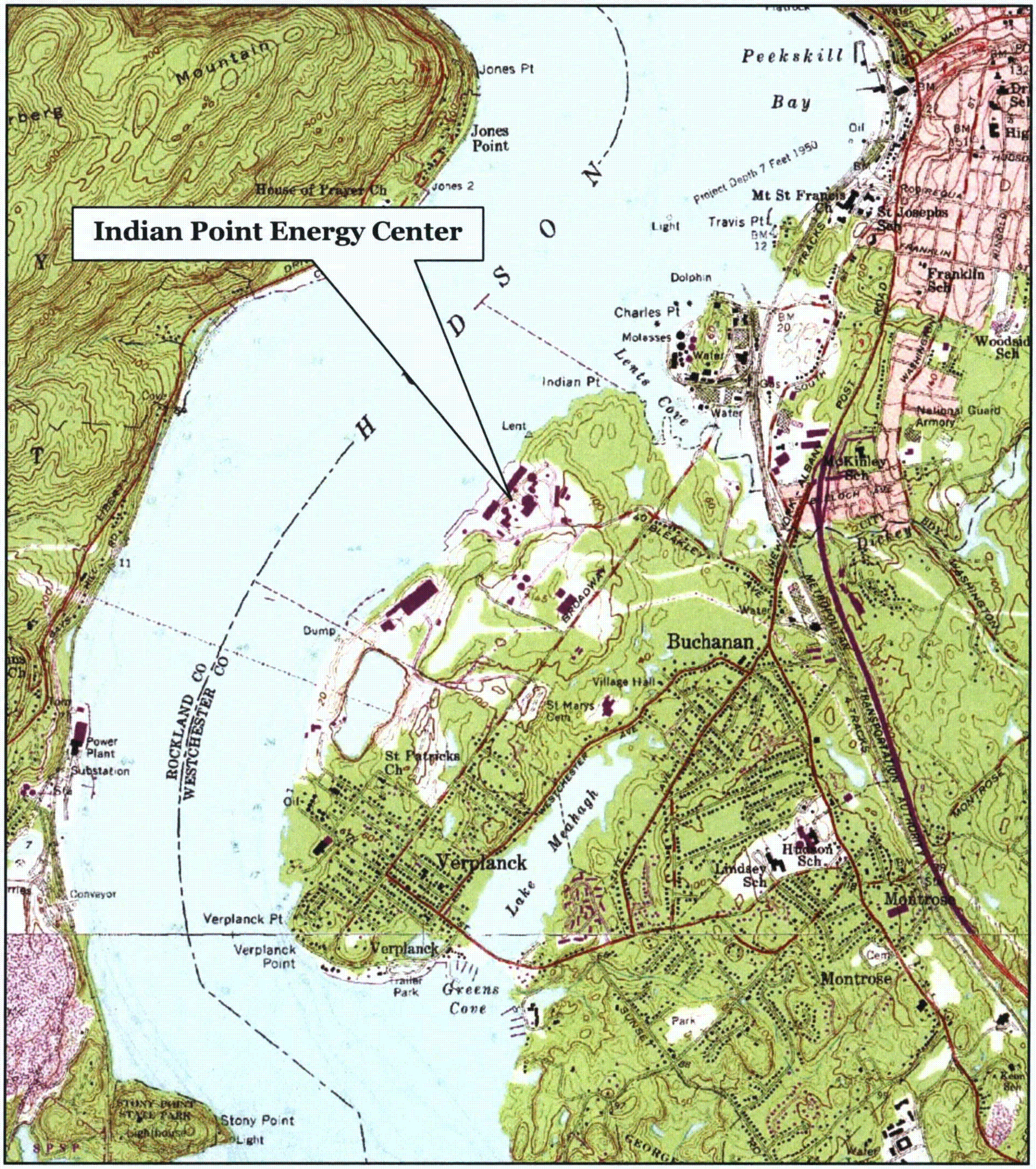
[10] EPA adopted a NAAQS for PM-2.5 in 1998 but has yet to adopt a complete PM-2.5 implementing rule. EPA has indicated the PM-10 rules may be used as a surrogate parameter for determining compliance with the PM-2.5 standard. (Memorandum from John S, Seitz, Director Office of Air Quality Planning and Standards to Regional Air Directors, "Interim Implementation of New Source Review for PM2.5" (October 23, 1997); as reconfirmed in Memorandum from Stephen D. Page to Addressees, "Implementation of New Source Review Requirements in PM-2.5 Non-attainment Areas" (April 5, 2005).)

Indian Point Energy Center
Westchester County, New York

Figure 2-1. Site Location Aerial Photograph

Source: Microsoft Virtual Earth, March 2009

TRC



Indian Point Energy Center
Westchester County, New York

Figure 2-2. Site Location Map

Source: USGS 7.5 Minute Quadrangle Maps - (Peekskill, NY, 1981) and (Haverstraw, NY, 1979)

3.0 FINE PARTICULATE EMISSIONS

3.1 Summary of Air Quality Assessment

TRC performed a rigorous air quality analysis that examined the effects of the particulate matter emissions resulting from the Project cooling tower spray drift evaporating and becoming fine particulate. This analysis considered air quality impacts from the Project cooling towers operating (1) in wet mode and plume abated mode, and (2) individually and simultaneously. Through this analysis, TRC determined that the modeled concentrations from the particulate emissions from the Project cooling towers, individually and together, equal or exceed the surrogate PM-2.5 SILs. As noted above, the relevant SILs currently are the PM-10 SILs and which are the levels below which a source is assumed to have a negligible impact, and therefore no potential to cause or contribute to a violation of applicable NAAQS. Thus, Part 231-12.6 indicates that the particulate emissions from the Project towers, individually and together, have the potential to cause or contribute to a violation of NAAQS within these areas.

The maximum modeled concentrations of the Project cooling towers operating separately and together (in both wet and plume abated modes) must be added to measured background concentrations to evaluate the compliance of the towers fine particulate emissions with the applicable standards. Because of the high PM-2.5 background level, which is unrelated to operation of the Stations, cooling tower PM-2.5 concentrations that exceed approximately 6 ug/m^3 will result in contravention of the 24-hour PM-2.5 NAAQS.

When the cooling towers are operated in the wet-mode (i.e. no plume abatement), the emissions from the towers plus the existing background concentrations will exceed both the 24-hour PM-10 and PM-2.5 NAAQS by a substantial margin and also will exceed the annual PM-2.5 NAAQS. TRC also found that the towers operating individually in wet mode would cause the 24-hour average PM-2.5 NAAQS to be exceeded for each tower, and the annual average PM-2.5 NAAQS to be exceeded for the Unit 2 Project cooling tower (due to the orientation of the Unit 2 cooling tower and the facility property line). As such, due to the emissions of particulates from circulating water drift, the cooling towers would not satisfy NYSDEC air permit regulations when operating in wet mode, either simultaneously or individually.

When the cooling towers are operated together in plume abated mode, TRC found that the particulate concentrations, when added to background, will exceed the 24-hour PM-2.5 NAAQS by a substantial margin. TRC also concluded that individual tower operation in plume abated mode will result in particulate concentrations that exceed the 24-hour PM-2.5 SIL, meaning there is a potential to cause or contribute to a NAAQS violation. The balance of this section describes the study which resulted in this conclusion.

3.2 Particulate Emissions

Although the Project cooling towers being studied are designed to minimize the amount of cooling tower drift, due to the large size of each tower, the drift droplets that escape would still result in an appreciable quantity of fine particulate emissions. This is due to the dissolved solids in the circulating water being concentrated,[11] or cycled, upwards to 7,200 parts per million (ppm by mass), which, when entrained in the exhaust from the towers, will evaporate, leaving a fine particulate. Cycles of concentration is a term used in calculating and determining the amount of cooling tower circulating water that is drawn[12] from the tower and discharged as waste-water. Cycles can be defined as the number of times the dissolved minerals in the circulating water are concentrated versus the level in the raw makeup water (i.e. fresh water added to the cooling tower to "makeup" for losses through evaporation and discharge). As an example, if the minerals in the makeup water stream are concentrated four times, the tower is said to be operating with four cycles of concentration.[13]

As noted earlier, the quantity of drift can be minimized using high efficiency drift eliminators. TRC has been informed by Enercon that the cooling tower vendor has quoted that 0.001% of the circulating water flow will result in approximately 7 gallons per minute of drift from each tower. TRC's analysis of lower drift rates and their feasibility is presented in Section 3.13. Enercon informed TRC that the Project cooling towers' circulating water has an annual average dissolved solids content of 7,200 ppm. This results in an emission rate of 25 pounds per hour of particulate material, per tower. In the absence of a particulate size distribution defining the size range of the particulate emissions, TRC by operation of Part 201 must assume the evaporated particles are PM-2.5 and smaller in the context of regulatory compliance.[14] With an emission

[11] In order to reduce the amount of water used, the circulating water in the cooling towers is recycled. This results in increased dissolved mineral concentration because the dissolved solids remain as water evaporates.

[12] Circulating water is discharged from the cooling tower as an operational necessity to reduce the quantity of dissolved solids in the circulating water.

[13] The total dissolved solids content of the circulating water is based on an annual average Hudson River makeup water salinity of 1,800 ppm and 4 cycles of concentration, per Enercon Services, Inc., Economic and Environmental Impacts Associated with Conversion of Indian Point Units 2 and 3 to a Closed-Loop Condenser Cooling Water Configuration, Attachment 5 Plume Model/ Salt Deposition Analysis, June 2003 (Enercon, 2003). Chloride concentration data was obtained by the U.S. Geological Service for the Verplanck Station, immediately adjacent to IPEC, for the period 1969 to 1975. The maximum monthly average salinity ranges from 100 to 3,500 ppm, with the highest salinity concentrations observed during the summer months when the cooling towers will operate at their maximum design rate. 7,200 ppm represents an estimated circulating water concentration assuming between two and four cycles, depending upon the makeup water salinity, i.e., the higher the salt content of the makeup water, the fewer cycles of operation are necessary to maintain 7,200 ppm dissolved solids in the circulating water. As a point of reference, sea water is typically 35,000 ppm of sodium chloride, thus the maximum cooling tower circulating water salinity would be approximately one fifth that of sea water.

[14] The "burden of proof" that the particulate emitted by the cooling towers are greater than PM-2.5 is placed upon the applicant of an NYSDEC Part 201 air quality permit. Based on a particle size distribution provided by the vendors Marley/SPX Cooling Technologies, the water droplets are typically in the size range of 10-200 micrometers, and nearly 99 percent water. When the water evaporates, the remaining solid particle size is typically less than 2 micrometers in diameter and is considered PM-2.5 particulate.

rate of 25 pounds/hour, each cooling tower will emit over 100 tons per year of fine particulate consisting of PM-2.5. Thus, both individually and collectively the Project cooling towers would trigger the major source threshold for definition of a major source of particulate matter under Part 201.

3.3 Monitoring Data

The NYSDEC Bureau of Air Surveillance operates air quality monitors for several air pollutants, including inhalable particulates (PM-10 and PM-2.5). Recent data from these monitors has been used to describe the background air quality of the region. The representative NYSDEC monitors for PM-10 nearest to IPEC are located in Suffern, Rockland County, roughly 15 miles (24 kilometers) southwest of IPEC, and in Mt. Ninham, in Putnam County, approximately 20 miles (32 kilometers) northeast of the Project site. However, after 1998, both of these monitors were shut down by NYSDEC. Thus, TRC used the next closest representative NYSDEC monitors: PM-10 was recorded at the PS59 monitoring station in New York County (for the years 2006 and 2007), approximately 36 miles (57 kilometers) south of IPEC in a commercial/urban area; PM-2.5 was recorded at the Newburg monitoring station located in Orange County, New York approximately 16 miles (26 kilometers) north of IPEC. These monitors are all representative of the study area for IPEC.

Table 3-1 presents background concentration data for PM-10 and PM-2.5 along with the corresponding NAAQS. Comparison of the background ambient concentrations to the NAAQS in the following table shows that measured concentrations of PM-2.5 are quite close to the NAAQS.

Table 3-1: Background Concentrations of Inhalable Particulates

Pollutant	Averaging Period	Units	Ambient Concentration (μg/m³)			NAAQS	Monitor Location
			2005	2006	2007		
PM-10	24-hour[a]	μg/m³	--	60	53	150	PS59 Monitoring Station New York County, NY
PM-2.5	24-hour[b]	μg/m³	29.6	27.5	30.4	35	Newburg Monitor Orange County, NY
	Annual[c]	μg/m³	12.09	9.74	10.59	15	

Notes:
[a] 24-hour PM-10 is the highest of the second-highest recorded values.
[b] 24-Hour PM-2.5 is the 98th percentile value.
[c] Annual PM-2.5 is the maximum annual value.
μg/m³ = micrograms per cubic meter
Sources: Monitored background concentrations obtained from the EPA AIRData and NYSDEC websites.

Data from 2006 and 2007 show the maximum 24-hour PM-10 level (60 μg/m³) during that three-year period is 40% of the NAAQS; the 3-year average 24-hour PM-2.5 level (29.17 μg/m³) is 83% of the corresponding NAAQS; and the 3-year average annual PM-2.5 concentration (10.81 μg/m³) is 72% of the NAAQS. Averaging the most recent 3-years of PM-2.5 monitoring data is in accordance with the definition of the ambient standard.[15]

3.4 Applicable Regulatory Requirements

The Project cooling towers being studied would result in particulate emissions that would exceed the major source threshold of 100 tons per year of fine particulate resulting in the towers being designated as a major source of air contaminants. As an owner and an operator of a major stationary source subject to Subpart 201-6 of this Part, Entergy would be required to obtain a Part 201 facility permit for each, and both, of the Project cooling towers. The applicable requirement for obtaining a Part 201 permit would include an air quality impact analysis for determining compliance with the NAAQS and comparable New York State standards. The following sections walk through the regulatory process for obtaining an air quality permit to construct, which includes the preparation of an air quality impact (i.e., modeling) analysis.

3.4.1 PM-2.5

As discussed in Section 2, Westchester County currently is designated as a non-attainment area for PM-2.5. Although NYSDEC has submitted a plan to EPA for bringing Westchester County and the surrounding area into compliance with the PM-2.5 NAAQS by 2010, re-designation as an attainment area for PM-2.5 is neither assumed nor imminent because EPA must first approve NYSDEC's request. Because each Project cooling tower being studied, with an emission rate of over 100 tons per year of PM-2.5, is considered a major source of PM-2.5, the towers, both individually and collectively, currently are subject to the state's non-attainment new source review ("NA-NSR") program for PM-2.5 and must be reviewed in that context. As such, the construction and operation of the Project cooling towers will be subject to NYSDEC air permitting requirements for PM-2.5, including the need to demonstrate that the proposed cooling towers will not cause or contribute to a violation of NAAQS for PM-2.5.

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[15] 40 CFR Part 50—National Primary and Secondary Ambient Air Quality Standards
Sec. 50.7 National primary and secondary ambient air quality standards for particulate matter.
(b) The annual primary and secondary PM-2.5 standards are met when the annual arithmetic mean concentration, as determined in accordance with Appendix N of this part, is less than or equal to 15.0 micrograms per cubic meter.
(c) The 24-hour primary and secondary PM-2.5 standards are met when the 98th percentile 24-hour concentration, as determined in accordance with Appendix N of this part, is less than or equal to 35 micrograms per cubic meter.
(e) The 24-hour primary and secondary PM-10 standards are met when the 99th percentile 24-hour concentration, as determined in accordance with Appendix N of this part, is less than or equal to 150 micrograms per cubic meter

Appendix N to Part 50--Interpretation of the National Ambient Air Quality Standards for PM-2.5
(2) The 3-year average of annual 98th percentile 24-hour average values recorded at each monitoring site (referred to as the "24-hour standard design value").

3.4.2 *PM-10*

Since Westchester County is an attainment area for PM-10, the construction and operation of the Project cooling towers will be subject to NYSDEC air permitting requirements, including the need to demonstrate that the proposed cooling towers will not cause or contribute to a violation of NAAQS for PM-10.

3.5 Fine Particulate Emissions Modeling

In order to ascertain the potential impact of Project cooling tower fine particulate emissions on air quality pursuant to NA-NSR and NYSDEC permitting requirements, the cooling towers were assessed using current state-of-the-art air quality dispersion modeling analyses, substantively identical to the level of analysis necessary to obtain an air quality permit for the technology evaluated. The modeling analysis examined the impacts of both towers operating simultaneously, and the impacts of each tower operating separately, in both wet and plume abated modes. Additionally, operational constraints on the tower design and operation were considered as potential methods that might be employed to reduce the particulate matter emissions.

3.5.1 *Methodology*

Modeling was performed consistent with the preferred procedures found in the following EPA documents: Guideline on Air Quality Models (Revised) (U.S. EPA, 2005), New Source Review Workshop Manual (U.S. EPA, 1990), and Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (U.S. EPA, 1992). These represent the current and preferred modeling guidelines for the technology being evaluated, and EPA and NYSDEC would require their use in order to obtain an air quality permit for the Project cooling towers.

In developing a comprehensive air quality modeling assessment, several methodology decisions must be made. The EPA modeling guidelines initially prescribe the selection of the model to use for the analysis. Once the model has been selected, source characteristics are developed for use with the model. Source inputs will include: the facility structure dimensions, operating parameters of the source such as exit diameter and exhaust flow and emissions from the source. Additional relevant modeling inputs include: using a representative meteorological database in a format suitable for use by the air model, using topographic data representing the surrounding terrain and land forms, and developing the land use characteristics of the study area using AERSURFACE (an EPA program for determining land use criteria).

3.5.2 *Model Selection*

The EPA has compiled a set of preferred and alternative computer models. The selection of a model depends on the characteristics of the source, as well as the nature of the surrounding study area. Of the four classes of models available, the Gaussian type model is the most widely used technique for evaluating nonreactive pollutants, such as particulate matter.[16] A Gaussian model was used for both the Project cooling tower particulate matter impact analysis, as well as the cooling tower condensed water vapor plume analysis discussed in Section 4. Specifically, the EPA AERMOD (version 07026 with PRIME) was used for the modeling of the Project cooling towers' potential particulate emissions to determine the maximum ambient air concentrations. The AERMOD model was designed for assessing pollutant concentrations from a wide variety of sources (point, area, and volume). AERMOD currently is recommended for modeling studies in rural or urban areas, flat or complex terrain, and transport distances less than 50 kilometers (31 miles), with one hour to annual averaging times. In November 2005, AERMOD became an EPA guideline model replacing the Industrial Source Complex model. The regulatory default option was used in the dispersion modeling analysis as required by the modeling guidelines specified in Section 3.5.1 for assessing the impacts of a source of an air contaminant on the NAAQS.[17]

3.5.3 Dispersion Parameters (Land Cover Analysis)

Dispersion parameters reflect how vigorously the atmosphere mixes a plume emitted from a source. One factor which strongly influences this mixing is the underlying ground surface, with more vigorous mixing typically being associated with urban environments. A land cover classification analysis was performed to determine whether AERMOD's URBAN option (as opposed to its RURAL option) should be used in quantifying ground-level concentrations of emitted air contaminants. The methodology utilized a United States Geological Survey ("USGS") topographic quadrangle map to identify the land use categories within the study area. The area within 3 kilometers (2 miles) of the IPEC, as well as the full modeling domain (10 kilometers by 10 kilometers or 6 miles by 6 miles), is predominantly rural according to the USGS classification scheme, which segregates specific land use into either rural or urban. (Water, agricultural and forested areas are considered rural, while densely populated, commercial and industrial areas are considered urban.) Thus, the RURAL dispersion option was used in the AERMOD dispersion modeling analyses. As demonstrated using the USGS classification scheme, the study area does not meet the USGS definition of an urban environment.

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[16] The Gaussian model assumes that the air pollutant dispersion follows a Gaussian distribution in the atmosphere, meaning that the pollutant distribution, once emitted from a source, experiences a normal statistical probability distribution. Gaussian models are most often used for evaluating the dispersion of continuous, buoyant air pollution plumes originating from ground-level or elevated sources.

[17] AERMOD is a robust scientific tool that can be used to accurately assess air contaminant dispersion using a variety of options to simulate the dispersion in diverse environmental settings. Setting the regulatory default option ensures the model is used with a consistent set of options that the regulatory community has agreed upon should the modeling results be used to demonstrate compliance with applicable air quality standards.

3.6 Good Engineering Practice ("GEP") Stack Height

In accordance with the modeling guidelines referenced in section 3.5.1 of this report, a comprehensive GEP height analysis was conducted to determine if the Project cooling towers met a GEP defined stack height. The EPA provides specific guidance for determining GEP stack height and for determining whether building downwash[18] will occur. See Guidance for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (U.S. EPA, 1985). GEP stack height is defined by section 123 of the CAA 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."[19] This definition clearly applies to the particulate matter emissions that would occur from the cooling towers being studied because drift is readily susceptible to downwash in the immediate vicinity of the towers. Although the Project cooling towers are elevated point sources, they are sufficiently large to cause turbulent downwash.

The GEP stack height 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 EPA GEP stack height regulations (40 CFR 51.100) specify that the GEP stack height be calculated in the following manner:

$$H_{GEP} = H_B + 1.5L$$

Where: H_B = the height of adjacent or nearby structures, and

L = the lower value of either the height, or the projected width of the adjacent or nearby structures.

A general arrangement plan showing the locations and dimensions of all existing and proposed major structures at IPEC is shown in Figure 3-1. The largest structure(s) on the site are the two Project cooling towers being studied (168 feet tall each including the cooling tower fan decks and 525 feet in diameter at the base). These two structures result in a formula GEP stack height of 420 feet above grade (i.e., 2.5 times the 168 foot cooling tower height), which equates to the preferred stack height to avoid downwash. Since the Project cooling towers are substantially lower than the formula GEP stack height in order to minimize aesthetic impact and meet the IPEC construction height limitations, direction-specific downwash parameters based on the

[18] Building downwash is a phenomenon caused by turbulent eddies created by air movement around building (structures) obstacles. These effects result from the deflection of the normal wind flow by the structures/obstacles, which cause the affected plume to be brought rapidly to the ground close to the structure and before it has had time to experience significant dilution.

[19] A terrain obstacle, in this context, means terrain within a sufficiently short distance to the source that would cause higher ground level concentrations of an emitted air contaminant due to the turbulent wake (area of disturbed wind flow) caused by the obstacle.

towers as well as the containment and reactor buildings of Unit 2 and Unit 3 were determined using the EPA approved Building Profile Input Program (BPIPPRM, version 04274). The AERMOD dispersion analysis incorporated downwash effects by using the heights of the Project cooling towers, which are lower than the GEP height, and the dispersion influencing effects of the other structures located at IPEC were input using their respective structure dimensions.

3.7 Meteorological Data

According to the EPA Guideline on Air Quality Models (Revised 2005), the meteorological data used in a modeling analysis should be selected based on its spatial and climatological representativeness of a proposed facility site and its ability to accurately characterize the transport and dispersion conditions in the area of concern. The spatial and climatological representativeness of the meteorological data are dependent on four factors:

1. The proximity of the meteorological monitoring site to the area under consideration (with a representative on-site station such as is operated by IPEC ranking the highest);
2. The complexity of the terrain;
3. The exposure of the meteorological monitoring site; and,
4. The period of time during which data were collected.

For a modeling analysis conducted using the AERMOD model, two meteorological datasets are required: 1) hourly surface data and 2) twice daily upper air sounding data.[20] The difference between these two data sets is that the hourly surface data represents the meteorological conditions (i.e., wind speed, wind direction, temperature, and atmospheric stability) in the vicinity of IPEC. The upper air sounding measures these same parameters at multiple levels within the atmosphere through a height of several miles above IPEC. Merging these two data sets provides a definitive meteorological regime that can be used by AERMOD to accurately calculate the dispersion of air contaminants from a source on an hour by hour basis.

This modeling analysis used two hourly surface datasets and one twice daily upper air sounding dataset. Each of these meteorological datasets was reviewed using the EPA criteria. The primary data set used for this analysis is the most recent five years (2004 – 2008) of hourly meteorological data collected by the meteorological tower at IPEC. This tower has been collecting data at the site for many years and is designed, sited and operated in accordance with stringent United States Nuclear Regulatory Commission ("NRC") meteorological monitoring

[20] Upper air soundings are performed twice daily at various upper air stations, at the same time throughout the world, one at midnight (00Z) and one at noon (12Z) Coordinated Universal Time. The U.S. National Weather Service operates 92 upper air stations in North America and the Pacific islands, and supports the operation of 10 stations in the Caribbean.

guidelines that are consistent with EPA guidelines in terms of quality assurance and quality control of the data collection and the reliability of the data itself.[21]

The IPEC meteorological tower location is such that the recorded data are free of interferences caused by nearby natural or manmade structures and provide an excellent representation of dispersion characteristics within the local area. Since the primary purpose of meteorological data collection at IPEC is for emergency planning purposes, the monitoring program is subject to NRC approval. Data were recorded at 10 meters, 60 meters, and 122 meters above grade level on the tower. The specific parameters collected and the heights at which they were collected are as follows:

- 10 meters: Wind Speed, Wind Direction, Temperature, Sigma-Theta[22]
- 60 meters: Wind Speed, Wind Direction, Sigma-Theta, Delta-Temperature (60 and 10 meter levels)[23]
- 122 meters: Wind Speed, Wind Direction, Sigma-Theta, Delta-Temperature (122 and 10 meter levels)

The data quality assurance and quality control procedures that were used during the data collection period included weekly visual inspections of all equipment, gross comparison of recorded data versus real conditions, semiannual electronic zero/span checks, and semiannual instrument and accuracy tests with independent equipment and standards. These data were further examined by year for specific "modeling completeness", e.g., the data recovery rates for wind direction, wind speed, temperature, and Sigma-Theta were determined. The percent recovery by year for each of the modeling parameters exceeds the minimum criterion of 90 percent for the five year period, which is the criteria for determining an acceptable modeling completeness. The onsite data recovery was superb and well above 99 percent, with only a scant few hours of missing data in any given year.

In addition to the onsite meteorological data, additional necessary data from a National Weather Service operated meteorological monitoring station was obtained to produce a model-ready meteorological data file. Westchester County Airport (WBAN 94745) ceiling heights and cloud cover (from 2004 – 2008) were used in the modeling analysis to supplement the meteorological

[21] NRC Regulatory Guide 1.23: Meteorological Monitoring Programs for Nuclear Power Plants. (March 2007) http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active/01-023/01-023r1.pdf (last visited on August 28, 2009.)

[22] Sigma-theta is the standard deviation of the horizontal wind direction, essentially, a measure of the fluctuation in the wind direction over a short period of time, typically 15 minutes to one hour. It is used as an indicator of the amount of turbulence in the atmosphere and means for determining the atmospheric stability for atmospheric dispersion modeling.

[23] Delta-temperature is the difference in temperature at the upper level and the 10-meter level and is another indicator of atmospheric stability.

data collected from the tower at IPEC. Westchester County Airport is located approximately 30 kilometers (20 miles) southeast of the IPEC at an elevation of approximately 379 feet (116 meters) above mean sea level.

An Automated Surface Observing System station at the Westchester County Airport was installed on April 25, 2001 with a height of 33 feet (10 meters). Data collected from April 25, 2001 to the present, which included the period from 2004 through 2008 used for this study, was analyzed. These data were further examined by year for specific "modeling completeness," which evaluates all of the coincident meteorological parameters to determine if an individual hour of data is sufficient to perform a dispersion calculation. Namely, the data recovery rates for ceiling height and opaque sky cover were determined coincident with the on-site meteorological data. The percent recovery by year for these two modeling parameters exceeds the minimum criterion of 90 percent for all five years, which is the criterion for determining an acceptable modeling completeness. The average data recovery for these parameters across all years was 95 percent.

Concurrent upper air sounding data from Albany International Airport (WBAN 14735) was used with the two hourly surface datasets to create the meteorological dataset required for the modeling analysis. Albany is approximately 165 kilometers (about 100 miles) to the north of IPEC. Based on an examination of the spatial distribution of seasonal and annual mixing heights using Holzworth's Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States (U.S. EPA, 1972), upper air meteorological conditions in the Albany area are considered more representative than those from the next most proximate upper air station at Brookhaven National Labs at Upton, NY.[24]

Data substitution was performed for missing morning (12Z) observations in the upper air sounding data. In accordance with EPA meteorological data substitution guidance, the previous day's 12Z data was substituted for a single missing 12Z observation, while any subsequent consecutive missing 12Z observations were left unfilled (and treated as missing in the final merged dataset). The upper air data also was of high quality and required few substitutions. Both the surface and upper air sounding data were processed using AERMOD's meteorological processor, AERMET (version 06341). The output from AERMET was used as the meteorological database for the modeling analysis and consisted of a surface data file and a vertical profile data

[24] Holzworth's mixing height study was commissioned by EPA as a comprehensive compilation of seasonal and annual mixing heights throughout the contiguous United States. This study is used to compare average mixing heights between locations to determine which upper air station may best represent a given location. As can be supported by Holzworth, mixing heights have a steep gradient along the coast, at the transition zone between the continental and maritime planetary boundary layers. Thus, the inland Albany station was indicated to be more representative of the upper air conditions at IPEC than the coastal Brookhaven station.

file. Thus, the complete meteorological data set developed for modeling the IPEC cooling towers is both representative and accurate for this assessment.

3.8 Land Use Determination Using AERSURFACE

Appropriate values for three surface characteristics at the IPEC meteorological tower – albedo, Bowen ratio, and surface roughness length – were calculated using AERSURFACE (version 08009.[25] Albedo is a measure of the reflectivity of the surface; Bowen ratio is a measure of the heat and moisture fluxes (i.e., flows) from the surface; roughness length is a measure of terrain roughness (obstacles to wind flow) as "seen by" surface wind. The AERSURFACE User's Guide (U.S. EPA, 2008) was followed in order to obtain realistic and reproducible surface characteristic values for input to AERMET. Land cover data from the USGS National Land Cover Dataset 1992 ("NLCD92") archives was used as the input to AERSURFACE. This dataset provides land cover data at a spatial resolution of 30 meters (98 feet) based on a 21-category classification scheme.

The recommended default value of one kilometer was used to define the radius of the study area used for surface roughness. Additionally, surface roughness lengths were determined for twelve sectors to reflect the changes in land use across the study area rather than using an average roughness length for the entire area. Similarly, the temporal resolution of surface characteristic outputs was set to monthly rather than a single yearly average. Bowen ratio is dependent upon snow cover within the study area, and a wintertime value is recommended if nearly continuous snow cover is present during the winter. During winter conditions with little to no continuous snow cover, the AERMOD User's Guide recommends using autumn values for Bowen ratio.

After reviewing snow cover imagery from the National Climatic Data Center,[26] TRC determined that IPEC had experienced continuous snow cover (i.e., for more than half the days in a given month) for several months during the five years of meteorological data proposed to be used. Other than the several months that experienced continuous snow cover, the default month-to-season associations in AERSURFACE were followed. Further, the meteorological tower at IPEC is not located at an airport, and the site is not in an arid region.[27]

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[25] The surface characteristics albedo, Bowen ratio and roughness length all define how the surface interacts with the atmosphere (boundary layer) and the dispersion characteristics of atmosphere in the vicinity of IPEC. The same land use characteristics define both the nature of either rural or urban coefficients, and also the surface characteristics.

[26] http://lwf.ncdc.noaa.gov/climate-monitoring/index.php (last visited on August 28, 2009 prior to filing.)

[27] The significance of being at an airport or an arid area affects the land use categories. If the site is at an airport, AERSURFACE will use surface characteristics that reflect an area more dominated by transportation land cover. Similarly, the site being an "arid area" affects the Shrubland (Class 51) and the Bare Rock/Sand/Clay (Class 31) categories. These two categories may appear in the NLCD92 data in both desert and non-arid regions of the U.S., two climatologically different areas which will have quite different surface characteristic values. Selecting "non-arid" applies the appropriate land use to these classes for the study area.

Finally, the surface moisture conditions at the site relative to climatic normals were characterized as either average, wet, or dry. The 30-year climatic normal precipitation, as recorded in Central Park, New York City, New York is 48.65 inches per year, which is the nearest station which has a 30-year climatic record of precipitation. As defined in the AERSURFACE User's Guide, average conditions are defined as the middle 40th percentile, or in Central Park, a range from 44.48 to 52.82 inches per year. Correspondingly, wet conditions are defined as the upper 30th percentile and dry conditions are defined as the lower 30th percentile. The surface moisture conditions, as determined by evaluating precipitation data collected in Central Park during the five years (2004 – 2008), are as follows:

2004:	Average (51.93 inches)
2005:	Wet (55.97 inches)
2006:	Wet (59.89 inches)
2007:	Wet (61.67 inches)
2008:	Wet (53.61 inches)

AERSURFACE was run five times to account for the moisture variability across the five year period, which predominantly experienced greater than normal precipitation during the period of record.[28]

3.9 Receptor Grid

3.9.1 Basic Grid

TRC used part of the AERMOD package, the receptor-generating program, AERMAP (version 09040) to develop a complete receptor grid around the IPEC property to a distance of approximately 5 kilometers (3 miles) in all directions. The selection of a 5 kilometer (3 miles) radius study area (of approximately 100 square kilometers, or about 40 square miles) was based on TRC modeling experience regarding the extent the particulate emissions from the Project cooling towers would have significant impacts. AERMOD requires receptor data consisting of location coordinates and ground-level elevations. Since AERMOD is recommended for use in complex terrain, as well as simple terrain, the elevations that are associated with each receptor include a calculated terrain scaling value. This scaling value is automatically calculated when the receptor grid is generated using the AERMAP receptor grid and terrain processor. AERMAP uses digital elevation model ("DEM") data obtained from the USGS. Nine 7.5-minute DEM files

[28] The surface moisture condition affects the calculation of Bowen ratio which is ultimately an AERMOD input parameter. However, EPA studies have determined that for tall sources, such as IPEC cooling towers, AERMOD results are generally insensitive to Bowen ratio.

with 10-meter (33 feet) resolution were obtained for the area around IPEC. These nine DEM files include:

- Cornwall-on-Hudson, Haverstraw, Mohegan Lake, Oscawana Lake, Ossining, Peekskill, Popolopen Lake, Thiells, and West Point.

In accordance with modeling guidance, AERMAP was used to determine the representative elevations for each receptor. A dense Cartesian receptor grid (10 kilometers x 10 kilometers or 6 miles by 6 miles) with receptors spaced at 100 meter (328 feet) intervals was developed to assess the air quality impacts from the Project cooling towers. The grid extended from the center of IPEC out to a sufficient distance in the north, south, east, and west directions to assure that the maximum modeled concentrations were identified. Based on TRC modeling experience and judgment, a 10 kilometer (6 miles) square receptor grid with the sources near the center is adequate to obtain the maximum air quality impacts within the area covered by the grid. Figure 3-2 depicts the 10-kilometer x 10-kilometer Cartesian receptor grid used in the modeling analyses.

3.9.2 Property Line Receptors

The IPEC facility has a fenced property line that restricts public access to the site. Ambient air is therefore defined as the area at and beyond the fence. The modeling receptor grid includes receptors spaced at 25-meter (82 feet) intervals along the entire fence line. Any Cartesian receptors located within the fence line were removed since the IPEC property within its fence line would not be considered ambient air.

3.10 Cooling Tower Emission Parameters (Plume Abated and Wet Modes)

Exhaust characteristics and PM-10/PM-2.5 emission rates associated with the Project cooling towers being studied provided in Tables 3-2 and 3-3 reflect emissions and exhaust parameters for these cooling towers in both plume abated and wet modes. Since the towers could be run in both plume abatement mode and wet mode, modeling was conducted for each mode of operation to assure that maximum potential emissions were identified. Table 3-2 reflects the emissions and exhaust parameters for the Project cooling towers in plume abated mode. Table 3-3 reflects the emissions and exhaust parameters for the cooling towers being studied in wet mode (i.e., no plume abatement). The relevance of assessing the Project cooling towers with and without plume abatement concerns the increased volume flow and thus a higher exit velocity when the towers are plume abated. The increased velocity translates to a higher plume rise and subsequently lower ground level concentrations of PM-2.5, even though the cooling towers have identical PM-2.5 emission rates when operated in either mode. Thus, as shown in Tables 3-2 and 3-3, PM emission rates for the Project towers are the same regardless of mode, but plume abated mode results in an exit velocity of 37.67 feet/second, as opposed to 20.55 feet/second for wet mode.

Table 3-2: Cooling Tower Exhaust Characteristics (in Plume Abated Mode) and PM-10/PM-2.5 Emission Rate

Emissions Parameter	
Tower Type	Circular Plume Abated Mechanical Draft
Maximum Total Air Flow Rate (acfm) (Each Tower)	103,400,000
Maximum Water Flow Rate (gpm) (Each Tower)	700,000
Maximum Drift Rate	0.001%
PM-10/PM-2.5 Emission Rate (lb/hr) (Each Tower)	25.14
PM-10/PM-2.5 Emission Rate (g/s) (Each Tower)	3.168
PM-10/PM-2.5 Annual Emission Rate (ton/yr) (Each Tower)	110.11
Exhaust Parameter	
Exhaust Height (ft above grade)	168
Exhaust Height (m above grade)	51.21
Exhaust Temperature (deg F)	80
Exhaust Velocity (ft/sec)	37.67
Exhaust Velocity (m/sec)	11.49
Exhaust Diameter (ft)	241.40
Exhaust Diameter (m)	73.58

Table 3-3: Cooling Tower Exhaust Characteristics (in Wet Mode) and PM-10/PM-2.5 Emission Rate

Emissions Parameter	
Tower Type	Wet Mechanical Draft
Maximum Total Air Flow Rate (acfm) (Each Tower)	56,400,000
Maximum Water Flow Rate (gpm) (Each Tower)	700,000
Maximum Drift Rate	0.001%
PM-10/PM-2.5 Emission Rate (lb/hr) (Each Tower)	25.14
PM-10/PM-2.5 Emission Rate (g/s) (Each Tower)	3.168
PM-10/PM-2.5 Annual Emission Rate (ton/yr) (Each Tower)	110.11
Exhaust Parameter	
Exhaust Height (ft above grade)	168
Exhaust Height (m above grade)	51.21
Exhaust Temperature (deg F)	80
Exhaust Velocity (ft/sec)	20.55
Exhaust Velocity (m/sec)	6.26
Exhaust Diameter (ft)	241.40
Exhaust Diameter (m)	73.58

3.11 Summary of Maximum Modeled Concentrations

3.11.1 Combined Cooling Tower Operation

Table 3-4 presents the combined maximum modeled PM-10/PM-2.5 concentrations calculated by AERMOD for the simultaneous operation of the Project cooling towers in plume abated mode. Modeling results were compared to SILs. Currently, the SIL for 24-hour PM-10 and PM-2.5 impacts is 5 ug/m^3, and the SIL for annual PM-2.5 impacts 0.3 ug/m^3.

Table 3-4: Maximum Modeled PM-10/PM-2.5 Concentrations (in Plume Abated Mode)

Pollutant	Averaging Period	Significant Impact Level (ug/m^3)	NAAQS (μg/m^3)	Maximum Modeled Concentration (μg/m^3)
PM-10	24-Hour	5	150	32.9
PM-2.5	24-Hour	5[a]/1.2[b]	35	32.9
	Annual	0.3[c]	15	0.28

[a]24-hour PM-2.5 SIL per NYSDEC's Policy CP-33: Assessing and Mitigating Impacts of Fine Particulate Matter Emissions.
[b]24-hour PM-2.5 SIL per NESCAUM recommendations and proposed Option 3 per EPA.
[c]Annual PM-2.5 SIL per NYSDEC's Policy CP-33, NESCAUM recommendations, and proposed Option 3 per EPA.

The values presented in Table 3-4 show that 24-hour PM-10 and PM-2.5 concentrations for the operation of the cooling towers being studied are greater than the 24-hour PM-10 and PM-2.5 SILs, but less than 24-hour PM-10 and PM-2.5 NAAQS when the towers are operating in plume abated mode. The maximum modeled 24-hour PM-10/PM-2.5 concentration occurs immediately south of Petersons Pond, approximately 3.7 kilometers (2.3 miles) east-southeast of IPEC as shown on Figure 3-3. The maximum distance at which modeled impacts are at or above the SILs is at least 7.2 kilometers (4.5 miles) for the PM-10 and PM-2.5 24-hour SIL: this distance is the maximum extent of the modeling receptor grid, and therefore significant concentrations are likely to extend beyond the edge of the grid.[29]

Because modeled impacts exceed existing and proposed SILs, the towers have the potential to cause or contribute to a violation of NAAQS within these areas. Consequently, the maximum

[29] Since the modeled PM-2.5 concentrations exceed the SIL at the greatest extent of the modeling receptor grid which was 7.2 kilometers, TRC reasonably concludes that the SILs would be exceeded beyond this distance as well.

modeled impacts must be added to measured background concentrations to evaluate the potential compliance of the towers' fine particulate emissions with the applicable standards.[30] Table 3-5 presents a comparison of maximum modeled impacts (plus background) to the NAAQS. The values in the table show that the emissions from the Project cooling towers when operating in plume abated mode, plus a representative background ambient particulate concentration, will be in compliance with the 24-hour PM-10 and annual PM-2.5 NAAQS, but will exceed the 24-hour PM-2.5 NAAQS by a wide margin. Because of the high PM-2.5 background level, cooling tower PM-2.5 concentrations, which exceed roughly 6 ug/m^3, will result in contravention of the 24-hour PM-2.5 NAAQS. Moreover, referring back to Figure 3-3, the proposed Project cooling towers have the potential to violate the 24-hour PM-2.5 NAAQS over a wide area. Finally, annual PM-2.5 maximum modeled concentrations during plume abated operation are less than both the annual PM-2.5 SIL and the annual PM-2.5 NAAQS (See Tables 3-4 and 3-5). The maximum modeled annual PM-10/PM-2.5 concentration occurs approximately 3.1 kilometers northeast of IPEC (see Figure 3-4).

Table 3-5: Maximum Modeled PM-10/PM-2.5 Concentrations (in Plume Abated Mode) plus Background

Pollutant	Averaging Period	NAAQS (μg/m^3)	Maximum Modeled Concentration (μg/m^3)	Background (μg/m^3)	Total Concentration (μg/m^3)
PM-10	24-Hour	150	32.9	60	92.9
PM-2.5	24-Hour	35	32.9	29.2	**62.1[a]**
	Annual	15	0.28	12.09	12.37

[a] Bold and underline indicate the total exceeds the NAAQS

Table 3-6 presents the maximum modeled PM-10/PM-2.5 concentrations calculated by AERMOD for operating the Project cooling towers in wet mode. The 24-hour PM-10 and PM-2.5 concentrations are greater than the 24-hour PM-10 and PM-2.5 SILs and greater than the 24-hour PM-10 and PM-2.5 NAAQS, and are shown on Figure 3-5. Additionally, annual PM-2.5 maximum modeled concentrations in wet mode are greater than the annual PM-2.5 SIL, but less than the annual PM-2.5 NAAQS. Both the maximum modeled 24-hour and annual concentrations occur on the fence line immediately adjacent to the Unit 2 proposed cooling tower location (see Figures 3-5 and 3-6). Table 3-7 presents a comparison of maximum modeled impacts (plus background) to the NAAQS. The values in the table show that the emissions from the towers when operating in wet mode (plus background) will exceed both the 24-hour PM-10 and PM-2.5 NAAQS by a wide margin, and also will exceed the annual PM-2.5 NAAQS. Similar to the impacts resulting from plume abated operation, the maximum

[30] As a point of clarification, cooling tower PM-10/PM-2.5 concentrations when referenced to the SILs do not include background concentrations.

concentrations for wet mode exceed the SILs up to and beyond a distance of 7.2 kilometers (4.5 miles) and have the potential to exceed the 24-hour PM-2.5 NAAQS over a wide area.

Table 3-6: Maximum Modeled PM-10/PM-2.5 Concentrations (in Wet Mode)

Pollutant	Averaging Period	Significant Impact Level (ug/m3)	NAAQS (μg/m3)	Maximum Modeled Concentration (μg/m3)
PM-10	24-Hour	5	150	192.7
PM-2.5	24-Hour	5[a]/1.2[b]	35	192.7
	Annual	0.3[c]	15	3.5

[a]24-hour PM-2.5 SIL per NYSDEC's Policy CP-33: Assessing and Mitigating Impacts of Fine Particulate Matter Emissions.
[b]24-hour PM-2.5 SIL per NESCAUM recommendations and proposed Option 3 per EPA.
[c]Annual PM-2.5 SIL per NYSDEC's Policy CP-33, NESCAUM recommendations, and proposed Option 3 per EPA.

Table 3-7: Maximum Modeled PM-10/PM-2.5 Concentrations (in Wet Mode) plus Background

Pollutant	Averaging Period	NAAQS (μg/m3)	Maximum Modeled Concentration (μg/m3)	Background (μg/m3)	Total Concentration (μg/m3)
PM-10	24-Hour	150	192.7	60	**252.7[a]**
PM-2.5	24-Hour	35	192.7	29.2	**221.9**
	Annual	15	3.5	12.09	**15.59**

[a] Bold and underline indicate the total exceeds the NAAQS

The modeling results demonstrate that the Project cooling towers will not comply with applicable federal and state particulate matter air quality requirements, since under both the plume abated and wet operating modes the towers' fine particulate emissions will exceed one or more NAAQS. Moreover, cooling tower particulate emissions would have to be lowered by more than a factor of 30 to assure that they would not exceed the 24-hour PM-2.5 SIL during any type of operation.

3.11.2 Individual Cooling Tower Operation

TRC also assessed the Project's individual cooling tower particulate matter impacts.[31] Similar to the combined impact results, the individual tower impact results are presented in Tables 3-8 through 3-11. The PM-10 and PM-2.5 concentration contours for the individual cooling tower operation are presented on Figures 3-7 through 3-14. Table 3-8 presents the individual PM-10/PM-2.5 impacts from each of the towers being studied while operating in plume abated mode. As shown in Table 3-8, the maximum 24-hour concentrations of either PM-10 or PM-2.5 due to only the cooling tower for Unit 3 of 19.4 ug/m^3 is roughly two-thirds of the associated maximum concentration of 32.9 ug/m^3 for the combined impact (see Table 3-5), and still well above the associated SILs for either PM-10 or PM-2.5. Figures 3-7 and 3-8 present the individual cooling tower concentration 24-hour average PM-10 or PM-2.5 contours while operating in plume abated mode. It should be noted that because the two Project cooling towers are relatively far apart and the locations of maximum impact for each tower are close to the towers, that the maximum impacts for each tower will not substantively overlap. That is why the impacts for an individual tower are more than half of the impacts of both towers combined. This result indicates that, even for single unit operation, the Project cooling towers potentially will adversely impact the NAAQS. Table 3-9 presents the maximum single unit operation particulate matter impact (when added to background) to determine the potential impact on the NAAQS. As presented in Table 3-9, the maximum single unit concentration for 24-hour PM-2.5 of 48.6 ug/m^3 exceeds the NAAQS of 35 ug/m^3 by a substantial margin.

Table 3-8: Maximum Modeled PM-10/PM-2.5 Concentrations CT2 and CT3 (in Plume Abated Mode)

Pollutant	Averaging Period	Significant Impact Level (ug/m^3)	NAAQS (μg/m^3)	Maximum Modeled Concentration (μg/m^3) (CT2/CT3)
PM-10	24-Hour	5	150	18.1
				19.4
PM-2.5	24-Hour	5[a]/1.2[b]	35	18.1
				19.4
	Annual	0.3[c]	15	0.15
				0.14

[a]24-hour PM-2.5 SIL per NYSDEC's Policy CP-33: Assessing and Mitigating Impacts of Fine Particulate Matter Emissions.
[b]24-hour PM-2.5 SIL per NESCAUM recommendations and proposed Option 3 per EPA.
[c]Annual PM-2.5 SIL per NYSDEC's Policy CP-33, NESCAUM recommendations, and proposed Option 3 per EPA.

[31] In this context, the Project cooling tower for Unit 2 is referred to as CT2, while the Project cooling tower for Unit 3 is referred to as CT3.

Table 3-9: Maximum Modeled PM-10/PM-2.5 Concentrations plus Background (in Plume Abated Mode)

Pollutant	Averaging Period	Unit	NAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background (μg/m³)	Total Concentration (μg/m³)
PM-10	24-Hour	CT2	150	18.1	60	78.1
	24-Hour	CT3	150	19.4	60	79.4
PM-2.5	24-Hour	CT2	35	18.1	29.2	**47.3**[a]
	24-Hour	CT3	35	19.4	29.2	**48.6**[a]
	Annual	CT2	15	0.15	12.09	12.24
	Annual	CT3	15	0.14	12.09	12.23

[a] Bold and underline indicate the total exceeds the NAAQS

Similarly, individual Project cooling tower impacts were assessed while operating in wet mode. These results are presented in Tables 3-10 and 3-11. The maximum single unit impact of 187.1 ug/m³ for the 24-hour average of PM-10 and PM-2.5 is very similar to the combined impact value of 192.7 ug/m³. This result suggests that the maximum impacts from the combined operation are essentially the individual tower operation impacts with a slight addition from the other tower since the maximum concentration for each tower is much closer to the individual tower than the separation distance between the towers. Figures 3-9 and 3-10 present the individual cooling tower 24-hour average PM-10 or PM-2.5 concentration contours while operating in wet mode. The annual average PM-10 or PM-2.5 concentration contours for both plume abated and wet mode operation are illustrated by Figures 3-11 through 3-14.

Table 3-11 presents the maximum single unit operation impact added to background concentration. As presented on Table 3-11, the maximum concentrations of PM-10 and PM-2.5 from Unit 2 exceed the applicable NAAQS for both the 24-hour and annual averaging periods. The maximum concentrations of PM-10 and PM-2.5 from Unit 3 exceed the applicable NAAQS for the 24-hour averaging period. As such, the conclusions drawn for the combined tower operation in wet mode regarding violations of the NAAQS and presented in Section 3.11 hold true for the single unit operation as well. The cooling towers being studied would potentially exceed the NAAQS for PM-10 and PM-2.5 for both single unit and combined unit operation.

Table 3-10: Maximum Modeled PM-10/PM-2.5 Concentrations CT2 and CT3 (in Wet Mode)

Pollutant	Averaging Period	Significant Impact Level (ug/m³)	NAAQS (µg/m³)	Maximum Modeled Concentration (µg/m³) (CT2/CT3)
PM-10	24-Hour	5	150	187.1
				137.7
PM-2.5	24-Hour	5[a]/1.2[b]	35	187.1
				137.7
	Annual	0.3[c]	15	3.29
				2.48

[a]24-hour PM-2.5 SIL per NYSDEC's Policy CP-33: Assessing and Mitigating Impacts of Fine Particulate Matter Emissions.
[b]24-hour PM-2.5 SIL per NESCAUM recommendations and proposed Option 3 per EPA.
[c]Annual PM-2.5 SIL per NYSDEC's Policy CP-33, NESCAUM recommendations, and proposed Option 3 per EPA.

Table 3-11: Maximum Modeled PM-10/PM-2.5 Concentrations plus Background (in Wet Mode)

Pollutant	Averaging Period	Unit	NAAQS (µg/m³)	Maximum Modeled Concentration (µg/m³)	Background (µg/m³)	Total Concentration (µg/m³)
PM-10	24-Hour	CT2	150	187.1	60	**247.1**[a]
	24-Hour	CT3	150	137.7	60	**197.1**[a]
PM-2.5	24-Hour	CT2	35	187.1	29.2	**216.3**
	24-Hour	CT3	35	137.7	29.2	**166.9**
	Annual	CT2	15	3.3	12.09	**15.39**
	Annual	CT3	15	2.5	12.09	14.59

[a] Bold and underline indicate the total exceeds the NAAQS

3.12 Exceedance Counts

To demonstrate that the occurrence of exceedances of the PM-10 and PM-2.5 SILs and NAAQS were not limited to a small number, TRC evaluated all of the 24-hour particulate matter concentrations compared to threshold values. A daily exceedance occurs if only one location experiences a concentration greater than the trigger threshold for the 24-hour average, whether for the SIL or the NAAQS.[32] The threshold values were identified as the 24-hour SILS, and the incremental difference between the NAAQS and the representative background value. The exceedance counts are presented in Table 3-12, which indicates that for PM-2.5 with the Project cooling towers always operating in the plume abated mode, the PM-2.5 24-hour NAAQS would be exceeded an average of 19 days per year (5 percent of the year). Similarly, when the towers operate in the wet-mode, the PM-2.5 24-hour NAAQS would be exceeded an average of 31 days per year (8 percent of the year). These are appreciable numbers of exceedances and indicate that the cooling towers as modeled would not be permittable even if the area is re-designated as attainment for PM-2.5. Furthermore, a total of 49 days result in concentrations exceeding the PM-2.5 SIL for the plume abated case, while 91 days exceed the SIL (a quarter of the year) the PM-2.5 SILs for the wet mode case. These counts illustrate the severity of the particulate matter impact on the surrounding community, which is currently designated as not achieving the PM-2.5 NAAQS.

Table 3-12: Average Exceedances of SILs and NAAQS

Mode	SIL	Exceedances (days per year)	NAAQS	Exceedances (days per year)
Plume Abated				
PM-10 24-hour	5	22	150	none
PM-2.5 24-hour	1.2	49	35	19
Wet				
PM-10 24-hour	5	33	150	2
PM-2.5 24-hour	1.2	91	35	31

3.13 Potential Mitigation Measures

TRC considered two potential mitigation strategies for reducing the particulate matter emissions from the Project cooling towers. Although untried in a comparable tower

[32] An exceedance-day was tabulated if the highest 24-hour average exceeded either the SIL or the NAAQS. Neither the magnitude of the exceedance nor the number of receptor locations during the day having an exceedance were relevant to counting the day as an exceedance-day.

configuration and unable to be demonstrated prior to construction, the cooling tower spray drift itself can be reduced through introduction of a higher efficiency drift eliminator within the cooling towers. The vendor, SPX Cooling Technologies ("SPX"), has already indicated that towers of this size and configuration would typically be quoted/guaranteed with a drift rate of 0.001% of the circulating water flow rate. Although drift eliminators that can achieve 0.0005% are available for smaller mechanical draft towers, SPX indicated that the large round hybrid cooling towers considered for the IPEC site are not typically constructed with this reduced drift rate. In particular, it is difficult to design a 0.0005% drift rate for round hybrid towers due to the added air flow through the dry section, and even more difficult to measure, and thus guarantee, due to the large open central discharge. Moreover, SPX indicated that any confirmation of the 0.0005% drift rate for the Project cooling towers could not take place until after construction.

TRC has hypothetically considered the implications of reducing the drift rate. The PM-10 and PM-2.5 concentration plus background are presented in Table 3-13. In the case of the wet-mode combined tower operation, the maximum PM-10 and PM-2.5 concentrations would be reduced from 193 ug/m^3 to approximately 96 ug/m^3. This value is substantially larger than the SIL, and when added to background concentrations of 60 and 29 ug/m^3 (for PM-10 and PM-2.5, respectively) results in concentrations of 156 ug/m^3 and 126 ug/m^3: values that still exceed the respective NAAQS. Similarly, even when considering the plume abated tower PM-2.5 concentrations, Table 3-14 indicates that the PM-2.5 NAAQS is exceeded even at the 0.0005% drift rate. Thus, even if the Project cooling towers, regardless of operational mode, were designed with a drift rate of 0.0005%, the ambient standards for fine particulates would be exceeded.

Table 3-13: Maximum Modeled PM-10/PM-2.5 Concentrations (in Wet Mode) plus Background Assuming 0.0005% Drift

Pollutant	Averaging Period	NAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background (μg/m³)	Total Concentration (μg/m³)
PM-10	24-Hour	150	96.4	60	**<u>156.4</u>**[a]
PM-2.5	24-Hour	35	96.4	29.2	**<u>125.6</u>**
	Annual	15	1.8	12.09	13.9

[a] Bold and underline indicate the total exceeds the NAAQS

Table 3-14: Maximum Modeled PM-10/PM-2.5 Concentrations (in Plume Abated Mode) plus Background Assuming 0.0005% Drift

Pollutant	Averaging Period	NAAQS (μg/m³)	Maximum Modeled Concentration (μg/m³)	Background (μg/m³)	Total Concentration (μg/m³)
PM-10	24-Hour	150	16.5	60	76.5
PM-2.5	24-Hour	35	16.5	29.2	**<u>45.7</u>**[a]
	Annual	15	0.14	12.09	12.2

[a] Bold and underline indicate the total exceeds the NAAQS

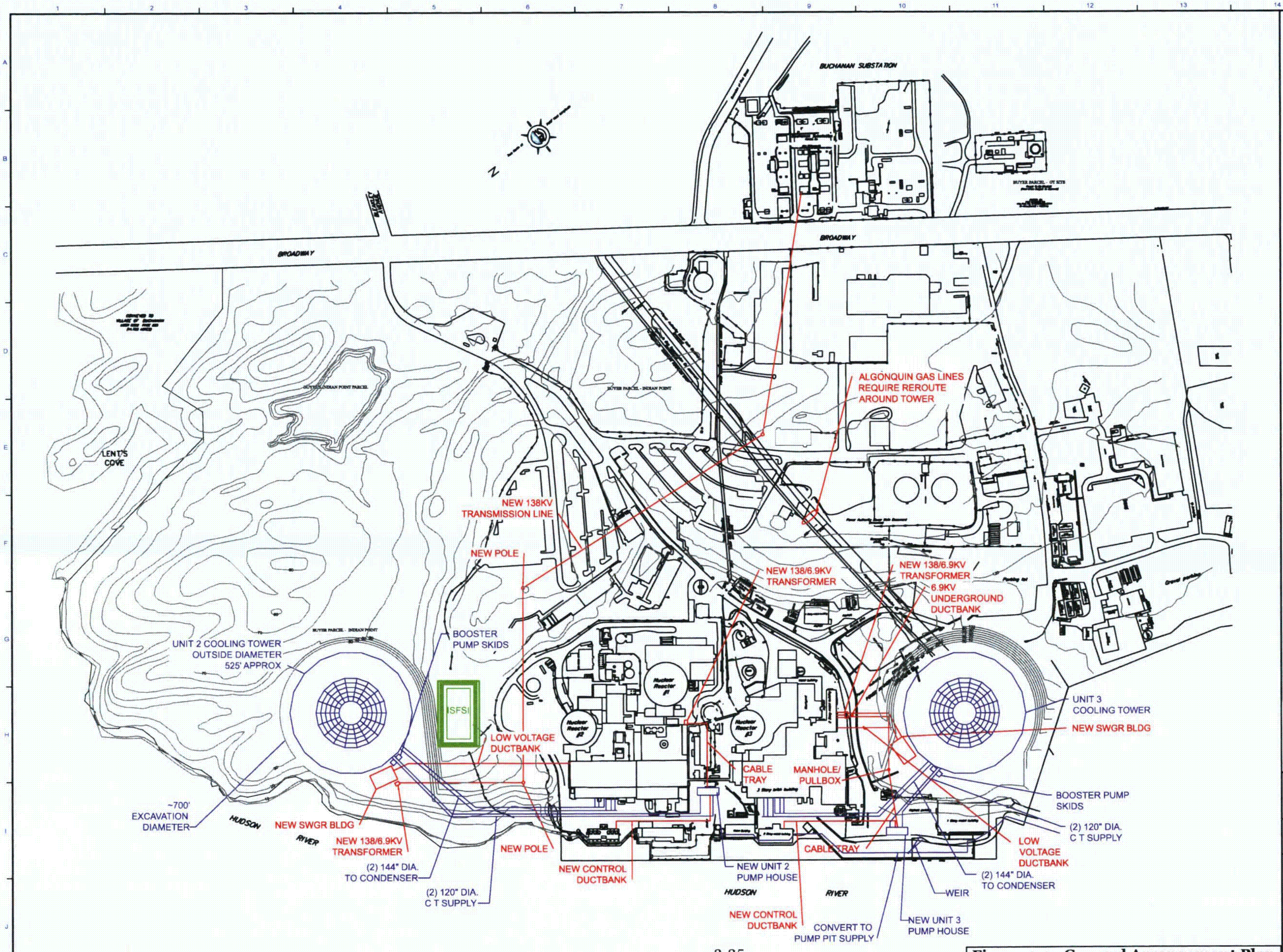
The second mitigation method would be to reduce the dissolved solids content of the circulating water. As previously discussed, this involves withdrawing make-up water from the Hudson River for the proposed cooling towers. During the summer months, the salt line in the river extends well north of IPEC, such that during the conditions when the cooling towers would be operated in wet-mode only, the Total Dissolved Solids ("TDS") content of the circulating water can, and would approach and often exceed the modeled value of 7200 ppm. As demonstrated and discussed previously, the cooling towers would need to be operated at low levels of TDS in the circulating water to avoid exceeding the PM-2.5 NAAQS. In order to achieve a modeled PM-2.5 concentration of less than the 5 ug/m³ SIL, the total dissolved solids would need to be reduced from 7,200 ppm to less than 200 ppm. Further, the circulating water TDS of less than 40 ppm would be required to achieve the 1.2 ug/m³ PM-2.5 SIL.

The only reasonably practical method of operating a cooling tower with a circulating water TDS at the very low value of 200 ppm and the extremely low value of 40 ppm would be to use drinking water with a naturally extremely low TDS content as makeup water and constantly discharge circulating water after one pass through the tower(s) to avoid cycling up the concentrations of minerals. However, this operation is not practical. The EPA Secondary Water Quality Regulations advise a maximum contamination level ("MCL") of 500 mg/liter (500 ppm) for TDS which exceeds the values required. Moreover, numerous drinking water supplies in the United States exceed this level. Finally, with potable (drinkable) water supplies becoming a significant concern for adjacent communities, the public opposition for using the massive quantities of potable water necessary for cooling tower makeup (over 1 billion gallons per day per tower, with no cycling) would be substantial.

Consequently, neither of these mitigation measures are practical or technologically feasible because of the fundamental impossibility of maintaining a circulating water with a dissolved solids content of 40 ppm. It is not possible to obtain a circulating water dissolved solids concentration sufficiently low enough to avoid exceeding the 24-hour PM-2.5 ambient standard or the significant impact level.

3.14 Fine Particulate Emissions Conclusions

The impacts of the proposed Project cooling tower particulate emissions were rigorously assessed using modeling methods recommended by the EPA and NYSDEC. As a result of this analysis, it was determined that each of the towers would emit more than 100 tons per year of PM-10 and PM-2.5 and, because they would be located in a PM-2.5 non-attainment area, subject to NA-NSR in addition to Part 201 new major source permitting. Modeling results show that the towers, when operated together or individually would exceed the applicable PM-10 and PM-2.5 SILs, thus giving them the potential to cause or contribute to a contravention of the PM-10 and PM-2.5 NAAQS. Because of the high background concentrations of PM-10 and PM-2.5, the tower impacts when added to background would violate the 24-hour average PM-10 and 24-average PM-2.5 and/or annual average PM-2.5 standards over a large area and on multiple occasions. The use of higher efficiency drift eliminators would lower the frequency and severity of these violations, but not eliminate them. Reducing the TDS concentration in the circulating water to the extent necessary to resolve these violations is not practical. The air quality modeling analysis prepared by TRC on behalf of Entergy demonstrates the closed cycle cooling system being studied would significantly contribute to the Westchester County PM-2.5 non-attainment area, and thus not be licensable under Part 201.



Coolin Towers (typical for two):

Tower Type:
Counterflow, forced draft, plume abated (hybrid) with low noise fans & sound attenuation baffles.

Tower Geometry:
OD= 524.8 ft
Overall Ht. = 168 ft.
ID exit cone: 241.4 ft.
No. fans (wet section) = 44 (Motor Output Power = 300 HP)
No. fans (dry section)= 44 (Motor Output Power = 350 HP)

Wet Section Data:
Flow = 700,000 gpm
Plan area of fill: 121660 ft2
Fill Type: 6 ft. PVC low fouling film (MCT FC-18)
DE type / drift rate: Cellular PVC (MCT TU-12)/ drift rate .001%
Distribution system: FRP headers/PVC pipes
Nozzles: High efficiency polypropylene

Dry Section Data:
Flow= 245,000 gpm
Element type: 4 row/ 2 pass
Tube type: 1" OD Titanium
Fin Type: 2.25" OD Aluminum fins @ 11 fins/in ("L" fin)
Tube length = 49 ft.
No. tubes/ bundle = 218
No. bundles = 264

Thermal Data:
Wet design condition: (76 WBT, 88 CWT, 108 HWT)
HP (motor output wet section) = 270 HP, evaporation rate = 1.67%, Vexit= 1233 fpm

Hybrid Operation@ plume abatement design point (27 WBT @ 90 % RH)
HP (MOP wet section) = 300 HP, evaporation rate = .81%, CWT = 59 °F, Vexit=2260 fpm
HP (MOP dry section)= 350 HP

Pumping Head Required for Tower:

Main Pumps:
700,000 gpm @ 45 ft. TDH

Booster Pumps Required for Dry Section:
245000 gpm @ 26 ft

Electrical Distribution:

The design assumes there is adequate room in the Unit 1 138KV switchyard to install a circuit breaker and transformer to feed the new Unit 2 circ water pumps. If not, the breaker and transformer will be installed near the new Unit 2 Switchgear Building and a ductline installed along the same excavation as the 120" diameter pipes from the Unit 2 cooling tower to the new pump house.

The design assumes a new overhead line will have to be run to the Buchanan substation. If possible, a tap can be made in the overhead 138KV feeder at the existing pole between the Buchanan substation and the plant for a new 138KV overhead feeder to the Unit 2 cooling tower.

A control ductbank is shown from the old circ water pump house to the new for control of the new pumps. This is based on the assumption that no new control circuits will be routed back into the plant and the existing controls can simply be extended from the existing pump house.

Depicted design does not address safety related control and instrumentation interlocks, which will require plant and control room interfaces not shown.

Circulating Water Pumps:

(6) Pumps required per Unit
Type - Vertical Turbine / 1 Stage
117,000 gpm @ 72.0 TDH
Bowl and Impeller - 316 SS
3000 HP / 446 RPM / 4160 V
40 ft. NPSHR

ENERCON SERVICES, INC.
Kennesaw, GA 30144

CLIENT
ENTERGY
INDIAN POINT 2 & INDIAN POINT 3

CLOSED LOOP
CONDENSER COOLING CONVERSION

SITE LAYOUT

SCALE	DRAWING NUMBER	REV
1/16" = 1'	SKETCH 01	0

Figure 3-1: General Arrangement Plan

...\SKETCH 01_ISFSI LAYOUT.DWG 2/6/2009 2:43:37 PM

Figure 3-2: 10 Kilometer x 10 Kilometer Cartesian Receptor Grid

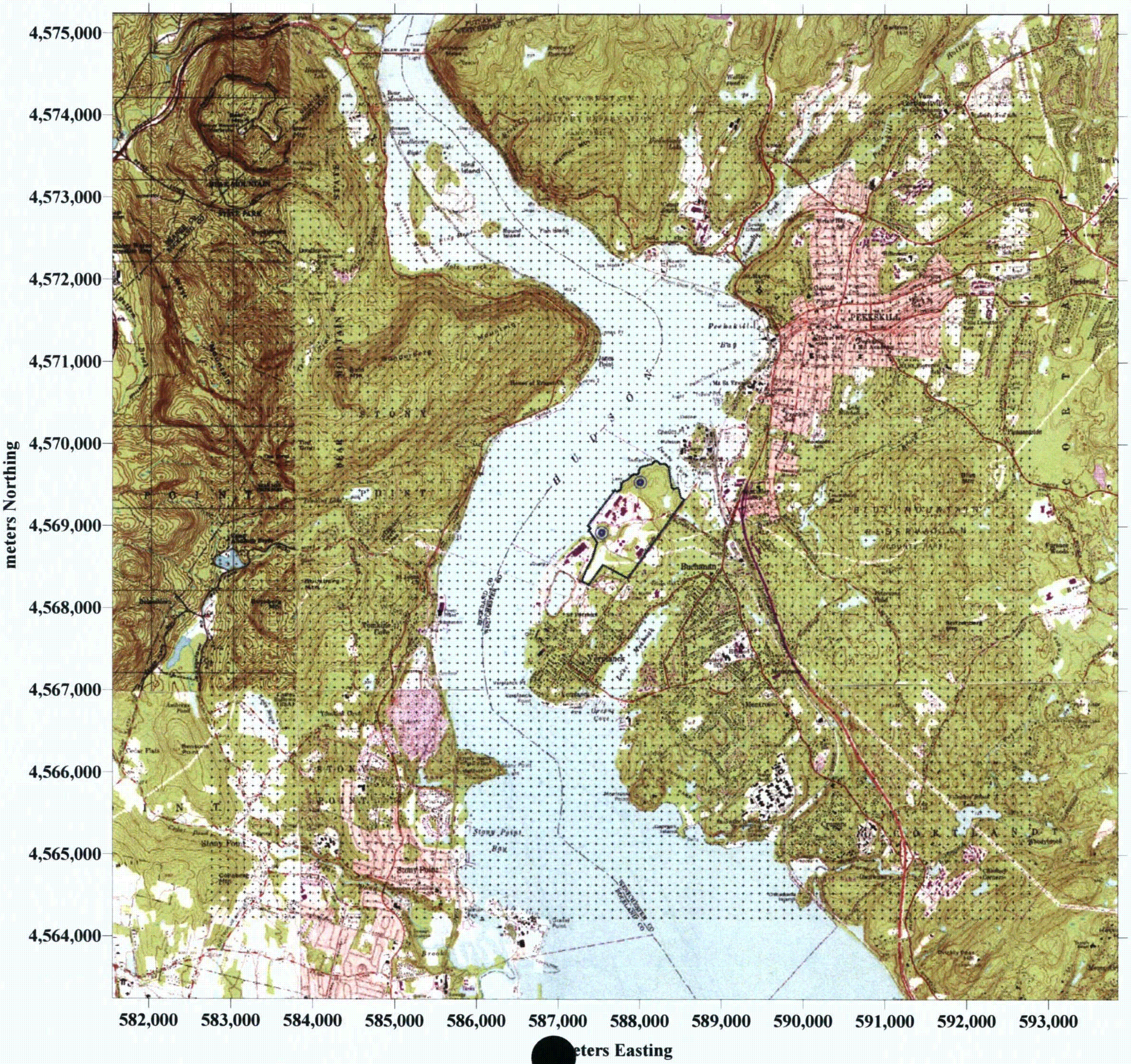


Figure 3-3: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (ug/m3)

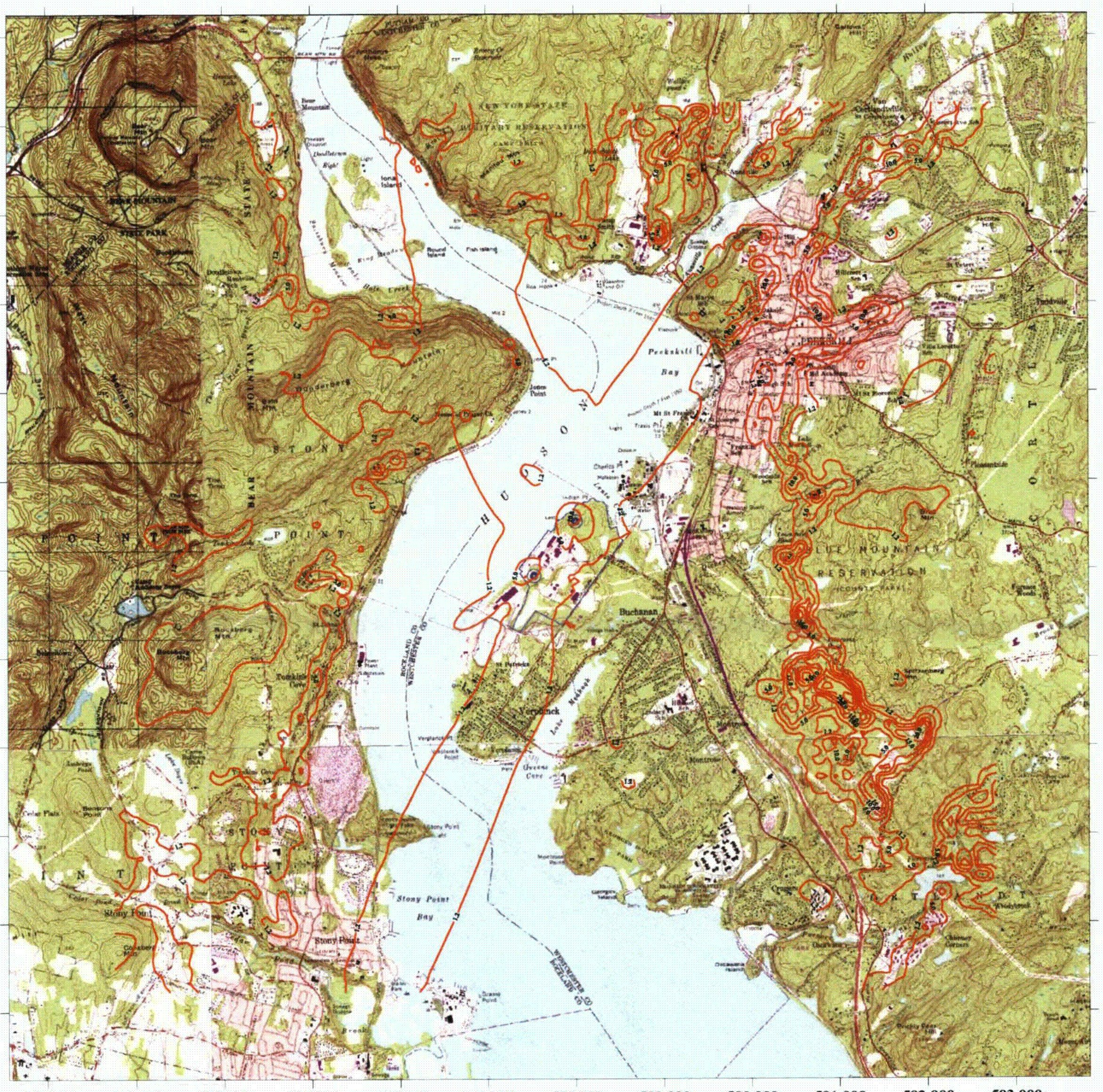


Figure 3-4: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (ug/m3)

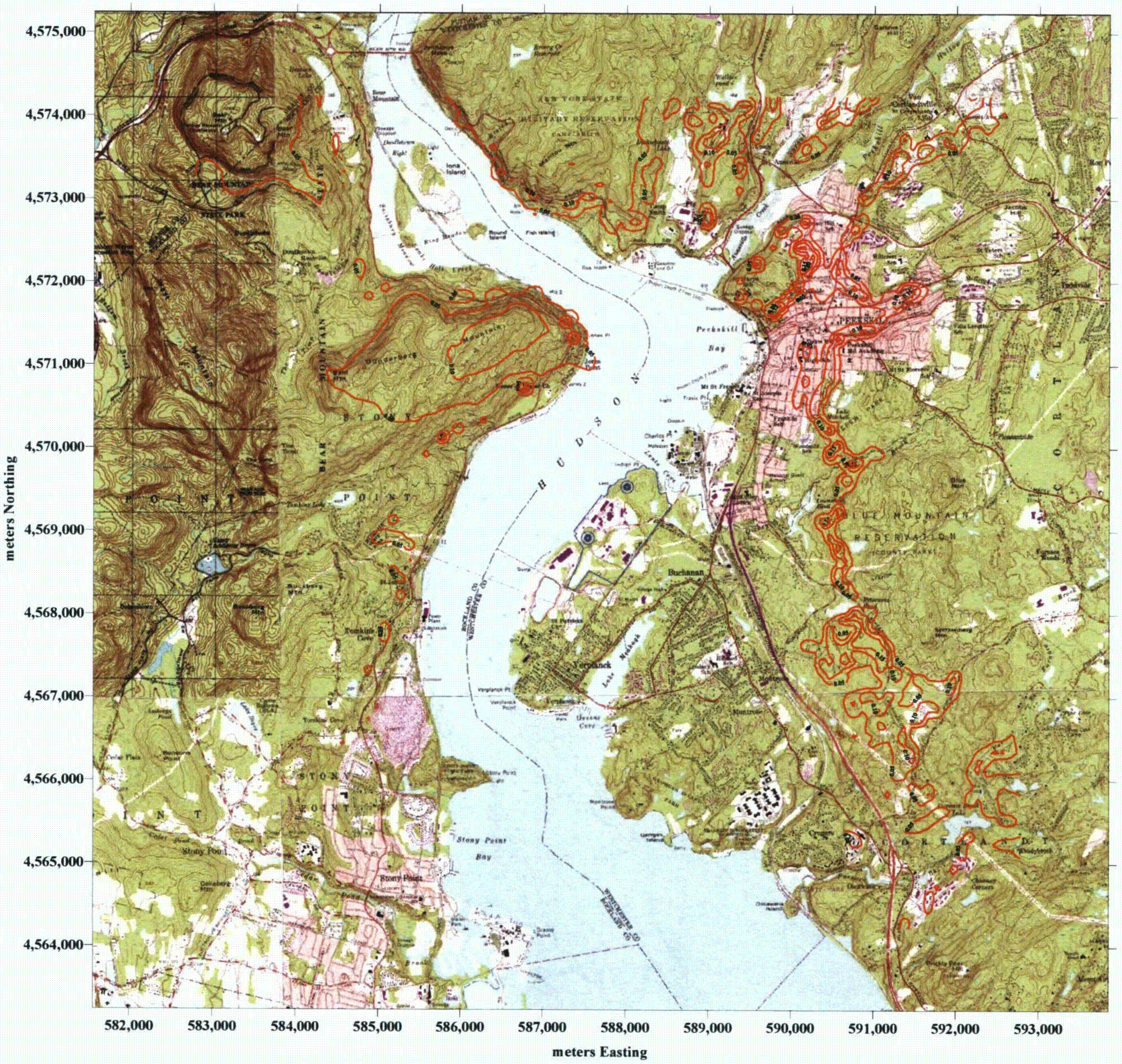


Figure 3-5: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (ug/m3)

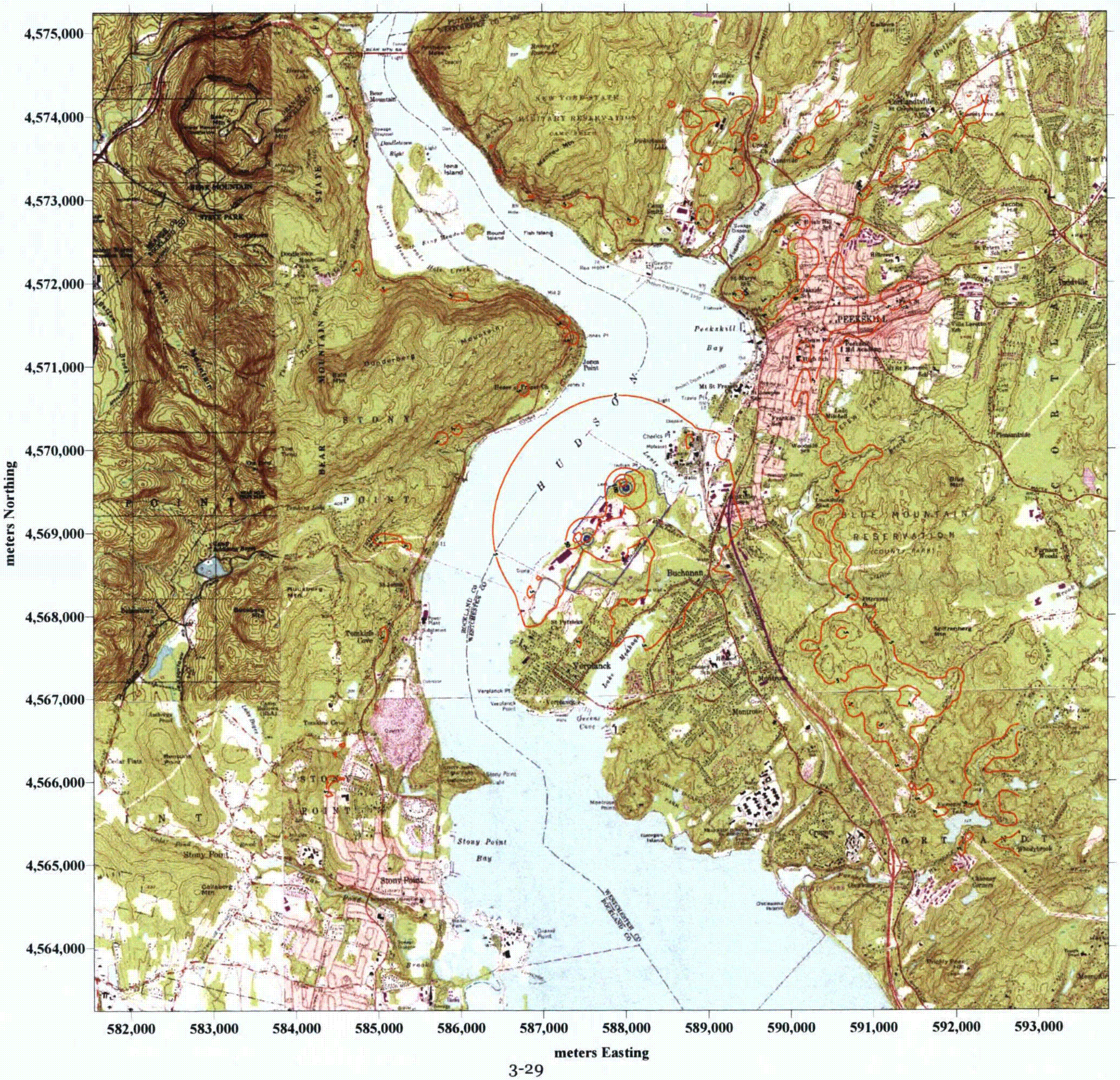


Figure 3-6: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (ug/m3)

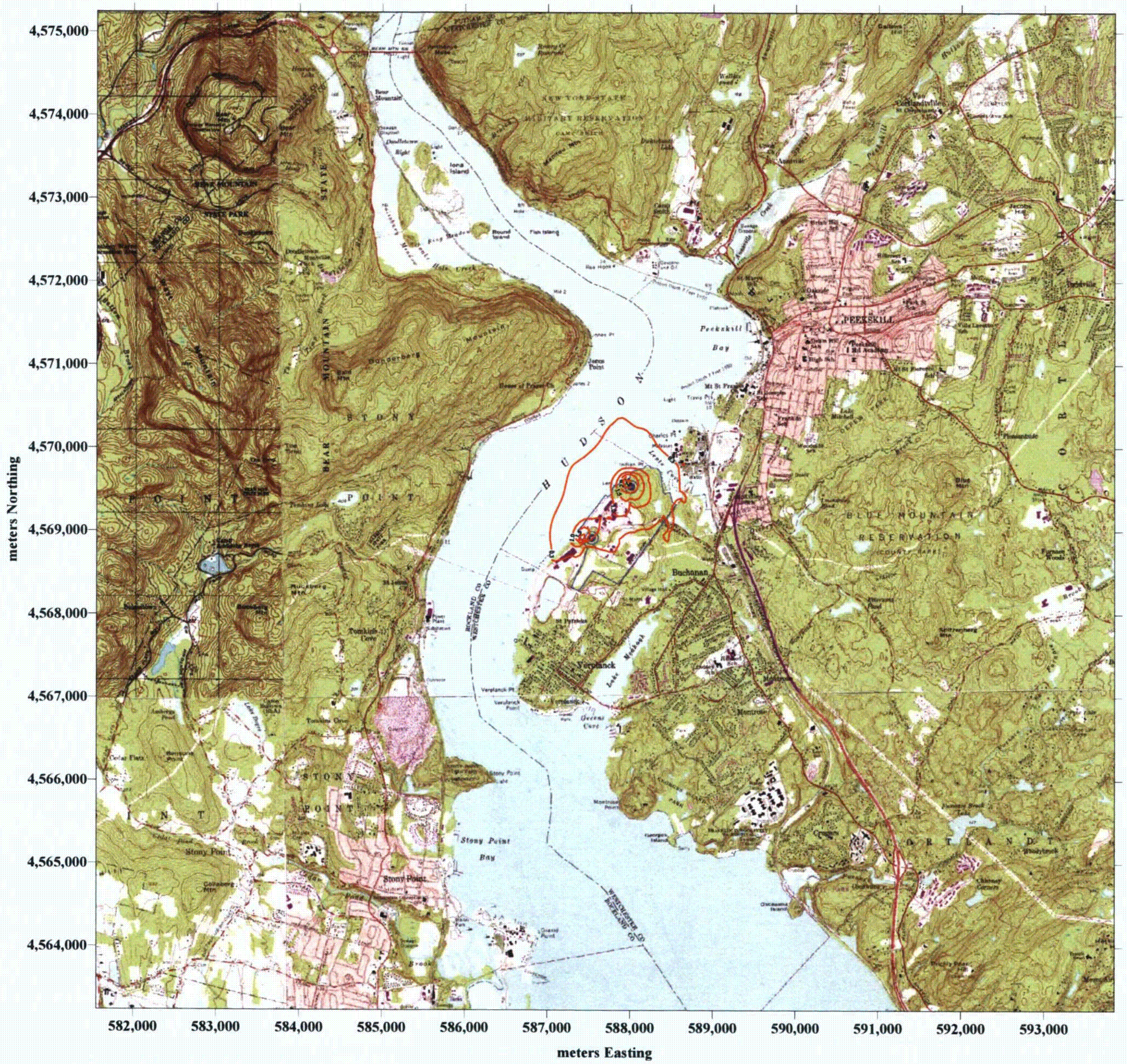


Figure 3-7: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (CT2 only) (ug/m3)

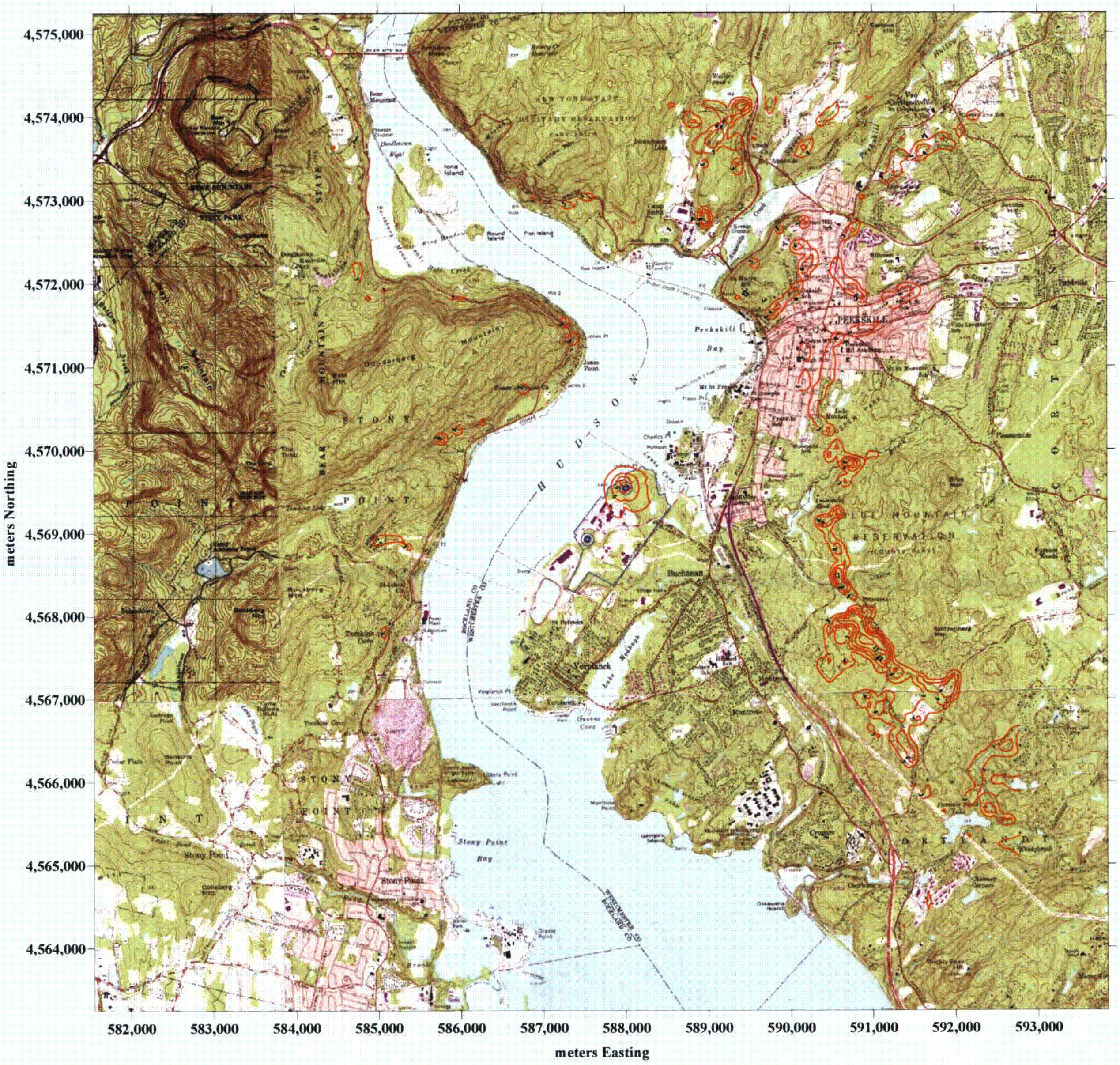


Figure 3-8: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (CT3 only) (ug/m3)

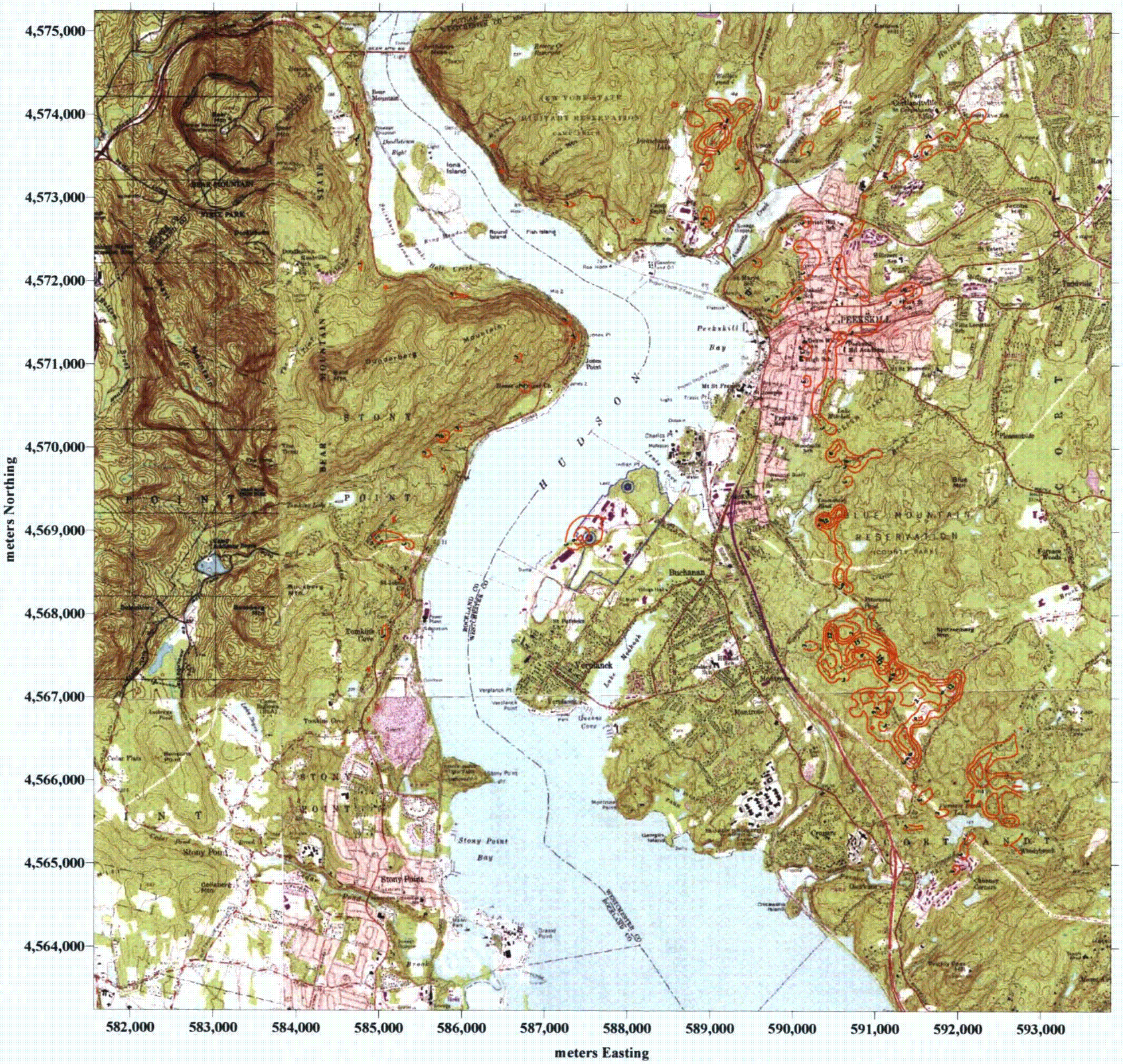


Figure 3-9: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (CT2 only) (ug/m3)

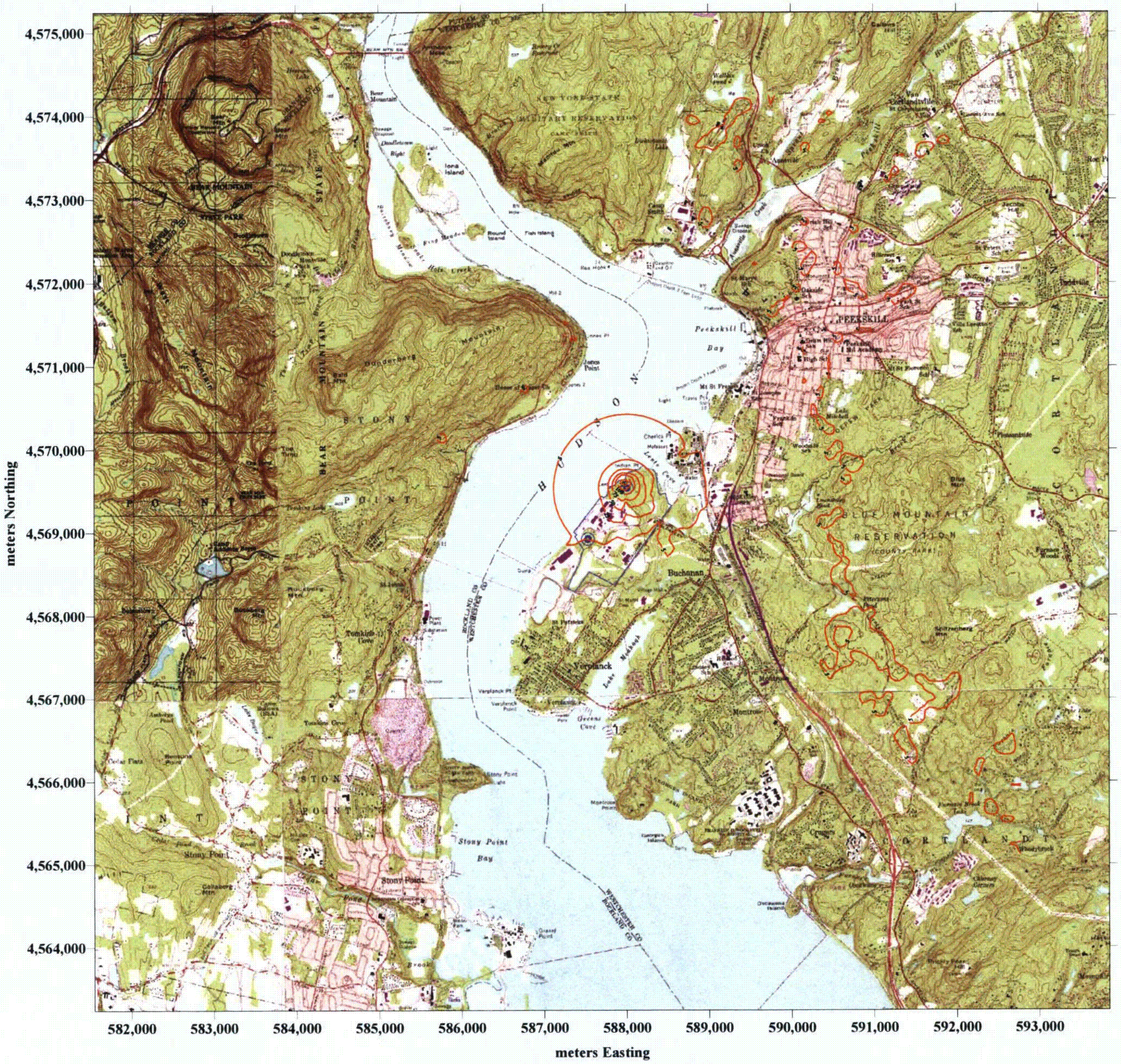


Figure 3-10: 24-Hour Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (CT3 only) (ug/m3)

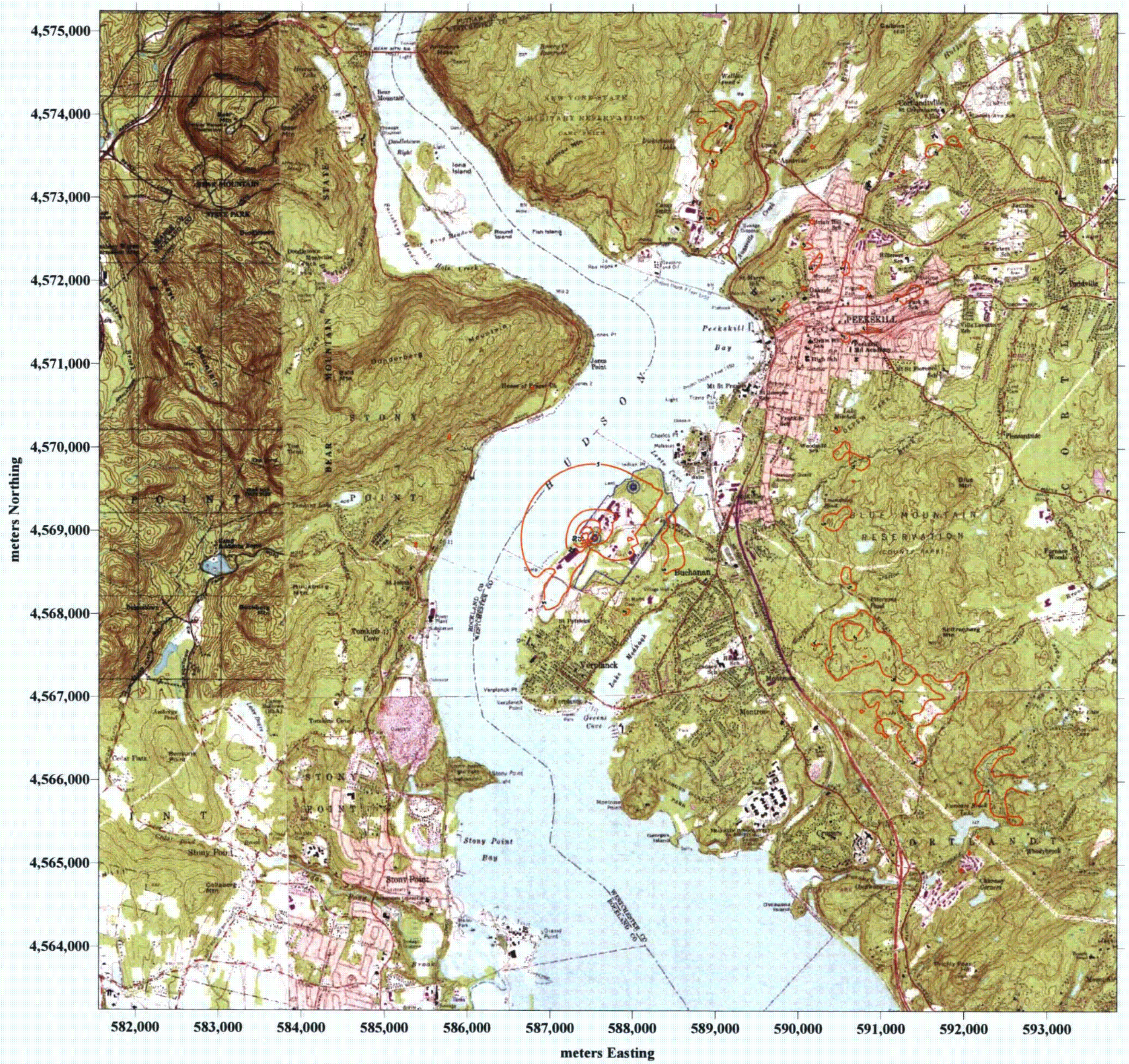


Figure 3-11: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (CT2 only) (ug/m3)

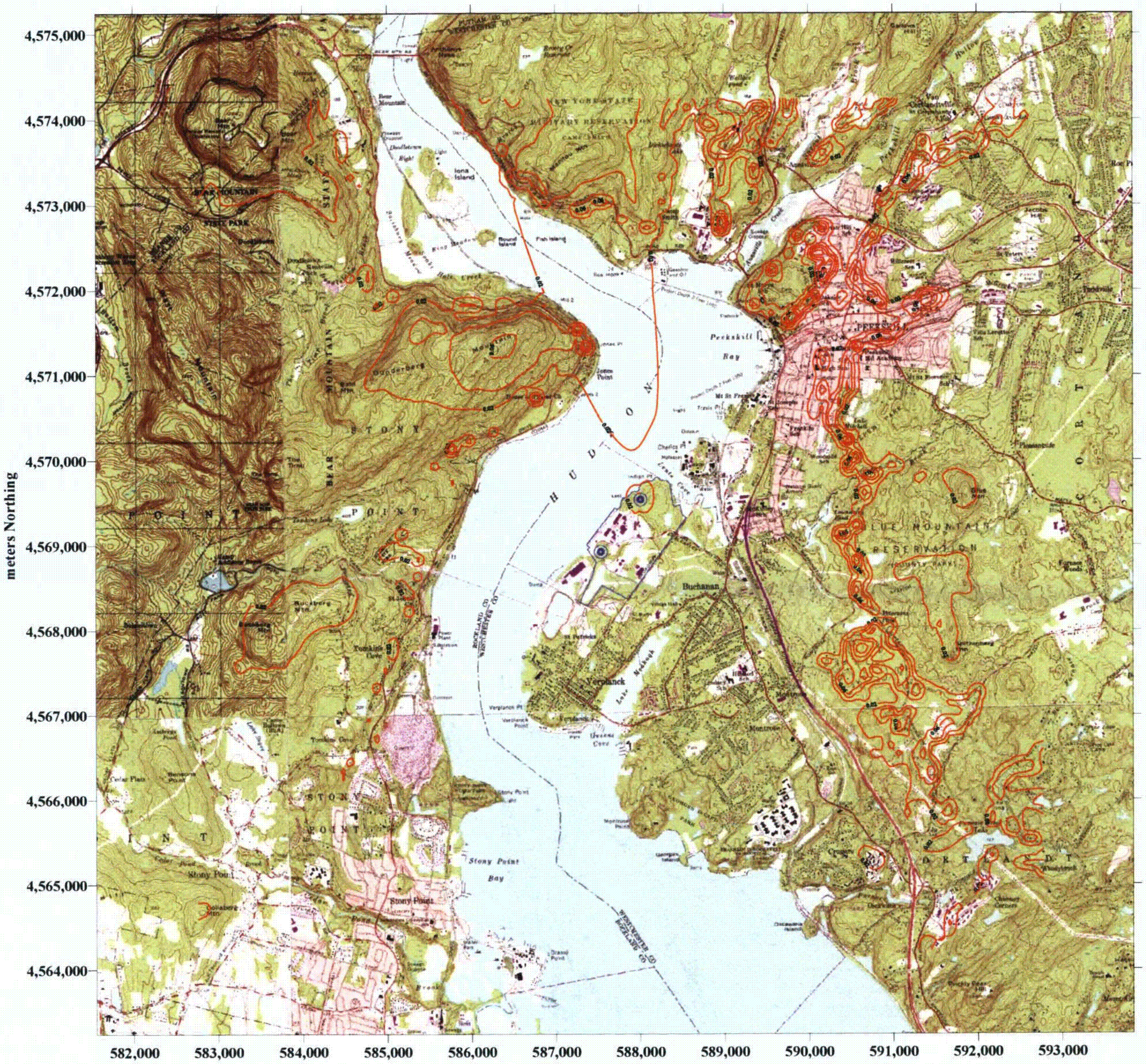


Figure 3-12: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Plume Abated Mode (CT3 only) (ug/m3)

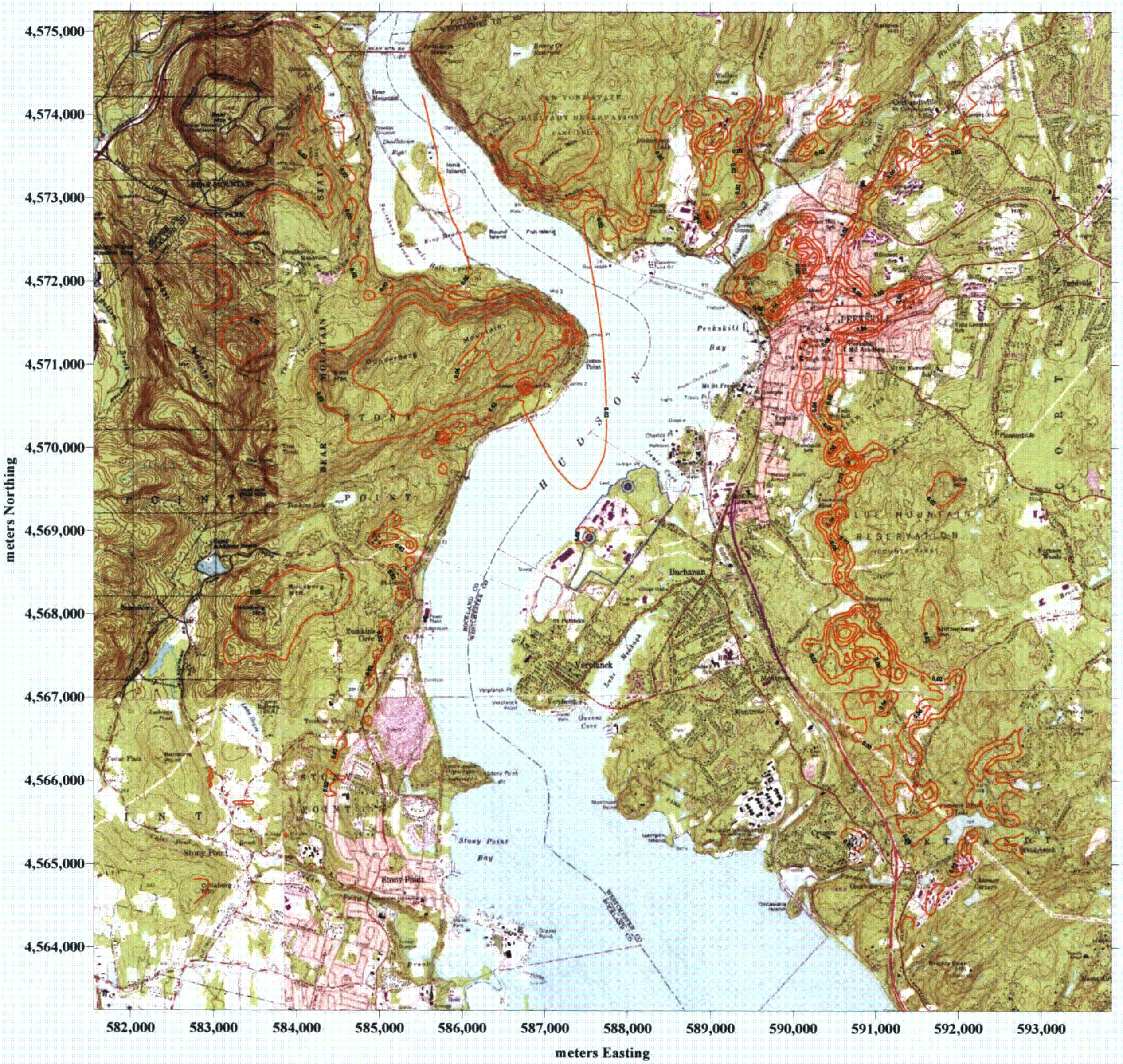


Figure 3-13: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (CT2 only) (ug/m3)

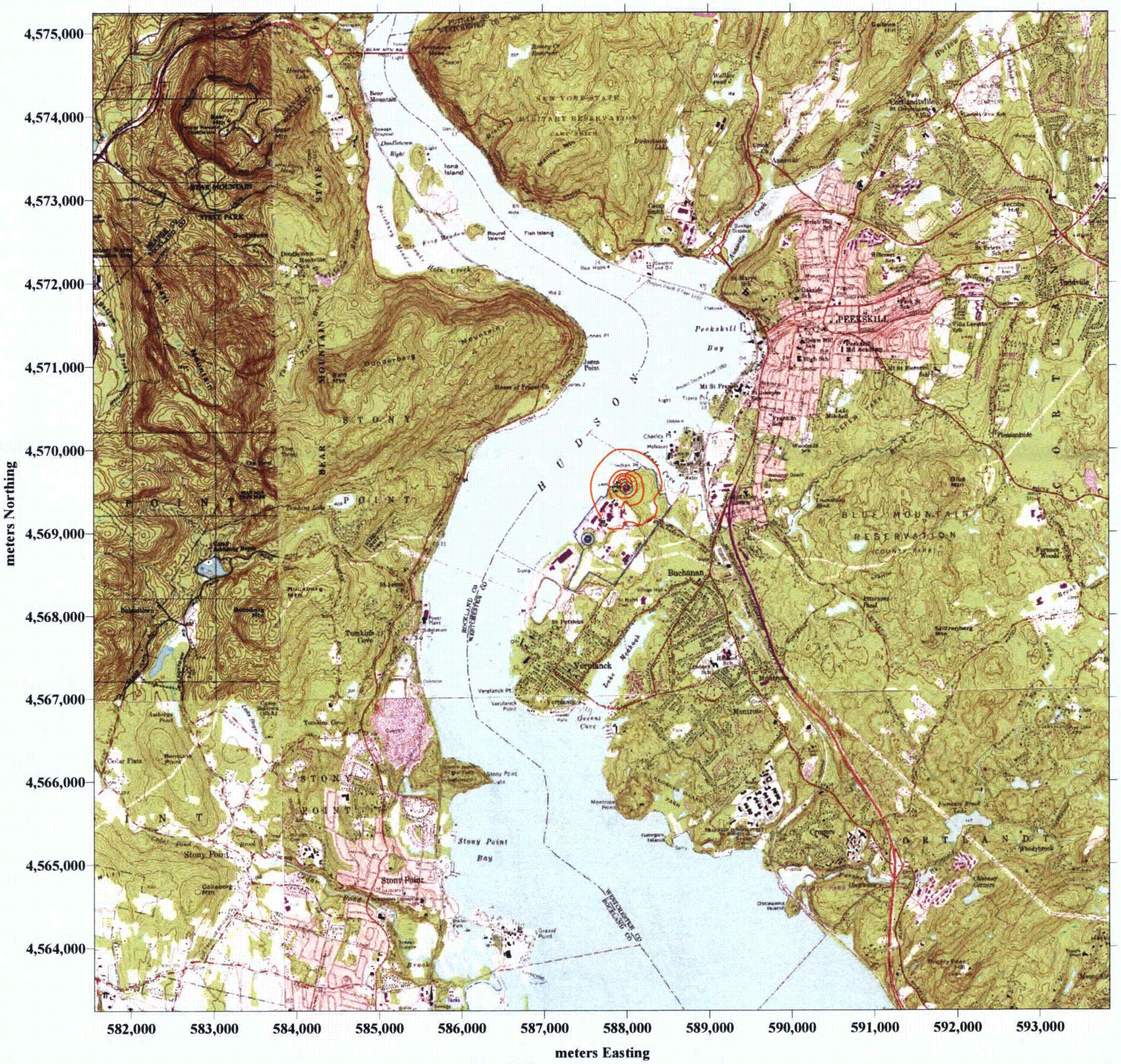


Figure 3-14: Annual Cooling Tower PM-10/PM-2.5 Concentrations in Wet Mode (CT3 only) (ug/m3)