Table 19 - 1 hr AAQC Concentration at the Receptors of Interest (Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	1 hr AAQC µg/m^3	Maximum 1 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	R1	NO_2	0	400	16.79	41.2	57.99	45.5	62.29
		CO		36200	15.76	385.6	401.36	530.3	546.06
		SO_2		690	0.19	40.8	40.99	52.3	52.49
		NO_2	4.5	400	17.12	41.2	58.32	45.5	62.62
		CO		36200	16.07	385.6	401.67	530.3	546.37
		SO_2		690	0.20	40.8	41	52.3	52.5
	R2	NO_2	0	400	12.03	41.2	53.23	45.5	57.53
		CO		36200	11.29	385.6	396.89	530.3	541.59
		SO_2		690	0.14	40.8	40.94	52.3	52.44
		NO_2	4.5	400	12.08	41.2	53.28	45.5	57.58
		CO		36200	11.34	385.6	396.94	530.3	541.64
		SO_2		690	0.14	40.8	40.94	52.3	52.44
	R3	NO_2	0	400	11.22	41.2	52.42	45.5	56.72
		CO		36200	10.53	385.6	396.13	530.3	540.83
		SO_2		690	0.13	40.8	40.93	52.3	52.43
		NO_2	4.5	400	11.23	41.2	52.43	45.5	56.73
		CO		36200	10.54	385.6	396.14	530.3	540.84
		SO_2		690	0.13	40.8	40.93	52.3	52.43
	R4	NO_2	0	400	9.76	41.2	50.96	45.5	55.26
		CO		36200	9.16	385.6	394.76	530.3	539.46
		SO_2		690	0.11	40.8	40.91	52.3	52.41
		NO_2	4.5	400	9.76	41.2	50.96	45.5	55.26
		CO		36200	9.16	385.6	394.76	530.3	539.46
		SO_2		690	0.11	40.8	40.91	52.3	52.41

Scenario	Receptor	Species	Flagpole Elevation (m)	1 hr AAQC µg/m^3	Maximum 1 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
	R5	NO_2	0	400	9.20	41.2	50.4	45.5	54.7
		CO		36200	8.63	385.6	394.23	530.3	538.93
		SO_2		690	0.11	40.8	40.91	52.3	52.41
		NO_2	4.5	400	9.19	41.2	50.39	45.5	54.69
		CO		36200	8.63	385.6	394.23	530.3	538.93
		SO_2		690	0.11	40.8	40.91	52.3	52.41
	R6	NO_2	0	400	12.48	41.2	53.68	45.5	57.98
		CO		36200	11.71	385.6	397.31	530.3	542.01
		SO_2		690	0.14	40.8	40.94	52.3	52.44
		NO_2	4.5	400	12.51	41.2	53.71	45.5	58.01
		CO		36200	11.74	385.6	397.34	530.3	542.04
		SO_2		690	0.14	40.8	40.94	52.3	52.44

Table 20 - 1 hr AAQC Concentration at the Receptors of Interest (Start-up followed by Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	1 hr AAQC µg/m^3	Maximum 1 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 2 Start-up followed by Full Load Operation	R1	NO_2	0	400	19.38	41.2	60.58	45.5	64.88
		CO		36200	30.39	385.6	415.99	530.3	560.69
		SO_2		690	0.18	40.8	40.98	52.3	52.48
		NO_2	4.5	400	19.76	41.2	60.96	45.5	65.26
		CO		36200	30.99	385.6	416.59	530.3	561.29
		SO_2		690	0.18	40.8	40.98	52.3	52.48
	R2	NO_2	0	400	13.88	41.2	55.08	45.5	59.38
		CO		36200	21.77	385.6	407.37	530.3	552.07
		SO_2		690	0.13	40.8	40.93	52.3	52.43
		NO_2	4.5	400	13.94	41.2	55.14	45.5	59.44
		CO		36200	21.86	385.6	407.46	530.3	552.16
		SO_2		690	0.13	40.8	40.93	52.3	52.43
	R3	NO_2	0	400	12.95	41.2	54.15	45.5	58.45
		CO		36200	20.31	385.6	405.91	530.3	550.61
		SO_2		690	0.12	40.8	40.92	52.3	52.42
		NO_2	4.5	400	12.96	41.2	54.16	45.5	58.46
		CO		36200	20.33	385.6	405.93	530.3	550.63
		SO_2		690	0.12	40.8	40.92	52.3	52.42
	R4	NO_2	0	400	11.26	41.2	52.46	45.5	56.76
		CO		36200	17.65	385.6	403.25	530.3	547.95
		SO_2		690	0.10	40.8	40.9	52.3	52.4
		NO_2	4.5	400	11.26	41.2	52.46	45.5	56.76
		CO		36200	17.66	385.6	403.26	530.3	547.96
		SO_2		690	0.10	40.8	40.9	52.3	52.4

Scenario	Receptor	Species	Flagpole Elevation (m)	1 hr AAQC µg/m^3	Maximum 1 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
	R5	NO_2	0	400	10.61	41.2	51.81	45.5	56.11
		CO		36200	16.64	385.6	402.24	530.3	546.94
		SO_2		690	0.10	40.8	40.9	52.3	52.4
		NO_2	4.5	400	10.61	41.2	51.81	45.5	56.11
		CO		36200	16.63	385.6	402.23	530.3	546.93
		SO_2		690	0.10	40.8	40.9	52.3	52.4
	R6	NO_2	0	400	14.40	41.2	55.6	45.5	59.9
		CO		36200	22.58	385.6	408.18	530.3	552.88
		SO_2		690	0.13	40.8	40.93	52.3	52.43
		NO_2	4.5	400	14.44	41.2	55.64	45.5	59.94
		CO		36200	22.64	385.6	408.24	530.3	552.94
		SO_2		690	0.13	40.8	40.93	52.3	52.43

Table 21 - 8 hr AAQC Concentration at the Receptors of Interest (Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	8 hr AAQC µg/m^3	Maximum 8 hr Concentration µg/m^3	Average 8 hr Concentration (2006 through 2010)		Maximum 8 hr Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	R1	CO	0	15700	12.18	867.7	879.88	1096.7	1108.88
		CO	4.5	15700	12.38	867.7	880.08	1096.7	1109.08
	R2	CO	0	15700	7.79	867.7	875.49	1096.7	1104.49
		CO	4.5	15700	7.72	867.7	875.42	1096.7	1104.42
	R3	CO	0	15700	7.26	867.7	874.96	1096.7	1103.96
		CO	4.5	15700	7.16	867.7	874.86	1096.7	1103.86
	R4	CO	0	15700	7.06	867.7	874.76	1096.7	1103.76
		CO	4.5	15700	6.96	867.7	874.66	1096.7	1103.66
	R5	CO	0	15700	5.81	867.7	873.51	1096.7	1102.51
		CO	4.5	15700	5.88	867.7	873.58	1096.7	1102.58
	R6	CO	0	15700	7.12	867.7	874.82	1096.7	1103.82
		CO	4.5	15700	7.16	867.7	874.86	1096.7	1103.86

Table 22 - 8 hr AAQC Concentration at the Receptors of Interest (Start-up followed by Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	8 hr AAQC µg/m^3	Maximum 8 hr Concentration µg/m^3	Average 8 hr Concentration (2006 through 2010)		Maximum 8 hr Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 2 Start-up followed by Full Load Operation	R1	CO	0	15700	26.27	867.7	893.97	1096.7	1122.97
		CO	4.5	15700	26.71	867.7	894.41	1096.7	1123.41
	R2	CO	0	15700	16.80	867.7	884.5	1096.7	1113.5
		CO	4.5	15700	16.65	867.7	884.35	1096.7	1113.35
	R3	CO	0	15700	15.66	867.7	883.36	1096.7	1112.36
		CO	4.5	15700	15.45	867.7	883.15	1096.7	1112.15
	R4	CO	0	15700	15.23	867.7	882.93	1096.7	1111.93
		CO	4.5	15700	15.02	867.7	882.72	1096.7	1111.72
	R5	CO	0	15700	12.54	867.7	880.24	1096.7	1109.24
		CO	4.5	15700	12.69	867.7	880.39	1096.7	1109.39
	R6	CO	0	15700	15.37	867.7	883.07	1096.7	1112.07
		CO	4.5	15700	15.46	867.7	883.16	1096.7	1112.16

Table 23 - 24 hr AAQC Concentration at the Receptors of Interest (Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	24 hr AAQC µg/m^3	Maximum 24 hr Concentration µg/m^3	Average 24 hr Concentration (2006 through 2010)		Maximum 24 hr Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	R1	NO_2	0	200	1.63	58.2	59.83	65.3	66.93
		SO_2		275	0.0019	260	260.0019	534.4	534.4019
		PM10		50	0.25	N/A	N/A	N/A	N/A
		PM2.5		30	0.25	37.4	37.65	46	46.25
		NO_2	4.5	200	1.65	58.2	59.85	65.3	66.95
		SO_2		275	0.0019	260	260.0019	534.4	534.4019
		PM10		50	0.26	N/A	N/A	N/A	N/A
		PM2.5		30	0.26	37.4	N/A	46	N/A
	R2	NO_2	0	200	1.16	58.2	59.36	65.3	66.46
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
		NO_2	4.5	200	1.16	58.2	59.36	65.3	66.46
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
	R3	NO_2	0	200	1.06	58.2	59.26	65.3	66.36
		SO_2		275	0.0012	260	260.0012	534.4	534.4012
		PM10		50	0.17	N/A	N/A	N/A	N/A
		PM2.5		30	0.17	37.4	N/A	46	N/A
		NO_2	4.5	200	1.05	58.2	59.25	65.3	66.35
		SO_2		275	0.0012	260	260.0012	534.4	534.4012
		PM10		50	0.16	N/A	N/A	N/A	N/A
		PM2.5		30	0.16	37.4	N/A	46	N/A

Scenario	Receptor	Species	Flagpole Elevation (m)	24 hr AAQC µg/m^3	Maximum 24 hr Concentration µg/m^3	Average 24 hr Concentration (2006 through 2010)		Maximum 24 hr Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
	R4	NO_2	0	200	0.98	58.2	59.18	65.3	66.28
		SO_2		275	0.0011	260	260.0011	534.4	534.4011
		PM10		50	0.15	N/A	N/A	N/A	N/A
		PM2.5		30	0.15	37.4	N/A	46	N/A
		NO_2	4.5	200	0.97	58.2	59.17	65.3	66.27
		SO_2		275	0.0011	260	260.0011	534.4	534.4011
		PM10		50	0.15	N/A	N/A	N/A	N/A
		PM2.5		30	0.15	37.4	N/A	46	N/A
	R5	NO_2	0	200	0.71	58.2	58.91	65.3	66.01
		SO_2		275	0.0008	260	260.0008	534.4	534.4008
		PM10		50	0.11	N/A	N/A	N/A	N/A
		PM2.5		30	0.11	37.4	N/A	46	N/A
		NO_2	4.5	200	0.70	58.2	58.9	65.3	66
		SO_2		275	0.0008	260	260.0008	534.4	534.4008
		PM10		50	0.11	N/A	N/A	N/A	N/A
		PM2.5		30	0.11	37.4	N/A	46	N/A
	R6	NO_2	0	200	1.14	58.2	59.34	65.3	66.44
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
		NO_2	4.5	200	1.14	58.2	59.34	65.3	66.44
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A

Table 24 - 24 hr AAQC Concentration at the Receptors of Interest (Start-up followed by Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	24 hr AAQC µg/m^3	Maximum 24 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 2 Start-up followed by Full Load Operation	R1	NO_2	0	200	2.43	58.2	60.63	65.3	67.73
		SO_2		275	0.0019	260	260.0019	534.4	534.4019
		PM10		50	0.25	N/A	N/A	N/A	N/A
		PM2.5		30	0.25	37.4	37.65	46	46.25
		NO_2	4.5	200	2.47	58.2	60.67	65.3	67.77
		SO_2		275	0.0020	260	260.002	534.4	534.402
		PM10		50	0.26	N/A	N/A	N/A	N/A
		PM2.5		30	0.26	37.4	N/A	46	N/A
	R2	NO_2	0	200	1.73	58.2	59.93	65.3	67.03
		SO_2		275	0.0014	260	260.0014	534.4	534.4014
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
		NO_2	4.5	200	1.73	58.2	59.93	65.3	67.03
		SO_2		275	0.0014	260	260.0014	534.4	534.4014
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
	R3	NO_2	0	200	1.58	58.2	59.78	65.3	66.88
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.17	N/A	N/A	N/A	N/A
		PM2.5		30	0.17	37.4	N/A	46	N/A
		NO_2	4.5	200	1.56	58.2	59.76	65.3	66.86
		SO_2		275	0.0012	260	260.0012	534.4	534.4012
		PM10		50	0.16	N/A	N/A	N/A	N/A
		PM2.5		30	0.16	37.4	N/A	46	N/A

Scenario	Receptor	Species	Flagpole Elevation (m)	24 hr AAQC µg/m^3	Maximum 24 hr Concentration µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
	R4	NO_2	0	200	1.46	58.2	59.66	65.3	66.76
		SO_2		275	0.0012	260	260.0012	534.4	534.4012
		PM10		50	0.15	N/A	N/A	N/A	N/A
		PM2.5		30	0.15	37.4	N/A	46	N/A
		NO_2	4.5	200	1.45	58.2	59.65	65.3	66.75
		SO_2		275	0.0011	260	260.0011	534.4	534.4011
		PM10		50	0.15	N/A	N/A	N/A	N/A
		PM2.5		30	0.15	37.4	N/A	46	N/A
	R5	NO_2	0	200	1.05	58.2	59.25	65.3	66.35
		SO_2		275	0.0008	260	260.0008	534.4	534.4008
		PM10		50	0.11	N/A	N/A	N/A	N/A
		PM2.5		30	0.11	37.4	N/A	46	N/A
		NO_2	4.5	200	1.05	58.2	59.25	65.3	66.35
		SO_2		275	0.0008	260	260.0008	534.4	534.4008
		PM10		50	0.11	N/A	N/A	N/A	N/A
		PM2.5		30	0.11	37.4	N/A	46	N/A
	R6	NO_2	0	200	1.71	58.2	59.91	65.3	67.01
		SO_2		275	0.0014	260	260.0014	534.4	534.4014
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A
		NO_2	4.5	200	1.70	58.2	59.9	65.3	67
		SO_2		275	0.0013	260	260.0013	534.4	534.4013
		PM10		50	0.18	N/A	N/A	N/A	N/A
		PM2.5		30	0.18	37.4	N/A	46	N/A

Table 25 - Annual AAQC Concentration at the Receptors of Interest (Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	Annual AAQC µg/m^3	Maximum Annual Concentration µg/m^3	Average Annual Concentration (2006 through 2010)		Maximum Annual Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	R1	SO_2	0	55	0.00235	17.9	17.90235	22.8	22.80235
			4.5		0.00238	17.9	17.90238	22.8	22.80238
	R2	SO_2	0	55	0.0014	17.9	17.9014	22.8	22.8014
			4.5		0.0014	17.9	17.9014	22.8	22.8014
	R3	SO_2	0	55	0.00187	17.9	17.90187	22.8	22.80187
			4.5		0.00185	17.9	17.90185	22.8	22.80185
	R4	SO_2	0	55	0.00162	17.9	17.90162	22.8	22.80162
			4.5		0.00161	17.9	17.90161	22.8	22.80161
	R5	SO_2	0	55	0.00112	17.9	17.90112	22.8	22.80112
			4.5		0.00112	17.9	17.90112	22.8	22.80112
	R6	SO_2	0	55	0.00126	17.9	17.90126	22.8	22.80126
			4.5		0.00125	17.9	17.90125	22.8	22.80125

Table 26 - Annual AAQC Concentration at the Receptors of Interest (Start-up followed by Full Load Operation)

Scenario	Receptor	Species	Flagpole Elevation (m)	Annual AAQC µg/m^3	Maximum Annual Concentration µg/m^3	Average Annual Concentration (2006 through 2010)		Maximum Annual Concentration (2006 through 2010)	
						Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 2 Start-up followed by Full Load Operation	R1	SO_2	0	55	0.00227	17.9	17.90227	22.8	22.80227
			4.5		0.00230	17.9	17.9023	22.8	22.8023
	R2	SO_2	0	55	0.00135	17.9	17.90135	22.8	22.80135
			4.5		0.00135	17.9	17.90135	22.8	22.80135
	R3	SO_2	0	55	0.00181	17.9	17.90181	22.8	22.80181
			4.5		0.00179	17.9	17.90179	22.8	22.80179
	R4	SO_2	0	55	0.00157	17.9	17.90157	22.8	22.80157
			4.5		0.00155	17.9	17.90155	22.8	22.80155
	R5	SO_2	0	55	0.00108	17.9	17.90108	22.8	22.80108
			4.5		0.00108	17.9	17.90108	22.8	22.80108
	R6	SO_2	0	55	0.00122	17.9	17.90122	22.8	22.80122
			4.5		0.00121	17.9	17.90121	22.8	22.80121

9.6 Cooling Tower and Stack Moisture Plume Analysis Results

A detailed analysis and conclusion for the cooling tower moisture plume and icing analysis can be found in Appendix A of this report.

10 Conclusions

The emissions from the Green Electron east site will meet the MOE Guideline A-5 for limits of oxides for nitrogen, carbon monoxide, and sulphur dioxide emissions. The emissions from the Green Electron east site will meet the Ontario Regulation 419/05 point of impingement criteria using AERMOD modeling. The analyses also showed that the air emissions from the proposed power plant will be below the O.Reg 419/05 POI criteria under all normal operating conditions, during start up conditions followed by full load operations and under worst-case meteorological conditions. The analyses also showed that the point of impingement contaminant concentrations at the receptors of interest will be a fraction of the POI permissible criteria.

The analyses also showed that the proposed power plant's air emissions in terms of their influence on local ambient air quality data will be only slight and only in the local vicinity of the facility and, are unlikely to contribute to any short term exceedances of MOE Ambient Air Quality Criteria. The analyses shows that the impact of the proposed facility on medium-term air quality will also not result in any exceedances of the MOE Ambient Air Quality Criteria, but occasionally, very small exceedances of the interim 24 hr PM2.5 will occur. Existing ambient air quality will be affected only slightly and only close to the operating facility. Nitrogen oxides, carbon monoxide, sulphur dioxide, and PM10 (assumed to be 100% PM2.5) emissions from the proposed power plant will increase the concentration of these contaminants only slightly in the immediate vicinity of the facility.

Due to the small contribution of the project to ambient NOx concentrations, the potential for contribution of the project to ground level ozone and smog levels is very modest. The project was found to have no significant health impacts in relation to its emissions. Moreover, the project can be expected to have a positive impact on human health due to its role in the phase out of coal fired electricity generation.

Appendix A - Ortech Environmental - Cooling Tower Icing Study

ORTECH Environmental
a division of ORTECH Consulting Inc.

Cooling Tower Icing Study for the Green Electron Power Project (East Site)

A Report to: Greenfield South Power Corporation
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TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY 1

1. INTRODUCTION 2

2. METHODOLOGIES AND BENCHMARKING 2
   2.1 Methodologies 2
   2.2 Benchmarking 8

3. SUMMARY OF RESULTS 9

REFERENCES 12

Table 1 Summary of Modelling Results 1
Table 2 Summary of Drift Particle Size Distribution 6
Table 3 Modelling Results 10

Figure 1 Receptors of Interest 7
Figure 2 Receptors with Expected Icing Events 11

Attachment A Dispersion Modelling Input and Output Files

EXECUTIVE SUMMARY

ORTECH Environmental (ORTECH) was retained by Greenfield South Power Corporation (GSPC) to assess the risk of icing impacts on roadways near the proposed Green Electron Power Plant (East Site) to be located on Oil Springs Line about 0.7 kilometers from Highway 40, near Courtright, Ontario.

Dispersion modeling was utilized to examine both the potential for the water vapour plume from the cooling towers to touch down on the arterial and local roadways as well as the potential for deposition of the water particles that are present in the plume leaving the cooling towers.

A summary of the modeling results in terms of icing potential events due to the proposed cooling towers is presented in Table 1. Based on these results, the icing potential on the arterial and local roads due to the proposed cooling towers is almost negligible.

Table 1: Summary of Modelling Results

Water Vapor				
Receptors		Annual Number of Potential Icing Events Likely Caused by Saturated Plume Touching the Ground		
		Consecutive 3 Hours or More	Consecutive 5 Hours or More	Consecutive 10 Hours or More
Arterial Roads	Oil Springs Line	1	<1	0
	Highway 40	1	0	0
	Total	1	<1	0
Local Roads	Bickford Line	0	0	0
	Greenfield Road	0	0	0
	Total	0	0	0
Drift Droplets Fallout				
Receptors		Annual Number of Potential Icing Events of 10 g/m2 or more of Drift Fallout		
		Consecutive 3 Hours or More	Consecutive 5 Hours or More	Consecutive 10 Hours or More
Aterial Roads	Oil Springs Line	0	0	0
	Highway 40	0	0	0
	Total	0	0	0
Local Roads	Bickford Line	0	0	0
	Greenfield Road	0	0	0
	Total	0	0	0

1. INTRODUCTION

ORTECH Environmental (ORTECH) was retained by Greenfield South Power Corporation (GSPC) to assess the risk of icing impacts on roadways near the proposed Green Electron Power Plant (East Site) to be located on Oil Springs Line about 0.7 kilometers east of Highway 40, near Courtright, Ontario.

2. METHODOLOGIES AND BENCHMARKING

Fogging is likely to occur when air is cooled to or below its dew point temperature and/or enough moisture is added to the air within a water vapour plume to reach or exceed the point of saturation. Icing can occur when fogging occurs and air is below the freezing temperatures (32°C or 0°C)[1] and the plume touches down on a solid surface that is also below 0°C. This so called 'rime' icing has been observed from mechanical-draft cooling towers, as has another form of icing that has been documented when water droplets are entrained in the exhaust air ('drift droplets') impact on the ground and freeze[2].

2.1 Methodologies

AERMOD is an approved Ministry of the Environment (MOE) dispersion model as stated in Subsection 6 (1) of Ontario Regulation 419/05: Air Pollution – Local Air Quality. The model was specially designed to support the US EPA's regulatory modeling programs. AERMOD is a steady-state straight-line Gaussian plume model that incorporates a "state-of-science" modeling platform.

Although AERMOD is not typically used to predict steam plume icing (such modelling is not required for US regulatory purposes), the model (version 12060) was used with some simple modelling assumptions to assess fogging and icing:

- There is no change to spatial or temporal atmospheric pressure, temperature and humidity within the model domain;
- There is a constant liquid water quantity in the plume;
- There is no in-plume evapouration or condensation; and
- The plume temperature quickly mixes to the ambient condition.

Electronic copies of the dispersion modelling files are provided in Attachment A.

Under these assumptions, the rime icing potential at freezing temperatures was determined by comparing the moisture deficit to reach saturation (i.e., the difference between the actual relative humidity and 100% humidity) in the atmosphere and the dispersed water vapour concentration from the cooling towers at the specific receptors. The 'dry deposition algorithm' (i.e., the model section that looks at particle fallout [termed 'dry'] as opposed to the model section that looks at particle washout due to precipitation [termed 'wet']) of AERMOD was used to predict the deposition of the drift droplets, as an indicator to look for the other form of icing potential.

Vapour Plume Formulation and Touchdown

The saturated vapor pressure of water was calculated using a formula by Wexler[3]:

$$\ln e_{sat} = \sum_{i-0}^{6} g_i T^{i-2} + g_7 \ln T$$

Where: e_{sat} is the saturated vapor pressure of water (Pa);
T is the temperature (K)
g0 = -2.99x10 ;
g1 = -6.02×10^{3};
g2 = 1.89×10^{1};
g3 = -2.83×10^{-2};
g4 = 1.78×10^{-5}
g5 = -8.42×10^{-10};
g6 = 4.44×10^{-13};
g7 = 2.86×10^{0}

Using the ideal gas law, the saturated water vapor density in the atmosphere can be calculated as:

$$SVD = \frac{e_{sat}}{RT}$$

Where: SVD is the saturated water vapor density (kg/m^3)
R is the water vapor constant (461.5 J/kg*K)
T is the ambient temperature

Based on the recorded humidity, the actual water vapor density in the atmosphere is calculated as:

$$AVD = SVD \times \frac{RH}{100}$$

Where: AVD is the actual water vapor density (kg/m^3)
RH is the relative Humidity (%)

The water vapor deficit (VDD) in the atmosphere is calculated by:

$$VDD = SVD - AVD$$

If the predicted hourly water vapor concentrations calculated by AERMOD were greater than the VDD at a specific receptor, that hour was considered to have a potential icing event when the temperature is at or below the freezing point.

Drift Droplet Size Distribution

The droplet size distribution spectrum of the drift particles from the cooling tower is provided in Table 2. The density of the drift droplets selected was 1 g/cm^3 (essentially water at standard temperature and pressure).

Meteorological Data

The Ontario Ministry of the Environment was contacted to provide assistance with regards to the meteorological data for the project. The resulting meteorological data provided by the MOE consisted of wind data from Mooreline weather station (Sarnia), temperature and relative humidity data from the Sarnia weather station, and precipitation data from Windsor. London data was used to fill in missing hours for relative humidity at Sarnia. The data set was compiled and pre-processed by the MOE using site specific surface conditions (Included in Attachment A). The pre-processed 5-year (2005-2009) meteorological data set provided was used for both AERMOD runs.

Variable Emissions

Since load on the cooling tower varies with ambient conditions, emission factors were selected to represent winter, spring and fall for both the vapour and drift models to account for the seasonally reduced water emission rates and air flow. A factor of 0.8 was applied for winter, while a factor of 0.9 was applied for the spring and fall.

Receptors of Interest

The icing potential was assessed at receptors along the following transportation routes:

- Portions of arterial roads including the Oil Springs Line and Highway 40; and
- Local roads including Greenfield Road and Bickford Line.

Within the AERMOD model, discrete receptors were spaced along these transportation routes at 10 metre intervals, within a 2.5 km radius of the proposed sites, as shown by the red Xs on Figure 1.

Table 2: Summary of Drift Particle Size Distribution

ACCU-PAC® SURFACE MEDIA

Brentwood CDX-020 Drift Eliminator Performance Test Results

Air Velocity =	2.955	m/sec	552.4	ft/min
Water loading =	19.02	m3/hr/m2	7.78	gpm/ft2

SUMMARY DROP SIZE DISTRIBUTION

AREA SAMPLED = 5.94 m2 64 ft2
File: CDX20T4.SUM

Bin	D(low) microns	D(high) microns	Log D(high)	Mass Flux ug/m2/sec	Count Flux #/m2/sec	% Mass Smaller	% Count Smaller
1	10	20	1.301	0.00E+00	0.00E+00	0.000%	0.000%
2	20	30	1.477	6.98E+00	8.53E+02	0.024%	5.283%
3	30	40	1.602	1.48E+00	6.58E+01	0.030%	5.690%
4	40	50	1.699	4.40E+00	9.23E+01	0.045%	6.262%
5	50	60	1.778	1.47E+01	1.69E+02	0.097%	7.309%
6	60	70	1.845	5.62E+01	3.91E+02	0.294%	9.730%
7	70	90	1.954	1.18E+03	4.42E+03	4.432%	37.105%
8	90	110	2.041	1.64E+03	3.12E+03	10.183%	56.428%
9	110	130	2.114	2.22E+03	2.45E+03	17.969%	71.602%
10	130	150	2.176	2.50E+03	1.74E+03	26.736%	82.378%
11	150	180	2.255	2.46E+03	1.05E+03	35.363%	88.881%
12	180	210	2.322	2.15E+03	5.50E+02	42.903%	92.288%
13	210	240	2.380	2.07E+03	3.47E+02	50.163%	94.437%
14	240	270	2.431	2.59E+03	2.98E+02	59.246%	96.283%
15	270	300	2.477	2.78E+03	2.29E+02	68.995%	97.701%
16	300	350	2.544	4.56E+03	2.54E+02	84.987%	99.274%
17	350	400	2.602	1.41E+03	5.11E+01	89.932%	99.590%
18	400	450	2.653	2.26E+03	5.62E+01	97.857%	99.938%
19	450	500	2.699	4.61E+02	8.22E+00	99.474%	99.989%
20	500	600	2.778	1.50E+02	1.72E+00	100.000%	100.000%

TOTAL MASS FLUX =	2.85E+04	ug/m2/sec
TOTAL COUNT FLUX =	9.60E+04	#/m2/sec
MASS MEAN DIAMETER =	242	microns
COUNT MEAN DIAMETER =	117	microns
MASS EMISSION RATE =	1.69E-01	grams/sec

BRENTWOOD INDUSTRIES

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Page 2 of 2

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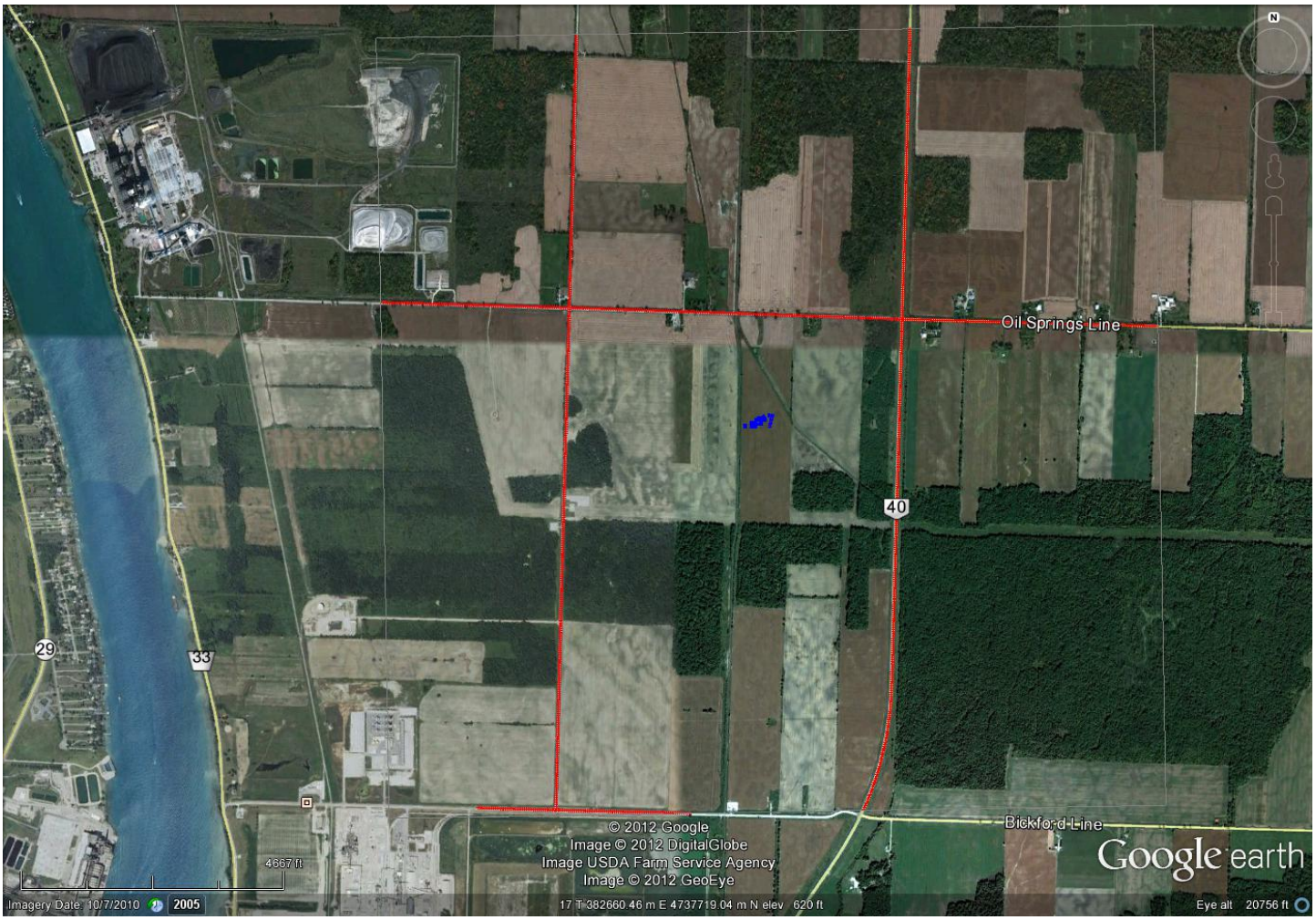
Figure 1: Receptors of Interest



2.2 Benchmarking

Ice deposition on objects in the air or on the ground is a recognized issue for ground-based communication lines; transport, aviation, transmission lines and wind power generators. Many studies have been devoted into this issue, including the freezing precipitation climatology in different regions[4,5]. However, natural icing is a very complicated process.

Since it is reasonable to assume that the contribution of moisture from the cooling towers to the atmosphere will be very minimal if the atmosphere is already saturated or there is any natural precipitation, icing potential from the cooling tower will likely only occur during those hours without natural precipitation when the ambient temperatures were at or below the freezing point (≤ 0°C).

Using the 5-year (2005-2009) meteorological data from Sarnia, there were 1097 hours (i.e., 2.5% of the time) with different forms of precipitation when the ambient temperatures were at or below the freezing point. There were 9273 hours (i.e., 21.6% of the time) when there was no precipitation and ambient temperatures were at or below the freezing point within the same 5-year period. Only these 9273 "dry hours" were assessed for the incremental icing potential by the proposed cooling towers. Further, the Green Electron Power Plant is only expected to operate on non-holiday weekdays during hours of peak and intermediate peak demand and therefore the AERMOD model was set to assess hours between 7 a.m. and 11 p.m. on weekdays (AERMOD does not allow for exclusion of holidays, resulting in slight conservatism of the results). During some of the dry, freezing hours the ground temperature might be above freezing, thus causing additional conservatism in the assessment.

In southwestern Ontario, there are about 50 icing precipitation events (some events may last for more than one hour) annually[4,5]. The number of events in Sarnia is expected to be similar.

The meteorological conditions for natural icing events have been studied[1]. Time periods of at least three hours are required to build up any significant icing[1]. There is no reason to suspect that icing from the plume would occur more quickly. Thus, in order to have icing due to the plume, the plume should steadily impinge on the ground in a condensed zone for several hours, when the temperatures are at or below freezing point.

In order to indicate the drift droplet fallout impinging on the ground and causing icing, 1/10th of the minimum reportable precipitation amount by the Environment Canada, i.e., 0.01 mm, was used to gauge the fallout. The equivalent deposition of the precipitation (DoP) can be calculated as:

$$DoP = 0.01(mm) \times 1.0(g/cm^3) = 1E^{-5}(m) \times 1E^{6}(g/m^3) = 10\ g/m^2$$

Therefore, the "dry deposition" predicted by AERMOD for drift droplet fallout at 10 g/m^2 or above on those "dry hours" was considered to have icing potential on the ground.

3. SUMMARY OF RESULTS

Table 3 summarizes the modeling results in terms of icing potential events of at least 3 hour duration due to the proposed cooling towers. As previously described, only "dry hours" occurring on weekdays between 7 a.m. and 11 p.m. which had no natural precipitation and had temperatures at or below the freezing point within the 5-year modeling period (2005-2009) were assessed in this report.

As shown in Table 3, there will be about 45 individual hourly events per year when the ambient temperature will be at or below the freezing point and the saturated vapor plume is expected to impinge on an arterial road, as shown in Figure 2 by the green X's. This compares to the 1097/5 = 219 hours of natural precipitation per year when the ambient temperature is below freezing. About 1 event per year of 3 hours or more is expected. Less than 1 event per year of 5 hours or more would be expected. The drift fallout is always expected to be below 10 g/m^2 at any nearby arterial roads.

For local roads, there will be about 23 individual hourly events per year when the saturated plume will impinge on the ground, as indicated by the green X's shown in Figure 2. Consecutive 3-hour events are not expected.

Therefore, on the basis of further modelling with AERMOD and reasonable benchmarks for the frequency and level of icing events, the icing potential on the arterial and local roads is almost negligible.

Table 3: Modelling Results

Water Vapor					
Receptors		Annual Number of Potential Icing Events Likely Caused by Saturated Plume Touching the Ground			
		Individual Hour	Consecutive 3 Hours or More	Consecutive 5 Hours or More	Consecutive 10 Hours or More
Arterial Roads	Oil Springs Line	18	1	<1	0
	Highway 40	27	1	0	0
	Total	45	1	<1	0
Local Roads	Bickford Line	0	0	0	0
	Greenfield Road	23	0	0	0
	Total	23	0	0	0
Drift Droplets Fallout					
Receptors		Annual Number of Potential Icing Events of 10 g/m2 or more of Drift Fallout			
		Individual Hour	Consecutive 3 Hours or More	Consecutive 5 Hours or More	Consecutive 10 Hours or More
Aterial Roads	Oil Springs Line	0	0	0	0
	Highway 40	0	0	0	0
	Total	0	0	0	0
Local Roads	Bickford Line	0	0	0	0
	Greenfield Road	0	0	0	0
	Total	0	0	0	0

Figure 2: Receptors with Expected Icing Events

4. REFERENCES

[1] Ontario Hydro Research Division, "An Assessment of Potential Fogging and Icing due to Proposed SO2 Scrubbers at Lambton GS, May 17, 1982, Report No. 82-200-K.

[2] Policastro, A.J., Dunn, W.E., Carhart, R.A., "A Model for Seasonal and Annual Cooling Tower Impact", Atmospheric Environment, Vol. 28, No. 3, pp379-395, 1994.

[3] Carruthers, D.J., Dyster, S.J., and Ellis, K.L., "Plume Visibility", ADMS3 P26/01D/03, CERC, November 2003.

[4] Cortinas Jr., John, "A Climatology of Freezing Rain in the Great Lakes Region of North America, Monthly Weather Review, Vol. 128, pp 3574-3588, 2000.

[5] Stuart, R.A., and Isaac, G.A., "Freezing Precipitation in Canada", Atmosphere-Ocean, Vol. 37(1), pp 87-102, 1999.

ATTACHMENT A

Dispersion Modelling Input and Output Files (CD)

Appendix B - Air Quality Impact Study Supporting Calculations

Source S1

a) Gas Turbine Generator

Methodology: Emission Factor (EF)

For NOx and CO, the gas turbine manufacturer has guaranteed the emission concentration of 9 ppmvd (15% O_2) and 9 ppmvd, respectively. Actual emission rates for unburned hydrocarbon and PM10 were taken from the gas turbine manufacturer.

Sample Calculation (NOx 24 hr average):

Exhaust Flow Rate = 1202.5 m^3/s

Exhaust Temperature = 874.8 K

Mol Weight NO_2 = 46

Density NO_2 = 101.325 / 8.314 x 46 / 874.8 = 0.641 kg/m^3

The Facility, on average will operate 10.9 hrs per day, during peak electricity demand.

NOx emission rate = 9 [ppm] / 1000000 x 1202.5 [m^3/s] x 0.641 [kg/m^3] x 1000 [g/kg] x 10.9 [hr/day] / 24 [hr/day]
= 3.15 g/s

Sample Calculation (NOx 1 hr average):

Exhaust Flow Rate = 1202.5 m^3/s

Exhaust Temperature = 874.8 K

Mol Weight NO_2 = 46

Density NO_2 = 101.325 / 8.314 x 46 / 874.8 = 0.641 kg/m^3

NOx emission rate = 9 [ppm] / 1000000 x 1202.5 [m^3/s] x 0.641 [kg/m^3] x 1000 [g/kg]
= 6.94 g/s

Operating Condition:

The emission rate calculation for these sources are based the gas turbine generator operating at or close to 100% capacity for 10.9 hours.

b) Heat Recovery Steam Generator (HRSG)

Methodology: Emission Factor (EF)

The HRSG duct burner emissions were taken from the guaranteed emission factors from the duct burner manufacturer:

Contaminant	Natural Gas	
	Emission Factor ($lb/MMBtu_{HHV}$)	Emission Rate (g/s)
NOx	0.10	0.95
CO	0.16	1.52
PM10	0.02	0.20

The maximum heat input to the HRSG duct is 250 MMBtu/hr (LHV).

Sample Calculation (NOx 24 hr average):

NOx [g/s] = 0.10 [$lb/MMBtu_{HHV}$] x 250 [$MMBtu/hr_{LHV}$] x 1.1 [$MMBtu_{HHV}/MMBTU_{LHV}$] / 2.2046 [kg/lb] x 1000 [g/kg] / 3600 [s/hr]
= 3.46 g/s

The Facility, on average, will operate 10.9 hr/day, during peak electricity demand.

NOx [g/s] = 3.46 [g/s] x 10.9 [hr/day] x 1/24 [hr/day]
= 1.57 g/s

Sample Calculation (NOx 1 hr average):

NOx [g/s] = 0.10 [$lb/MMBtu_{HHV}$] x 250 [$MMBtu/hr_{LHV}$] x 1.1 [$MMBtu_{HHV}/MMBTU_{LHV}$] / 2.2046 [kg/lb] x 1000 [g/kg] / 3600 [s/hr]
= 3.46 g/s

Sample Calculation (CO 0.5 hr average):

NOx [g/s] = 0.16 [$lb/MMBtu_{HHV}$] x 250 [$MMBtu/hr_{LHV}$] x 1.1 [$MMBtu_{HHV}/MMBTU_{LHV}$] / 2.2046 [kg/lb] x 1000 [g/kg] / 3600 [s/hr]
= 5.54 g/s

Operating Condition:

The emission rate calculation for these sources are based the HRSG duct burner operating at or close to 100% capacity for 10.9 hours.

Start Up Emission Calculation

Hot Start Emission Rate Calculation

	A	B	C	D	E	F
	% Load	Minutes	NOx	NOx Total	CO	CO Total
			lb/h	lb	lb/h	lb
1	10	4.0	100.0	6.7	1000.0	66.7
2	20	26.0	200.0	86.7	80.0	34.7
3	30	1.5	280.0	7.0	1010.0	25.3
4	40	1.5	330.0	8.3	900.0	22.5
5	50	1.5	39.0	1.0	21.0	0.5
6	60	3.0	42.0	2.1	23.0	1.2
7	80	3.0	50.0	2.5	24.0	1.2
8	Total	40.5		114.2		152.0

	NOx	CO	SOx
Emission Rate (g/s)	**21.3**	**28.4**	**0.0370**

Notes:
For SOx emission rate calculation, see below
D = C x (B/60)
F = E x (B/60)
Emission Rate (NOx) = D8/(B8/60)/3600/2.2046(1000)
Emission Rate (CO) = E8/(B8/60)/3600/2.2046(1000)

Hot Start Emission Rate Calculation - SO_x

		Heat Input	NG flow	NG flow	S	S total
% Load	Minutes	MMBTU/h	ft^3/h	m^3/h	g/h	g/s
10	4.0	219.3	230732.4	6533.6	23.3	1.6
20	26.0	438.6	461464.8	13067.2	46.5	20.2
30	1.5	657.9	692197.2	19600.8	69.8	1.7
40	1.5	877.2	922929.6	26134.5	93.0	2.3
50	1.5	1096.5	1153662.0	32668.1	116.3	2.9
60	3.0	1315.9	1384394.4	39201.7	139.6	7.0
80	3.0	1754.5	1845859.2	52268.9	186.1	9.3
Total	40.5					45.0

emission rate SOx (g/s) 0.0370

Heat Value NG =	950.5	BTU/ft^3
Heat Input =	2193.1	MMBTU/h
Sulfur content =	3.56	mg/m^3

Notes:
Emission Rate (SOx) = 2 x 45.0 [g] / 80 [min] x 1 [min] / 60 [s]

Warm Start Emission Rate Calculation

	A	B	C	D	E	F
	% Load	Minutes	NOx	NOx Total	CO	CO Total
			lb/h	lb	lb/h	lb
1	10	50.0	100.0	83.3	1000.0	833.3
2	15	10.0	140.0	23.3	380.0	63.3
3	30	2.5	280.0	11.7	1010.0	42.1
4	40	2.5	330.0	13.8	900.0	37.5
5	50	2.5	39.0	1.6	21.0	0.9
6	60	2.5	42.0	1.8	23.0	1.0
7	80	10.0	50.0	8.3	24.0	4.0
8	Total	80.0		143.8		982.1

	NOx	**CO**	**SOx**
Start up Emission Rate (g/s)	**13.6**	**92.8**	**0.0307**

Notes:
For SOx emission rate calculation, see below
D = C x (B/60)
F = E x (B/60)
Emission Rate (NOx) = D8/(B8/60)/3600/2.2046(1000)
Emission Rate (CO) = E8/(B8/60)/3600/2.2046(1000)

Warm Start Emission Rate Calculation - SO_x

% Load	Minutes	Heat Input	NG flow	NG flow	S	S total
		MMBTU/h	ft^3/h	m^3/h	g/h	g/s
10	50.0	219.3	230732.4	6533.6	23.3	19.4
15	10.0	329.0	346098.6	9800.4	34.9	5.8
30	2.5	657.9	692197.2	19600.8	69.8	2.9
40	2.5	877.2	922929.6	26134.5	93.0	3.9
50	2.5	1096.5	1153662.0	32668.1	116.3	4.8
60	2.5	1315.9	1384394.4	39201.7	139.6	5.8
80	10.0	1754.5	1845859.2	52268.9	186.1	31.0
Total	80					73.7

emission rate SOx (g/s) 0.0307

Heat Value NG =	950.5	BTU/ft^3
Heat Input =	2193.1	MMBTU/h
Sulfur content =	3.56	mg/m^3

Notes:
Emission Rate (SOx) = 2 x 73.7 [g] / 80 [min] x 1 [min] / 60 [s]

Cold Start Emission Rate Calculation

	A	B	C	D	E	F
	% Load	Minutes	NOx	NOx Total	CO	CO Total
			lb/h	lb	lb/h	lb
1	8	148.0	140.0	345.3	180.0	444.0
2	15	17.0	140.0	39.7	380.0	107.7
3	30	4.5	280.0	21.0	1010.0	75.8
4	40	4.5	330.0	24.8	900.0	67.5
5	50	4.5	39.0	2.9	21.0	1.6
6	60	4.5	42.0	3.2	23.0	1.7
7	80	4.5	50.0	3.8	24.0	1.8
8	Total	187.5		440.6		700.0
				NOx		**CO**
	Emission Rate (g/s)			**17.8**		**28.2**

SOx

0.0180

Notes:
For SOx emission rate calculation, see below
D = C x (B/60)
F = E x (B/60)
Emission Rate (NOx) = D8/(B8/60)/3600/2.2046(1000)
Emission Rate (CO) = E8/(B8/60)/3600/2.2046(1000)

Cold Start Emission Rate Calculation - SO_x

% Load	Minutes	Heat Input	NG flow	NG flow	S	S total
		MMBTU/h	ft^3/h	m^3/h	g/h	g/s
8	148.0	175.4	184585.9	5226.9	18.6	45.9
15	17.0	329.0	346098.6	9800.4	34.9	9.9
30	4.5	657.9	692197.2	19600.8	69.8	5.2
40	4.5	877.2	922929.6	26134.5	93.0	7.0
50	4.5	1096.5	1153662.0	32668.1	116.3	8.7
60	4.5	1315.9	1384394.4	39201.7	139.6	10.5
80	4.5	1754.5	1845859.2	52268.9	186.1	14.0
Total	187.5					101.1

emission rate SOx (g/s) 0.0180

Heat Value NG = 950.49 BTU/ft^3

Heat Input = 2193.09 MMBTU/h

Sulfur content = 3.56 mg/m^3

Notes:
Emission Rate (SOx) = 2 x 101.1 [g] / 80 [min] x 1 [min] / 60 [s]

		Hot Start			Full Load Operation			Start up followed by full operation (data for Table 9)				
		total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	24 hr average period (g/s)	0.5 or 1 hr average period (g/s)
1	NOx	0.675	51781.9	21.31	10.9	408107.4	10.40	11.6	459889.3	11.04	5.32	11.04
2	CO	0.675	68927.8	28.37	10.9	383196.6	9.77	11.6	452124.5	10.85		10.85
3	SOX	0.675	89.9	0.04	10.9	4649.2	0.12	11.6	4739.1	0.11	0.05	0.1137
4	PM	0.675	3960.9	1.63	10.9	63961.2	1.63	11.6	67922.1	1.63	0.79	
		A	B	C	D	E	F	G	H	I	J	K

Sample Calculation (NOx)

Total Emissions (B1) = C1 x 3600 x A1

Total Emissions (E1) = F1 x 3600 x D1

Total hours (G1) = A1 + D1

Total Emissions (H1) = B1 + E1

Emission Rate (I1) = H1 / G1 /3600

24 hour Average (J1) = I1 x G1 / 24

	Warm Start			Full Load Operation			Start up followed by full operation (data for Table 9)				
	total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	24 hr average period (g/s)	0.5 / 1 hr average period (g/s)
NOx	1.3	65223.5	13.59	10.90	408107.4	10.40	12.2	473330.9	10.75	5.48	10.75
CO	1.3	445470.1	92.81	10.90	383196.6	9.77	12.2	828666.7	18.82		18.82
SOX	1.3	147.3	0.03	10.90	4649.2	0.12	12.2	4796.5	0.11	0.056	0.1089
PM	1.3	7628.4	1.63	10.90	63961.2	1.63	12.2	71589.6	1.63	0.83	

	Cold Start			Full Load Operation			Start up followed by full operation (data for Table 9)				
	total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	total hours	total emissions (g)	emission rate (g/s)	24 hr average period (g/s)	0.5 / 1 hr average period (g/s)
NOx	3.1	199843.5	17.76	10.90	408107.4	10.40	14.0	607951.0	12.04	7.04	12.04
CO	3.1	317525.5	28.22	10.90	383196.6	9.77	14.0	700722.1	13.88		13.88
SOX	3.1	202.3	0.02	10.90	4649.2	0.12	14.0	4851.5	0.10	0.056	0.0961
PM	3.1	18190.8	1.63	10.90	63961.2	1.63	14.0	82152.0	1.63	0.95	

The highlighted data are the maximum emission rate according to the averaging period for the relevant MOE POI Limit corresponding to the respective contaminant

Greenhouse Gas Sample Calculation

Gas Turbine Heat Input = 1740 MMBTU/hr (A)
CO_2 Emission Factor = 99.58 lbm/MMBTU (B) (US EPA Emission Factor)
N_2O Emission Factor = 3.000E-03 lbm/MMBTU (US EPA Emission Factor)
CH_4 Emission Factor = 7.785E-03 lbm/MMBTU (US EPA Emission Factor)
Number of Cold Starts = 20
Number of Warm Starts = 275
Number of Hot Starts = 5

Sample Calculation
Gas Turbine CO_2
Cold Start
120 minutes Gas turbine load at 8%
CO_2 Emission Rate = (A) x (B) x 0.08 = 13861 lbm/hr [1746 g/s]
Total CO_2 = 1746 x 60 x 120 / 1000 / 1000 = 12.6 tonne
Next 30 minutes Gas turbine load ramps from 8% to 100% with a total of 21.2 tonne of CO_2 (see table, column G below)
Total CO_2 at the end of cold start-up = 12.6 + 21.2 = 33.8 tonne
Number of cold start in a year = 20
Total cold start CO_2 emitted in a year = 33.8 x 20 = 676 tonne
Warm Start
50 minutes Gas turbine load at 10%
CO_2 Emission Rate = (A) x (B) x 0.1 = 17327 lbm/hr [2183 g/s]
Total CO_2 = 2183 x 60 x 50 / 1000 / 1000 = 6.55 tonne
Next 40 minutes Gas turbine load ramps from 10% to 100% with a total of 28.8 tonne of CO_2 (see table, column I below)
Total CO_2 at the end of cold start-up = 6.55 + 28.8 = 35.3 tonne
Number of cold start in a year = 275
Total cold start CO_2 emitted in a year = 35.3 x 275 = 9721 tonne
Hot Start
30 minutes Gas turbine load at 20%
CO_2 Emission Rate = (A) x (B) x 0.2 = 34654 lbm/hr [4366 g/s]
Total CO_2 = 4366 x 60 x 30 / 1000 / 1000 = 7.86 tonne
Next 10 minutes Gas turbine load ramps from 20% to 100% with a total of 0.131 tonne of CO_2 (see table, column K below)
Total CO_2 at the end of cold start-up = 7.86 + 0.131 = 7.99 tonne
Number of cold start in a year = 5
Total cold start CO_2 emitted in a year = 7.99 x 5 = 39.9 tonne
Full Load Operation (Gas Turbine)
CO_2 Emission Rate = 3.72% of Flue Gas volumetric flow rate (from Gas Turbine manufacturer)
Flue Gas Volumetric Flow Rate = 310.2 m^3/s
CO_2 Volumetric Flow Rate = 0.0372 x 310.2 = 11.54 m^3/s
Total run time in a year = 365 x 24 x 0.25 = 2136 hr (where 0.25 is the expected percent operating in a year)
Total Volume of CO_2 in a year = 11.54 x 60 x 60 2136 = 88739873 m^3
Total mass of CO_2 in a year = 88739873 x 1.49 / 1000 = 132,222 tonne (where 1.49 kg/m^3 is the CO_2 density)
Sub Total CO_2 in a year = 676 + 9721 + 39.9 + 132222 = 142,569 tonne (cold start + warm start + hot start + full load operation)

Heat Recovery Steam Generator (HRSG) CO_2
CO_2 Emission Factor = 120000 lbm/$MMft^3$ Natural Gas burned (US EPA Emission Factor)
Natural Gas Flow Rate = 2.07 m^3/s
CO_2 mass emission flow rate = 2.0696 x 35.31467 /1000000 x 120000 / 2.2046 x 1000 = 3978 g/s
Total run time in a year = 365 x 24 x 0.25 = 2136 hr (where 0.25 is the expected percent operating in a year)
Sub Total CO_2 mass in a year = 3978 x 60 x 60 x 2136 / 1000000 = 30,591 tonne

TOTAL ANNUAL CO_2 EMISSION = 142569 + 30591 = 173160 TONNE (Gas Turbine + HRSG)

E	F	G	H	I	J	K	
Minutes	% Load Cold Start	CO_2 Emission Rate Cold Start (g/min)	% Load Warm Start	CO_2 Emission Rate Warm Start (g/min)	% Load Hot Start	CO_2 Emission Rate Hot Start (g/min)	NOTES
1	8%	104788	10%	130985	20%	4366	(G) = (A) x (B) x (F) / 60 /2.2046 * 1000 (I) = (A) x (B) x (H) / 60 /2.2046 * 1000 (K) = (A) x (B) x (J) / 60 /2.2046 * 1000
2	11%	146341	12%	161212	29%	6307	
3	14%	187895	15%	191439	38%	8247	
4	18%	229449	17%	221666	47%	10188	
5	21%	271003	19%	251894	56%	12128	
6	24%	312556	22%	282121	64%	14069	
7	27%	354110	24%	312348	73%	16009	
8	30%	395664	26%	342575	82%	17950	
9	33%	437218	28%	372802	91%	19890	
10	37%	478771	31%	403030	100%	21831	
11	40%	520325	33%	433257	Total	130985	
12	43%	561879	35%	463484			
13	46%	603433	38%	493711			
14	49%	644986	40%	523939			
15	52%	686540	42%	554166			
16	56%	728094	45%	584393			
17	59%	769648	47%	614620			
18	62%	811201	49%	644847			
19	65%	852755	52%	675075			
20	68%	894309	54%	705302			
21	71%	935863	56%	735529			
22	75%	977416	58%	765756			
23	78%	1018970	61%	795984			
24	81%	1060524	63%	826211			
25	84%	1102078	65%	856438			
26	87%	1143631	68%	886665			
27	90%	1185185	70%	916893			
28	94%	1226739	72%	947120			
29	97%	1268293	75%	977347			
30	100%	1309846	77%	1007574			
31	Total	21219512	79%	1037801			
32			82%	1068029			
33			84%	1098256			
34			86%	1128483			
35			88%	1158710			
36			91%	1188938			
37			93%	1219165			
38			95%	1249392			
39			98%	1279619			
40			100%	1309846			
			Total	28816622			

A-5 Emission Limits for Gas Turbine Calculation

NOx Emission Limit

Natural Gas at 7 °C design conditions

GT Power Output =	1008.00 GJ on an hourly basis	A =	140 g/GJ (emission limits per power output)
GT useful Heat Output to HRSG =	0.00 GJ on an hourly basis	B =	40 g/GJ (emission limits per heat output)
Combined Power & Heat Output =	140.00 g/GJ	D =	1.7 g NO_2 per GJ per ppmv at 15% O_2
Efficiency =	0.486		
Emission Limit (15% O_2) =	40.0 ppmv NOx @ 15% O_2		

SO_2 Emission Limit

Natural Gas at 7 °C design conditions

Combined Power & Heat Output =	800 g/GJ	D =	2.37 g SO_2 per GJ per ppmv at 15% O_2
Efficiency =	0.486		
Emission Limit (15% O2) =	164.1 ppmv SO_2 @ 15% O_2		

CO Emission Limit 60 ppmv (dry) CO @ 15% O_2

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17.3 APPENDIX 17.3 - Noise Feasibility Study East Site

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Noise Feasibility Study
Proposed Green Electron East Site Power Project
Courtright, Ontario

Prepared for

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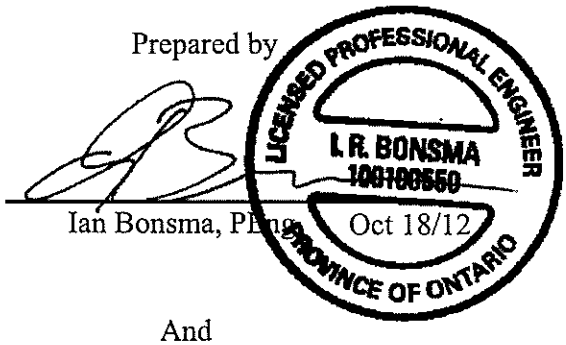


Ian Bonsma, PEng Oct 18/12

And

Bill Gastmeier, MASc, PEng

October 18, 2012

VERSION CONTROL

Proposed Green Electron East Site Power Project, Lambton, Ontario

Ver.	Date	Version Description	Prepared By
1	October 18, 2012	Original Noise Feasibility Study	I. Bonsma

CONTENTS

1.0 INTRODUCTION AND SUMMARY 1

2.0 THE ACOUSTICAL ENVIRONMENT AND SURROUNDING AREA 3

3.0 POWER PLANT AND NOISE SOURCE DESCRIPTIONS 3

3.1 POWER PLANT SOURCE DESCRIPTIONS 4

4.0 POINT OF RECEPTION SUMMARY 6

5.0 CRITERIA 7

5.1 CRITERIA GOVERNING STATIONARY (INDUSTRIAL) NOISE SOURCES 7

6.0 ACOUSTICAL MODELING 8

6.1 RECOMMENDED NOISE MITIGATION MEASURES 9

7.0 IMPACT ASSESSMENT 14

8.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS 14

Figure 1 – Area Map
Figure 2 – Site Location Plan
Figure 3 – Receptor Locations
Figure 4 – Source Sketch
Figure 5 – Predicted L_{EQ} Contours - Daytime
Figure 6 – Predicted L_{EQ} Contours – Evening/Nighttime

APPENDIX A – Assessment Summary Tables
APPENDIX B – Zoning Maps
APPENDIX C – Details of Predictive Acoustical Modeling
APPENDIX D – Determination of Applicable Sound Level Limits
APPENDIX E – Manufacturer's Sound Level Data
APPENDIX F – Sample Calculations Results

1.0 INTRODUCTION AND SUMMARY

Howe Gastmeier Chapnik Limited ("HGC Engineering") was retained by Greenfield South Power Corporation ("GSPC") to investigate compliance with the Ontario Ministry of the Environment ("MOE") sound level limits, to permit the construction and operation of an approximately 300 megawatt combined cycle power plant ("the Power Plant"), southwest of the intersection of Oil Springs Line and Highway 40. The lands are currently utilized for agricultural however they are zoned to permit an electrical generation facility. This investigation follows MOE Guidelines with regard to issues of noise impact. The issues to be addressed in this study are:

1. Identify the noise sensitive land uses in the area.

2. Investigate criteria for acceptable sound levels from the Power Plant at those noise sensitive land uses based on the existing acoustical environment and background sound levels in accordance with the applicable MOE Guidelines.

3. Identify the significant noise sources at the proposed Power Plant based on the most up to date information.

4. Propose feasible mitigation measures that result in acceptable sound levels at the noise sensitive points of reception, if required.

5. Identify further actions or noise studies required by the proponent to demonstrate the feasibility of such measures and that the appropriate MOE Guideline limits can be met.

Site visits were performed in August of 2012 to investigate the site, the surrounding topography and buildings and to identify and measure background sound levels at the residential receptors. Operational data and other information concerning the proposed power plant site, buildings and equipment were obtained from GSPC. Source sound levels for the majority of sources were based on the equipment specifications, manufacturer's sound data, generic published sound

power data from reference texts and from sound level measurements conducted during the fall of 2006 of similar operating facilities in Windsor, Ontario and Calgary, Alberta.

This information was used as input to an acoustical computer model of the facility which was used to investigate feasible means of mitigation, where required, to meet MOE guideline limits. The results of our investigation indicate the following conclusions and recommendations.

1. The noise sensitive points of reception include a number of residential homes located approximately 500 to 700 meters to the north, along Oil Springs Line.
2. The acoustical environment at the points of reception is rural, dominated by natural sounds with minor contributions from distant traffic and other industry. For the purposes of this study the 45 dBA and 40 dBA, L_{EQ} exclusionary minimum daytime and nighttime sound level limit of the MOE are applicable, respectively.
3. The most significant Power Plant noise sources are the cooling tower, step-up transformers and the heat recovery steam generator ("HRSG"). A complete listing is provided in the body of the report.
4. Mitigation measures including acoustic barriers for the transformers and cooling tower, and gas turbine inlet and outlet silencers, are recommended to decrease the overall sound emissions from the facility to below the MOE criteria at the receptors.
5. A more detailed acoustic assessment report should be prepared in support of an application for an Environmental Compliance Approval once all key equipment is selected and building and site plans are finalized to ensure that the acoustical specifications are met and that the mitigation measures, as approved, will provide sufficient noise reduction to meet the applicable MOE sound level limits.

These items are discussed further in the following sections.

2.0 THE ACOUSTICAL ENVIRONMENT AND SURROUNDING AREA

The site of the proposed Green Electron East Site Power Project is located southwest of the intersection of Oil Springs Line and Highway 40, in Courtright, Ontario (see Figure 1 – Area Map). The site will generate electricity through the use of a single approximately 200 MW gas turbogenerator set and an associated heat recovery steam generator ("HRSG"), equipped with supplemental firing to accommodate peak demand periods and an approximately 100 MW steam turbine system. Oil Springs Line will be the designated gateway for all vehicular traffic entering and leaving the site.

Figure 2 is a site sketch showing the facility layout and the individual plant components. The project site is bound on the north, east and west by agricultural lands and to the south by lands zoned for Environmental Protection Woodlot and Natural. The closest residential receptors are north of the proposed facility along Oil Springs Line at a distance of approximately 500 meters, as shown on Figure 3. The project site is currently zoned as Industrial M3 which permits an electrical generation facility. Zoning maps for the project area are included in Appendix B.

During site visits by HGC Engineering in August 2012, the background sound in the vicinity of the proposed plant and the receptors along Oil Springs Line was found to be dominated by natural sounds and distant industrial noise. The area is best characterized as a "Class 3" rural area, under MOE noise assessment guidelines.

3.0 POWER PLANT AND NOISE SOURCE DESCRIPTIONS

The Green Electron East Site Power Project will generate power through a single gas turbogenerator set ("GTS") and it's associated Heat Recovery Steam Generator ("HRSG"), the latter is to be equipped with supplemental firing to accommodate peak demand periods. The GTS will have a generating capacity of approximately 200 MW (nominal). The HRSG will be connected to a single approximately 100 MW steam turbine generator ("STG"), which will utilize the waste heat from the GTS.

The plant will include cooling towers to condense the waste steam so that it may be recycled back to the HRSG, while heat from the condenser will be rejected by means of water evaporated by the cooling tower fans.

Details of the various types of sources are provided below. Figure 4 shows the approximate location of each source with respect to the site plan.

3.1 Power Plant Source Descriptions

GTS Exhaust

The gas turbine will exhaust (Source ID: 1) through a 40m tall stack at the outlet of the HRSG.

GTS Air Intake

The combustion turbine air intake (NS-01) emits sound from the gas turbine inlet through the filter system. The gas turbine air intake is located on the southwest face of the main plant building. This assessment considers that the noise produced by a turbine air intake can be tonal and the MOE 5 dBA tonal penalty has been added.

Heat Recovering Steam Generator (HRSG)

The HRSG (NS-02) will emit noise from the various associated steam piping and valve connections in addition to break-out noise from the transition duct between the GTS and the HRSG.

Gas Turbogenerator Set (GTS)

The GTS will be housed within an acoustical enclosure inside the plant building. The enclosure has been specified to reduce the sound of the GTS inside the building. Two potential paths of sound emission are expected: 1) via the building roof and walls; and 2) from the rooftop ventilation fan systems. Both are included in the model.

Steam Turbine Generator (STG)

The STG will be housed indoors and an acoustic enclosure is proposed for this unit, similar to the GTS above. The same paths of sound emission are accounted for.

Cooling Tower

The cooling tower, located on the eastern portion of the site, will have five cells. The acoustic model includes the side air inlets (NS-34 and NS-35), and the five fans (NS-11 to NS-15) and their associated motors (NS-26 to NS-30). The side air inlets are proposed to be approximately 2.4m in height. During evening and nighttime hours the fans will operate at 50% of capacity.

Step-Up Transfomers

The facility will utilize two step-up transformers, a 200 MVA unit (NS-04) for the STG and a 250 MVA unit (NS-03) for the GTS. The associated switch gear required to transfer the power to the grid will also generate noise and has been included in the model. The two step-up transformers and the switchgear are anticipated to have a tonal quality and a 5 dBA tonal penalty has been included. During evening and nighttime hours the cooling fans on the transformers will not operate.

Building Ventilation Fans (Exhaust / Intake Openings)

Rooftop ventilation fans will be utilized to provide building ventilation. Four fans have been placed on the roof of both the STG and GTS generator halls (NS-07 to NS-09, NS-16 to NS-20). In addition two units (NS-21 and NS-22) have been assumed to provide ventilation for the gas compressor building (total of 10).

Building Construction

Noise generated by indoor equipment will radiate outdoors via the building walls and roof. The building walls and roof have been acoustically designed and constructed to reduce noise emissions to insignificant levels.

Trucking and Other Site Traffic

Trucks and facility staff will enter the site via access off Oil Springs Line. Truck deliveries will be minimal, mainly comprised of courier deliveries and personal staff vehicles. The traffic volume is insignificant in comparison to volumes on the surrounding roadways.

Miscellaneous

In addition to the sources listed above there will also be several overhead doors, outdoor pumps, and sound emitted by the indoor gas and steam turbine generators.

A worst case hourly scenario has been considered assuming the simultaneous operation of all the equipment at the facility to test feasibility as per MOE requirements.

4.0 POINT OF RECEPTION SUMMARY

Homes on agriculturally zoned lands located north of the subject facility are the nearest noise-sensitive points of reception to the subject site. Nine key receptors were chosen to represent these areas, which are shown as locations R1 through R7 in Figures 3, 5 and 6.

Locations R2 through R4 represent single storey homes on Oil Springs Line while locations R1 and R5 through R9 represent upper storey windows of two storey homes located on Oil Springs Line. In general, upper storey windows are the most potentially impacted points on a given property since they are most exposed to elevated sources at the subject site and benefit least from ground absorption and ground level obstructions. The selected points of reception are described briefly in Table A3.

During visits to the site and surrounding area by HGC Engineering on August 10 and 15, 2012, background sound in the area of the receptors was dominated by distant industrial activities and natural sounds.

5.0 CRITERIA

5.1 Criteria Governing Stationary (Industrial) Noise Sources

An industrial facility is classified in MOE guidelines as a stationary source of sound (as compared to sources such as traffic or construction, for example) for noise assessment purposes. In terms of background sound, the lands in question are located in a rural acoustical environment which is characterized by natural sounds.

The MOE provides Guidelines for the assessment of Industrial Noise. The guideline document relevant in this case is NPC-232 "Sound Level Limits for Station Sources in Class 3 Areas (Rural)" [1] which apply to the assessment of stationary (industrial) sources of sound with regard to Section 9 of the Environmental Protection Act.

The façade of a residence (i.e., in the plane of a window), or any associated usable outdoor area is considered a sensitive point of reception, so the limits are generally considered to apply at the nearest residential property line during daytime hours and outside the upper storey windows during daytime and nighttime hours.

NPC-232 states that the sound level limit for a stationary source which operates during daytime and nighttime hours in a Class 3 environment is the greater of the minimum one-hour L_{EQ} ambient sound level or 45 dBA during the daytime hours (07:00 – 19:00), and 40 dBA during evening/nighttime hours (19:00 – 07:00), at any potentially impacted residential point of reception. The MOE guidelines also stipulate that the noise assessment shall consider a *predictable worst-case hour*, which is defined as an hour when typically busy operation of the stationary sources under consideration could coincide with an hour of low background sound. The background sound measurements, reported in Appendix D, indicate sound levels during daytime and nighttime hours have contributions from distant traffic and industry, but are typically dominated by natural sounds. The minimum measured hourly (Leq_{1hr}) sound levels at the residences were generally in the range of 35 to 55 dBA during daytime and nighttime hours.

For the purposes of this report, to demonstrate feasibility, it is appropriate to use the exclusionary minimum limits of 45 dBA (daytime) and 40 dBA (nighttime) as the target sound level for the Power Plant. The facility will be designed to operate on demand during peak energy consumption periods which generally occur in the late afternoon and early evening hours. Nighttime operations are therefore not expected on a regular basis, but to consider a worst case scenario, the more stringent minimum nighttime limits of 40 dBA are appropriate.

It is a responsibility of the Power Plant under the Environmental Protection Act, to ensure that sound levels emitted by their operations comply with MOE limits at neighbouring residences. This process is regulated through the Environmental Compliance Approval process and GSPC should apply for an Environmental Compliance Approval for the Power Plant before the start of construction.

6.0 ACOUSTICAL MODELING

To investigate the compatibility of the project with surrounding land uses, an acoustical model was employed and was calibrated and verified by the sound level measurements conducted at a typical facility near Calgary. Note that the facility near Calgary was a typical installation surrounded by industrial and agricultural land uses and was not specifically designed for low noise emissions. It did not incorporate many of the noise mitigation features recommended herein.

In order to predict the worst-case impact of the facility as a whole, the acoustically significant sources listed in Section 3.0 above, were identified through discussions with GSPC and HGC Engineering's site visits to similar facilities. Once the noise sources were identified, and the corresponding source sound level data collected, an acoustic model of the site was created on computer using *Cadna/A version 4.2.141*, a commercially available acoustic modeling system. *Cadna/A* uses the computational procedures of ISO standard 9613, *"Acoustics – Attenuation of Sound During Propagation Outdoors"*, [2] to predict sound contours and levels at specified receptors.

The sources have been placed in their approximate location within the site on the basis of the site plan shown in Figure 2. The details of the prediction model are summarized in Appendix C and a summary of all source information is provided in Table A1.

6.1 Recommended Noise Mitigation Measures

The noise control measures were chosen based on the assumption that the equipment finally selected and supplied for this project will have mitigated sound power levels that are reasonably similar to those presented in Table A1. The details and extent of the noise control measures should be refined during the detailed engineering phase of the project, at a time when additional noise level data can be obtained from vendors, and when additional design details for the facility are available.

Acoustical modeling results indicate that the mitigation measures listed below will result in sound emissions from the facility that meet the sound level limits at all sensitive receptors.

- Gas turbine exhaust mitigation via HRSG and silencers.
- Gas turbine intake system (plenum, silencer, and air filter).
- Silencers for building ventilation openings.
- Insulated overhead doors.
- HRSG Duct silencing.
- Upgraded building wall and roof constructions.
- Acoustic barriers around the transformers, the rooftop ventilation fans and to the north of the cooling tower.

The specification for each of the power plant systems should require the absence of any tonal (narrow band frequency) components. Tonal components can be produced at the blade pass frequency (and its harmonics) of turbine inlet systems, for example. For tonal sound, the MOE guidelines stipulate that a penalty of 5 dBA is to be added to the measured source level. A tonal sound is defined as one which has a "pronounced audible tonal quality such as a whine, screech, buzz or hum" [3]. In the subsequent analysis, a tonal penalty has been applied to the sound of the

transformers, the switchgear and the GTS air intake, based on the tonal characteristic typically exhibited by these sources, observed by HGC Engineering at similar facilities.

HRSG Stack (Gas Turbine Exhaust)

The gas turbine exhaust is ducted through the stack at the outlet of the HRSG. The HRSG supplier should provide sufficient silencing (through the HRSG and a silencer) such that the sound power radiated from the GTS exhaust system, via stack top, does not exceed 101 dBA (Lw), with no tonality, which results in a sound pressure level target of 40 dBA (Lp) at 100m from this source alone after accounting for a reduction in the sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures. Based on the generic sound data used in the model, the following minimum dynamic insertion loss values were used in our analysis for the GTS exhaust system. The sound power level of 101 dBA (Lw) at the HRSG stack outlet should be verified by the HRSG supplier to ensure compliance with the sound performance target.

Minimum Required Dynamic Sound Insertion Loss [dB]

Item	Octave Band Centre Frequency [Hz]								
	31.5	63	125	250	500	1k	2k	4k	8k
HRSG	16	18	18	18	21	24	25	22	20
Silencer	10	20	35	35	35	30	25	25	25

The purchase specification for the GTS should also require the absence of excessive low frequency sound (no more than 73 dB linear sound pressure at 100 meters at 31.5 Hz) from the exhaust system and should include allowance for statistical uncertainty in accordance with ISO 10494.

Cooling Tower

The cooling tower manufacturer has provided sound level data for the proposed cooling tower (Appendix E). The cooling tower was assumed to include water baffles and their associated sound attenuation factors. However, the sound reduction related to the basin attenuation has not been included. During evening and nighttime hours (19:00 to 07:00) the cooling tower fans will operate at 50%. An acoustic barrier, 35 meters long and 4 meters high will be located north of the cooling tower.

Step-Up Transformers

Sound level information for the specified transformers was obtained from the transformer manufacturer and is contained in Appendix E. The data indicates that the transformers will have a National Electrical Manufacturers Association ("NEMA") standard sound pressure level measured in accordance with IEEE Standard C57.12.90, "IEEE Standard Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers" [3] of not more than 82 dBA for both the gas turbine generator transformer (250 MVA) and the steam turbine generator transformer (200 MVA). Using the drawings provided in Appendix E, an enclosing surface area estimate of about 310 m^2 was determined. The NEMA sound rating and the measurement surface area were used to compute the overall sound power level of 107 dBA, not including tonality [4]. This assessment includes a 5 dBA tonal penalty for the transformers, resulting in a sound power level of 112 dBA.

During nighttime hours the transformers will operate without cooling fans. The measured data in Appendix E indicates a sound level reduction of 8.3 dBA and 4.0 dBA over full operation for the 250 MVA and 200 MVA transformers, respectively.

The 250 MVA and 200 MVA step-up transformers are recommended to have acoustic barriers 8 meters in height, constructed around the north face of each transformer with returns on the east and west sides. Additionally, absorptive material should be installed on the building walls

facing the transformers. The barriers and absorptive material should have a minimum Noise Reduction Coefficient ("NRC") of 0.75.

GTS Air Intake

The GTS supplier should provide sufficient silencing such that the sound power radiated from the GTS inlet does not exceed 100 dBA (Lw) which results in a sound pressure level target of 40 dBA at 100 meters from this source alone with no tonality, after accounting for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures. Based on the generic sound data used in the model the following minimum dynamic insertion loss values were used in our analysis for the plenum/inlet silencer/air filter system. The sound power level of 100 dBA (Lw) from the GTS air intake should be verified by the GTS supplier to ensure compliance with the performance target.

Minimum Required Dynamic Sound Insertion Loss [dB]

Item	Octave Band Centre Frequency [Hz]								
	31.5	63	125	250	500	1k	2k	4k	8k
Plenum / Inlet Silencer/ Air Filter System	20	30	35	40	45	50	50	50	40

HRSG

The GTS exhaust is ducted outside to the HRSG. Breakout sound from the transition duct between the GTS and the HRSG, from the HRSG walls, and from the HRSG stack walls as well as HRSG related valve and piping noise have been considered in the model. Sound level measurements conducted of an HRSG at similar facilities in Windsor and Calgary have been utilized in the acoustic model. The maximum sound power level for the HRSG walls, transition duct work, stack wall and related valve and piping noise should be limited to 108 dBA. Octave band data is provided in Table A1.

GTS Acoustic Enclosure

An enclosure around the combustion turbine, generator, and accessory modules will be provided. The purchase documents should require that the manufacturer meet a sound pressure level specification of 85 dBA at 1 m from the enclosure and all associated ductwork and other components inside the building.

Steam Turbine Casing and Other Indoor Noise Sources

The steam turbine casing and any other significant indoor noise sources (pumps, etc) are recommended to be limited to 85 dBA at 1m. Acoustical enclosures may be needed, therefore the purchase documents should require the manufacturer meet a sound pressure level specification of 85 dBA at 1 m from the equipment.

Ventilation Fans (Exhaust Openings)

A total of ten rooftop ventilation fans will be utilized at this facility. The sound power radiated from each rooftop ventilation fan opening should be limited to a sound power level of 92 dBA (total of the fan sound power level and the sound radiated from within the building). This can be achieved by selecting an appropriate fan and/or providing acoustical screening or silencing as required. The acoustic model includes 2 meter high, U-shaped acoustic barriers around eight of the rooftop ventilation fans.

Exterior Building Construction

Sound level measurements conducted at a similar facility indicate indoor sound levels of approximately 85 dBA. To achieve a similar indoor sound level at this proposed facility all pieces of equipment located in the buildings should be subject to a purchase specification and manufacturers guarantee of 85 dBA at a distance of 1m from the equipment in all directions.

The transmission loss required for the gas turbine generator building, the steam turbine generator building and the gas compressor building are as follows:

Minimum Required Transmission Loss for Building Walls and Roof (dB)

63	125	250	500	1000	2000	4000	8000
12	19	32	40	46	53	56	47

This level of noise reduction can be achieved by constructing a wall consisting of an 18-gauge galvanized outer liner, four inches of semi-rigid fibreglass insulation and a 22-gauge galvanized perforated inner liner, for example. Alternative wall and roof systems with equal or greater noise reduction would be acceptable.

7.0 IMPACT ASSESSMENT

The recommended mitigation measures and specifications described above were entered into the acoustic prediction model to develop the results shown in Assessment Tables A2 and A3 in Appendix A. As evident from Table A3, the predictive analysis indicates that with the specified noise reductions in place, the sound emissions of the facility will meet the sound level limits as set out in MOE publication NPC-232. Figures 5 and 6 show contours of predicted sound exposure levels, L_{EQ} [dBA], for daytime and nighttime respectively, including the effects of the noise control measures above. Details of the prediction methods are summarized in Appendix C, and sample calculation results are included as Appendix F.

8.0 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The acoustical measurements and analysis indicate that with the recommended noise control measures in place, the Power Plant facility can be considered to be compatible in terms of noise emissions. The recommended mitigation measures may be modified during the detailed design phase if further acoustic modeling confirms that the established sound level limits are met.

The following mitigation measures are recommended:

1. Gas turbine air inlet and exhaust silencers. Specifications are provided.

2. All indoor equipment should have a sound level specification of 85 dBA at 1m or less.

3. 8 meter high acoustic barriers are recommended around the north side of the 200 MVA and 250 MVA step-up transformers. Additionally, absorptive material should be applied to the walls facing the two step-up transformers.

4. A 4 meter high acoustic barrier, approximately 35 meters long is recommended along the north driveway, north of the cooling tower.

5. 2 meter high, U-shaped, acoustic barriers are recommended around the north sides of the general ventilation fans.

6. Upgraded building wall and roof constructions are required and specifications are provided.

7. Equipment sound power emission levels should be limited to those values listed in Table A1.

8. A detailed acoustic assessment report should be prepared and updated as required as specific equipment is selected and building and site plans are formalized to ensure that the acoustical specifications are met and that the mitigation measures, as approved, will provide sufficient noise reduction to meet the applicable MOE sound level limits.

9. An Environmental Compliance Approval should be applied for and the final detailed acoustic assessment report should be submitted to the MOE as supporting documentation for their review and approval.

The reader is referred to previous section of this report where these recommendations are discussed in more detail.

REFERENCES

1. Ontario Ministry of the Environment Publication NPC-232, *Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)*, October, 1995.

2. International Organization for Standardization, *Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation*, ISO-9613-2, Switzerland, 1996.

3. Institute of Electrical and Electronics Engineers (IEEE), Standard C57-12-90-2006, *IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulation Transformers.*

4. Crocker, Malcolm, J., Sound *Power Level Predictions for Industrial Machinery*, In Encyclopedia of Acoustics (Vol. 2, pp. 1049 - 1057), John Wiley & Sons, Inc., 1997.

5. Ontario Ministry of the Environment Publication NPC-104, *Sound Level Adjustments,* August, 1978.

6. D.A. Bies & C.H. Hanson, *Engineering Noise Control Theory & Practice – Second Edition,* E & FN Spon, New York, 1997.

7. Google Maps Aerial Imagery, Internet Application: *maps.google.com.*

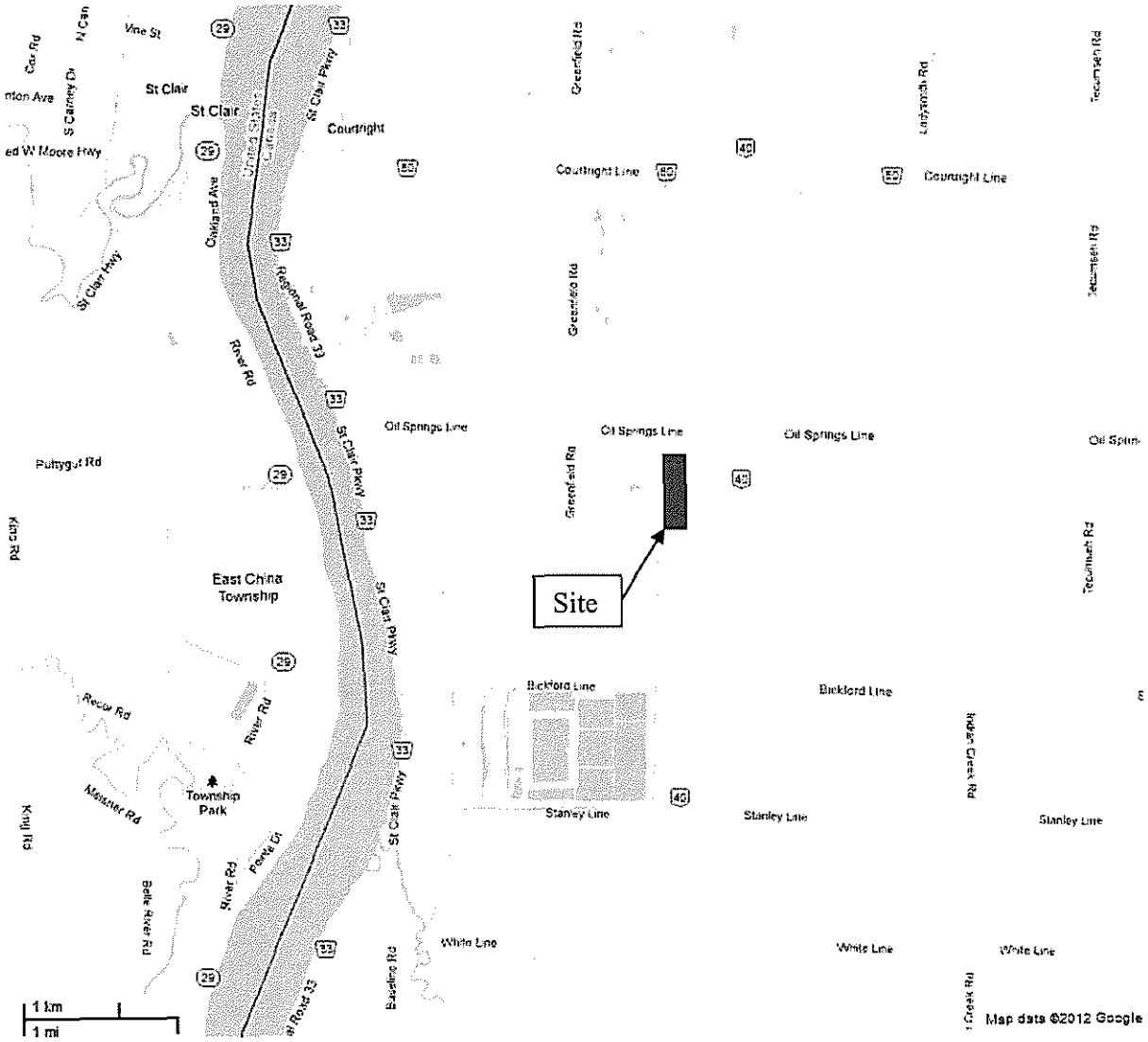


Figure 1: Key Area Plan

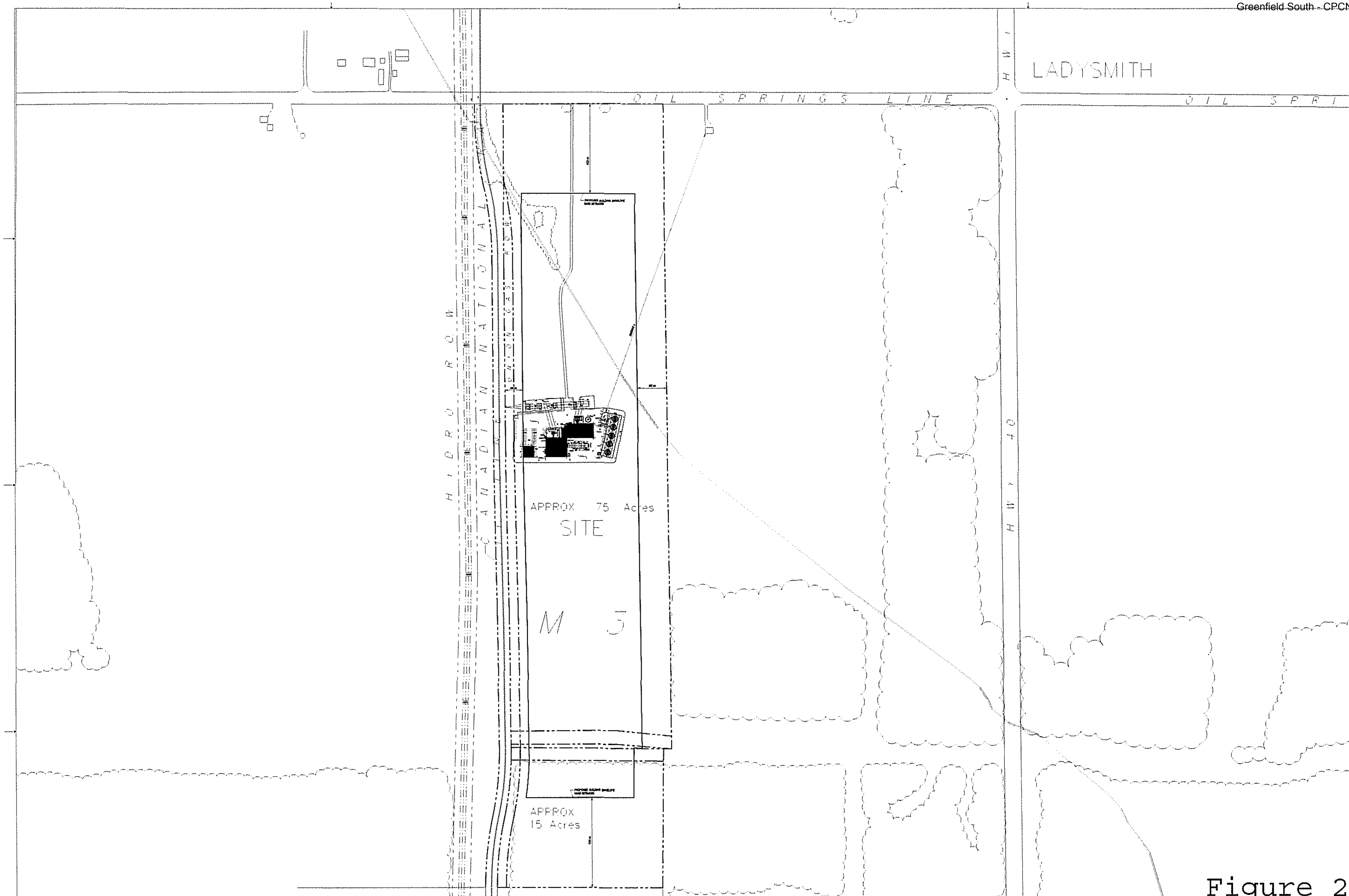


Figure 2

DEVELOPMENT APPLICATION NUMBERS	
DEVELOPMENT TYPE	INDUSTRIAL
LEGAL DESCRIPTION	Part Lot 25, Con 2E, Part Lot 26 & Part Road Allowance between Con 1&2 Plan 24PP 25R 1585 Parts 1 to 10 TOWNSHIP OF ST. CLAIR

SECTION	ARCHITECTURAL		
SCALE	1:500	DATE	
DESIGNED	C. POLSINELLI	FEB 14, 2012	
DRAWN	A. OHMAN	FEB 14, 2012	
CHECKED	C. POLSINELLI	FEB 14, 2012	
REVIEWED			

CLIENT: EASTERN POWER LIMITED/

PROJECT: ELECTRICAL GENERATING FACILITY on OIL SPRINGS LINE TOWNSHIP OF ST. CLAIR

TITLE: SITE PLAN 1:2000

DRAWING CODE: X X X - 1 1 - 0 1 - 1 REV: A

Figure 3: Receptor Locations
Green Electron East Site Power Project

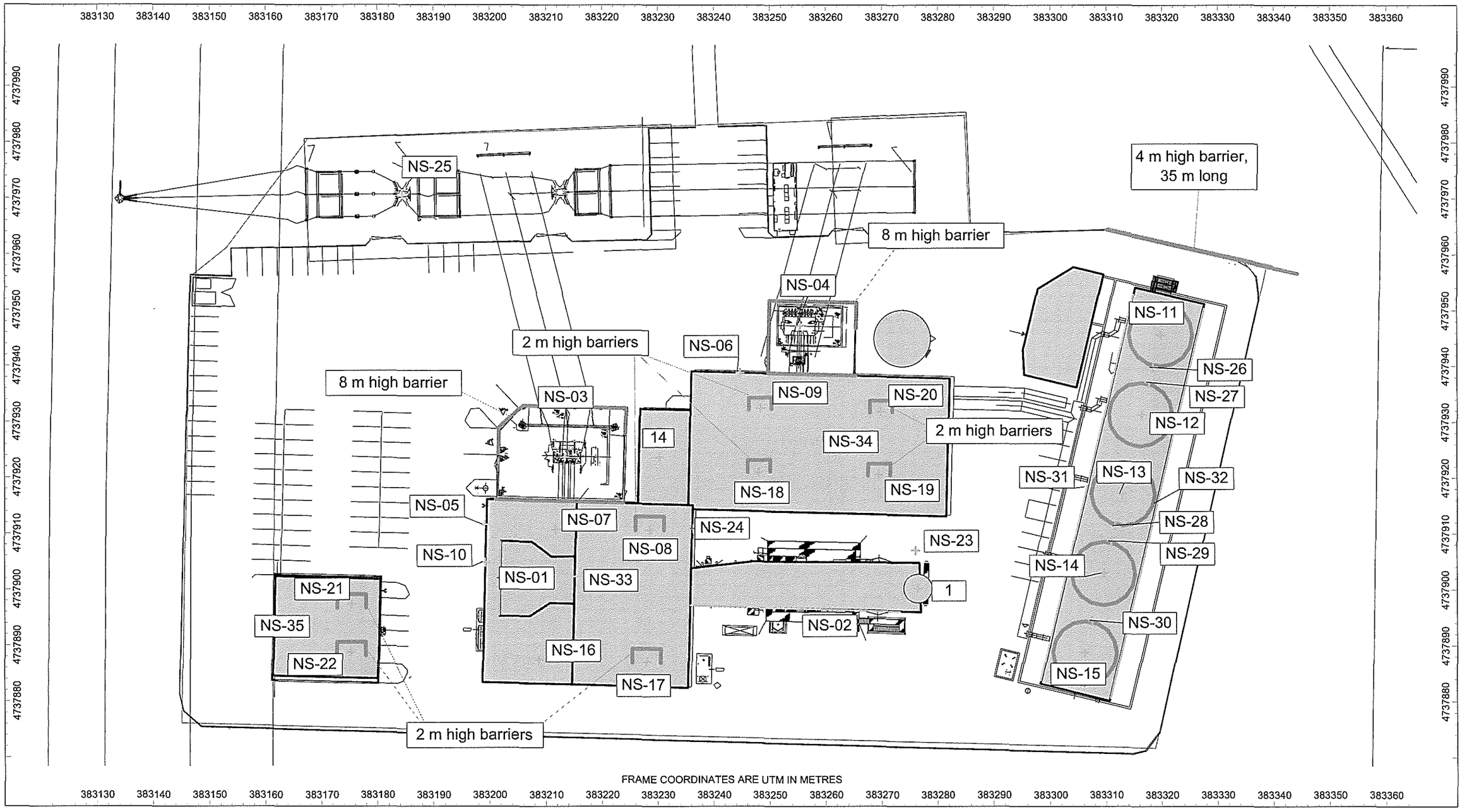


Figure 4: Source Location Plan
Green Electron East Site Power Project

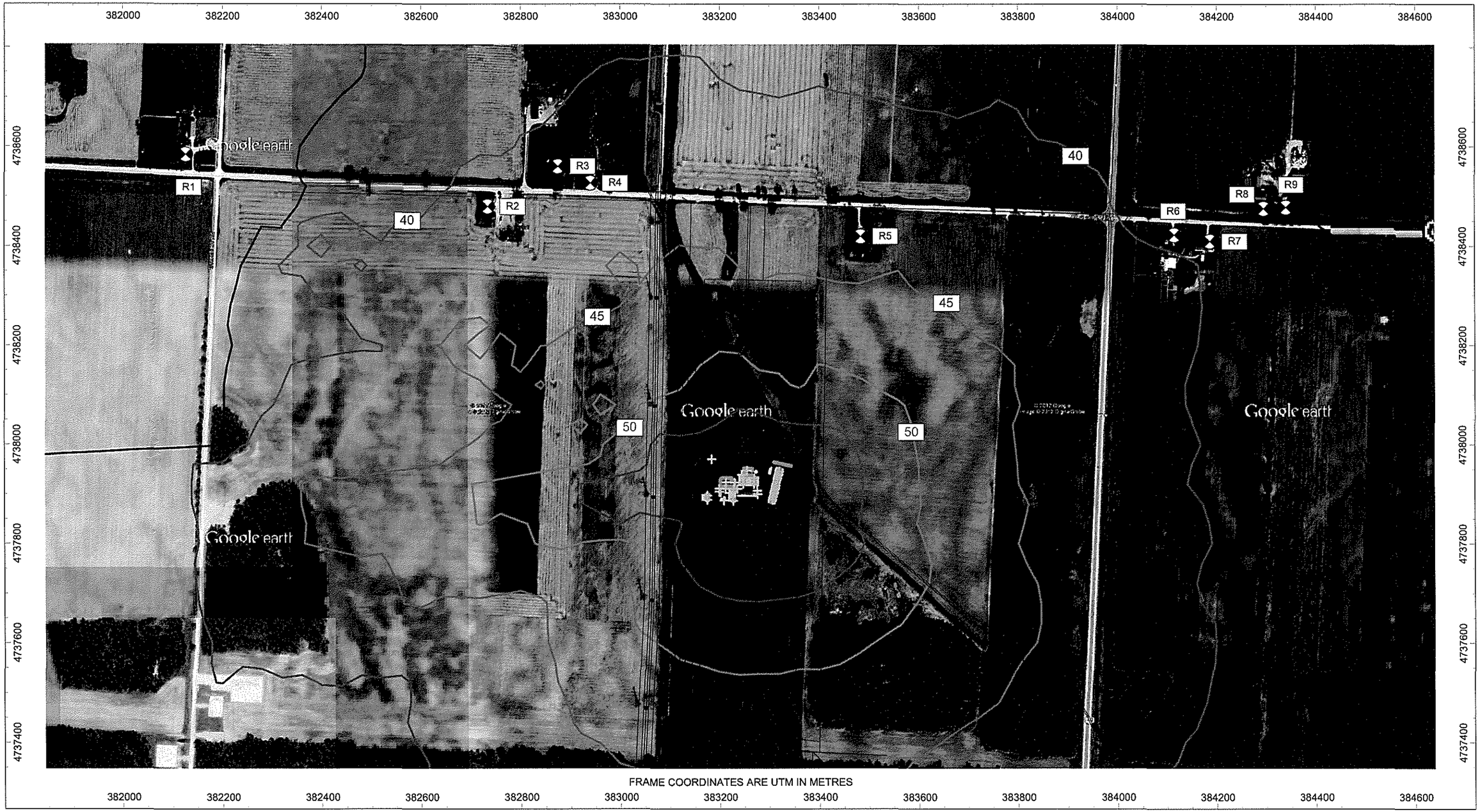


Figure 5: Predicted Daytime Sound Levels, Leq [dBA]
Green Electron East Site Power Project
Sound Level Grid Height Calculated at 4.5m

Figure 6: Predicted Nighttime Sound Levels, Leq [dBA]
Green Electron East Site Power Project
Sound Level Grid Height Calculated at 4.5m

APPENDIX A
Tables of Analysis Results

SUMMARY TABLES

VERSION CONTROL

Green Electron East Site Power Project, Lambton, Ontario

Tables Ver.	Date	Issued as Part of AAR?	Version Description	Prepared By
1.0	October 18, 2012	Y	Original version of tables as part of Ver. 1 of the Noise Feasibility Report	I. Bonsma

Table A1: Noise Source Summary Table

Source ID	Source Description	Sound Power Level* [dBA re 10^-12 W]	Source Location	Sound Characteristic	Noise Control Measure
1	HRSG Stack Outlet (Gas Turbogen Exhaust)	101	O	S	S
14	Rooftop A/C Unit	84	O	S	B
NS-01	GTS Air Inlet	101	O	S, T	S
NS-02	HRSG (Walls, Ducts, Piping)	108	O	S	U
NS-03d	250 MVA Transformer	112	O	S, T	B
NS-03n	250 MVA Transformer	104	O	S, T	B
NS-04d	200 MVA Transformer	112	O	S, T	B
NS-04n	200 MVA Transformer	108	O	S, T	B
NS-05	Roll up door Gas turbogen Room (large)	82	O	S	O
NS-06	Roll up door Steam genset Room	83	O	S	O
NS-07	Exhaust opening gas genset roof (2 of 4)	92	O	S	O
NS-08	Exhaust opening gas genset roof (1 of 4)	92	O	S	O
NS-09	Exhaust opening steam genset roof (1 of 4)	92	O	S	O
NS-10	Roll up door Gas turbogen Room (small west)	81	O	S	O
NS-11d	Cooling Tower Fan	106	O	S	O
NS-11n	Cooling Tower Fan - night	91	O	S	O
NS-12d	Cooling Tower Fan	106	O	S	O
NS-12n	Cooling Tower Fan - night	91	O	S	O
NS-13d	Cooling Tower Fan	106	O	S	O
NS-13n	Cooling Tower Fan - night	91	O	S	O
NS-14d	Cooling Tower Fan	106	O	S	O
NS-14n	Cooling Tower Fan - night	91	O	S	O
NS-15d	Cooling Tower Fan	106	O	S	O
NS-15n	Cooling Tower Fan - night	91	O	S	O
NS-16	Exhaust opening gas genset roof (3 of 4)	92	O	S	O
NS-17	Exhaust opening gas genset roof (4 of 4)	92	O	S	O
NS-18	Exhaust opening steam genset roof (2 of 4)	92	O	S	O
NS-19	Exhaust opening steam genset roof (3 of 4)	92	O	S	O
NS-20	Exhaust opening steam genset roof (4 of 4)	92	O	S	O
NS-21	Exhaust Fan Compressor Roof (1 of 2)	92	O	S	O
NS-22	Exhaust Fan Compressor Roof (2 of 2)	92	O	S	O
NS-23	Recirculating Pumps (30 hp total)	87	O	S	U
NS-24	Roll up door Gas turbogen Room (small east)	81	O	S	U
NS-25	Outdoor Switchgear	94	O	S, T	U
NS-26	Cooling Tower Fan Motor	94	O	S	O
NS-27	Cooling Tower Fan Motor	94	O	S	O
NS-28	Cooling Tower Fan Motor	94	O	S	O
NS-29	Cooling Tower Fan Motor	94	O	S	O
NS-30	Cooling Tower Fan Motor	94	O	S	O
NS-31	Falling water, Cooling Tower (west)	109	O	S	B, O
NS-32	Falling water, Cooling tower (east)	109	O	S	B, O
NS-33	Indoor gas turbogen room	89	I	S	O
NS-34	Indoor steam genset room	95	I	S	O
NS-35	Indoor gas compressor room	82	I	S	O

* Sound levels include mitigation measures.

Legend

Sound Characteristics
S: Steady
Q: Quasi-steady impulsive
I: Impulsive
B: Buzzing
T: Tonal (5dBA Penalty Included)
C: Cyclically varying
O: Occasional

Noise Control Measures (Noise Reductions Included)
S: Silencer, Acoustic Louvre, Muffler
A: Acoustic Lining, Plenum
B: Barrier, Berm, Screening
L: Lagging (Acoustical Wrapping)
E: Acoustic Enclosure
O: Other
U: Currently Uncontrolled

Source Location
O: Outdoors
I: Indoors

Table A1b: Origin of Raw Sound Level Data

Source ID	Source Description	Raw Source Sound Power Levels [dB] @ Octave Band Centre Frequency [Hz]									Source of Sound Level Data
		63	125	250	500	1000	2000	4000	8000	A	
1	HRSG Stack Outlet (Gas turbogen Exhaust)	147	149	149	148	146	144	140	134	152	Predicted based on standard texts
14	Rooftop A/C Unit	64	70	73	78	81	77	73	67	84	Manufacturer's Data
NS-01	GTS Air Inlet	137	132	128	129	132	133	137	135	141	Predicted based on standard texts
NS-02	HRSG (Walls, Ducts, Piping)	115	107	102	100	102	103	99	89	108	HGC Measurements at a simlar facility
NS-03d	250 MVA Transformer, daytime	110	112	107	107	101	96	91	84	107	Manufacturer's Data and Calculations
NS-03n	250 MVA Transformer, nighttime	102	104	99	99	93	88	83	76	99	Manufacturer's Data and Calculations
NS-04d	200 MVA Transformer, daytime	110	112	107	107	101	96	91	84	107	Manufacturer's Data and Calculations
NS-04n	200 MVA Transformer, nighttime	106	108	103	103	97	92	87	80	103	Manufacturer's Data and Calculations
NS-05	Roll up door Gas turbogen Room (large)	100	100	96	94	92	93	87	79	98	Predictions based on indoor calcs
NS-06	Roll up door Steam genset Room	101	103	97	93	93	90	86	80	98	Predictions based on indoor calcs
NS-07	Exhaust opening gas genset roof (2 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-08	Exhaust opening gas genset roof (1 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-09	Exhaust opening steam genset roof (1 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-10	Roll up door Gas turbogen Room (small west)	99	100	95	93	91	92	87	78	97	Predictions based on indoor calcs
NS-11d to NS-15d	Cooling Tower Fan, daytime	111	110	107	103	102	97	92	86	107	Manufacturer's Data
NS-11n to NS-15n	Cooling Tower Fan, nighttime	96	95	92	88	87	81	77	71	91	Manufacturer's Data
NS-16	Exhaust opening gas genset roof (3 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-17	Exhaust opening gas genset roof (4 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-18	Exhaust opening steam genset roof (2 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-19	Exhaust opening steam genset roof (3 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-20	Exhaust opening steam genset roof (4 of 4)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-21, NS-22	Exhaust Fan Compressor Roof (1 of 2)	93	84	82	83	88	87	81	76	92	Predictions based on indoor calcs
NS-23	Recirculating Pumps (30 hp total)	77	78	80	80	83	80	76	70	87	Predicted based on standard texts
NS-24	Roll up door Gas turbogen Room (small east)	99	100	95	93	91	92	87	78	97	Predictions based on indoor calcs
NS-25	Outdoor Switchgear	94	103	87	85	76	69	63	59	89	HGC Measurements at a simlar facility
NS-26 to NS-30	Cooling Tower Fan Motor	98	97	94	97	97	95	90	81	101	HGC Measurements at a simlar facility
NS-31	Falling water, Cooling Tower (west)	78	86	91	106	108	108	110	106	115	Manufacturer's Data
NS-32	Falling water, Cooling tower (east)	78	86	91	106	108	108	110	106	115	Manufacturer's Data
NS-33	Indoor gas turbogen room	119	119	115	112	111	112	106	98	117	Casing Rad Predictions Indoors
NS-34	Indoor steam genset room	124	126	120	116	116	113	109	103	121	Casing Rad Predictions Indoors
NS-35	Indoor gas compressor room	108	113	112	110	113	118	115	108	122	Casing Rad Predictions Indoors

*Unmitigated Sound Power Levels

Table A2: Point of Reception Noise Impact Table

Source ID	Source Name	Point of Reception																											
		R1 LEQ [dBA]			R2 LEQ [dBA]			R3 LEQ [dBA]			R4 LEQ [dBA]			R5 LEQ [dBA]			R6 LEQ [dBA]			R7 LEQ [dBA]			R8 LEQ [dBA]			R9 LEQ [dBA]		
		Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night	Dist [m]	Day	Night
1	HRSG Stack Outlet (Gas turbogen Exhaust)	1338	15	15	794	20	20	774	20	20	712	21	21	560	23	23	989	18	18	1044	18	18	1171	16	16	1211	16	16
14	Rootop A/C unit	1286	6	6	745	16	16	730	16	16	669	17	17	557	6	6	1016	--	--	1073	--	--	1199	--	--	1241	--	--
NS-01	GTS Air Inlet	1276	25	25	746	29	29	740	29	29	682	29	29	594	24	24	1063	13	13	1125	13	13	1255	12	12	1291	12	12
NS-02	HRSG (Walls, Ducts, Piping)	1317	11	11	768	18	18	758	17	17	693	18	18	561	19	19	1002	13	13	1063	11	11	1190	10	10	1229	10	10
NS-03	250 MVA Transformer	1272	29	20	733	36	28	722	34	25	662	34	26	565	36	28	1031	19	11	1088	18	10	1215	17	9	1256	17	9
NS-04	200 MVA Transformer	1296	25	21	744	32	28	722	33	29	659	33	29	524	36	32	982	32	28	1039	28	24	1166	27	23	1208	27	23
NS-05	Roll up door Gas turbogen Room (large)	1266	11	11	733	19	19	726	19	19	667	20	20	582	9	9	1049	--	--	1106	--	--	1233	--	--	1274	--	--
NS-06	Roll up door Steam genset Room	1290	12	12	742	18	18	723	17	17	661	18	18	536	16	16	995	8	8	1053	3	3	1179	2	2	1221	2	2
NS-07	Exhaust opening gas genset roof (2 of 4)	1276	14	14	741	20	20	732	20	20	672	21	21	576	23	23	1038	--	--	1095	--	--	1221	--	--	1263	--	--
NS-08	Exhaust opening gas genset roof (1 of 4)	1291	6	6	753	14	14	741	13	13	680	14	14	569	6	6	1024	--	--	1080	--	--	1207	--	--	1248	--	--
NS-09	Exhaust opening steam genset roof (1 of 4)	1297	6	6	750	12	12	731	11	11	670	12	12	541	14	14	996	12	12	1053	7	7	1180	6	6	1221	6	6
NS-10	Roll up door Gas turbogen Room (small west)	1269	11	11	739	15	15	732	15	15	674	16	16	588	7	7	1052	--	--	1109	--	--	1236	--	--	1277	--	--
NS-11d	Cooling Tower Fan	1353	24	--	792	30	--	760	30	--	694	31	--	501	34	--	927	29	--	983	28	--	1110	25	--	1151	25	--
NS-11n	Cooling Tower Fan - night	1353	--	9	792	--	15	760	--	15	694	--	16	501	--	19	927	--	14	983	--	13	1110	--	10	1151	--	10
NS-12d	Cooling Tower Fan	1357	24	--	799	30	--	769	30	--	704	31	--	516	31	--	938	29	--	993	28	--	1120	25	--	1161	25	--
NS-12n	Cooling Tower Fan - night	1357	--	9	799	--	15	769	--	15	704	--	16	516	--	16	938	--	13	993	--	13	1120	--	10	1161	--	10
NS-13d	Cooling Tower Fan	1361	16	--	807	30	--	779	30	--	715	31	--	531	31	--	948	30	--	1003	26	--	1130	25	--	1171	25	--
NS-13n	Cooling Tower Fan - night	1361	--	1	807	--	15	779	--	15	715	--	16	531	--	16	948	--	15	1003	--	11	1130	--	10	1171	--	10
NS-14d	Cooling Tower Fan	1364	13	--	813	19	--	788	30	--	724	31	--	544	31	--	958	30	--	1013	26	--	1140	25	--	1180	25	--
NS-14n	Cooling Tower Fan - night	1364	--	--	813	--	4	788	--	15	724	--	16	544	--	15	958	--	14	1013	--	11	1140	--	10	1180	--	10
NS-15d	Cooling Tower Fan	1369	11	--	822	17	--	799	16	--	735	17	--	560	30	--	969	28	--	1023	26	--	1150	25	--	1190	25	--
NS-15n	Cooling Tower Fan - night	1369	--	--	822	--	2	799	--	1	735	--	2	560	--	15	969	--	13	1023	--	11	1150	--	10	1190	--	10
NS-16	Exhaust opening gas genset roof (3 of 4)	1287	13	13	758	14	14	752	7	7	693	7	7	599	2	2	1053	--	--	1109	--	--	1235	--	--	1276	--	--
NS-17	Exhaust opening gas genset roof (4 of 4)	1303	5	5	770	12	12	761	12	12	701	12	12	590	5	5	1036	3	3	1092	3	3	1219	2	2	1259	1	1
NS-18	Exhaust opening steam genset roof (2 of 4)	1303	5	5	759	12	12	742	11	11	680	12	12	552	14	14	1002	5	5	1059	5	5	1185	4	4	1226	4	4
NS-19	Exhaust opening steam genset roof (3 of 4)	1321	3	3	773	12	12	753	11	11	690	12	12	543	14	14	984	12	12	1040	8	8	1166	7	7	1207	6	6
NS-20	Exhaust opening steam genset roof (4 of 4)	1316	5	5	765	12	12	743	11	11	680	12	12	533	14	14	978	12	12	1034	8	8	1161	7	7	1202	6	6
NS-21	Exhaust Fan Compressor Roof (1 of 2)	1254	7	7	730	12	12	729	11	11	672	21	21	607	13	13	1077	--	--	1134	--	--	1261	--	--	1302	--	--
NS-22	Exhaust Fan Compressor Roof (2 of 2)	1258	7	7	737	12	12	736	11	11	680	12	12	614	13	13	1081	--	--	1138	--	--	1264	--	--	1306	--	--
NS-23	Recirculating Pumps (30 hp total)	1333	--	--	787	--	--	767	--	--	704	--	--	552	5	5	985	--	--	1040	--	--	1167	--	--	1207	--	--
NS-24	Roll up door Gas turbogen Room (small east)	1297	--	--	757	--	--	743	--	--	683	--	--	565	--	--	1017	--	--	1073	--	--	1200	--	--	1241	--	--
NS-25	Outdoor Switchgear	1223	18	18	679	24	24	667	24	24	607	25	25	539	26	26	1035	20	20	1094	20	20	1220	18	18	1262	18	18
NS-26	Cooling Tower Fan Motor	1354	11	11	794	5	5	763	5	5	698	5	5	507	16	16	931	10	10	987	10	10	1114	0	0	1155	--	--
NS-27	Cooling Tower Fan Motor	1355	11	11	796	20	20	766	20	20	700	21	21	511	16	16	934	24	24	989	24	24	1116	18	18	1157	18	18
NS-28	Cooling Tower Fan Motor	1362	--	--	809	3	3	783	11	11	718	12	12	536	14	14	952	15	15	1007	0	0	1134	--	--	1174	--	--
NS-29	Cooling Tower Fan Motor	1363	--	--	811	12	12	785	25	25	721	26	26	539	15	15	954	23	23	1009	19	19	1136	18	18	1176	17	17
NS-30	Cooling Tower Fan Motor	1367	--	--	818	5	5	795	12	12	731	21	21	554	14	14	965	22	22	1019	19	19	1146	18	18	1186	17	17
NS-31	Falling water, Cooling Tower (west)	1354	11	11	800	27	27	783	30	30	721	31	31	535	29	29	955	22	22	1011	18	18	1138	7	7	1175	6	6
NS-32	Falling water, Cooling tower (east)	1377	4	4	815	11	11	784	12	12	718	13	13	532	36	36	931	32	32	986	32	32	1113	30	30	1154	30	30
NS-33	Indoor gas turbogen room	1284	2	2	750	11	11	741	11	11	682	11	11	582	18	18	1039	5	5	1096	4	4	1223	4	4	1264	5	5
NS-34	Indoor steam genset room	1308	10	10	761	23	23	742	26	26	679	27	27	543	29	29	991	21	21	1047	11	11	1174	11	11	1215	11	11
NS-35	Indoor gas compressor room	1252	7	7	731	12	12	731	12	12	675	13	13	613	11	11	1083	--	--	1140	--	--	1266	1	1	1308	--	--

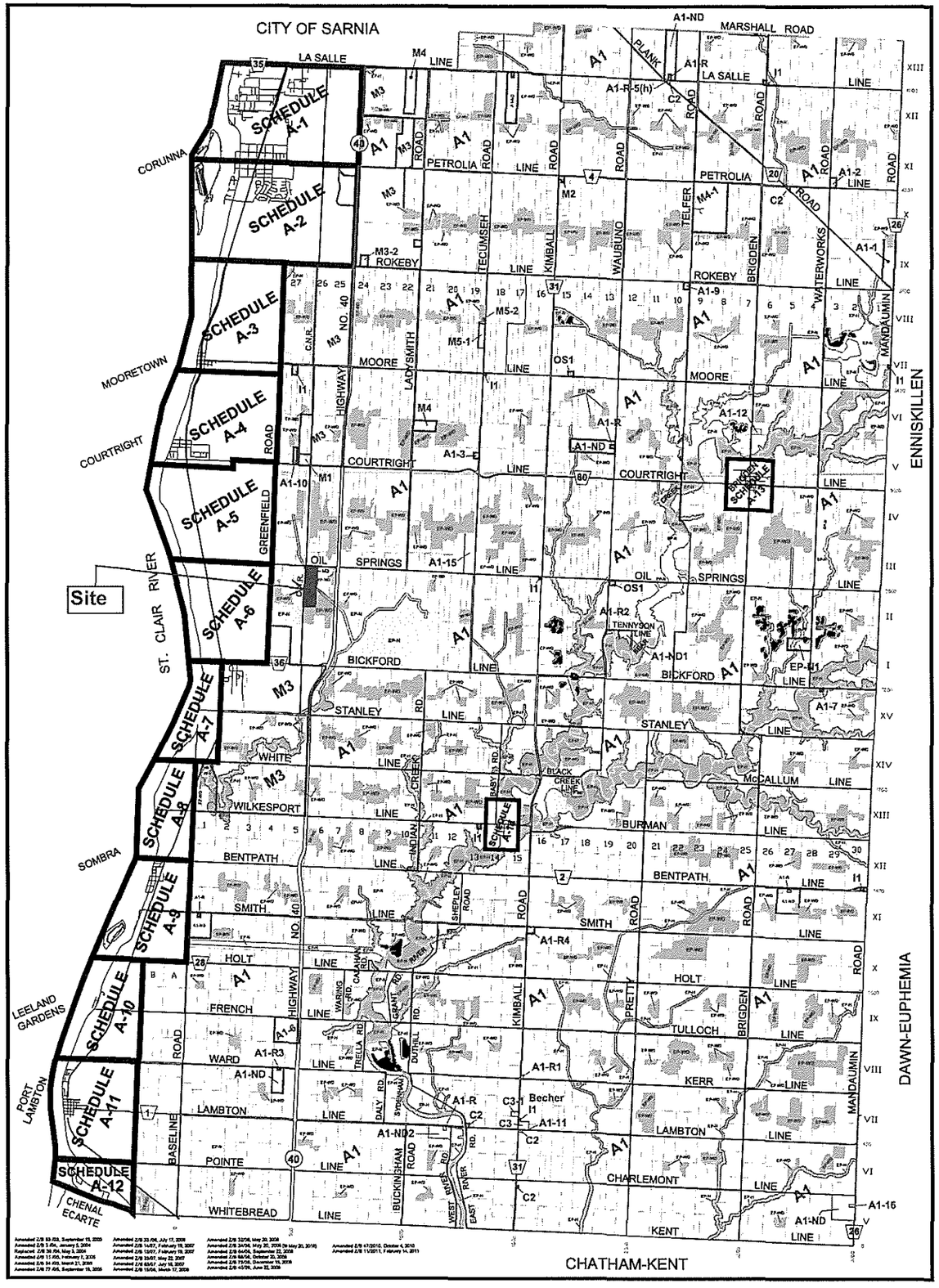
Note: Reported sound levels include all adjustment factors (time weighting, tonal penalty), as applicable

Table A3: Acoustic Assessment Summary Table

Point of Reception	Point of Reception Description	Sound Level at Point of Reception, LEQ [dBA]		Verified by Acoustic Audit	Performace Limit, LEQ [dBA]		Compliance with Performance Limit
		Day	Evening/ Night		Day	Evening/ Night	
R1	Two Storey Home on Oil Springs Line	33	29	No	45	40	Yes/Yes
R2	Single Storey Home on Oil Springs Line	41	36	No	45	40	Yes/Yes
R3	Single Storey Home on Oil Springs Line	41	37	No	45	40	Yes/Yes
R4	Single Storey Home on Oil Springs Line	42	38	No	45	40	Yes/Yes
R5	Two Storey Home on Oil Springs Line	43	40	No	45	40	Yes/Yes
R6	Two Storey Home on Oil Springs Line	40	36	No	45	40	Yes/Yes
R7	Two Storey Home on Oil Springs Line	37	34	No	45	40	Yes/Yes
R8	Two Storey Home on Oil Springs Line	36	32	No	45	40	Yes/Yes
R9	Two Storey Home on Oil Springs Line	35	32	No	45	40	Yes/Yes

APPENDIX B

Zoning



TOWNSHIP OF ST. CLAIR
SCHEDULE "A"

TO BY-LAW NO. 39 OF 2004

PASSED THIS 3 DAY OF MAY, 2004

JOSEPH DEDECKER, MAYOR

JOHN DeMARS, CLERK

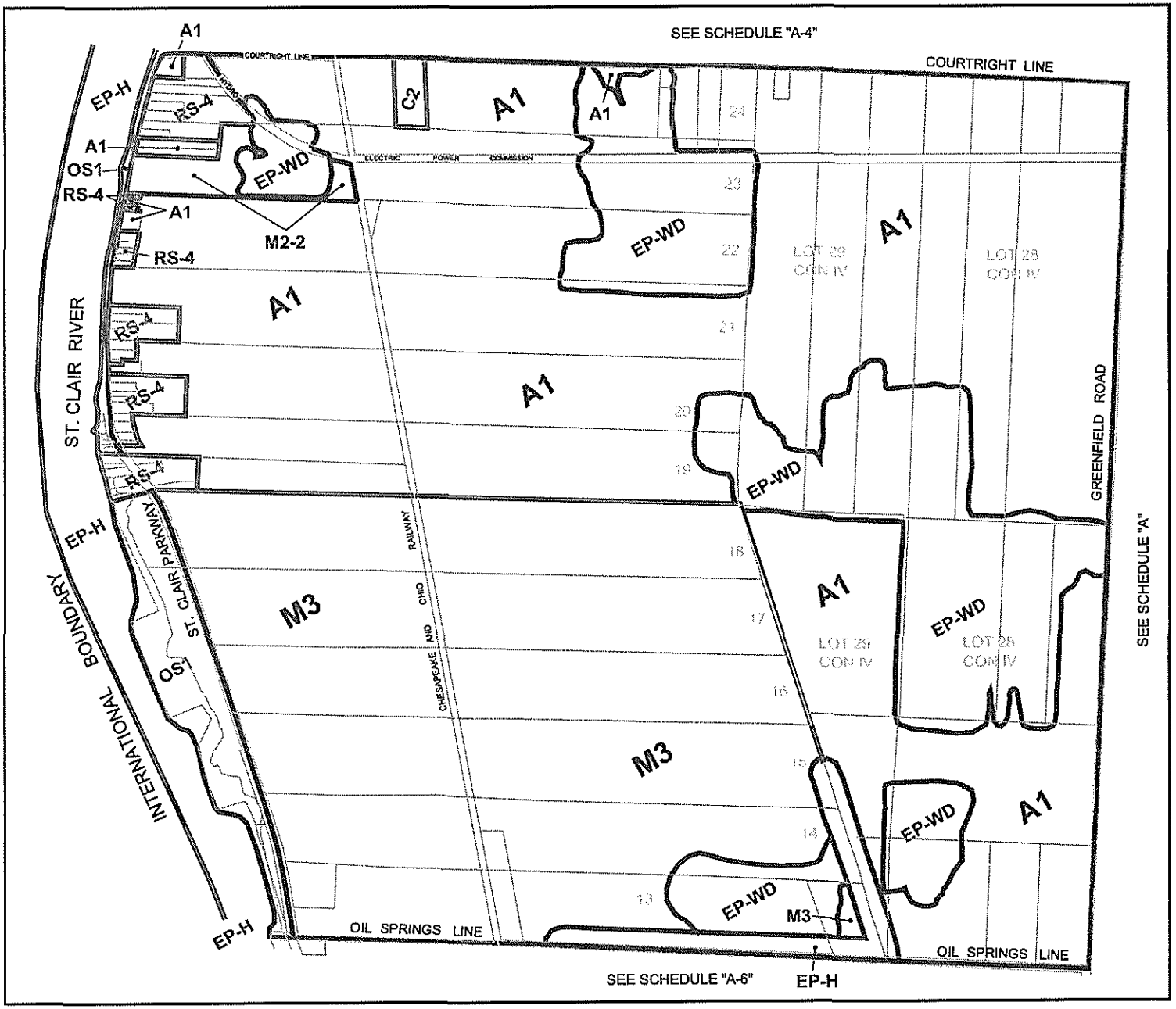
LEGEND:

ZONE	SYMBOL
AGRICULTURAL - 1	A1
AGRICULTURAL - Non-Farm Rural Residential	A1-R
RESIDENTIAL - 1	R1
RESIDENTIAL - 2	R2
RESIDENTIAL - 3	R3
RESIDENTIAL - 4	R4
RESIDENTIAL - 5	R5
RESIDENTIAL - 6	R6
SUBURBAN RESIDENTIAL	RS
INSTITUTIONAL - 1	I1
CENTRAL COMMERCIAL	C1
HIGHWAY COMMERCIAL	C2
AGRICULTURAL COMMERCIAL	C3
WATERFRONT COMMERCIAL	C4
NEIGHBOURHOOD COMMERCIAL	C5
INDUSTRIAL TYPE 1	M1
INDUSTRIAL TYPE 2	M2
INDUSTRIAL TYPE 3	M3
WASTE DISPOSAL INDUSTRIAL	M4
AGRICULTURAL INDUSTRIAL	M5
ENVIRONMENTAL PROTECTION - WETLAND	EP-WET
ENVIRONMENTAL PROTECTION - HAZARD	EP-H
ENVIRONMENTAL PROTECTION - WOODLOT	EP-WD
ENVIRONMENTAL PROTECTION - NATURAL	EP-N
OPEN SPACE - 1	OS1
OPEN SPACE - 2	OS2
FUTURE DEVELOPMENT	FD
HOLDING SYMBOL	h1, h2, ...
NO DWELLING	-ND
EXCEPTIONS	-1, -2, ...

0 500 1000 2000 4000 6000 METRES

SCALE

PREPARED BY:
COUNTY OF LAMBTON
PLANNING AND DEVELOPMENT DEPARTMENT
April 7, 2004



TOWNSHIP OF ST. CLAIR
SCHEDULE "A-5"
COURTRIGHT LINE - OIL SPRINGS LINE

TO BY-LAW NO. 17 OF 2003

PASSED THIS 21 st DAY OF April, 2003

JOSEPH DEDECKER, MAYOR

JOHN DeMARS, CLERK

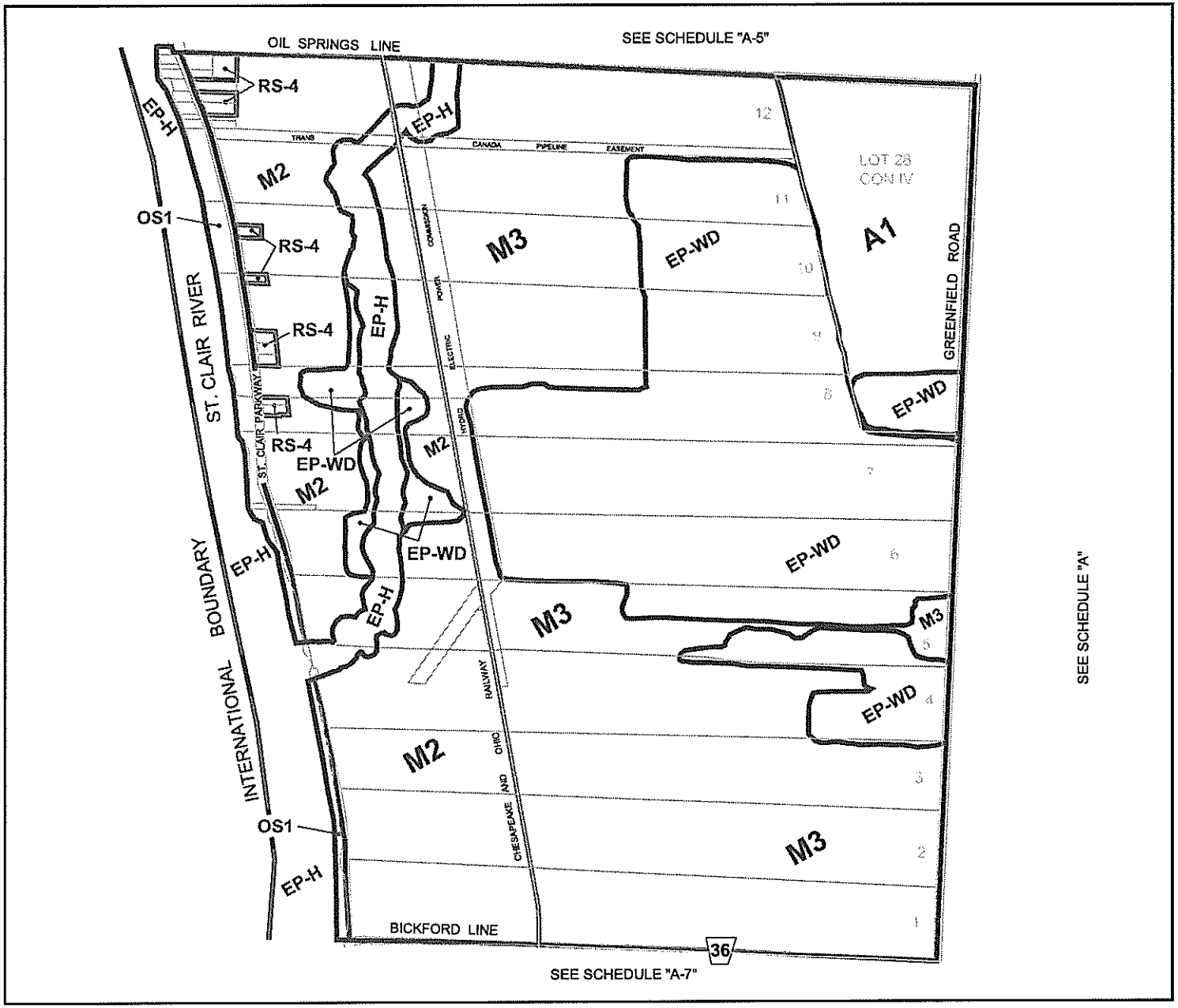
LEGEND:

ZONE	SYMBOL
AGRICULTURAL - 1	A1
RESIDENTIAL - 1	R1
RESIDENTIAL - 2	R2
RESIDENTIAL - 3	R3
RESIDENTIAL - 4	R4
RESIDENTIAL - 5	R5
RESIDENTIAL - 6	R6
SUBURBAN RESIDENTIAL	RS
INSTITUTIONAL - 1	I1
CENTRAL COMMERCIAL	C1
HIGHWAY COMMERCIAL	C2
AGRICULTURAL COMMERCIAL	C3
WATERFRONT COMMERCIAL	C4
NEIGHBOURHOOD COMMERCIAL	C5
INDUSTRIAL TYPE 1	M1
INDUSTRIAL TYPE 2	M2
INDUSTRIAL TYPE 3	M3
WASTE DISPOSAL INDUSTRIAL	M4
AGRICULTURAL INDUSTRIAL	M5
ENVIRONMENTAL PROTECTION - HAZARD	EP-H
ENVIRONMENTAL PROTECTION - WETLAND	EP-WET
ENVIRONMENTAL PROTECTION - WOODLOT	EP-WD
ENVIRONMENTAL PROTECTION - NATURAL	EP-N
OPEN SPACE - 1	OS1
OPEN SPACE - 2	OS2
FUTURE DEVELOPMENT	FD
HOLDING SYMBOL	h1, h2, ...
EXCEPTIONS	-1, -2, ...

0 50 100 200 400 600 METRES

SCALE

PREPARED BY:
COUNTY OF LAMBTON
PLANNING AND DEVELOPMENT DEPARTMENT
April 21, 2003



TOWNSHIP OF ST. CLAIR
SCHEDULE "A-6"
OIL SPRINGS LINE - BICKFORD LINE

TO BY-LAW NO. 17 OF 2003

PASSED THIS 21 st DAY OF April, 2003

JOSEPH DEDECKER, MAYOR — JOHN DeMARS, CLERK

LEGEND:

ZONE	SYMBOL
AGRICULTURAL - 1	A1
RESIDENTIAL - 1	R1
RESIDENTIAL - 2	R2
RESIDENTIAL - 3	R3
RESIDENTIAL - 4	R4
RESIDENTIAL - 5	R5
RESIDENTIAL - 6	R6
SUBURBAN RESIDENTIAL	RS
INSTITUTIONAL - 1	I1
CENTRAL COMMERCIAL	C1
HIGHWAY COMMERCIAL	C2
AGRICULTURAL COMMERCIAL	C3
WATERFRONT COMMERCIAL	C4
NEIGHBOURHOOD COMMERCIAL	C5
INDUSTRIAL TYPE 1	M1
INDUSTRIAL TYPE 2	M2
INDUSTRIAL TYPE 3	M3
WASTE DISPOSAL INDUSTRIAL	M4
AGRICULTURAL INDUSTRIAL	M5
ENVIRONMENTAL PROTECTION - HAZARD	EP-H
ENVIRONMENTAL PROTECTION - WETLAND	EP-WET
ENVIRONMENTAL PROTECTION - WOODLOT	EP-WD
ENVIRONMENTAL PROTECTION - NATURAL	EP-N
OPEN SPACE - 1	OS1
OPEN SPACE - 2	OS2
FUTURE DEVELOPMENT	FD
HOLDING SYMBOL	h1, h2, ...
EXCEPTIONS	-1, -2, ...

0 50 100 200 400 600 METRES
SCALE

PREPARED BY:
COUNTY OF LAMBTON
PLANNING AND DEVELOPMENT DEPARTMENT
April 21, 2003

APPENDIX C

Details of Predictive Acoustical Modeling

The predictive model used for this Assessment (*Cadna-A version 4.2.141*) is based on the methods from ISO Standard 9613-2.2 "Acoustics - Attenuation of Sound During Propagation Outdoors" [2], which accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures (or by topography and foliage where applicable). This modeling technique is acceptable to the MOE.

The Green Electron East Site Power Project and surrounding area were modelled as flat ground based on observations made during the site visits. Ground attenuation was assumed to be spectral for all sources, with the ground factor (G) assumed to be 0.25 for the subject site and 0.75 for the surrounding area (representative of open fields). The temperature and relative humidity were assumed to be 10° C and 70%, respectively.

The predictive modelling considered one order of reflection, with shielding/reflections afforded by onsite and offsite buildings/structures, with spectral absorptive characteristics applied to each structure as appropriate, with values representative of concrete block, corrugated metal or steel, as appropriate.

Most mechanical sources – gas turbine exhaust, transformers, building ventilation, cooling tower fans, etc. – were modeled as point sources of sound. Sound propagating through the building walls were modeled as line sources within the building and the gas turbine air inlet and cooling tower air inlets were modeled as vertical area sources. All plant sources were assumed to run continuously.

APPENDIX D

Background Sound Measurements

HGC Engineering conducted automated and attended sound level measurements at R1 during the week of August 10 to 15, 2012. The acoustical environment at the receptors comprised of distant industrial sounds and natural sounds. The results are summarized in Table D1 and the figures. Weather conditions were generally acceptable, except during periods of high winds and rain identified on the figures.

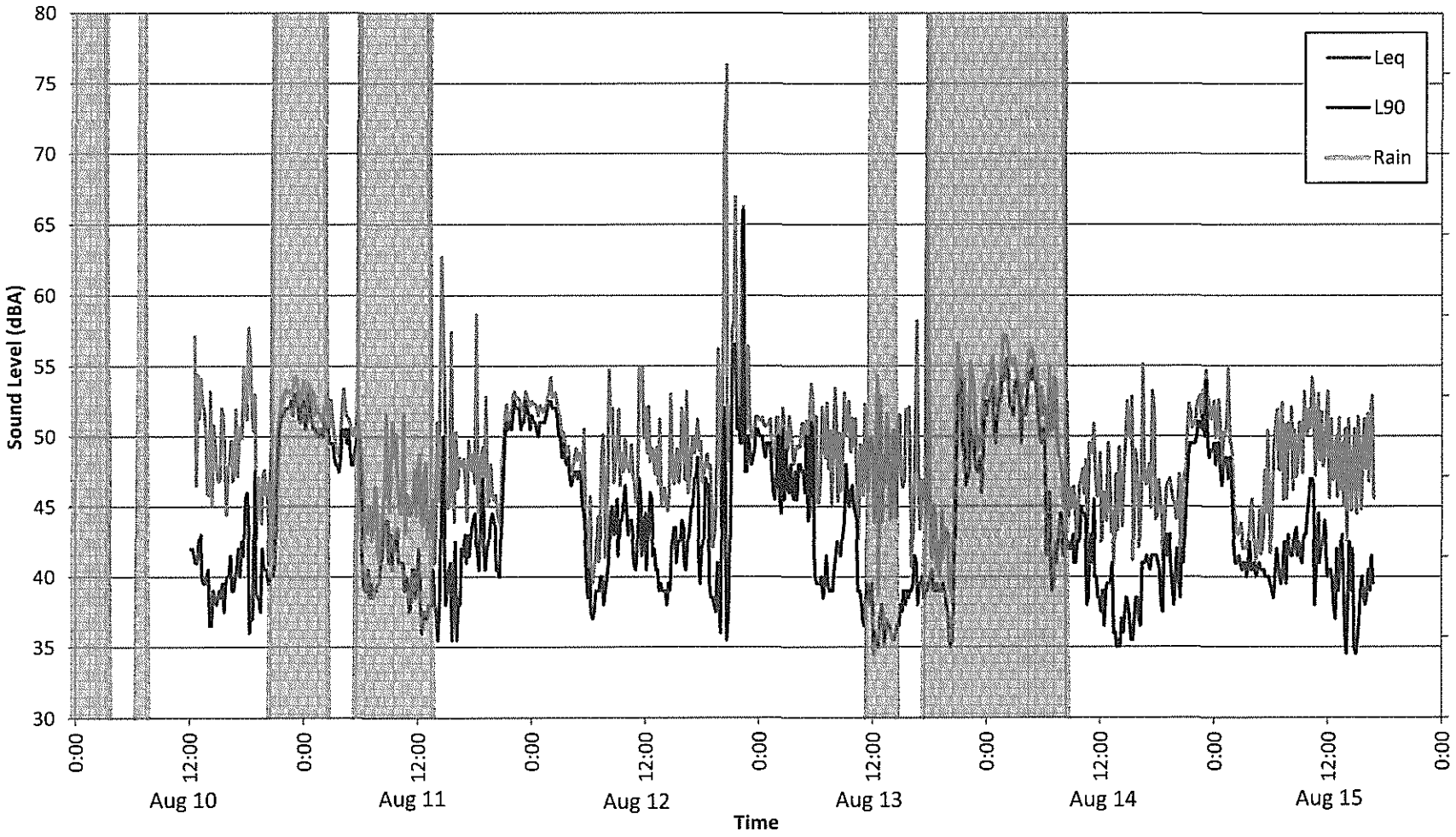
The results of the unattended, automatically monitored background sound levels show that the sound levels generally ranged from 35 to 55 dBA, with elevated sound levels during nighttime hours due to the presence of crickets. Daytime sound levels are dominated by natural sounds, distant road traffic on St. Clair Parkway and Highway 40 and other industrial sounds.

The attended and automated sound level measurements were conducted using Brüel and Kjaer model 2236 Precision Integrating Sound Level Meters. All instrumentation was within its annual laboratory calibration period. Field checks of correct calibration were made before and after the measurements. The measurement methods followed the procedures stipulated in MOE guideline NPC-103.

Table D1 – Attended Background Sound Level Measurements, L_{EQ} [dBA]

Location	Date, Time of Measurement	L_{EQ} Sound Level	Noise Sources and Comments
R5	Fri. August 10, 2012 17:30	53	Crickets, Distant traffic and industry
	Wed. August 15, 2012, 12:00	44	Crickets, Distant traffic and industry

Figure D1: L_{EQ} and L_{90} Sound Level Data Collected Automatically near Receptor R5, August 10 - 15, 2012



APPENDIX E

Manufacturer's Sound Level Data

NOISE PREDICTION (FAR FIELD) MODEL: CFD(F)-424834-5I-33

Project: GREENFIELD SOUTH POWER PROJECT
CTD Ref: 787-NB05

TOWER INFO

Measuring distance (ft):	328	100.0 meters	
Cell Length (ft):	48		
Cell Width (ft):	42	Water baffles Y/N?	Y
No. of cells (longitudinal):	5	Inlet Barrier Wall (IF installed):	
Air inlet Ht (ft):	14	Wall Height	7 ft
Water loading (gpm/sqft):	9.92	Tower to wall distance	11 ft

Water Noise

		Octave Band Data								
	Overall	63	125	250	500	1K	2K	4K	8K	
SPL (A)	89.6	53.1	61.1	65.6	80.6	82.6	83.1	84.7	80.6	
10 Log (S)		24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	
PWL (A)	114.6	78.0	86.0	90.5	105.5	107.5	108.0	109.6	105.5	Note #1
Divergence		-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	
Air absorption		0	0	0	0	0	0	-1	-3	
Ground effect		0	-0.6	-1.8	-1.8	-1.2	-1.2	-0.6	0	
Basin attenuation		-2	-3	-3	-3	-4	-4	-4	-4	
Baffles attenuation		-5	-5	-6	-8	-8	-8	-4	-3	
SPL(A)	55.3	23.0	29.4	31.7	44.7	46.3	46.8	52.0	47.5	
		71.0	78.0	81.5	94.5	95.5	96.0	101.6	98.5	
PWL (A)	105.1	97.0	94.0	90.5	97.5	95.5	95.0	100.6	99.5	

Water Noise at Air Inlet

Fan Noise

Fan Mfg: HUDSON
Model: APT-32.8K-12
Rpm 109.5 RPM

		Octave Band Data								
	Overall	63	125	250	500	1K	2K	4K	8K	
PWL		111.1	109.6	107.2	103.1	102.2	96.6	92.1	85.7	
A weighting		-26	-16	-9	-3	0	1	1	-1	
PWL(A)	106.4	85.1	93.6	98.2	100.1	102.2	97.6	93.1	84.7	
										Note #2
Add for N fa		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Divergence		-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	
Directivity		-2	-6	-8	-9	-10	-11	-12	-13	
Air absorption		0	0	0	0	0	0	-1	-3	
SPL (A)	56.3	42.1	46.6	49.2	50.1	51.2	45.6	39.1	27.7	
		83.1	87.6	90.2	91.1	92.2	86.6	81.1	71.7	
PWL (A)	97.3	109.1	103.6	99.2	94.1	92.2	85.6	80.1	72.7	

Fan Noise Relative to Stack Exit

SPL(A)	58.8	42.2	46.7	49.3	51.2	52.4	49.2	52.2	47.5

Combined Water & Fan Noise at 100 m

SPL(A)	84.9	95.5	87.8	81.6	80.1	77.6	76.4	77.6	75.4

Combined Water & Fan Noise at 1 m from basin curb "A" Weighted

NOTE #1: Octave band sound values interpolated from field test data.

NOTE #2: Octave band sound values from Manufacturer's data

	Octave Band Data							
	63	125	250	500	1K	2K	4K	8K
Per fan mfg	108.6	107.1	104.7	100.6	99.7	94.1	89.6	83.2
Offset	2.5							

NOISE PREDICTION (FAR FIELD) MODEL: CFD(F)-424834-5I-33

Project: GREENFIELD SOUTH POWER PROJECT
CTD Ref: 787-NB05

TOWER INFO

Measuring distance (ft):	328	100.0 meters		
Cell Length (ft):	48			
Cell Width (ft):	42		Water baffles Y/N?	N
No. of cells (longitudinal):	5		Inlet Barrier Wall (IF installed):	
Air inlet Ht (ft):	14		Wall Height	7 ft
Water loading (gpm/sqft):	9.92		Tower to wall distance	11 ft

Water Noise

		Octave Band Data								
	Overall	63	125	250	500	1K	2K	4K	8K	
SPL (A)	89.6	53.1	61.1	65.6	80.6	82.6	83.1	84.7	80.6	
10 Log (S)		24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	
PWL (A)	114.6	78.0	86.0	90.5	105.5	107.5	108.0	109.6	105.5	Note #1
Divergence		-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	-48.1	
Air absorption		0	0	0	0	0	0	-1	-3	
Ground effect		0	-0.6	-1.8	-1.8	-1.2	-1.2	-0.6	0	
Basin attenuation		-2	-3	-3	-3	-4	-4	-4	-4	
Baffles attenuation		0	0	0	0	0	0	0	0	
SPL(A)	61.0	28.0	34.4	37.7	52.7	54.3	54.8	56.0	50.5	
		76.0	83.0	87.5	102.5	103.5	104.0	105.6	101.5	
PWL (A)	110.7	102.0	99.0	96.5	105.5	103.5	103.0	104.6	102.5	

Water Noise at Air Inlet

Fan Noise

Fan Mfg: HUDSON
Model: APT-32.8K-12
Rpm 109.5 RPM

		Octave Band Data								
	Overall	63	125	250	500	1K	2K	4K	8K	
PWL		111.1	109.6	107.2	103.1	102.2	96.6	92.1	85.7	
A weighting		-26	-16	-9	-3	0	1	1	-1	
PWL(A)	106.4	85.1	93.6	98.2	100.1	102.2	97.6	93.1	84.7	
										Note #2
Add for N fa		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Divergence		-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	
Directivity		-2	-6	-8	-9	-10	-11	-12	-13	
Air absorption		0	0	0	0	0	0	-1	-3	
SPL (A)	56.3	42.1	46.6	49.2	50.1	51.2	45.6	39.1	27.7	
		83.1	87.6	90.2	91.1	92.2	86.6	81.1	71.7	
PWL (A)	97.3	109.1	103.6	99.2	94.1	92.2	85.6	80.1	72.7	

Fan Noise Relative to Stack Exit

SPL(A)	62.3	42.3	46.9	49.5	54.6	56.0	55.3	56.1	50.5

Combined Water & Fan Noise at 100 m

SPL(A)	84.9	95.5	87.8	81.6	80.1	77.6	76.4	77.6	75.4

Combined Water & Fan Noise at 1 m from basin curb "A" Weighted

NOTE #1: Octave band sound values interpolated from field test data.

NOTE #2: Octave band sound values from Manufacturer's data

	Octave Band Data							
	63	125	250	500	1K	2K	4K	8K
Per fan mfg	108.6	107.1	104.7	100.6	99.7	94.1	89.6	83.2
Offset	2.5							

Ian Bonsma

From: Francis C. Itliong <fitliong@easternpower.on.ca>
Sent: September-10-12 8:48 AM
To: Ian Bonsma
Cc: Bill Gastmeier
Subject: FW: Cooling Tower Noise

Follow Up Flag: Follow up
Flag Status: Flagged

Ian,

Please see below regarding the cooling tower fan noise profile.

Regards,
Francis

Francis C. Itliong, P.Eng.
Eastern Power Limited

Site Office
1796 Mattawa Ave.
Mississauga, Ontario, Canada L4X 1K1
Tel: (905) 272-5145, ext 113 Fax: (905) 272-8918

Head Office
2275 Lake Shore Blvd. West, Suite 401
Toronto, Ontario, Canada M8V 3Y3
Tel: (416) 234-1301, ext. 113 Fax: (416) 234-8336
fitliong@easternpower.on.ca

From: Robin Stahnke [mailto:rstahnke@ctdinc.com]
Sent: Friday, September 07, 2012 5:05 PM
To: Fitliong@EasternPower.ON.CA
Cc: Ray Monette
Subject: FW: Cooling Tower Noise

Francis,

Listed below is the breakdown for the noise per your request.

	Overall	63	125	250	500	1K	2K	4K	8K
PWL (A)	82.2	94.0	88.5	84.0	79.0	77.1	70.4	65.0	57.6

Fan Noise Relative to Stack Exit

Steve Adams
President
Cooling Tower Depot, Inc.
720-746-1234

From: Steve Adams [mailto:sadams@ctdinc.com]
Sent: Wednesday, September 05, 2012 5:15 PM
To: 'Fitliong@EasternPower.ON.CA'
Cc: Ray Monette
Subject: Cooling Tower Noise

Francis,

I checked the fan noise for the cooling tower, per your request. The Fan Power level (relative to stack exit) at full speed is 97.3 dB(A) and 82.2 dB(A) at half speed. Please let us know if you need anything else.

Best Regards,

Steven D. Adams, President
Cooling Tower Depot, Inc.
651 Corporate Circle, Suite 206
Golden, Colorado 80401
(720) 746-1234 Phone
(720) 746-1110 Fax
(303) 513-3874 Cell
sadams@CTDInc.com

ABB

TEST REPORT

Sound Level

Report No. 9815-01

NO FANS

MT-1

Serial No.: LN09815-01

Test Condition:	100% ONAN Id=0 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAN
Number of Pumps:	0	**Measured Sound Pressure Level:**	68.77 dB(A)
Number of Fans:	0	**Measured Sound Power Level:**	90.11 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	80.00 dB(A)
Average Ambient Temperature:	26.0 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	54.77 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:		**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			66.1	73.6		
2	54.6	54.5	70.5	68.9	54.8	54.4
3			68.9	69.3		
4			67.9	71.3		
5			69.5	70.2		
6			70.2	65.8		
7			70.0	67.6		
8	56.6	54.5	66.4	70.7	56.5	54.8
9			64.9	68.2		
10			67.4	72.3		
11			67.5	65.4		
12			67.5	65.3		
13			66.2	62.0		
14	55.1	54.3	74.4	64.2	54.1	53.9
15			63.8	68.4		
16			66.6	66.6		
17			65.8	64.8		
18			67.7	70.6		
19			69.5	70.2		
20	53.5	54.1	67.9	67.2	54.7	54.6
21			69.8	68.2		
22			68.7	69.1		
23			67.4	69.0		
24			67.2	67.5		

Test Date:	Test Personnel:	Test Department:
10-02-2012	DP CS	USA STL TP/TPT

ABB

TEST REPORT

Sound Level

Report No. 9815-01

16 FANS IN OPERATION MT-1

Serial No.: LN09815-01

Test Condition:	100% ONAF Id=1 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAF
Number of Pumps:	0	**Measured Sound Pressure Level:**	74.34 dB(A)
Number of Fans:	16	**Measured Sound Power Level:**	95.69 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	81.00 dB(A)
Average Ambient Temperature:	26.0 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	54.77 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:		**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			76.7	77.1		
2	54.6	54.5	74.3	75.5	54.8	54.4
3			74.1	75.7		
4			74.7	75.1		
5			74.8	75.2		
6			74.8	74.5		
7			75.6	75.8		
8	56.6	54.5	74.2	75.5	56.5	54.8
9			74.6	75.5		
10			74.4	74.6		
11			74.3	75.5		
12			73.3	73.1		
13			74.3	74.1		
14	55.1	54.3	74.0	75.0	54.1	53.9
15			73.7	73.4		
16			73.5	74.0		
17			72.7	72.5		
18			72.2	72.1		
19			73.1	71.5		
20	53.5	54.1	72.5	71.2	54.7	54.6
21			74.0	72.3		
22			73.8	73.2		
23			74.3	73.3		
24			74.9	75.3		

Test Date:	Test Personnel:	Test Department:
10-02-2012	DP CS	USA STL TP/TPT

ABB

TEST REPORT

Sound Level

Report No. 9815-01

32 FANS IN OPERATION MT-1

Serial No.: LN09815-01

Test Condition:	100% ONAF Id=2 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAF
Number of Pumps:	0	**Measured Sound Pressure Level:**	77.08 dB(A)
Number of Fans:	32	**Measured Sound Power Level:**	98.42 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	82.00 dB(A)
Average Ambient Temperature:	26.0 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	54.77 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:		**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			78.3	78.3		
2	54.6	54.5	77.1	77.5	54.8	54.4
3			77.1	77.9		
4			76.6	77.1		
5			76.6	76.6		
6			76.3	76.6		
7			76.7	77.0		
8	56.6	54.5	76.7	77.0	56.5	54.8
9			75.4	76.3		
10			76.1	77.0		
11			78.2	78.5		
12			76.8	76.0		
13			75.6	75.3		
14	55.1	54.3	77.2	76.3	54.1	53.9
15			77.5	77.5		
16			77.3	76.4		
17			77.0	76.2		
18			77.0	75.9		
19			78.3	77.9		
20	53.5	54.1	78.0	78.4	54.7	54.6
21			77.7	76.8		
22			77.4	77.5		
23			77.4	76.9		
24			76.4	76.8		

Test Date:	Test Personnel:	Test Department:
10-02-2012	DP CS	USA STL TP/TPT

ABB

TEST REPORT
Sound Level

Report No. 9816-01

Serial No.: LN09816-01

NO FANS MT-2

Test Condition:	100% ONAN Id=0 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAN
Number of Pumps:	0	**Measured Sound Pressure Level:**	72.54 dB(A)
Number of Fans:	0	**Measured Sound Power Level:**	93.44 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	80.00 dB(A)
Average Ambient Temperature:	25.1 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	57.84 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:	Y1-Y2-Y3-Y0	**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			75.1	64.4		
2	58.4	57.9	71.3	69.2	58.3	57.7
3			67.1	69.5		
4			71.5	70.2		
5			71.2	69.1		
6			71.1	68.4		
7			72.6	71.4		
8	59.5	59.9	71.2	70.3	57.3	57.3
9			71.0	70.5		
10			69.4	78.0		
11			69.4	70.3		
12			73.5	76.7		
13	56.6	56.9	68.8	67.0	56.7	57.3
14			70.6	72.4		
15			68.7	68.6		
16			69.3	73.8		
17			73.9	70.2		
18			71.7	77.7		
19	58.0	58.0	75.8	76.5	56.6	57.4
20			72.1	69.8		
21			74.9	74.3		
22			72.5	75.0		

Test Date:	Test Personnel:	Test Department:
30-12-2011	MZ ME MK	USA STL TP/TPT

ABB

TEST REPORT
Sound Level

Report No. 9816-01

12 FANS MT-2

Serial No.: LN09816-01

Test Condition:	100% ONAF Id=1 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAF
Number of Pumps:	0	**Measured Sound Pressure Level:**	74.21 dB(A)
Number of Fans:	12	**Measured Sound Power Level:**	95.12 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	81.00 dB(A)
Average Ambient Temperature:	25.1 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	57.84 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:	Y1-Y2-Y3-Y0	**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			74.1	72.0		
2	58.4	57.9	74.9	76.0	58.3	57.7
3			74.4	75.1		
4			73.3	75.2		
5			74.5	75.4		
6			74.9	74.5		
7			72.6	74.4		
8	59.5	59.9	72.7	73.8	57.3	57.3
9			72.9	73.7		
10			73.0	75.5		
11			73.6	75.7		
12			74.4	73.8		
13	56.6	56.9	75.6	73.1	56.7	57.3
14			73.4	74.1		
15			72.8	74.2		
16			72.3	77.1		
17			75.0	71.9		
18			71.2	72.4		
19	58.0	58.0	78.1	70.5	56.6	57.4
20			75.0	72.4		
21			71.9	75.3		
22			73.5	73.7		

Test Date:	Test Personnel:	Test Department:
30-12-2011	MZ ME MK	USA STL TP/TPT

ABB

TEST REPORT
Sound Level

Report No. 9816-01

24 FANS MT-2

Serial No.: LN09816-01

Test Condition:	100% ONAF Id=2 A-Wt P 3 - -		
Applied Standard for Test:	ANSI	**Cooling Condition:**	ONAF
Number of Pumps:	0	**Measured Sound Pressure Level:**	76.49 dB(A)
Number of Fans:	24	**Measured Sound Power Level:**	97.40 dB(A)
Frequency:		**Guaranteed Sound Pressure Level:**	82.00 dB(A)
Average Ambient Temperature:	25.1 °C	**Guaranteed Sound Power Level:**	
Environmental Correction Factor:	0.00 dB(A)	**Background Sound Pressure Level:**	57.84 dB(A)
Measurement Type:	A-Weighted Sound Pressure Level		

1st Terminals:	H1-H2-H3-H0	**Tap:**	3
2nd Terminals:	X1-X2-X3	**Tap:**	-
3rd Terminals:	Y1-Y2-Y3-Y0	**Tap:**	

Measuring Point Number	At 1/3 Before Meas. (dB(A))	At 2/3 Before Meas. (dB(A))	At 1/3 Measured (dB(A))	At 2/3 Measured (dB(A))	At 1/3 After Meas. (dB(A))	At 2/3 After Meas. (dB(A))
1			76.5	76.8		
2	58.4	57.9	76.7	78.2	58.3	57.7
3			76.2	77.6		
4			74.7	76.0		
5			75.0	75.6		
6			75.4	74.8		
7			74.7	76.3		
8	59.5	59.9	75.0	75.6	57.3	57.3
9			74.2	75.2		
10			74.9	75.6		
11			75.4	77.5		
12			75.5	75.4		
13	56.6	56.9	77.7	75.9	56.7	57.3
14			76.5	76.7		
15			75.0	77.6		
16			75.3	76.9		
17			76.9	76.4		
18			78.8	77.2		
19	58.0	58.0	80.1	78.1	56.6	57.4
20			76.2	75.0		
21			75.4	78.0		
22			75.6	78.5		

Test Date:	Test Personnel:	Test Department:
30-12-2011	MZ ME MK	USA STL TP/TPT

Proposed Transformer - 250 MVA, with Fans

1 Ft ONAN / 6 Ft ONAF LwA	Lp	NEMA Surface S		Lw = Lp + 10*log S	
106.9	**82.0**	**306.8**	m^2	Total Perimeter:	40.6
				Height:	5.0
		0.0		Top Surface:	103.4

	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A**
Adjustment Value	-3	3	5	0	0	-6	-11	-16	-23	
Sound Power Level	103.9	109.9	111.9	106.9	106.9	100.9	95.9	90.9	83.9	**107.2**
									Tonal Penalty:	5
									Penalized A-Weighted Sum:	112

Proposed Transformer - 250 MVA, No Fans

1 Ft ONAN / 6 Ft ONAF LwA	Lp	NEMA Surface S		Lw = Lp + 10*log S	
98.6	**73.7**	**306.8**	m^2	Total Perimeter:	40.6
				Height:	5.0
		0.0		Top Surface:	103.4

	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A**
Adjustment Value	-3	3	5	0	0	-6	-11	-16	-23	
Sound Power Level	95.6	101.6	103.6	98.6	98.6	92.6	87.6	82.6	75.6	**98.9**
									Tonal Penalty:	5
									Penalized A-Weighted Sum:	104

NEMA sound level without fans is determined from guaranteed sound level (82.0) less the difference between the measured sound levels with and without the fans (8.3).

Proposed Transformer - 200 MVA, with Fans

1 Ft ONAN / 6 Ft ONAF LwA	NEMA Surface Lp	S		Lw = Lp + 10*log S	
106.9	**82.0**	**310.1**	m^2	Total Perimeter:	40.6
				Height:	5.1
		0.0		Top Surface:	103.0

	31.5	63	125	250	500	1000	2000	4000	8000	A
Adjustment Value	-3	3	5	0	0	-6	-11	-16	-23	
Sound Power Level	103.9	109.9	111.9	106.9	106.9	100.9	95.9	90.9	83.9	**107.3**
								Tonal Penalty:		5
								Penalized A-Weighted Sum:		112

Proposed Transformer - 200 MVA, No Fans

1 Ft ONAN / 6 Ft ONAF LwA	NEMA Surface Lp	S		Lw = Lp + 10*log S	
103.0	**78.1**	**310.1**	m^2	Total Perimeter:	40.6
				Height:	5.1
		0.0		Top Surface:	103.0

	31.5	63	125	250	500	1000	2000	4000	8000	A
Adjustment Value	-3	3	5	0	0	-6	-11	-16	-23	
Sound Power Level	100.0	106.0	108.0	103.0	103.0	97.0	92.0	87.0	80.0	**103.3**
								Tonal Penalty:		5
								Penalized A-Weighted Sum:		108

NEMA sound level without fans is determined from guaranteed sound level (82.0) less the difference between the measured sound levels with and without the fans (3.9).

APPENDIX F

Sample Calculation Results

In the following tables of calculation results, the column headings for the various sound attenuation mechanisms follow the terminology of ISO Standard 9613-2. LxD and LxN are the A-weighted, one-hour energy-equivalent source sound power levels for day and night, respectively, which include the effects of any source-abatement measures included in the model, and any time-averaging effects for intermittent sources. LrD and LrN are the A-weighted, one-hour energy-equivalent sound levels at the points of reception. The results are presented in terms of overall A-weighted results, at the most impacted off-site points of reception.

Summary of Calculations - Condensed Overall dBA Format

R2	Single Storey Home on Oil Springs Line	382735	4738479	2.5																
Src ID	Src Name	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	RefID	RefIN	LrD	LrN
1	HRSG Stack Outlet (Gas turbogen Exhaust)	383276	4737900	39.9	101	101	69.0	0	-6.4	-0.8	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	20	20
14	Rootop A/C unit	383230	4737924	14.3	84	84	68.4	0	0.0	-1.0	0.0	3.9	0.0	0.0	0.0	0.0	2.8	2.8	16	16
NS-01	GTS Air Inlet	383202	4737897	16.5	101	101	68.4	3	-0.6	-2.0	0.0	7.9	0.0	0.0	0.0	0.0	0.0	0.0	29	29
NS-02	HRSG (Walls, Ducts, Piping)	383250	4737909	1.5	108	108	68.8	3	0.0	-1.9	22.4	3.9	0.0	0.0	0.0	0.0	0.0	0.0	18	18
NS-03	250 MVA Transformer	383213	4737924	3.0	112	104	68.3	0	0.0	0.5	9.7	1.4	0.0	0.0	0.0	0.0	3.4	3.4	36	28
NS-04	200 MVA Transformer	383255	4737948	3.0	112	108	68.4	0	0.0	1.1	12.4	1.3	0.0	0.0	0.0	0.0	3.3	3.3	32	28
NS-05	Roll up door Gas turbogen Room (large)	383199	4737912	3.5	82	82	68.3	3	0.0	-0.7	0.0	1.5	0.0	0.0	0.0	0.0	2.9	2.9	19	19
NS-06	Roll up door Steam genset Room	383245	4737940	2.5	83	83	68.4	3	0.0	-0.3	0.0	1.0	0.0	0.0	0.0	0.0	1.1	1.1	18	18
NS-07	Exhaust opening gas genset roof (2 of 4)	383212	4737912	11.0	92	92	68.4	0	0.0	-1.1	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0	20	20
NS-08	Exhaust opening gas genset roof (1 of 4)	383229	4737911	21.0	92	92	68.5	0	0.0	-0.5	9.0	3.6	0.0	0.0	0.0	0.0	2.4	2.4	14	14
NS-09	Exhaust opening steam genset roof (1 of 4)	383248	4737933	26.0	92	92	68.5	0	0.0	-0.4	8.7	3.6	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-10	Roll up door Gas turbogen Room (small west)	383199	4737905	2.0	81	81	68.4	3	0.0	-1.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	15	15
NS-11d	Cooling Tower Fan	383320	4737946	9.5	106	--	69.0	0	0.0	0.5	7.4	1.9	0.0	0.0	0.0	0.0	2.3	2.2	30	--
NS-11n	Cooling Tower Fan - night	383320	4737946	9.5	--	91	69.0	0	0.0	0.5	7.5	1.9	0.0	0.0	0.0	0.0	2.3	2.3	--	15
NS-12d	Cooling Tower Fan	383316	4737932	9.5	106	--	69.1	0	0.0	0.4	7.4	1.9	0.0	0.0	0.0	0.0	2.3	2.5	30	--
NS-12n	Cooling Tower Fan - night	383316	4737932	9.5	--	91	69.1	0	0.0	0.4	7.4	1.9	0.0	0.0	0.0	0.0	2.3	2.3	--	15
NS-13d	Cooling Tower Fan	383313	4737917	9.5	106	--	69.1	0	0.0	0.4	7.7	1.9	0.0	0.0	0.0	0.0	2.4	1.6	30	--
NS-13n	Cooling Tower Fan - night	383313	4737917	9.5	--	91	69.1	0	0.0	0.4	7.7	1.9	0.0	0.0	0.0	0.0	2.4	2.4	--	15
NS-14d	Cooling Tower Fan	383310	4737904	9.5	106	--	69.2	0	0.0	0.5	16.7	1.2	0.0	0.0	0.0	0.0	0.0	1.6	19	--
NS-14n	Cooling Tower Fan - night	383310	4737904	9.5	--	91	69.2	0	0.0	0.4	16.7	1.2	0.0	0.0	0.0	0.0	0.0	0.0	--	4
NS-15d	Cooling Tower Fan	383306	4737889	9.5	106	--	69.3	0	0.0	0.2	18.5	1.4	0.0	0.0	0.0	0.0	0.0	0.0	17	--
NS-15n	Cooling Tower Fan - night	383306	4737889	9.5	--	91	69.3	0	0.0	0.2	18.5	1.4	0.0	0.0	0.0	0.0	0.0	0.0	--	2
NS-16	Exhaust opening gas genset roof (3 of 4)	383209	4737888	11.0	92	92	68.6	0	0.0	-1.1	6.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	14	14
NS-17	Exhaust opening gas genset roof (4 of 4)	383228	4737888	21.0	92	92	68.7	0	0.0	-0.6	8.4	3.8	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-18	Exhaust opening steam genset roof (2 of 4)	383248	4737921	26.0	92	92	68.6	0	0.0	-0.5	8.5	3.6	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-19	Exhaust opening steam genset roof (3 of 4)	383270	4737921	26.0	92	92	68.8	0	0.0	-0.5	8.6	3.7	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-20	Exhaust opening steam genset roof (4 of 4)	383270	4737932	26.0	92	92	68.7	0	0.0	-0.4	8.5	3.6	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-21	Exhaust Fan Compressor Roof (1 of 2)	383175	4737897	10.0	92	92	68.3	0	0.0	-0.9	9.4	3.5	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-22	Exhaust Fan Compressor Roof (2 of 2)	383175	4737889	10.0	92	92	68.3	0	0.0	-0.9	9.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-23	Recirculating Pumps (30 hp total)	383276	4737908	2.0	87	87	68.9	0	0.0	-1.4	23.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-24	Roll up door Gas turbogen Room (small east)	383236	4737912	2.0	81	81	68.6	3	0.0	-1.8	19.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-25	Outdoor Switchgear	383185	4737971	5.0	94	94	67.6	0	0.0	1.8	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	24	24
NS-26	Cooling Tower Fan Motor	383318	4737940	9.5	94	94	69.0	0	0.0	-0.3	17.7	2.2	0.0	0.0	0.0	0.0	0.0	0.0	5	5
NS-27	Cooling Tower Fan Motor	383318	4737937	9.5	94	94	69.0	0	0.0	-0.9	4.5	4.1	0.0	0.0	0.0	0.0	2.7	2.7	20	20
NS-28	Cooling Tower Fan Motor	383312	4737912	9.5	94	94	69.2	0	0.0	-0.4	19.7	2.2	0.0	0.0	0.0	0.0	0.0	0.0	3	3
NS-29	Cooling Tower Fan Motor	383311	4737909	9.5	94	94	69.2	0	0.0	-0.8	11.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	12	12
NS-30	Cooling Tower Fan Motor	383307	4737895	9.5	94	94	69.3	0	0.0	-0.8	18.4	2.6	0.0	0.0	0.0	0.0	0.9	0.9	5	5
NS-31	Falling water, Cooling Tower (west)	383304	4737917	1.1	109	109	69.0	3	0.0	-1.0	8.7	8.6	0.0	0.0	0.0	0.0	0.0	0.0	27	27
NS-32	Falling water, Cooling tower (east)	383319	4737910	1.1	109	109	69.2	3	0.0	-0.9	23.5	8.7	0.0	0.0	0.0	0.0	0.0	0.0	11	11
NS-33	Indoor gas turbogen room	383215	4737903	9.9	89	89	68.5	0	0.0	-1.6	12.2	0.2	0.0	0.0	0.0	0.0	1.2	1.2	11	11
NS-34	Indoor steam genset room	383258	4737926	12.4	95	95	68.6	0	0.0	-0.4	3.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	23	23
NS-35	Indoor gas compressor room	383171	4737893	4.4	82	82	68.3	0	0.0	1.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	12	12

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

R5	Two Storey Home on Oil Springs Line	383483	4738420	4.5																
Src ID	Src Name	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN
1	HRSG Stack Outlet (Gas turbogen Exhaust)	383276	4737900	39.9	101	101	66.0	0	-7.1	-1.2	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	23	23
14	Rootop A/C unit	383230	4737924	14.3	84	84	65.9	0	0.0	-0.8	10.3	2.4	0.0	0.0	0.0	0.0	0.0	0.0	6	6
NS-01	GTS Air Inlet	383202	4737897	16.5	101	101	66.4	3	-0.1	-2.4	15.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	24	24
NS-02	HRSG (Walls, Ducts, Piping)	383253	4737908	1.5	108	108	66.1	3	0.0	-2.0	24.1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	19	19
NS-03	250 MVA Transformer	383213	4737924	3.0	112	104	66.0	0	0.0	-0.4	11.4	1.0	0.0	0.0	0.0	0.0	1.7	1.7	36	28
NS-04	200 MVA Transformer	383255	4737948	3.0	112	108	65.4	0	0.0	0.2	14.1	1.0	0.0	0.0	0.0	0.0	4.2	4.2	36	32
NS-05	Roll up door Gas turbogen Room (large)	383199	4737912	3.5	82	82	66.3	3	0.0	-1.5	11.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	9	9
NS-06	Roll up door Steam genset Room	383245	4737940	2.5	83	83	65.6	3	0.0	-0.3	3.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	16	16
NS-07	Exhaust opening gas genset roof (2 of 4)	383212	4737912	11.0	92	92	66.2	0	0.0	-1.1	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	23	23
NS-08	Exhaust opening gas genset roof (1 of 4)	383229	4737911	21.0	92	92	66.1	0	0.0	-0.9	18.5	2.3	0.0	0.0	0.0	0.0	0.0	0.0	6	6
NS-09	Exhaust opening steam genset roof (1 of 4)	383248	4737933	26.0	92	92	65.7	0	0.0	-0.8	10.7	2.6	0.0	0.0	0.0	0.0	0.0	0.0	14	14
NS-10	Roll up door Gas turbogen Room (small west)	383199	4737905	2.0	81	81	66.4	3	0.0	-2.0	13.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	7	7
NS-11d	Cooling Tower Fan	383320	4737946	9.5	106	--	65.0	0	0.0	-0.3	9.3	1.2	0.0	0.0	0.0	0.0	2.3	1.6	34	--
NS-11n	Cooling Tower Fan - night	383320	4737946	9.5	--	91	65.0	0	0.0	-0.3	9.3	1.2	0.0	0.0	0.0	0.0	2.4	2.4	--	19
NS-12d	Cooling Tower Fan	383316	4737932	9.5	106	--	65.3	0	0.0	-0.2	11.9	1.0	0.0	0.0	0.0	0.0	2.6	1.6	31	--
NS-12n	Cooling Tower Fan - night	383316	4737932	9.5	--	91	65.3	0	0.0	-0.2	11.9	1.0	0.0	0.0	0.0	0.0	2.6	2.6	--	16
NS-13d	Cooling Tower Fan	383313	4737917	9.5	106	--	65.5	0	0.0	-0.3	12.1	1.0	0.0	0.0	0.0	0.0	2.6	1.6	31	--
NS-13n	Cooling Tower Fan - night	383313	4737917	9.5	--	91	65.5	0	0.0	-0.3	12.1	1.0	0.0	0.0	0.0	0.0	2.7	2.7	--	16
NS-14d	Cooling Tower Fan	383310	4737904	9.5	106	--	65.7	0	0.0	-0.4	12.3	1.1	0.0	0.0	0.0	0.0	2.7	1.6	31	--
NS-14n	Cooling Tower Fan - night	383310	4737904	9.5	--	91	65.7	0	0.0	-0.4	12.3	1.1	0.0	0.0	0.0	0.0	2.8	2.8	--	15
NS-15d	Cooling Tower Fan	383306	4737889	9.5	106	--	66.0	0	0.0	-0.4	12.2	1.1	0.0	0.0	0.0	0.0	2.8	1.6	30	--
NS-15n	Cooling Tower Fan - night	383306	4737889	9.5	--	91	66.0	0	0.0	-0.4	12.2	1.1	0.0	0.0	0.0	0.0	2.8	2.8	--	15
NS-16	Exhaust opening gas genset roof (3 of 4)	383209	4737888	11.0	92	92	66.6	0	0.0	-1.3	22.1	2.7	0.0	0.0	0.0	0.0	0.0	0.0	2	2
NS-17	Exhaust opening gas genset roof (4 of 4)	383228	4737888	21.0	92	92	66.4	0	0.0	-0.9	18.9	2.4	0.0	0.0	0.0	0.0	0.0	0.0	5	5
NS-18	Exhaust opening steam genset roof (2 of 4)	383248	4737921	26.0	92	92	65.8	0	0.0	-0.8	10.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	14	14
NS-19	Exhaust opening steam genset roof (3 of 4)	383270	4737921	26.0	92	92	65.7	0	0.0	-0.8	10.8	2.6	0.0	0.0	0.0	0.0	0.0	0.0	14	14
NS-20	Exhaust opening steam genset roof (4 of 4)	383270	4737932	26.0	92	92	65.5	0	0.0	-0.8	10.7	2.5	0.0	0.0	0.0	0.0	0.0	0.0	14	14
NS-21	Exhaust Fan Compressor Roof (1 of 2)	383175	4737897	10.0	92	92	66.7	0	0.0	-1.2	10.3	2.9	0.0	0.0	0.0	0.0	0.0	0.0	13	13
NS-22	Exhaust Fan Compressor Roof (2 of 2)	383175	4737889	10.0	92	92	66.8	0	0.0	-1.2	10.4	2.9	0.0	0.0	0.0	0.0	0.0	0.0	13	13
NS-23	Recirculating Pumps (30 hp total)	383276	4737908	2.0	87	87	65.9	0	0.0	-1.5	14.9	2.4	0.0	0.0	0.0	0.0	0.0	0.0	5	5
NS-24	Roll up door Gas turbogen Room (small east)	383236	4737912	2.0	81	81	66.1	3	0.0	-2.2	20.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-25	Outdoor Switchgear	383185	4737971	5.0	94	94	65.6	0	0.0	1.4	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	26	26
NS-26	Cooling Tower Fan Motor	383318	4737940	9.5	94	94	65.1	0	0.0	-0.7	17.1	1.7	0.0	0.0	0.0	0.0	4.9	4.9	16	16
NS-27	Cooling Tower Fan Motor	383318	4737937	9.5	94	94	65.2	0	0.0	-0.7	14.1	1.6	0.0	0.0	0.0	0.0	2.5	2.5	16	16
NS-28	Cooling Tower Fan Motor	383312	4737912	9.5	94	94	65.6	0	0.0	-0.9	17.6	1.8	0.0	0.0	0.0	0.0	4.2	4.2	14	14
NS-29	Cooling Tower Fan Motor	383311	4737909	9.5	94	94	65.6	0	0.0	-0.9	14.6	1.8	0.0	0.0	0.0	0.0	2.1	2.1	15	15
NS-30	Cooling Tower Fan Motor	383307	4737895	9.5	94	94	65.9	0	0.0	-0.9	14.6	1.8	0.0	0.0	0.0	0.0	2.0	2.0	14	14
NS-31	Falling water, Cooling Tower (west)	383307	4737914	1.1	109	109	65.4	3	0.0	-0.8	21.9	5.8	0.0	0.0	0.0	0.0	9.2	9.2	29	29
NS-32	Falling water, Cooling tower (east)	383319	4737914	1.1	109	109	65.5	3	0.0	-1.2	4.7	7.3	0.0	0.0	0.0	0.0	0.0	0.0	36	36
NS-33	Indoor gas turbogen room	383215	4737903	9.9	89	89	66.3	0	0.0	-0.3	4.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	18	18
NS-34	Indoor steam genset room	383258	4737926	12.4	95	95	65.7	0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	29	29
NS-35	Indoor gas compressor room	383171	4737893	4.4	82	82	66.7	0	0.0	0.3	4.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	11	11

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

R6	Two Storey Home on Oil Springs Line	384115	4738423	4.5																
Src ID	Src Name	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN
1	HRSG Stack Outlet (Gas turbogen Exhaust)	383276	4737900	39.9	101	101	70.9	0	-5.9	-1.2	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	18	18
14	Rootop A/C unit	383230	4737924	14.3	84	84	71.1	0	0.0	-1.1	24.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-01	GTS Air Inlet	383200	4737882	16.6	101	101	71.4	3	-0.1	-3.5	22.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	13	13
NS-02	HRSG (Walls, Ducts, Piping)	383255	4737909	1.5	108	108	71.1	3	0.0	-2.2	24.5	4.7	0.0	0.0	0.0	0.0	0.0	0.0	13	13
NS-03	250 MVA Transformer	383213	4737924	3.0	112	104	71.3	0	0.0	-0.2	20.6	1.7	0.0	0.0	0.0	0.0	0.0	0.0	19	11
NS-04	200 MVA Transformer	383255	4737948	3.0	112	108	70.8	0	0.0	0.4	9.8	1.7	0.0	0.0	0.0	0.0	2.9	2.9	32	28
NS-05	Roll up door Gas turbogen Room (large)	383199	4737912	3.5	82	82	71.4	3	0.0	-2.2	21.3	0.8	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-06	Roll up door Steam genset Room	383245	4737940	2.5	83	83	71.0	3	0.0	-1.0	7.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	8	8
NS-07	Exhaust opening gas genset roof (2 of 4)	383212	4737912	11.0	92	92	71.3	0	0.0	-1.7	25.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-08	Exhaust opening gas genset roof (1 of 4)	383229	4737911	21.0	92	92	71.2	0	0.0	-1.1	19.8	3.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-09	Exhaust opening steam genset roof (1 of 4)	383248	4737933	26.0	92	92	71.0	0	0.0	-0.8	8.3	4.4	0.0	0.0	0.0	0.0	2.9	2.9	12	12
NS-10	Roll up door Gas turbogen Room (small west)	383199	4737905	2.0	81	81	71.4	3	0.0	-2.0	23.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-11d	Cooling Tower Fan	383320	4737946	9.5	106	--	70.3	0	0.0	-0.6	7.8	2.1	0.0	0.0	0.0	0.0	2.0	2.5	29	--
NS-11n	Cooling Tower Fan - night	383320	4737946	9.5	--	91	70.3	0	0.0	-0.6	7.8	2.1	0.0	0.0	0.0	0.0	2.0	2.0	--	14
NS-12d	Cooling Tower Fan	383316	4737932	9.5	106	--	70.4	0	0.0	-0.6	8.0	2.2	0.0	0.0	0.0	0.0	2.1	1.9	29	--
NS-12n	Cooling Tower Fan - night	383316	4737932	9.5	--	91	70.4	0	0.0	-0.6	8.0	2.2	0.0	0.0	0.0	0.0	2.1	2.1	--	13
NS-13d	Cooling Tower Fan	383313	4737917	9.5	106	--	70.5	0	0.0	-0.6	7.7	2.2	0.0	0.0	0.0	0.0	3.7	3.7	30	--
NS-13n	Cooling Tower Fan - night	383313	4737917	9.5	--	91	70.5	0	0.0	-0.6	7.7	2.2	0.0	0.0	0.0	0.0	3.7	3.7	--	15
NS-14d	Cooling Tower Fan	383310	4737904	9.5	106	--	70.6	0	0.0	-0.6	7.8	2.2	0.0	0.0	0.0	0.0	3.1	3.7	30	--
NS-14n	Cooling Tower Fan - night	383310	4737904	9.5	--	91	70.6	0	0.0	-0.6	7.8	2.2	0.0	0.0	0.0	0.0	3.1	3.1	--	14
NS-15d	Cooling Tower Fan	383306	4737889	9.5	106	--	70.7	0	0.0	-0.6	7.7	2.2	0.0	0.0	0.0	0.0	2.0	1.6	28	--
NS-15n	Cooling Tower Fan - night	383306	4737889	9.5	--	91	70.7	0	0.0	-0.6	7.7	2.2	0.0	0.0	0.0	0.0	2.0	2.0	--	13
NS-16	Exhaust opening gas genset roof (3 of 4)	383209	4737888	11.0	92	92	71.5	0	0.0	-1.7	24.8	5.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-17	Exhaust opening gas genset roof (4 of 4)	383228	4737888	21.0	92	92	71.3	0	0.0	-1.1	14.6	4.1	0.0	0.0	0.0	0.0	0.0	0.0	3	3
NS-18	Exhaust opening steam genset roof (2 of 4)	383248	4737921	26.0	92	92	71.0	0	0.0	-0.8	12.6	4.1	0.0	0.0	0.0	0.0	0.0	0.0	5	5
NS-19	Exhaust opening steam genset roof (3 of 4)	383270	4737921	26.0	92	92	70.9	0	0.0	-0.8	8.1	4.4	0.0	0.0	0.0	0.0	2.8	2.8	12	12
NS-20	Exhaust opening steam genset roof (4 of 4)	383270	4737932	26.0	92	92	70.8	0	0.0	-0.8	8.1	4.4	0.0	0.0	0.0	0.0	2.8	2.8	12	12
NS-21	Exhaust Fan Compressor Roof (1 of 2)	383175	4737897	10.0	92	92	71.6	0	0.0	-1.8	23.3	4.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-22	Exhaust Fan Compressor Roof (2 of 2)	383175	4737889	10.0	92	92	71.7	0	0.0	-1.8	21.9	3.8	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-23	Recirculating Pumps (30 hp total)	383276	4737908	2.0	87	87	70.9	0	0.0	-1.4	13.8	3.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-24	Roll up door Gas turbogen Room (small east)	383236	4737912	2.0	81	81	71.2	3	0.0	-2.2	22.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--
NS-25	Outdoor Switchgear	383185	4737971	5.0	94	94	71.3	0	0.0	1.2	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	20	20
NS-26	Cooling Tower Fan Motor	383318	4737940	9.5	94	94	70.4	0	0.0	-1.1	11.7	3.0	0.0	0.0	0.0	0.0	0.6	0.6	10	10
NS-27	Cooling Tower Fan Motor	383318	4737937	9.5	94	94	70.4	0	0.0	-1.1	0.0	4.5	0.0	0.0	0.0	0.0	4.4	4.4	24	24
NS-28	Cooling Tower Fan Motor	383312	4737912	9.5	94	94	70.6	0	0.0	-1.1	12.8	3.0	0.0	0.0	0.0	0.0	6.8	6.8	15	15
NS-29	Cooling Tower Fan Motor	383311	4737909	9.5	94	94	70.6	0	0.0	-1.2	0.0	4.5	0.0	0.0	0.0	0.0	3.4	3.4	23	23
NS-30	Cooling Tower Fan Motor	383307	4737895	9.5	94	94	70.7	0	0.0	-1.2	0.0	4.6	0.0	0.0	0.0	0.0	2.7	2.7	22	22
NS-31	Falling water, Cooling Tower (west)	383306	4737916	1.1	109	109	70.6	3	0.0	-0.7	23.2	8.6	0.0	0.0	0.0	0.0	11.4	11.4	22	22
NS-32	Falling water, Cooling tower (east)	383323	4737934	1.1	109	109	70.5	3	0.0	-0.3	0.2	9.2	0.0	0.0	0.0	0.0	0.0	0.0	32	32
NS-33	Indoor gas turbogen room	383215	4737903	9.9	89	89	71.3	0	0.0	-2.1	14.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	5	5
NS-34	Indoor steam genset room	383258	4737926	12.4	95	95	70.9	0	0.0	-0.7	2.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	21	21
NS-35	Indoor gas compressor room	383171	4737893	4.4	82	82	71.7	0	0.0	-0.4	15.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--

Where: LrD = LxD - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + CmetD + RefID
LrN = LxN - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + CmetN + RefIN

The column headings in this table follow the terminology of standard ISO 9613-2. LxD is the daytime A-weighted one-hour energy-equivalent source sound power level, and LxN is the corresponding nighttime level. These quantities include penalties for distictive source character if applicable. LrD is the daytime A-weighted one-hour energy-equivalent sound pressure level at a receptor, and LrN is the corresponding nighttime level.

X and Y are UTM coordinates in metres. Z is the elevation in metres

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Summary of Calculations - Octave Band Format

RS	Two Storey Home on Oil Springs Line		383483	4738420	4.5																	
Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
14	Rootop A/C unit	63	383230	4737924	14.3	38	38	65.9	0	0.0	-3.0	4.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
14	Rootop A/C unit	125	383230	4737924	14.3	54	54	65.9	0	0.0	1.7	5.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
14	Rootop A/C unit	250	383230	4737924	14.3	64	64	65.9	0	0.0	0.2	6.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
14	Rootop A/C unit	500	383230	4737924	14.3	75	75	65.9	0	0.0	-0.9	7.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	500
14	Rootop A/C unit	1000	383230	4737924	14.3	81	81	65.9	0	0.0	-0.9	9.8	2.0	0.0	0.0	0.0	0.0	0.0	0.0	4	4	1000
14	Rootop A/C unit	2000	383230	4737924	14.3	79	79	65.9	0	0.0	-0.9	12.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
14	Rootop A/C unit	4000	383230	4737924	14.3	74	74	65.9	0	0.0	-0.9	14.5	18.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
14	Rootop A/C unit	8000	383230	4737924	14.3	66	66	65.9	0	0.0	-0.9	16.9	65.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
1	HRSG Stack Outlet (Gas turbogen Exhaust)	32	383276	4737900	39.9	78	78	66.0	0	0.0	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15	15	32
1	HRSG Stack Outlet (Gas turbogen Exhaust)	63	383276	4737900	39.9	83	83	66.0	0	-1.3	-3.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	19	19	63
1	HRSG Stack Outlet (Gas turbogen Exhaust)	125	383276	4737900	39.9	82	82	66.0	0	-1.8	1.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	12	12	125
1	HRSG Stack Outlet (Gas turbogen Exhaust)	250	383276	4737900	39.9	88	88	66.0	0	-5.4	0.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	16	16	250
1	HRSG Stack Outlet (Gas turbogen Exhaust)	500	383276	4737900	39.9	89	89	66.0	0	-9.3	-0.8	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	14	14	500
1	HRSG Stack Outlet (Gas turbogen Exhaust)	1000	383276	4737900	39.9	92	92	66.0	0	-12.1	-0.8	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	13	13	1000
1	HRSG Stack Outlet (Gas turbogen Exhaust)	2000	383276	4737900	39.9	96	96	66.0	0	-12.4	-0.8	0.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	13	13	2000
1	HRSG Stack Outlet (Gas turbogen Exhaust)	4000	383276	4737900	39.9	94	94	66.0	0	-10.0	-0.8	0.0	18.4	0.0	0.0	0.0	0.0	0.0	0.0	1	1	4000
1	HRSG Stack Outlet (Gas turbogen Exhaust)	8000	383276	4737900	39.9	94	94	66.0	0	-9.2	-0.8	0.0	65.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-01	GTS Air Inlet	32	383202	4737903	16.5	87	87	66.4	3	0.0	-3.1	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22	22	32
NS-01	GTS Air Inlet	63	383202	4737903	16.5	85	85	66.4	3	0.0	-3.1	6.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	19	19	63
NS-01	GTS Air Inlet	125	383202	4737903	16.5	85	85	66.4	3	0.0	1.7	7.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	12	12	125
NS-01	GTS Air Inlet	250	383202	4737903	16.5	84	84	66.4	3	0.0	0.1	10.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	9	9	250
NS-01	GTS Air Inlet	500	383202	4737903	16.5	85	85	66.4	3	-5.0	-0.9	13.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	3	3	500
NS-01	GTS Air Inlet	1000	383202	4737903	16.5	87	87	66.4	3	-5.0	-0.9	15.9	2.2	0.0	0.0	0.0	0.0	0.0	0.0	1	1	1000
NS-01	GTS Air Inlet	2000	383202	4737903	16.5	89	89	66.4	3	-5.0	-0.9	18.3	5.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-01	GTS Air Inlet	4000	383202	4737903	16.5	93	93	66.4	3	-5.0	-0.9	20.5	19.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-01	GTS Air Inlet	8000	383202	4737903	16.5	98	98	66.4	3	-5.0	-0.9	22.1	68.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-02	HRSG (Walls, Ducts, Piping)	32	383253	4737897	1.5	79	79	66.1	3	0.0	-5.1	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6	6	32
NS-02	HRSG (Walls, Ducts, Piping)	63	383253	4737897	1.5	89	89	66.1	3	0.0	-5.1	18.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	13	13	63
NS-02	HRSG (Walls, Ducts, Piping)	125	383253	4737897	1.5	91	91	66.1	3	0.0	1.4	20.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	5	5	125
NS-02	HRSG (Walls, Ducts, Piping)	250	383253	4737897	1.5	94	94	66.1	3	0.0	0.6	22.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	7	7	250
NS-02	HRSG (Walls, Ducts, Piping)	500	383253	4737897	1.5	97	97	66.1	3	0.0	-0.7	23.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	10	10	500
NS-02	HRSG (Walls, Ducts, Piping)	1000	383253	4737897	1.5	102	102	66.1	3	0.0	-1.7	24.4	2.1	0.0	0.0	0.0	0.0	0.0	0.0	14	14	1000
NS-02	HRSG (Walls, Ducts, Piping)	2000	383253	4737897	1.5	104	104	66.1	3	0.0	-2.1	24.7	5.5	0.0	0.0	0.0	0.0	0.0	0.0	13	13	2000
NS-02	HRSG (Walls, Ducts, Piping)	4000	383253	4737897	1.5	100	100	66.1	3	0.0	-2.1	24.8	18.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-02	HRSG (Walls, Ducts, Piping)	8000	383253	4737897	1.5	88	88	66.1	3	0.0	-2.1	24.9	66.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-03	250 MVA Transformer	32	383213	4737924	3.0	70	61	66.0	0	0.0	-4.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4	--	32
NS-03	250 MVA Transformer	63	383213	4737924	3.0	89	80	66.0	0	0.0	-4.8	5.6	0.1	0.0	0.0	0.0	0.0	2.8	2.8	25	16	63
NS-03	250 MVA Transformer	125	383213	4737924	3.0	101	93	66.0	0	0.0	2.1	5.9	0.2	0.0	0.0	0.0	0.0	3.5	3.5	30	22	125
NS-03	250 MVA Transformer	250	383213	4737924	3.0	103	95	66.0	0	0.0	0.7	9.2	0.6	0.0	0.0	0.0	0.0	2.9	2.9	30	21	250
NS-03	250 MVA Transformer	500	383213	4737924	3.0	109	100	66.0	0	0.0	-1.7	12.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	31	23	500
NS-03	250 MVA Transformer	1000	383213	4737924	3.0	106	98	66.0	0	0.0	-1.8	15.0	2.1	0.0	0.0	0.0	0.0	0.6	0.6	25	17	1000
NS-03	250 MVA Transformer	2000	383213	4737924	3.0	102	94	66.0	0	0.0	-1.8	17.9	5.5	0.0	0.0	0.0	0.0	0.5	0.5	15	7	2000
NS-03	250 MVA Transformer	4000	383213	4737924	3.0	97	89	66.0	0	0.0	-1.8	19.3	18.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-03	250 MVA Transformer	8000	383213	4737924	3.0	88	80	66.0	0	0.0	-1.8	19.6	66.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-04	200 MVA Transformer	32	383255	4737948	3.0	70	66	65.4	0	0.0	-4.7	5.8	0.0	0.0	0.0	0.0	0.0	2.1	2.1	5	1	32
NS-04	200 MVA Transformer	63	383255	4737948	3.0	89	85	65.4	0	0.0	-4.7	7.8	0.1	0.0	0.0	0.0	0.0	2.2	2.2	22	18	63
NS-04	200 MVA Transformer	125	383255	4737948	3.0	101	97	65.4	0	0.0	2.7	8.1	0.2	0.0	0.0	0.0	0.0	6.0	6.0	30	26	125
NS-04	200 MVA Transformer	250	383255	4737948	3.0	103	99	65.4	0	0.0	1.5	11.7	0.6	0.0	0.0	0.0	0.0	5.5	5.5	30	26	250
NS-04	200 MVA Transformer	500	383255	4737948	3.0	109	105	65.4	0	0.0	-1.4	15.6	1.0	0.0	0.0	0.0	0.0	2.9	2.9	31	27	500
NS-04	200 MVA Transformer	1000	383255	4737948	3.0	106	102	65.4	0	0.0	-1.5	18.5	1.9	0.0	0.0	0.0	0.0	3.2	3.2	25	21	1000
NS-04	200 MVA Transformer	2000	383255	4737948	3.0	102	98	65.4	0	0.0	-1.5	19.3	5.1	0.0	0.0	0.0	0.0	3.0	3.0	17	13	2000
NS-04	200 MVA Transformer	4000	383255	4737948	3.0	97	93	65.4	0	0.0	-1.5	19.6	17.2	0.0	0.0	0.0	0.0	1.5	1.5	--	--	4000

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-04	200 MVA Transformer	8000	383255	4737948	3.0	88	84	65.4	0	0.0	-1.5	19.8	61.3	0.0	0.0	0.0	0.0	1.1	1.1	--	--	8000
NS-05	Roll up door Gas turbogen Room (large)	63	383199	4737912	3.5	73	73	66.3	3	0.0	-4.8	7.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	7	7	63
NS-05	Roll up door Gas turbogen Room (large)	125	383199	4737912	3.5	77	77	66.3	3	0.0	2.1	9.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	3	3	125
NS-05	Roll up door Gas turbogen Room (large)	250	383199	4737912	3.5	74	74	66.3	3	0.0	0.3	12.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-05	Roll up door Gas turbogen Room (large)	500	383199	4737912	3.5	71	71	66.3	3	0.0	-1.8	15.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-05	Roll up door Gas turbogen Room (large)	1000	383199	4737912	3.5	72	72	66.3	3	0.0	-1.8	17.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-05	Roll up door Gas turbogen Room (large)	2000	383199	4737912	3.5	74	74	66.3	3	0.0	-1.8	19.9	5.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-05	Roll up door Gas turbogen Room (large)	4000	383199	4737912	3.5	68	68	66.3	3	0.0	-1.8	21.7	19.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-05	Roll up door Gas turbogen Room (large)	8000	383199	4737912	3.5	58	58	66.3	3	0.0	-1.8	23.0	68.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-06	Roll up door Steam genset Room	63	383245	4737939	2.5	73	73	65.6	3	0.0	-4.8	2.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	13	13	63
NS-06	Roll up door Steam genset Room	125	383245	4737939	2.5	79	79	65.6	3	0.0	2.2	2.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	12	12	125
NS-06	Roll up door Steam genset Room	250	383245	4737939	2.5	75	75	65.6	3	0.0	1.4	4.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	6	6	250
NS-06	Roll up door Steam genset Room	500	383245	4737939	2.5	71	71	65.6	3	0.0	-1.4	5.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3	3	500
NS-06	Roll up door Steam genset Room	1000	383245	4737939	2.5	73	73	65.6	3	0.0	-1.7	6.8	2.0	0.0	0.0	0.0	0.0	0.0	0.0	3	3	1000
NS-06	Roll up door Steam genset Room	2000	383245	4737939	2.5	71	71	65.6	3	0.0	-1.7	8.4	5.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-06	Roll up door Steam genset Room	4000	383245	4737939	2.5	67	67	65.6	3	0.0	-1.7	10.4	17.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-06	Roll up door Steam genset Room	8000	383245	4737939	2.5	59	59	65.6	3	0.0	-1.7	12.7	62.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-07	Exhaust opening gas genset roof (2 of 4)	63	383212	4737911	11.0	67	67	66.2	0	0.0	-3.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	4	4	63
NS-07	Exhaust opening gas genset roof (2 of 4)	125	383212	4737911	11.0	68	68	66.2	0	0.0	1.5	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-07	Exhaust opening gas genset roof (2 of 4)	250	383212	4737911	11.0	73	73	66.2	0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	7	7	250
NS-07	Exhaust opening gas genset roof (2 of 4)	500	383212	4737911	11.0	80	80	66.2	0	0.0	-1.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	14	14	500
NS-07	Exhaust opening gas genset roof (2 of 4)	1000	383212	4737911	11.0	88	88	66.2	0	0.0	-1.1	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	21	21	1000
NS-07	Exhaust opening gas genset roof (2 of 4)	2000	383212	4737911	11.0	88	88	66.2	0	0.0	-1.1	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	17	17	2000
NS-07	Exhaust opening gas genset roof (2 of 4)	4000	383212	4737911	11.0	82	82	66.2	0	0.0	-1.1	0.0	18.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-07	Exhaust opening gas genset roof (2 of 4)	8000	383212	4737911	11.0	75	75	66.2	0	0.0	-1.1	0.0	67.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-08	Exhaust opening gas genset roof (1 of 4)	63	383229	4737911	21.0	67	67	66.1	0	0.0	-3.0	6.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-08	Exhaust opening gas genset roof (1 of 4)	125	383229	4737911	21.0	68	68	66.1	0	0.0	1.7	7.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-08	Exhaust opening gas genset roof (1 of 4)	250	383229	4737911	21.0	73	73	66.1	0	0.0	0.2	11.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-08	Exhaust opening gas genset roof (1 of 4)	500	383229	4737911	21.0	80	80	66.1	0	0.0	-0.9	15.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-08	Exhaust opening gas genset roof (1 of 4)	1000	383229	4737911	21.0	88	88	66.1	0	0.0	-0.9	17.9	2.1	0.0	0.0	0.0	0.0	0.0	0.0	3	3	1000
NS-08	Exhaust opening gas genset roof (1 of 4)	2000	383229	4737911	21.0	88	88	66.1	0	0.0	-0.9	20.9	5.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-08	Exhaust opening gas genset roof (1 of 4)	4000	383229	4737911	21.0	82	82	66.1	0	0.0	-0.9	23.8	18.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-08	Exhaust opening gas genset roof (1 of 4)	8000	383229	4737911	21.0	75	75	66.1	0	0.0	-0.9	24.3	66.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-09	Exhaust opening steam genset roof (1 of 4)	63	383248	4737933	26.0	67	67	65.7	0	0.0	-3.0	3.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	63
NS-09	Exhaust opening steam genset roof (1 of 4)	125	383248	4737933	26.0	68	68	65.7	0	0.0	1.7	3.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-09	Exhaust opening steam genset roof (1 of 4)	250	383248	4737933	26.0	73	73	65.7	0	0.0	0.2	5.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1	1	250
NS-09	Exhaust opening steam genset roof (1 of 4)	500	383248	4737933	26.0	80	80	65.7	0	0.0	-0.8	7.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-09	Exhaust opening steam genset roof (1 of 4)	1000	383248	4737933	26.0	88	88	65.7	0	0.0	-0.8	9.8	2.0	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-09	Exhaust opening steam genset roof (1 of 4)	2000	383248	4737933	26.0	88	88	65.7	0	0.0	-0.8	12.3	5.2	0.0	0.0	0.0	0.0	0.0	0.0	6	6	2000
NS-09	Exhaust opening steam genset roof (1 of 4)	4000	383248	4737933	26.0	82	82	65.7	0	0.0	-0.8	15.0	17.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-09	Exhaust opening steam genset roof (1 of 4)	8000	383248	4737933	26.0	75	75	65.7	0	0.0	-0.8	17.9	63.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-10	Roll up door Gas turbogen Room (small west)	63	383199	4737905	2.0	72	72	66.4	3	0.0	-5.0	8.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	5	5	63
NS-10	Roll up door Gas turbogen Room (small west)	125	383199	4737905	2.0	76	76	66.4	3	0.0	1.4	11.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0	0	125
NS-10	Roll up door Gas turbogen Room (small west)	250	383199	4737905	2.0	74	74	66.4	3	0.0	0.5	14.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-10	Roll up door Gas turbogen Room (small west)	500	383199	4737905	2.0	71	71	66.4	3	0.0	-1.5	17.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-10	Roll up door Gas turbogen Room (small west)	1000	383199	4737905	2.0	71	71	66.4	3	0.0	-2.0	19.5	2.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-10	Roll up door Gas turbogen Room (small west)	2000	383199	4737905	2.0	73	73	66.4	3	0.0	-2.1	21.4	5.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-10	Roll up door Gas turbogen Room (small west)	4000	383199	4737905	2.0	68	68	66.4	3	0.0	-2.1	22.8	19.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-10	Roll up door Gas turbogen Room (small west)	8000	383199	4737905	2.0	57	57	66.4	3	0.0	-2.1	23.8	68.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-11d	Cooling Tower Fan	32	383320	4737946	9.5	--	--	65.0	0	0.0	-3.5	-61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-11d	Cooling Tower Fan	63	383320	4737946	9.5	85	--	65.0	0	0.0	-3.5	5.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	18	--	63
NS-11d	Cooling Tower Fan	125	383320	4737946	9.5	94	--	65.0	0	0.0	1.8	4.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	22	--	125
NS-11d	Cooling Tower Fan	250	383320	4737946	9.5	99	--	65.0	0	0.0	0.1	7.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	26	--	250
NS-11d	Cooling Tower Fan	500	383320	4737946	9.5	100	--	65.0	0	0.0	-0.9	9.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	26	--	500
NS-11d	Cooling Tower Fan	1000	383320	4737946	9.5	102	--	65.0	0	0.0	-0.9	11.2	1.8	0.0	0.0	0.0	0.0	5.6	3.0	31	--	1000

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-11d	Cooling Tower Fan	2000	383320	4737946	9.5	98	--	65.0	0	0.0	-0.9	13.7	4.9	0.0	0.0	0.0	0.0	6.7	3.0	22	--	2000
NS-11d	Cooling Tower Fan	4000	383320	4737946	9.5	93	--	65.0	0	0.0	-0.9	16.4	16.4	0.0	0.0	0.0	0.0	7.5	3.0	4	--	4000
NS-11d	Cooling Tower Fan	8000	383320	4737946	9.5	85	--	65.0	0	0.0	-0.9	19.3	58.6	0.0	0.0	0.0	0.0	7.4	3.0	--	--	8000
NS-11n	Cooling Tower Fan-night	32	383320	4737946	9.5	--	--	65.0	0	0.0	-3.5	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-11n	Cooling Tower Fan-night	63	383320	4737946	9.5	--	70	65.0	0	0.0	-3.5	5.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	3	63
NS-11n	Cooling Tower Fan-night	125	383320	4737946	9.5	--	78	65.0	0	0.0	1.8	4.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	7	125
NS-11n	Cooling Tower Fan-night	250	383320	4737946	9.5	--	83	65.0	0	0.0	0.1	7.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	--	11	250
NS-11n	Cooling Tower Fan-night	500	383320	4737946	9.5	--	85	65.0	0	0.0	-0.9	9.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	--	11	500
NS-11n	Cooling Tower Fan-night	1000	383320	4737946	9.5	--	87	65.0	0	0.0	-0.9	11.2	1.8	0.0	0.0	0.0	0.0	5.6	5.6	--	16	1000
NS-11n	Cooling Tower Fan-night	2000	383320	4737946	9.5	--	83	65.0	0	0.0	-0.9	13.7	4.9	0.0	0.0	0.0	0.0	6.7	6.7	--	7	2000
NS-11n	Cooling Tower Fan-night	4000	383320	4737946	9.5	--	78	65.0	0	0.0	-0.9	16.4	16.4	0.0	0.0	0.0	0.0	7.5	7.5	--	--	4000
NS-11n	Cooling Tower Fan-night	8000	383320	4737946	9.5	--	70	65.0	0	0.0	-0.9	19.3	58.6	0.0	0.0	0.0	0.0	7.4	7.4	--	--	8000
NS-12d	Cooling Tower Fan	32	383316	4737932	9.5	--	--	65.3	0	0.0	-3.6	-61.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-12d	Cooling Tower Fan	63	383316	4737932	9.5	85	--	65.3	0	0.0	-3.6	5.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	18	--	63
NS-12d	Cooling Tower Fan	125	383316	4737932	9.5	94	--	65.3	0	0.0	1.8	5.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	21	--	125
NS-12d	Cooling Tower Fan	250	383316	4737932	9.5	99	--	65.3	0	0.0	0.1	9.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	24	--	250
NS-12d	Cooling Tower Fan	500	383316	4737932	9.5	100	--	65.3	0	0.0	-1.0	12.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	22	--	500
NS-12d	Cooling Tower Fan	1000	383316	4737932	9.5	102	--	65.3	0	0.0	-1.0	15.2	1.9	0.0	0.0	0.0	0.0	7.2	3.0	28	--	1000
NS-12d	Cooling Tower Fan	2000	383316	4737932	9.5	98	--	65.3	0	0.0	-1.0	18.1	5.0	0.0	0.0	0.0	0.0	8.0	3.0	18	--	2000
NS-12d	Cooling Tower Fan	4000	383316	4737932	9.5	93	--	65.3	0	0.0	-1.0	21.0	16.9	0.0	0.0	0.0	0.0	8.5	3.0	--	--	4000
NS-12d	Cooling Tower Fan	8000	383316	4737932	9.5	85	--	65.3	0	0.0	-1.0	24.0	60.3	0.0	0.0	0.0	0.0	8.0	3.0	--	--	8000
NS-12n	Cooling Tower Fan-night	32	383316	4737932	9.5	--	--	65.3	0	0.0	-3.6	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-12n	Cooling Tower Fan-night	63	383316	4737932	9.5	--	70	65.3	0	0.0	-3.6	5.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	3	63
NS-12n	Cooling Tower Fan-night	125	383316	4737932	9.5	--	78	65.3	0	0.0	1.8	5.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	6	125
NS-12n	Cooling Tower Fan-night	250	383316	4737932	9.5	--	83	65.3	0	0.0	0.1	9.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	--	8	250
NS-12n	Cooling Tower Fan-night	500	383316	4737932	9.5	--	85	65.3	0	0.0	-1.0	12.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	--	7	500
NS-12n	Cooling Tower Fan-night	1000	383316	4737932	9.5	--	87	65.3	0	0.0	-1.0	15.2	1.9	0.0	0.0	0.0	0.0	7.2	7.2	--	13	1000
NS-12n	Cooling Tower Fan-night	2000	383316	4737932	9.5	--	83	65.3	0	0.0	-1.0	18.1	5.0	0.0	0.0	0.0	0.0	8.0	8.0	--	3	2000
NS-12n	Cooling Tower Fan-night	4000	383316	4737932	9.5	--	78	65.3	0	0.0	-1.0	21.0	16.9	0.0	0.0	0.0	0.0	8.5	8.5	--	--	4000
NS-12n	Cooling Tower Fan-night	8000	383316	4737932	9.5	--	70	65.3	0	0.0	-1.0	24.0	60.3	0.0	0.0	0.0	0.0	8.0	8.0	--	--	8000
NS-13d	Cooling Tower Fan	32	383313	4737917	9.5	--	--	65.5	0	0.0	-3.6	-61.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-13d	Cooling Tower Fan	63	383313	4737917	9.5	85	--	65.5	0	0.0	-3.6	5.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	18	--	63
NS-13d	Cooling Tower Fan	125	383313	4737917	9.5	94	--	65.5	0	0.0	1.7	5.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	20	--	125
NS-13d	Cooling Tower Fan	250	383313	4737917	9.5	99	--	65.5	0	0.0	0.0	9.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	23	--	250
NS-13d	Cooling Tower Fan	500	383313	4737917	9.5	100	--	65.5	0	0.0	-1.0	12.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	22	--	500
NS-13d	Cooling Tower Fan	1000	383313	4737917	9.5	102	--	65.5	0	0.0	-1.0	15.0	1.9	0.0	0.0	0.0	0.0	7.1	3.0	28	--	1000
NS-13d	Cooling Tower Fan	2000	383313	4737917	9.5	98	--	65.5	0	0.0	-1.0	17.9	5.1	0.0	0.0	0.0	0.0	7.9	3.0	18	--	2000
NS-13d	Cooling Tower Fan	4000	383313	4737917	9.5	93	--	65.5	0	0.0	-1.0	20.8	17.4	0.0	0.0	0.0	0.0	8.4	3.0	--	--	4000
NS-13d	Cooling Tower Fan	8000	383313	4737917	9.5	85	--	65.5	0	0.0	-1.0	23.8	62.0	0.0	0.0	0.0	0.0	7.9	3.0	--	--	8000
NS-13n	Cooling Tower Fan - night	32	383313	4737917	9.5	--	--	65.5	0	0.0	-3.6	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-13n	Cooling Tower Fan - night	63	383313	4737917	9.5	--	70	65.5	0	0.0	-3.6	5.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	2	63
NS-13n	Cooling Tower Fan - night	125	383313	4737917	9.5	--	78	65.5	0	0.0	1.7	5.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	5	125
NS-13n	Cooling Tower Fan - night	250	383313	4737917	9.5	--	83	65.5	0	0.0	0.0	9.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	8	250
NS-13n	Cooling Tower Fan - night	500	383313	4737917	9.5	--	85	65.5	0	0.0	-1.0	12.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	--	7	500
NS-13n	Cooling Tower Fan - night	1000	383313	4737917	9.5	--	87	65.5	0	0.0	-1.0	15.0	1.9	0.0	0.0	0.0	0.0	7.1	7.1	--	13	1000
NS-13n	Cooling Tower Fan - night	2000	383313	4737917	9.5	--	83	65.5	0	0.0	-1.0	17.9	5.1	0.0	0.0	0.0	0.0	7.9	7.9	--	3	2000
NS-13n	Cooling Tower Fan - night	4000	383313	4737917	9.5	--	78	65.5	0	0.0	-1.0	20.8	17.4	0.0	0.0	0.0	0.0	8.4	8.4	--	--	4000
NS-13n	Cooling Tower Fan - night	8000	383313	4737917	9.5	--	70	65.5	0	0.0	-1.0	23.8	62.0	0.0	0.0	0.0	0.0	7.9	7.9	--	--	8000
NS-14d	Cooling Tower Fan	32	383310	4737903	9.5	--	--	65.7	0	0.0	-3.7	-62.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-14d	Cooling Tower Fan	63	383310	4737903	9.5	85	--	65.7	0	0.0	-3.7	5.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	17	--	63
NS-14d	Cooling Tower Fan	125	383310	4737903	9.5	94	--	65.7	0	0.0	1.7	6.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	20	--	125
NS-14d	Cooling Tower Fan	250	383310	4737903	9.5	99	--	65.7	0	0.0	0.0	9.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	23	--	250
NS-14d	Cooling Tower Fan	500	383310	4737903	9.5	100	--	65.7	0	0.0	-1.1	12.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	22	--	500
NS-14d	Cooling Tower Fan	1000	383310	4737903	9.5	102	--	65.7	0	0.0	-1.1	15.1	2.0	0.0	0.0	0.0	0.0	7.2	3.0	28	--	1000
NS-14d	Cooling Tower Fan	2000	383310	4737903	9.5	98	--	65.7	0	0.0	-1.1	17.9	5.3	0.0	0.0	0.0	0.0	8.1	3.0	18	--	2000

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-14d	Cooling Tower Fan	4000	383310	4737903	9.5	93	--	65.7	0	0.0	-1.1	20.8	17.9	0.0	0.0	0.0	0.0	8.5	3.0	--	--	4000
NS-14d	Cooling Tower Fan	8000	383310	4737903	9.5	85	--	65.7	0	0.0	-1.1	23.8	63.7	0.0	0.0	0.0	0.0	8.0	3.0	--	--	8000
NS-14n	Cooling Tower Fan - night	32	383310	4737903	9.5	--	--	65.7	0	0.0	-3.7	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-14n	Cooling Tower Fan - night	63	383310	4737903	9.5	--	70	65.7	0	0.0	-3.7	5.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	2	63
NS-14n	Cooling Tower Fan - night	125	383310	4737903	9.5	--	78	65.7	0	0.0	1.7	6.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	5	125
NS-14n	Cooling Tower Fan - night	250	383310	4737903	9.5	--	83	65.7	0	0.0	0.0	9.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	7	250
NS-14n	Cooling Tower Fan - night	500	383310	4737903	9.5	--	85	65.7	0	0.0	-1.1	12.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	7	500
NS-14n	Cooling Tower Fan - night	1000	383310	4737903	9.5	--	87	65.7	0	0.0	-1.1	15.1	2.0	0.0	0.0	0.0	0.0	7.2	7.2	--	13	1000
NS-14n	Cooling Tower Fan - night	2000	383310	4737903	9.5	--	83	65.7	0	0.0	-1.1	17.9	5.3	0.0	0.0	0.0	0.0	8.1	8.1	--	3	2000
NS-14n	Cooling Tower Fan - night	4000	383310	4737903	9.5	--	78	65.7	0	0.0	-1.1	20.8	17.9	0.0	0.0	0.0	0.0	8.5	8.5	--	--	4000
NS-14n	Cooling Tower Fan - night	8000	383310	4737903	9.5	--	70	65.7	0	0.0	-1.1	23.8	63.7	0.0	0.0	0.0	0.0	8.0	8.0	--	--	8000
NS-15d	Cooling Tower Fan	32	383306	4737889	9.5	--	--	66.0	0	0.0	-3.8	-62.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-15d	Cooling Tower Fan	63	383306	4737889	9.5	85	--	66.0	0	0.0	-3.8	5.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	17	--	63
NS-15d	Cooling Tower Fan	125	383306	4737889	9.5	94	--	66.0	0	0.0	1.6	6.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	20	--	125
NS-15d	Cooling Tower Fan	250	383306	4737889	9.5	99	--	66.0	0	0.0	-0.1	9.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	22	--	250
NS-15d	Cooling Tower Fan	500	383306	4737889	9.5	100	--	66.0	0	0.0	-1.1	12.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	22	--	500
NS-15d	Cooling Tower Fan	1000	383306	4737889	9.5	102	--	66.0	0	0.0	-1.1	15.0	2.1	0.0	0.0	0.0	0.0	7.3	3.0	28	--	1000
NS-15d	Cooling Tower Fan	2000	383306	4737889	9.5	98	--	66.0	0	0.0	-1.1	17.8	5.4	0.0	0.0	0.0	0.0	8.1	3.0	18	--	2000
NS-15d	Cooling Tower Fan	4000	383306	4737889	9.5	93	--	66.0	0	0.0	-1.1	20.8	18.3	0.0	0.0	0.0	0.0	8.7	3.0	--	--	4000
NS-15d	Cooling Tower Fan	8000	383306	4737889	9.5	85	--	66.0	0	0.0	-1.1	23.7	65.4	0.0	0.0	0.0	0.0	8.2	3.0	--	--	8000
NS-15n	Cooling Tower Fan - night	32	383306	4737889	9.5	--	--	66.0	0	0.0	-3.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-15n	Cooling Tower Fan - night	63	383306	4737889	9.5	--	70	66.0	0	0.0	-3.8	5.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	2	63
NS-15n	Cooling Tower Fan - night	125	383306	4737889	9.5	--	78	66.0	0	0.0	1.6	6.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	4	125
NS-15n	Cooling Tower Fan - night	250	383306	4737889	9.5	--	83	66.0	0	0.0	-0.1	9.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	7	250
NS-15n	Cooling Tower Fan - night	500	383306	4737889	9.5	--	85	66.0	0	0.0	-1.1	12.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	7	500
NS-15n	Cooling Tower Fan - night	1000	383306	4737889	9.5	--	87	66.0	0	0.0	-1.1	15.0	2.1	0.0	0.0	0.0	0.0	7.3	7.3	--	13	1000
NS-15n	Cooling Tower Fan - night	2000	383306	4737889	9.5	--	83	66.0	0	0.0	-1.1	17.8	5.4	0.0	0.0	0.0	0.0	8.1	8.1	--	3	2000
NS-15n	Cooling Tower Fan - night	4000	383306	4737889	9.5	--	78	66.0	0	0.0	-1.1	20.8	18.3	0.0	0.0	0.0	0.0	8.7	8.7	--	--	4000
NS-15n	Cooling Tower Fan - night	8000	383306	4737889	9.5	--	70	66.0	0	0.0	-1.1	23.7	65.4	0.0	0.0	0.0	0.0	8.2	8.2	--	--	8000
NS-16	Exhaust opening gas genset roof (3 of 4)	63	383209	4737888	11.0	67	67	66.6	0	0.0	-3.7	8.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-16	Exhaust opening gas genset roof (3 of 4)	125	383209	4737888	11.0	68	68	66.6	0	0.0	1.5	11.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-16	Exhaust opening gas genset roof (3 of 4)	250	383209	4737888	11.0	73	73	66.6	0	0.0	-0.1	15.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-16	Exhaust opening gas genset roof (3 of 4)	500	383209	4737888	11.0	80	80	66.6	0	0.0	-1.2	19.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-16	Exhaust opening gas genset roof (3 of 4)	1000	383209	4737888	11.0	88	88	66.6	0	0.0	-1.2	22.3	2.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-16	Exhaust opening gas genset roof (3 of 4)	2000	383209	4737888	11.0	88	88	66.6	0	0.0	-1.2	23.5	5.8	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-16	Exhaust opening gas genset roof (3 of 4)	4000	383209	4737888	11.0	82	82	66.6	0	0.0	-1.2	24.2	19.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-16	Exhaust opening gas genset roof (3 of 4)	8000	383209	4737888	11.0	75	75	66.6	0	0.0	-1.2	24.6	70.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-17	Exhaust opening gas genset roof (4 of 4)	63	383228	4737887	21.0	67	67	66.4	0	0.0	-3.0	7.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-17	Exhaust opening gas genset roof (4 of 4)	125	383228	4737887	21.0	68	68	66.4	0	0.0	1.7	8.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-17	Exhaust opening gas genset roof (4 of 4)	250	383228	4737887	21.0	73	73	66.4	0	0.0	0.2	12.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-17	Exhaust opening gas genset roof (4 of 4)	500	383228	4737887	21.0	80	80	66.4	0	0.0	-0.9	15.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-17	Exhaust opening gas genset roof (4 of 4)	1000	383228	4737887	21.0	88	88	66.4	0	0.0	-0.9	18.3	2.2	0.0	0.0	0.0	0.0	0.0	0.0	2	2	1000
NS-17	Exhaust opening gas genset roof (4 of 4)	2000	383228	4737887	21.0	88	88	66.4	0	0.0	-0.9	21.2	5.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-17	Exhaust opening gas genset roof (4 of 4)	4000	383228	4737887	21.0	82	82	66.4	0	0.0	-0.9	24.2	19.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-17	Exhaust opening gas genset roof (4 of 4)	8000	383228	4737887	21.0	75	75	66.4	0	0.0	-0.9	24.6	69.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-18	Exhaust opening steam genset roof (2 of 4)	63	383248	4737921	26.0	67	67	65.8	0	0.0	-3.0	3.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	63
NS-18	Exhaust opening steam genset roof (2 of 4)	125	383248	4737921	26.0	68	68	65.8	0	0.0	1.7	3.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-18	Exhaust opening steam genset roof (2 of 4)	250	383248	4737921	26.0	73	73	65.8	0	0.0	0.2	5.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1	1	250
NS-18	Exhaust opening steam genset roof (2 of 4)	500	383248	4737921	26.0	80	80	65.8	0	0.0	-0.8	7.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-18	Exhaust opening steam genset roof (2 of 4)	1000	383248	4737921	26.0	88	88	65.8	0	0.0	-0.9	9.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-18	Exhaust opening steam genset roof (2 of 4)	2000	383248	4737921	26.0	88	88	65.8	0	0.0	-0.9	12.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	6	6	2000
NS-18	Exhaust opening steam genset roof (2 of 4)	4000	383248	4737921	26.0	82	82	65.8	0	0.0	-0.9	14.7	18.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-18	Exhaust opening steam genset roof (2 of 4)	8000	383248	4737921	26.0	75	75	65.8	0	0.0	-0.9	17.5	64.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-19	Exhaust opening steam genset roof (3 of 4)	63	383270	4737921	26.0	67	67	65.7	0	0.0	-3.0	3.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	63
NS-19	Exhaust opening steam genset roof (3 of 4)	125	383270	4737921	26.0	68	68	65.7	0	0.0	1.8	3.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-19	Exhaust opening steam genset roof (3 of 4)	250	383270	4737921	26.0	73	73	65.7	0	0.0	0.2	5.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1	1	250
NS-19	Exhaust opening steam genset roof (3 of 4)	500	383270	4737921	26.0	80	80	65.7	0	0.0	-0.8	7.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-19	Exhaust opening steam genset roof (3 of 4)	1000	383270	4737921	26.0	88	88	65.7	0	0.0	-0.8	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-19	Exhaust opening steam genset roof (3 of 4)	2000	383270	4737921	26.0	88	88	65.7	0	0.0	-0.8	12.5	5.3	0.0	0.0	0.0	0.0	0.0	0.0	6	6	2000
NS-19	Exhaust opening steam genset roof (3 of 4)	4000	383270	4737921	26.0	82	82	65.7	0	0.0	-0.8	15.2	17.8	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-19	Exhaust opening steam genset roof (3 of 4)	8000	383270	4737921	26.0	75	75	65.7	0	0.0	-0.8	18.1	63.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-20	Exhaust opening steam genset roof (4 of 4)	63	383270	4737932	26.0	67	67	65.5	0	0.0	-3.0	3.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1	1	63
NS-20	Exhaust opening steam genset roof (4 of 4)	125	383270	4737932	26.0	68	68	65.5	0	0.0	1.8	3.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-20	Exhaust opening steam genset roof (4 of 4)	250	383270	4737932	26.0	73	73	65.5	0	0.0	0.2	5.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1	1	250
NS-20	Exhaust opening steam genset roof (4 of 4)	500	383270	4737932	26.0	80	80	65.5	0	0.0	-0.8	7.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-20	Exhaust opening steam genset roof (4 of 4)	1000	383270	4737932	26.0	88	88	65.5	0	0.0	-0.8	9.9	2.0	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-20	Exhaust opening steam genset roof (4 of 4)	2000	383270	4737932	26.0	88	88	65.5	0	0.0	-0.8	12.4	5.2	0.0	0.0	0.0	0.0	0.0	0.0	6	6	2000
NS-20	Exhaust opening steam genset roof (4 of 4)	4000	383270	4737932	26.0	82	82	65.5	0	0.0	-0.8	15.1	17.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-20	Exhaust opening steam genset roof (4 of 4)	8000	383270	4737932	26.0	75	75	65.5	0	0.0	-0.8	17.9	62.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-21	Exhaust Fan Compressor Roof (1 of 2)	63	383175	4737897	10.0	67	67	66.7	0	0.0	-3.9	3.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0	0	63
NS-21	Exhaust Fan Compressor Roof (1 of 2)	125	383175	4737897	10.0	68	68	66.7	0	0.0	1.5	3.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-21	Exhaust Fan Compressor Roof (1 of 2)	250	383175	4737897	10.0	73	73	66.7	0	0.0	-0.2	5.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0	0	250
NS-21	Exhaust Fan Compressor Roof (1 of 2)	500	383175	4737897	10.0	80	80	66.7	0	0.0	-1.2	7.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-21	Exhaust Fan Compressor Roof (1 of 2)	1000	383175	4737897	10.0	88	88	66.7	0	0.0	-1.2	9.4	2.2	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-21	Exhaust Fan Compressor Roof (1 of 2)	2000	383175	4737897	10.0	88	88	66.7	0	0.0	-1.2	11.8	5.9	0.0	0.0	0.0	0.0	0.0	0.0	5	5	2000
NS-21	Exhaust Fan Compressor Roof (1 of 2)	4000	383175	4737897	10.0	82	82	66.7	0	0.0	-1.2	14.4	19.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-21	Exhaust Fan Compressor Roof (1 of 2)	8000	383175	4737897	10.0	75	75	66.7	0	0.0	-1.2	17.2	70.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-22	Exhaust Fan Compressor Roof (2 of 2)	63	383175	4737889	10.0	67	67	66.8	0	0.0	-3.9	3.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0	0	63
NS-22	Exhaust Fan Compressor Roof (2 of 2)	125	383175	4737889	10.0	68	68	66.8	0	0.0	1.5	3.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-22	Exhaust Fan Compressor Roof (2 of 2)	250	383175	4737889	10.0	73	73	66.8	0	0.0	-0.2	6.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0	0	250
NS-22	Exhaust Fan Compressor Roof (2 of 2)	500	383175	4737889	10.0	80	80	66.8	0	0.0	-1.2	7.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	6	6	500
NS-22	Exhaust Fan Compressor Roof (2 of 2)	1000	383175	4737889	10.0	88	88	66.8	0	0.0	-1.2	9.6	2.2	0.0	0.0	0.0	0.0	0.0	0.0	11	11	1000
NS-22	Exhaust Fan Compressor Roof (2 of 2)	2000	383175	4737889	10.0	88	88	66.8	0	0.0	-1.2	11.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	5	5	2000
NS-22	Exhaust Fan Compressor Roof (2 of 2)	4000	383175	4737889	10.0	82	82	66.8	0	0.0	-1.2	14.6	20.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-22	Exhaust Fan Compressor Roof (2 of 2)	8000	383175	4737889	10.0	75	75	66.8	0	0.0	-1.2	17.4	71.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-23	Recirculating Pumps (30 hp total)	32	383276	4737907	2.0	37	37	65.9	0	0.0	-4.9	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-23	Recirculating Pumps (30 hp total)	63	383276	4737907	2.0	51	51	65.9	0	0.0	-4.9	6.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-23	Recirculating Pumps (30 hp total)	125	383276	4737907	2.0	62	62	65.9	0	0.0	1.4	8.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-23	Recirculating Pumps (30 hp total)	250	383276	4737907	2.0	71	71	65.9	0	0.0	0.6	10.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-23	Recirculating Pumps (30 hp total)	500	383276	4737907	2.0	77	77	65.9	0	0.0	-1.4	12.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-23	Recirculating Pumps (30 hp total)	1000	383276	4737907	2.0	83	83	65.9	0	0.0	-2.0	14.8	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2	2	1000
NS-23	Recirculating Pumps (30 hp total)	2000	383276	4737907	2.0	81	81	65.9	0	0.0	-2.0	17.2	5.3	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-23	Recirculating Pumps (30 hp total)	4000	383276	4737907	2.0	77	77	65.9	0	0.0	-2.0	19.5	18.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-23	Recirculating Pumps (30 hp total)	8000	383276	4737907	2.0	69	69	65.9	0	0.0	-2.0	21.4	64.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-24	Roll up door Gas turbogen Room (small east)	63	383236	4737911	2.0	72	72	66.1	3	0.0	-5.0	16.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-24	Roll up door Gas turbogen Room (small east)	125	383236	4737911	2.0	76	76	66.1	3	0.0	1.4	19.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-24	Roll up door Gas turbogen Room (small east)	250	383236	4737911	2.0	74	74	66.1	3	0.0	0.5	21.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-24	Roll up door Gas turbogen Room (small east)	500	383236	4737911	2.0	71	71	66.1	3	0.0	-1.5	23.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-24	Roll up door Gas turbogen Room (small east)	1000	383236	4737911	2.0	71	71	66.1	3	0.0	-2.0	24.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-24	Roll up door Gas turbogen Room (small east)	2000	383236	4737911	2.0	73	73	66.1	3	0.0	-2.1	24.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-24	Roll up door Gas turbogen Room (small east)	4000	383236	4737911	2.0	68	68	66.1	3	0.0	-2.1	24.7	18.5	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-24	Roll up door Gas turbogen Room (small east)	8000	383236	4737911	2.0	57	57	66.1	3	0.0	-2.1	24.9	66.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-25	Outdoor Switchgear	32	383185	4737971	5.0	66	66	65.6	0	0.0	-4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4	4	32
NS-25	Outdoor Switchgear	63	383185	4737971	5.0	73	73	65.6	0	0.0	-4.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	12	12	63
NS-25	Outdoor Switchgear	125	383185	4737971	5.0	92	92	65.6	0	0.0	3.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	22	22	125
NS-25	Outdoor Switchgear	250	383185	4737971	5.0	84	84	65.6	0	0.0	0.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	17	17	250
NS-25	Outdoor Switchgear	500	383185	4737971	5.0	87	87	65.6	0	0.0	-1.2	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	22	22	500
NS-25	Outdoor Switchgear	1000	383185	4737971	5.0	81	81	65.6	0	0.0	-1.2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	15	15	1000
NS-25	Outdoor Switchgear	2000	383185	4737971	5.0	75	75	65.6	0	0.0	-1.2	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	6	6	2000
NS-25	Outdoor Switchgear	4000	383185	4737971	5.0	69	69	65.6	0	0.0	-1.2	0.0	17.7	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-25	Outdoor Switchgear	8000	383185	4737971	5.0	63	63	65.6	0	0.0	-1.2	0.0	63.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-26	Cooling Tower Fan Motor	32	383318	4737940	9.5	62	62	65.1	0	0.0	-3.5	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-26	Cooling Tower Fan Motor	63	383318	4737940	9.5	64	64	65.1	0	0.0	-3.5	5.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-26	Cooling Tower Fan Motor	125	383318	4737940	9.5	73	73	65.1	0	0.0	1.8	7.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-26	Cooling Tower Fan Motor	250	383318	4737940	9.5	78	78	65.1	0	0.0	0.1	11.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1	1	250
NS-26	Cooling Tower Fan Motor	500	383318	4737940	9.5	86	86	65.1	0	0.0	-0.9	14.9	1.0	0.0	0.0	0.0	0.0	5.5	5.5	12	12	500
NS-26	Cooling Tower Fan Motor	1000	383318	4737940	9.5	90	90	65.1	0	0.0	-0.9	18.0	1.9	0.0	0.0	0.0	0.0	6.0	6.0	12	12	1000
NS-26	Cooling Tower Fan Motor	2000	383318	4737940	9.5	89	89	65.1	0	0.0	-0.9	20.5	4.9	0.0	0.0	0.0	0.0	6.5	6.5	6	6	2000
NS-26	Cooling Tower Fan Motor	4000	383318	4737940	9.5	84	84	65.1	0	0.0	-0.9	22.2	16.6	0.0	0.0	0.0	0.0	6.3	6.3	--	--	4000
NS-26	Cooling Tower Fan Motor	8000	383318	4737940	9.5	72	72	65.1	0	0.0	-0.9	23.3	59.3	0.0	0.0	0.0	0.0	4.5	4.5	--	--	8000
NS-27	Cooling Tower Fan Motor	32	383318	4737937	9.5	62	62	65.2	0	0.0	-3.5	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-27	Cooling Tower Fan Motor	63	383318	4737937	9.5	64	64	65.2	0	0.0	-3.5	3.7	0.1	0.0	0.0	0.0	0.0	1.9	1.9	1	1	63
NS-27	Cooling Tower Fan Motor	125	383318	4737937	9.5	73	73	65.2	0	0.0	1.8	4.6	0.2	0.0	0.0	0.0	0.0	2.3	2.3	4	4	125
NS-27	Cooling Tower Fan Motor	250	383318	4737937	9.5	78	78	65.2	0	0.0	0.1	8.5	0.5	0.0	0.0	0.0	0.0	2.0	2.0	6	6	250
NS-27	Cooling Tower Fan Motor	500	383318	4737937	9.5	86	86	65.2	0	0.0	-1.0	11.7	1.0	0.0	0.0	0.0	0.0	2.4	2.4	12	12	500
NS-27	Cooling Tower Fan Motor	1000	383318	4737937	9.5	90	90	65.2	0	0.0	-1.0	14.8	1.9	0.0	0.0	0.0	0.0	2.8	2.8	11	11	1000
NS-27	Cooling Tower Fan Motor	2000	383318	4737937	9.5	89	89	65.2	0	0.0	-1.0	17.8	4.9	0.0	0.0	0.0	0.0	3.6	3.6	5	5	2000
NS-27	Cooling Tower Fan Motor	4000	383318	4737937	9.5	84	84	65.2	0	0.0	-1.0	20.8	16.7	0.0	0.0	0.0	0.0	4.5	4.5	--	--	4000
NS-27	Cooling Tower Fan Motor	8000	383318	4737937	9.5	72	72	65.2	0	0.0	-1.0	22.6	59.6	0.0	0.0	0.0	0.0	3.7	3.7	--	--	8000
NS-28	Cooling Tower Fan Motor	32	383312	4737912	9.5	62	62	65.6	0	0.0	-3.7	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-28	Cooling Tower Fan Motor	63	383312	4737912	9.5	64	64	65.6	0	0.0	-3.7	6.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	63
NS-28	Cooling Tower Fan Motor	125	383312	4737912	9.5	73	73	65.6	0	0.0	1.7	8.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	125
NS-28	Cooling Tower Fan Motor	250	383312	4737912	9.5	78	78	65.6	0	0.0	0.0	12.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-28	Cooling Tower Fan Motor	500	383312	4737912	9.5	86	86	65.6	0	0.0	-1.1	15.3	1.0	0.0	0.0	0.0	0.0	4.9	4.9	10	10	500
NS-28	Cooling Tower Fan Motor	1000	383312	4737912	9.5	90	90	65.6	0	0.0	-1.1	18.2	2.0	0.0	0.0	0.0	0.0	5.1	5.1	10	10	1000
NS-28	Cooling Tower Fan Motor	2000	383312	4737912	9.5	89	89	65.6	0	0.0	-1.1	20.6	5.2	0.0	0.0	0.0	0.0	4.9	4.9	3	3	2000
NS-28	Cooling Tower Fan Motor	4000	383312	4737912	9.5	84	84	65.6	0	0.0	-1.1	22.3	17.6	0.0	0.0	0.0	0.0	4.2	4.2	--	--	4000
NS-28	Cooling Tower Fan Motor	8000	383312	4737912	9.5	72	72	65.6	0	0.0	-1.1	23.4	62.7	0.0	0.0	0.0	0.0	2.9	2.9	--	--	8000
NS-29	Cooling Tower Fan Motor	32	383311	4737909	9.5	62	62	65.6	0	0.0	-3.7	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-29	Cooling Tower Fan Motor	63	383311	4737909	9.5	64	64	65.6	0	0.0	-3.7	4.3	0.1	0.0	0.0	0.0	0.0	1.9	1.9	--	--	63
NS-29	Cooling Tower Fan Motor	125	383311	4737909	9.5	73	73	65.6	0	0.0	1.7	5.8	0.2	0.0	0.0	0.0	0.0	2.2	2.2	2	2	125
NS-29	Cooling Tower Fan Motor	250	383311	4737909	9.5	78	78	65.6	0	0.0	0.0	9.4	0.6	0.0	0.0	0.0	0.0	1.8	1.8	4	4	250
NS-29	Cooling Tower Fan Motor	500	383311	4737909	9.5	86	86	65.6	0	0.0	-1.1	12.2	1.0	0.0	0.0	0.0	0.0	1.8	1.8	10	10	500
NS-29	Cooling Tower Fan Motor	1000	383311	4737909	9.5	90	90	65.6	0	0.0	-1.1	15.0	2.0	0.0	0.0	0.0	0.0	1.8	1.8	10	10	1000
NS-29	Cooling Tower Fan Motor	2000	383311	4737909	9.5	89	89	65.6	0	0.0	-1.1	18.0	5.2	0.0	0.0	0.0	0.0	5.0	5.0	6	6	2000
NS-29	Cooling Tower Fan Motor	4000	383311	4737909	9.5	84	84	65.6	0	0.0	-1.1	20.9	17.7	0.0	0.0	0.0	0.0	6.5	6.5	--	--	4000
NS-29	Cooling Tower Fan Motor	8000	383311	4737909	9.5	72	72	65.6	0	0.0	-1.1	22.7	63.0	0.0	0.0	0.0	0.0	6.2	6.2	--	--	8000
NS-30	Cooling Tower Fan Motor	32	383307	4737895	9.5	62	62	65.9	0	0.0	-3.7	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-30	Cooling Tower Fan Motor	63	383307	4737895	9.5	64	64	65.9	0	0.0	-3.7	4.4	0.1	0.0	0.0	0.0	0.0	1.8	1.8	--	--	63
NS-30	Cooling Tower Fan Motor	125	383307	4737895	9.5	73	73	65.9	0	0.0	1.6	6.0	0.2	0.0	0.0	0.0	0.0	2.1	2.1	2	2	125
NS-30	Cooling Tower Fan Motor	250	383307	4737895	9.5	78	78	65.9	0	0.0	-0.1	9.4	0.6	0.0	0.0	0.0	0.0	1.7	1.7	4	4	250
NS-30	Cooling Tower Fan Motor	500	383307	4737895	9.5	86	86	65.9	0	0.0	-1.1	12.2	1.1	0.0	0.0	0.0	0.0	1.8	1.8	10	10	500
NS-30	Cooling Tower Fan Motor	1000	383307	4737895	9.5	90	90	65.9	0	0.0	-1.1	15.1	2.0	0.0	0.0	0.0	0.0	1.8	1.8	9	9	1000
NS-30	Cooling Tower Fan Motor	2000	383307	4737895	9.5	89	89	65.9	0	0.0	-1.1	18.0	5.4	0.0	0.0	0.0	0.0	4.4	4.4	5	5	2000
NS-30	Cooling Tower Fan Motor	4000	383307	4737895	9.5	84	84	65.9	0	0.0	-1.1	21.0	18.2	0.0	0.0	0.0	0.0	5.8	5.8	--	--	4000
NS-30	Cooling Tower Fan Motor	8000	383307	4737895	9.5	72	72	65.9	0	0.0	-1.1	22.7	64.7	0.0	0.0	0.0	0.0	5.8	5.8	--	--	8000
NS-31	Falling water, Cooling Tower (west)	63	383307	4737919	1.1	73	73	65.4	3	0.0	-5.0	10.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	5	5	63
NS-31	Falling water, Cooling Tower (west)	125	383307	4737919	1.1	81	81	65.4	3	0.0	1.8	12.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	4	4	125
NS-31	Falling water, Cooling Tower (west)	250	383307	4737919	1.1	85	85	65.4	3	0.0	1.6	15.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	4	4	250
NS-31	Falling water, Cooling Tower (west)	500	383307	4737919	1.1	98	98	65.4	3	0.0	0.2	18.9	1.0	0.0	0.0	0.0	0.0	7.8	7.8	23	23	500
NS-31	Falling water, Cooling Tower (west)	1000	383307	4737919	1.1	100	100	65.4	3	0.0	-1.4	21.1	1.9	0.0	0.0	0.0	0.0	9.8	9.8	25	25	1000
NS-31	Falling water, Cooling Tower (west)	2000	383307	4737919	1.1	100	100	65.4	3	0.0	-1.9	22.6	5.1	0.0	0.0	0.0	0.0	11.3	11.3	23	23	2000
NS-31	Falling water, Cooling Tower (west)	4000	383307	4737919	1.1	106	106	65.4	3	0.0	-1.9	23.7	17.3	0.0	0.0	0.0	0.0	11.5	11.5	16	16	4000
NS-31	Falling water, Cooling Tower (west)	8000	383307	4737919	1.1	103	103	65.3	3	0.0	-1.9	24.1	61.5	0.0	0.0	0.0	0.0	12.7	12.7	--	--	8000
NS-32	Falling water, Cooling tower (east)	63	383319	4737916	1.1	73	73	65.5	3	0.0	-5.0	3.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	12	12	63

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

Src ID	Src Name	Band	X	Y	Z	LxD	LxN	Adiv	K0	Dc	Agnd	Abar	Aatm	Afol	Ahous	CmetD	CmetN	ReflD	ReflN	LrD	LrN	Band
NS-32	Falling water, Cooling tower (east)	125	383319	4737916	1.1	81	81	65.5	3	0.0	1.6	2.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	14	14	125
NS-32	Falling water, Cooling tower (east)	250	383319	4737916	1.1	84	84	65.5	3	0.0	1.2	3.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	17	17	250
NS-32	Falling water, Cooling tower (east)	500	383319	4737916	1.1	97	97	65.5	3	0.0	-0.1	4.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	30	30	500
NS-32	Falling water, Cooling tower (east)	1000	383319	4737916	1.1	99	99	65.5	3	0.0	-1.5	4.7	1.9	0.0	0.0	0.0	0.0	0.0	0.0	32	32	1000
NS-32	Falling water, Cooling tower (east)	2000	383319	4737916	1.1	100	100	65.5	3	0.0	-2.0	4.9	5.1	0.0	0.0	0.0	0.0	0.0	0.0	29	29	2000
NS-32	Falling water, Cooling tower (east)	4000	383319	4737916	1.1	105	106	65.5	3	0.0	-2.0	5.2	17.3	0.0	0.0	0.0	0.0	0.0	0.0	23	23	4000
NS-32	Falling water, Cooling tower (east)	8000	383319	4737916	1.1	102	102	65.5	3	0.0	-2.0	5.6	61.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-33	Indoor gas turbogen room	63	383215	4737903	9.9	83	83	66.3	0	0.0	-3.8	4.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	15	15	63
NS-33	Indoor gas turbogen room	125	383215	4737903	9.9	87	87	66.3	0	0.0	1.5	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	15	15	125
NS-33	Indoor gas turbogen room	250	383215	4737903	9.9	74	74	66.3	0	0.0	-0.1	5.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	2	2	250
NS-33	Indoor gas turbogen room	500	383215	4737903	9.9	59	59	66.3	0	0.0	-1.2	7.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-33	Indoor gas turbogen room	1000	383215	4737903	9.9	61	61	66.3	0	0.0	-1.2	8.9	2.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-33	Indoor gas turbogen room	2000	383215	4737903	9.9	63	63	66.3	0	0.0	-1.2	11.2	5.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-33	Indoor gas turbogen room	4000	383215	4737903	9.9	57	57	66.3	0	0.0	-1.2	13.7	19.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-33	Indoor gas turbogen room	8000	383215	4737903	9.9	47	47	66.3	0	0.0	-1.2	16.4	68.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-34	Indoor steam genset room	63	383258	4737926	12.4	87	87	65.7	0	0.0	-3.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	25	25	63
NS-34	Indoor steam genset room	125	383258	4737926	12.4	94	94	65.7	0	0.0	1.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	26	26	125
NS-34	Indoor steam genset room	250	383258	4737926	12.4	79	79	65.7	0	0.0	0.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	13	13	250
NS-34	Indoor steam genset room	500	383258	4737926	12.4	63	63	65.7	0	0.0	-0.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-34	Indoor steam genset room	1000	383258	4737926	12.4	66	66	65.7	0	0.0	-0.9	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-34	Indoor steam genset room	2000	383258	4737926	12.4	64	64	65.7	0	0.0	-0.9	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-34	Indoor steam genset room	4000	383258	4737926	12.4	60	60	65.7	0	0.0	-0.9	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-34	Indoor steam genset room	8000	383258	4737926	12.4	52	52	65.7	0	0.0	-0.9	0.0	63.4	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000
NS-35	Indoor gas compressor room	32	383171	4737893	4.4	--	--	66.7	0	0.0	-4.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	32
NS-35	Indoor gas compressor room	63	383171	4737893	4.4	72	72	66.7	0	0.0	-4.7	2.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	7	7	63
NS-35	Indoor gas compressor room	125	383171	4737893	4.4	81	81	66.7	0	0.0	2.1	3.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	8	8	125
NS-35	Indoor gas compressor room	250	383171	4737893	4.4	71	71	66.7	0	0.0	-0.2	5.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	250
NS-35	Indoor gas compressor room	500	383171	4737893	4.4	57	57	66.7	0	0.0	-1.8	7.9	1.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	500
NS-35	Indoor gas compressor room	1000	383171	4737893	4.4	63	63	66.7	0	0.0	-1.8	10.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	--	--	1000
NS-35	Indoor gas compressor room	2000	383171	4737893	4.4	69	69	66.7	0	0.0	-1.8	12.5	5.9	0.0	0.0	0.0	0.0	0.0	0.0	--	--	2000
NS-35	Indoor gas compressor room	4000	383171	4737893	4.4	66	66	66.7	0	0.0	-1.8	14.6	20.1	0.0	0.0	0.0	0.0	0.0	0.0	--	--	4000
NS-35	Indoor gas compressor room	8000	383171	4737893	4.4	57	57	66.7	0	0.0	-1.8	16.4	71.6	0.0	0.0	0.0	0.0	0.0	0.0	--	--	8000

Where: LrD = LxD - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + CmetD + ReflD
LrN = LxN - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + CmetN + ReflN

The column headings in this table follow the terminology of standard ISO 9613-2. LxD is the daytime A-weighted one-hour energy-equivalent source sound power level, and LxN is the corresponding nighttime level. These quantities include penalties for distictive source character if applicable. LrD is the daytime A-weighted one-hour energy-equivalent sound pressure level at a receptor, and LrN is the corresponding nighttime level.

X and Y are UTM coordinates in metres. Z is the elevation in metres

Where: Lr = Lx - Adiv + K0 + Dc - Agnd - Abar - Aatm - Afol - Ahous + Cmet + Refl

17.4 APPENDIX 17.4 - Natural Resources Baseline Report and Environmental Impact Study East Site

GREEN ELECTRON POWER PROJECT
TOWNSHIP OF ST. CLAIR, LAMBTON COUNTY, ONTARIO

NATURAL RESOURCES BASELINE REPORT
AND
ENVIRONMENTAL IMPACT STUDY

EAST SITE

Submitted to:

Greenfield South Power Corporation
2275 Lakeshore Blvd. West, Suite 401
Toronto, Ontario
M8V 3Y3

Submitted by:

AMEC Environment & Infrastructure
a Division of AMEC Americas Limited
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November 2012
TC121601

LIST OF CONTENTS

Page

1.0 INTRODUCTION 1
1.1 Project Description 1
1.2 Study Scope and Rationale 1
2.0 EXISTING NATURAL ENVIRONMENT 5
2.1 General Biophysical Setting 5
2.2 Terrestrial Ecosystem 5
2.2.1 Natural Heritage Features 6
2.2.2 Wildlife and Wildlife Habitat 7
2.3 Aquatic Ecosystem 13
2.4 Species at Risk 16
2.4.1 Project Site Assessment - SAR 19
3.0 ENVIRONMENTAL EFFECTS ANALYSIS AND MITIGATION MEASURES 26
3.1 Construction Phase 26
3.1.1 Surface Water and Aquatic Habitat, Fish 26
3.1.2 Plant Communities, General Wildlife, Habitat 30
3.1.3 Species at Risk 32
3.2 Operation Phase 34
3.2.1 Surface Water and Aquatic Habitat, Fish 34
3.2.2 Plant Communities, Wildlife, Habitat 39
3.2.3 Species at Risk 40
4.0 FOLLOW-UP AND MONITORING PROGRAM 44
5.0 AGENCY CONSULTATION 45
6.0 CONCLUSION 46
7.0 REFERENCES 47

LIST OF APPENDICES

Appendix A Photo Records
Appendix B Field Records
Appendix C Correspondence
Appendix D DFO Operational Statements

LIST OF TABLES

Page

Table 2-1: Summary of Mammal Species occurring in the General Vicinity of the Proposed Project Site 8
Table 2-2: Summary of Bird Species occurring within the 10km2 block around the Proposed Project Site and their Potential for Occurrence within the Proposed Project Site 9
Table 2-3: Herpetofauna Recorded in the General Vicinity of the Proposed Project Site 12
Table 2-4: Clay Creek Fish Species 14
Table 2-5: Watercourse and Drainage Feature Morphology 15
Table 2-6: Species at Risk (SAR) and Rare Species Identified as Potentially occurring within the Project Study Area 20
Table 3-1: Summary of Impacts, Mitigation and Net Effects – Construction 35
Table 3-2: Summary of Impacts, Mitigation and Net Effects – Operation 42

LIST OF FIGURES

Figure 1-1 Project Location 3
Figure 1-2 Proposed General Project Layout 4
Figure 2-1 Terrestrial Natural Features 24
Figure 2-2 Aquatic Natural Features 25

1.0 INTRODUCTION

AMEC Environment & Infrastructure, a Division of AMEC Americas Limited (AMEC) has been retained by Eastern Power Limited (Eastern Power) on behalf of Greenfield South Power Corporation (project proponent) to complete an Environmental Impact Study for the proposed project site for the Green Electron Power Project (the Project).

The Green Electron Power Project, East Site, will be located on the south side of Oil Springs Line approximately 0.6 km west of highway #40 and 0.9 km east of Greenfield Road in St. Clair Township, Lambton County, Ontario (Figure 1-1). The site has been used for agricultural purposes for many years and is presently under cultivation. The East Site is located immediately east of Hydro One's 230 kV transmission corridor for circuit L28C. All of the plant's electrical output is to be delivered to the existing transmission circuit L28C.

1.1 Project Description

The Project involves the construction and operation of a new, clean, natural gas fuelled electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario. Under the contract with the Ontario Power Authority, the operating pattern of the power plant will likely be primarily during "shoulder" and "peak" electricity demand periods. The peak and shoulder demand periods occur typically between morning and evening on summer and winter business days. Current projections therefore indicate that the plant will likely run about 25% of the available hours in a given year. The plant will be able to start-up and reach full load within 3 hours of request.

The Project will have a generation capacity of approximately 300 MW and will comprise a gas turbogenerator set (nominal capacity of 217 MVA) and a steam turbogenerator set (nominal capacity of 157 MVA) configured as a combined cycle power plant to be fueled entirely with natural gas. Final configuration and/or sizing of key plant equipment may require adjustment during the engineering and procurement phases of the Project. However, the completed plant will meet all of the performance obligations to the Ontario Power Authority. Any such engineering optimizations would not likely affect the scope or the conclusions of this Natural Resources Baseline Report and Environmental Impact Study (EIS).

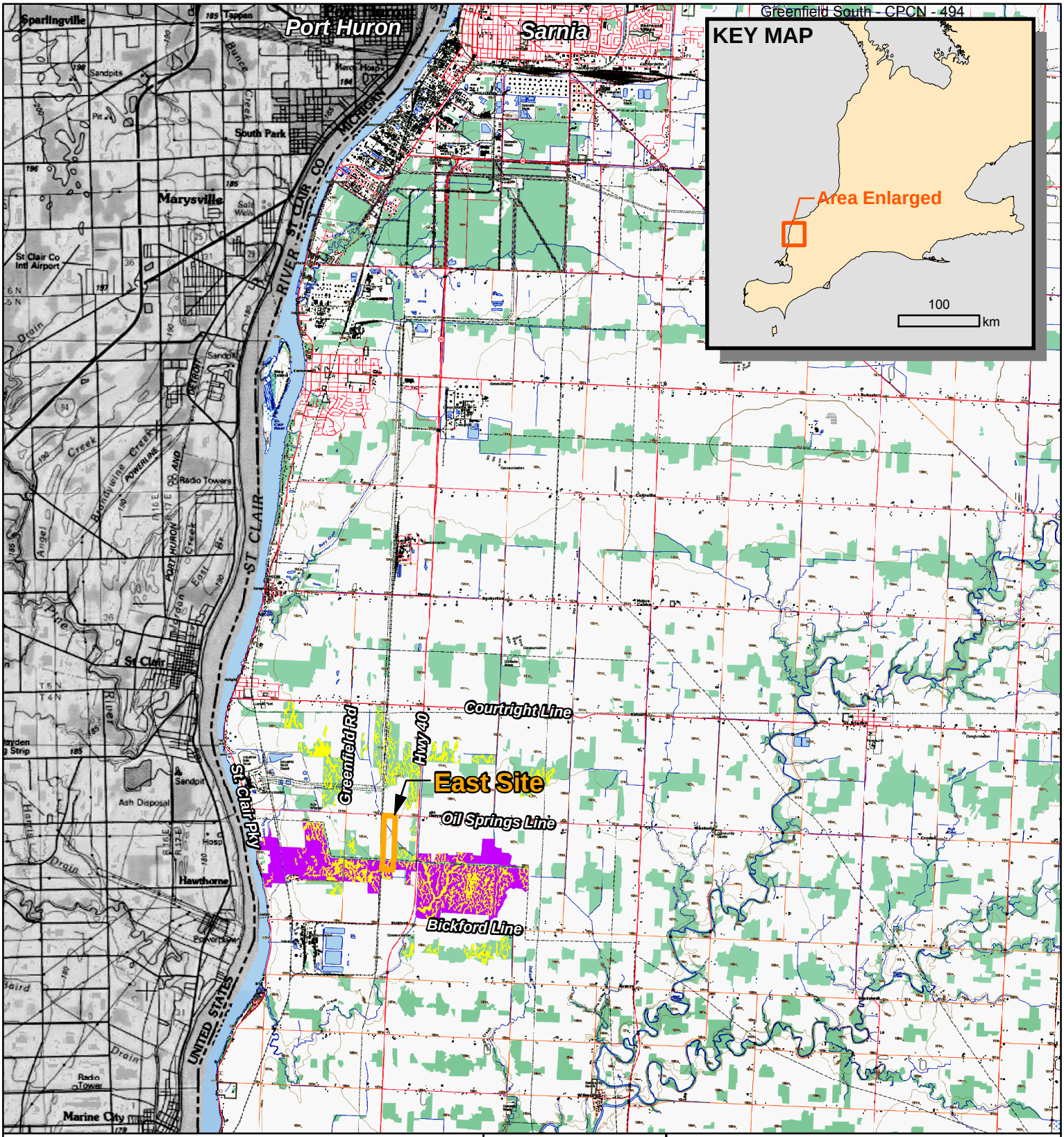
The proposed Project layout is illustrated in Figure 1-2.

1.2 Study Scope and Rationale

The scope of this report is to prepare a high level technical review of the terrestrial and aquatic components of the environment, including critical habitats, significant natural heritage features, rare species and Species at Risk (SAR) that require consideration relative to the proposed project site development. This technical information will support Greenfield South Power Corporation in the preparation of their Environmental Review Report and site planning. As such, relative to terrestrial and aquatic natural features, this report includes:

- A review of the existing natural environment and species present;
- The identification and assessment of negative environmental effects during the construction and operation phases of the Project;
- The development of mitigation and impact management measures for the construction and operation phases of the Project;
- The identification and assessment of net residual effects; and
- The identification of potential need for follow-up and/or monitoring, where required.

This assessment has been prepared based on the project description outlined above, the preliminary design layout at the time of the assessment, available secondary source information, discussions with regulatory agencies, and field reconnaissance completed on September 10, 2012 to provide a general confirmation of the status of site conditions relative to natural heritage related features and to support the evaluation of available secondary source information received.



P:\EM\Projects\2012\TC121601 Eastern Power\GIS\East_Site\Report\MXD_Maps\Project_Location_1.mxd

LEGEND

- Proposed East Site Property Boundary
- Clay Creek Woodland Life Science ANSI
- Bickford Oak Woods Wetland Complex (PSW)

NOTES:
- Topographic map background is a mixture of ESRI basemap services, USGS Topo and Geogratis 1:50k Toporama basemaps, NRCan

Datum: NAD83
Projection: UTM Zone 17N

0 1 2 4 6 8 10 Kilometres

N W E S

EP amec

GREEN ELECTRON POWER PROJECT

Location of Proposed East Site Property

PROJECT N^{o}: TC121601	**FIGURE: 1-1**
SCALE: 1:130,000	DATE: September 2012

LEGEND

- Property Boundary
- Proposed General Site Layout Features
- Railway
- Transmission Line
- Hydro Grid Connection (Overhead)
- Watercourses / Drains

NOTES:
- Background imagery was extracted from GE pro.
- Watercourse/drain information and existing infrastructure was extracted from Land Information Ontarion, MNR
- Property Boundary and proposed general site layout was provided by Eastern Power

Datum: NAD83
Projection: UTM Zone 17N

0 0.05 0.1 0.2 0.3 0.4 0.5 Kilometres

GREEN ELECTRON POWER PROJECT

East Site
Proposed General Layout

PROJECT N^{o}: TC121601	**FIGURE: 1-2**
SCALE: 1:6,800	DATE: September 2012

2.0 EXISTING NATURAL ENVIRONMENT

In order to determine the effects from this Project on the environment, it is first necessary to understand and characterize the existing environment. The existing natural environment assessment is based on a review of secondary source information, consultation with regulatory agencies and a site reconnaissance. Sources of information are provided within the relevant subsection below.

2.1 General Biophysical Setting

The average annual air temperature in Lambton County, as reported in the City of Sarnia between 2000 and 2006, ranges from approximately 8°C and 9°C (Lambton County, 2009). The average winter (December to March) air temperatures ranges between -4.2°C and 0.9°C and average summer (June to September) temperatures range between 17.2°C and 21.1°C. Average precipitation ranges widely from 566 to 1,006 mm per year, with snowfall averaging 77 to 188 cm per year.

The proposed Project site is located in the Clay Creek subwatershed, which lies within the St. Clair River watershed. The Clay Creek subwatershed is located approximately midway between Lake Huron and Lake St. Clair and is one of 11 subwatersheds draining to the St. Clair River on the Canadian (eastern) side. The Clay Creek subwatershed makes up approximately 9% of the total watershed area on the eastern side of St. Clair River.

The surficial geology in the area of the proposed Project site is Rannoch Till (silt to clayey silt matrix, highly calcareous, clast poor) from the Pleistocene age (MNDM, 1991). Bedrock geology in the area of the proposed Project Site is classified as shale of the Port Lambton Group and/or Kettle Point Formation, from the Paleozoic era (OGS, 1991).

2.2 Terrestrial Ecosystem

The proposed Project site lies within an area of agricultural land use. Approximately 500 m south of the facility footprint is the Clay Creek Woodland (see Section 2.2.1 for details). The Project site although substantially cleared of forest vegetation many years ago for agricultural use, is located within the Carolinian Forest Region of Ontario. The Carolinian forest region is composed on tree species not present anywhere else in Canada, including species such as tulip tree (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), cucumber tree (*Magnolia acuminata*) and sassafras (*Sassafras albidum*). Other more common tree species in the area include a variety of maples, oaks and ashes.

Field surveys were conducted on September 10, 2012. The vegetation on the Project study site is composed primarily of cultivated agricultural field. The Clay Creek Woodland ANSI is located within the boundaries of the subject property at the south end of the study area (see Section 2.2.1 for further details). The agricultural field was planted with wheat and has been harvested. Soya bean fields border the wheat field to the north, east and west. Based on the

Ecological Classification System for southern Ontario (ELC; Lee et al., 1998), the agricultural field does not fall into any known ecosystem type. Based on more recent, but unofficial ELC classifications for southern Ontario, the agricultural field is classified as open annual row crop (OAGM). Many non-native species are present including common ragweed (*Ambrosia artemisiifolia*), giant ragweed (*Ambrosia trifida*), bull thistle (*Cirsium vulgare*), canola (*Brassica* sp.), hairy-goats beard (*Tragopogon villosus*), common milkweed (*Asclepias syriaca*), burdock (*Arctium minus*), wild carrot (*Daucus carota*), white sweet clover (*Melilotus alba*), quack grass (*Elymus repens*) and common dandelion (*Taraxacum officinale*).

A small patch dry – moist mineral cultural meadow (CUM1-1) is present at the north end of the property and narrow band (~10 m wide) along the length of which is composed primarily of non-native species similar to those present within the wheat field. Some native species are present including Canada goldenrod (*Solidago canadensis*), narrow-leaved fragrant goldenrod (*Euthamia graminifolia*) and heath aster (*Symphyotrichum ericoides*). The community is associated with an old homestead. A small man-made pond is also present within the cultural meadow area. The pond in dominated by broad-leaved cattails (*Typha latifolia*), lesser duckweed (*Lemna minor*), soft-stemmed bulrush (*Schoenoplectus tabernaemontani*), black-girdled bulrush (*Scirpus actocinctus*) and algae, with some willows (*Salix* sp.) on the periphery. The pond water was very turbid with a substrate consisting of clay.

The ANSI area present at the extreme south end of the property is composed of Swamp Maple Mineral Deciduous Swamp Type (SWD 3-3) and Dry - Fresh Oak – Hickory Deciduous Forest Type (FOD2-2). As the Project footprint well beyond the 120 m from the ANSI, a species inventory was not undertaken.

The vegetation communities of the Project study area are illustrated in Figure 2-1. Photos of the terrestrial ecosystem within the Project study area are provided in Appendix A (Photo Record) and field notes are provided in Appendix B.

2.2.1 Natural Heritage Features

Based on a review of the Ontario Natural Heritage Information Centre (NHIC), the regionally significant Clay Creek Woodland Life Science Area of Natural Scientific Interest (ANSI) is the only designated natural heritage feature identified within or adjacent to the Project area (MNR, 2012). The Clay Creek Woodland ANSI measures approximately 641 ha, of which approximately 6.1 ha lies within the southern extent of the property. The ANSI includes examples of maple-beech, oak-hickory, silver maple swamp and marsh communities. The ANSI has been historically disturbed by extensive grazing, cutting and pipeline construction. Clay Creek Woodland ANSI is situated along Clay Creek and the Coyle Drain approximately 250 m south of the proposed facility footprint (MNR, 2012). As such, the project will not disturb the portion of ANSI within the property boundaries.

MNR's Land Information Ontario (LIO) database Provincially Significant Wetland (PSW) layer indicates that the Clay Creek Woodland ANSI is also part of the Bickford Oak Woods (BOW)

Wetland Complex (Figure 2-1). The BOW Wetland Complex encompasses 365 ha of woodland area and is the largest privately owned wooded land in Lambton County (Lambton Wildlife Incorporated, 2009). The land was purchased by the Nature Conservancy of Canada in 2002 and turned over to the MNR to operate as a conservation reserve. The BOW Wetland Complex is known to support several SAR such as the Shumard Oak (*Quercuss humardii*), Cerulean Warbler (*Setophaga cerulea;* formerly *Dendroica cerulea*), Prothonotary Warbler (*Protonotaria citrea*), and possibly Hooded Warbler (*Setophaga citrine*; formerly *Wilsonia citrine*). The complex is best known as the only site in Canada where swamp cottonwood (*Populus heterophylla*) has been identified (Lambton Wildlife Incorporated, 2009).

Upper Tier Municipality

The proposed Project site is located within the southwestern portion of Lambton County, which is the upper tier municipality for the area. The Lambton County Official Plan (County of Lambton, 1998) includes a Natural Heritage System map which delineates primary corridors, core areas (anchors), linkages, significant natural areas, provincially significant wetlands, and other natural features. In addition, an Existing and Potential Natural Heritage Corridors map is provided in the Official Plan which illustrates primary and secondary corridors as well as core areas (anchors) and linkages. Species use of the corridor is not specified; however, may include candidate deer corridor habitat.

The above-noted maps were reviewed for information pertaining to the proposed Project site.According to the Natural Heritage System Map, the proposed Project Site, as well as areas to the east and west, falls within an area identified as a primary corridor. The Project site is also located in an area identified as a Primary corridor on the Existing & Potential Natural Heritage Corridors map.

Lower Tier Municipality

The lower tier municipality the Project site is situated in is St. Clair Township. The St. Clair Township Official Plan includes Schedule ‘A’ to the Official Plan of St. Clair, which illustrates hazard and environmental protection areas.

The proposed Project Site falls within an area designated for Type 3 Industrial uses (large scale or heavy industry). The area immediately surrounding Government Drain No. 10, located within the proposed Project site limits, is designated environmental protection – hazard lands.

2.2.2 Wildlife and Wildlife Habitat

2.2.2.1 Mammals

To obtain information on mammal species potentially present within the proposed Project site, a desktop evaluation of mammals known to occur within the area was undertaken. The main desktop evaluation involved a review of the Atlas of the Mammals of Ontario (AMO; Dobbyn,

1994). A total of 22 mammal species have been recorded as occurring within the proposed Project site. A summary of mammal species and the probability of occurrence within the Project site footprint are provided in Table 2-1.

Table 2-1: Summary of Mammal Species occurring in the General Vicinity of the Proposed Project Site

Common Name	Scientific Name	S-Rank[1]	Potential Occurrence in the Study Area
Big Brown Bat	*Eptesicus fuscus*	S5	--
Coyote	*Canis latrans*	S5	--
Deer Mouse	*Peromyscus maniculatus*	S5	--
Eastern Chipmunk	*Tamias striatus*	S5	--
Eastern Cottontail	*Sylvilagus floridanus*	S5	--
European Hare	*Lepus europaeus*	SNA	--
Gray Squirrel (including gray phase and black phase)	*Sciurus carolinensis*	S5	--
Hoary Bat	*Lasiurus cinereus*	S5	--
House Mouse	*Mus musculus*	SNA	Y
Meadow Vole	*Microtus pennsylvanicus*	S5	Y
Mink	*Mustela vison*	S4	--
Muskrat	*Ondatra zibethicus*	S5	--
Norway Rat	*Rattus norvegicus*	SNA	--
Raccoon	*Procyon lotor*	S5	Y
Red Fox	*Vulpes vulpes*	S5	Y
Red Squirrel	*Tamiasciurus hudsonicus*	S5	--
Striped Skunk	*Mephitis mephitis*	S5	--
Virginia Opossum	*Didelphis virginiana*	S4	--
White-footed Mouse	*Peromyscus leucopus*	S5	--
White-tailed Deer	*Odocoileus virginianus*	S5	Y
Woodchuck	*Marmota monax*	S5	--

Source: Dobbyn, 1994

[1] Provincial Rank: S1 - Critically Imperilled; S2 - Imperilled; S3 - Vulnerable; S4 - Apparently Secure; S5 - Secure; SNA - Not Applicable (MNR, 2012)

No mammal species were observed during the site visit on September 10, 2012. Given the Project study area is largely agricultural lands, the likelihood of occurrence is largely restricted to those species that are adaptable to habitat limitations and human disturbance. The only species likely to use the site are moderate to large size species with large ranges such as White-tailed Deer (*Odocoileus virginianus*), Raccoon (*Procyon lotor*), Red Fox (*Vulpes vulpes*) and Coyote (*Canis latrans*). Smaller mammals such as Meadow Vole (*Microtus pennsylvanicus*) and (*Mus musculus*) may be present in the cultural meadow habitat and old homestead area.

2.2.2.2 Birds

To obtain information on bird species potentially present within the proposed Project site, a desktop evaluation of breeding birds was undertaken. The main desktop evaluation involved a review of the Atlas of the Breeding Birds of Ontario (ABBO; square 17LH83; Cadman et al., 2007). A total of 91 bird species were recorded in square 17LH83, of which 49 species are confirmed to breed in the area, 21 species are probably breeding in the area, and 21 species are considered to be possibly breeding in the area. A summary of bird species identified within the atlas square and the potential for occurrence within the Project site footprint is provided in Table 2-2.

Table 2-2: Summary of Bird Species occurring within the 10 km^2 Block around the Proposed Project Site and their Potential for Occurrence within the Proposed Project Site

Common Name	Scientific Name	Breeding Evidence[1]	Potential Breeding Occurrence in the Study Area
Acadian Flycatcher*	*Empidonax virescens*	Possible	--
Alder Flycatcher	*Empidonax alnorum*	Possible	--
American Crow	*Corvus brachyrhynchos*	Probable	--
American Goldfinch	*Spinus tristis*	Probable	--
American Kestrel	*Falco sparverius*	Confirmed	--
American Redstart	*Setophaga ruticilla*	Possible	--
American Robin	*Turdus migratorius*	Confirmed	--
American Woodcock	*Scolopax minor*	Probable	--
Baltimore Oriole	*Icterus galbula*	Confirmed	--
Bank Swallow	*Riparia riparia*	Possible	--
Barn Swallow*	*Hirundo rustica*	Confirmed	--
Belted Kingfisher	*Ceryle alcyon*	Possible	--
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Probable	--
Black-capped Chickadee	*Poecile atricapillus*	Confirmed	--
Blue Jay	*Cyanocitta cristata*	Confirmed	--
Blue or Golden-winged Warbler*	*Vermivora sp.*	Possible	--
Blue-gray Gnatcatcher	*Polioptila caerulea*	Confirmed	--
Blue-winged Warbler	*Vermivora cyanoptera*	Probable	--
Bobolink*	*Dolichonyx oryzivorus*	Probable	--
Brown Creeper	*Certhia americana*	Confirmed	--
Brown Thrasher	*Toxostoma rufum*	Probable	--
Brown-headed Cowbird	*Molothrus ater*	Confirmed	Y
Canada Goose	*Branta canadensis*	Confirmed	--
Carolina Wren	*Thryothorus ludovicianus*	Possible	--
Cedar Waxwing	*Bombycilla cedrorum*	Confirmed	--
Cerulean Warbler*	*Setophaga cerulea*	Possible	--
Chipping Sparrow	*Spizella passerina*	Confirmed	--
Cliff Swallow	*Petrochelidon pyrrhonota*	Confirmed	--
Common Grackle	*Quiscalus quiscula*	Confirmed	--
Common Yellowthroat	*Geothlypis trichas*	Confirmed	--
Cooper's Hawk	*Accipiter cooperii*	Confirmed	--
Downy Woodpecker	*Picoides pubescens*	Confirmed	--

Common Name	Scientific Name	Breeding Evidence[1]	Potential Breeding Occurrence in the Study Area
Eastern Bluebird	*Sialia sialis*	Confirmed	--
Eastern Kingbird	*Tyrannus tyrannus*	Probable	--
Eastern Meadowlark*	*Sturnella magna*	Probable	--
Eastern Phoebe	*Sayornis phoebe*	Possible	--
Eastern Screech-Owl	*Megascops asio*	Possible	--
Eastern Towhee	*Pipilo erythrophthalmus*	Possible	--
Eastern Wood-Pewee	*Contopus virens*	Probable	--
European Starling	*Sturnus vulgaris*	Confirmed	--
Field Sparrow	*Spizella pusilla*	Confirmed	--
Gray Catbird	*Dumetella carolinensis*	Confirmed	--
Great Blue Heron	*Ardea herodias*	Confirmed	--
Great Crested Flycatcher	*Myiarchus crinitus*	Confirmed	--
Great Horned Owl	*Bubo virginianus*	Possible	--
Green Heron	*Butorides virescens*	Possible	--
Hairy Woodpecker	*Picoides villosus*	Probable	--
Herring Gull	*Larus argentatus*	Possible	--
Horned Lark	*Eremophila alpestris*	Confirmed	--
House Finch	*Carpodacus mexicanus*	Probable	--
House Wren	*Troglodytes aedon*	Confirmed	--
Indigo Bunting	*Passerina cyanea*	Probable	--
Killdeer	*Charadrius vociferous*	Confirmed	--
Least Flycatcher	*Empidonax minimus*	Probable	--
Mallard	*Anas platyrhynchos*	Confirmed	--
Mourning Dove	*Zenaida macroura*	Confirmed	--
Northern Cardinal	*Cardinalis cardinalis*	Confirmed	--
Northern Flicker	*Colaptes auratus*	Confirmed	--
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Confirmed	--
Northern Waterthrush	*Parkesia noveboracensis*	Possible	--
Orchard Oriole	*Icterus spurius*	Confirmed	--
Ovenbird	*Seiurus aurocapillus*	Probable	--
Pileated Woodpecker	*Dryocopus pileatus*	Probable	--
Prothonotary Warbler*	*Protonotaria citrea*	Probable	--
Purple Martin	*Progne subis*	Possible	--
Red-bellied Woodpecker	*Melanerpes carolinus*	Confirmed	--
Red-eyed Vireo	*Vireo olivaceus*	Probable	--
Red-headed Woodpecker*	*Melanerpes erythrocephalus*	Probable	--
Red-tailed Hawk	*Buteo jamaicensis*	Confirmed	--
Red-winged Blackbird	*Agelaius phoeniceus*	Confirmed	Y
Rock Pigeon	*Columba livia*	Confirmed	--
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Confirmed	--
Ruby-throated Hummingbird	*Archilochus colubris*	Possible	--
Savannah Sparrow	*Passerculus sandwichensis*	Probable	Y
Scarlet Tanager	*Piranga olivacea*	Possible	--
Song Sparrow	*Melospiza melodia*	Confirmed	Y
Spotted Sandpiper	*Actitis macularia*	Confirmed	--
Swamp Sparrow	*Melospiza georgiana*	Possible	--
Tree Swallow	*Tachycineta bicolor*	Confirmed	--

Common Name	Scientific Name	Breeding Evidence[1]	Potential Breeding Occurrence in the Study Area
Tufted Titmouse	*Baeolophus bicolor*	Confirmed	--
Turkey Vulture	*Cathartes aura*	Possible	--
Veery	*Catharus fuscescens*	Confirmed	--
Vesper Sparrow	*Pooecetes gramineus*	Possible	--
Warbling Vireo	*Vireo gilvus*	Confirmed	--
White-breasted Nuthatch	*Sitta carolinensis*	Confirmed	--
Wild Turkey	*Meleagris gallopavo*	Confirmed	--
Willow Flycatcher	*Empidonax traillii*	Confirmed	--
Wood Duck	*Aix sponsa*	Confirmed	--
Wood Thrush	*Hylocichla mustelina*	Confirmed	--
Yellow Warbler	*Setophaga petechia*	Confirmed	--
Yellow-throated Vireo	*Vireo flavifrons*	Probable	--

Source: Cadman et al., 2007

[1]See http://www.birdsontario.org/atlas/codes.jsp?lang=en for information on evidence definitions.

* Listed under the provincial *Endangered Species Act, 2007*

As the field surveys at the Project study area were conducted outside the breeding bird survey period, the status of breeding birds could not be determined. Field surveys were conducted on September 10, 2012. Several species of birds were flocking in the Project study area including House Sparrows (*Passer domesticus*; ~25 birds), Horned Larks (*Eremophila alpestris*; ~60 birds), mourning doves (*Zenaida macroura*; ~30) and American Goldfinch (*Spinus tristis*; ~10 birds). A single Killdeer and Red-winged Blackbird was also observed. Given the limited habitat present, there are only a few species potentially breeding in the Project footprint area (Table 2-2).

Eight species identified in the review of the ABBO are listed as SAR under the provincial *Endangered Species Act* (ESA) including Acadian Flycatcher (*Empidonax virescens*), Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), Cerulean Warbler, Eastern Meadowlark (*Sayornis phoebe*), Golden-winged Warbler (*Vermivora chrysoptera*), Prothonotary Warbler and Red-headed Woodpecker (*Melanerpes erythrocephalus*). None of these species are expected to be present within the Project footprint. Further information on SAR is discussed in Section 2.4.

2.2.2.3 Reptiles and Amphibians

A desktop evaluation of amphibians and reptiles was conducted to obtain information on species potentially present in the general vicinity of the proposed Project site. The main desktop evaluation involved a review of the Ontario Herpetofaunal Summary Atlas (OHSA; Oldham and Weller, 2000). A total of 11 amphibian species and seven reptile species were recorded as occurring in the general vicinity of the proposed Project site (Table 2-3) and can be anticipated to occur where appropriate habitat is available.

Table 2-3: Herpetofauna Recorded in the General Vicinity of the Proposed Project Site

Name	Scientific	S-Rank[1]	Potential Occurrence in the Study Area
Amphibians			
Spotted Salamander	*Ambystoma maculatum*	S4	--
American Toad	*Bufo americanus americanus*	S5	Y
Gray Treefrog	*Hyla versicolor*	S5	--
Common Mudpuppy	*Necturus maculosus*	S4	--
Red-spotted Newt	*Notophthalmus viridescens viridescens*	S5	--
Northern Red-back Salamander	*Plethodon cinereus*	S5	--
Spring Peeper	*Pseudacris crucifer*	S5	--
Western Chorus Frog	*Pseudacris triseriata* pop. [1]	S4	--
Green Frog	*Rana clamitans melanota*	S5	Y
Northern Leopard Frog	*Rana pipiens*	S5	--
Wood Frog	*Rana sylvatica*	S5	--
Reptiles			
Eastern Spiny Softshell*	*Apalone spinifera*	S3	--
Common Snapping Turtle*	*Chelydra serpentine*	S3	--
Midland Painted Turtle	*Chrysemys picta marginata*	S5	--
Blanding's Turtle	*Emydoidea blandingii*	S3	Y
Five-lined Skink*	*Plestiodon fasciatus* pop. [1]	S2	--
Brown Snake	*Storeria dekayi*	S5	--
Butler's Gartersnake*	*Thamnophis butleri*	S2	Y
Eastern Gartersnake	*Thamnophis sirtalis sirtalis*	S5	Y
Eastern Foxsnake (Carolinian population)	*Pantherophis gloydi* pop. [2]	S2	Y

Source: Oldham and Weller, 2002; MNR, 2012

[1] Provincial Rank: S1 - Critically Imperilled; S2 - Imperilled; S3 - Vulnerable; S4 - Apparently Secure; S5 - Secure; SNA - Not Applicable (Source: MNR, 2012)

* Listed under the provincial *Endangered Species Act, 2007*

During the site reconnaissance on September 10, 2012, one green frog was observed on the periphery of the small man-made pond. This pond is located in a limited naturalized area (adjacent to Government Drain #10) of the otherwise disturbed agricultural fields, with limited riparian habitat. This limits potential amphibian and reptile species to narrow areas of remnant habitat (i.e., along the drainage ditch itself and outside of the project footprint area, except the facility access road crossing). Such species would not be found within the project footprint which has largely avoided potential habitat areas by remaining in the disturbed agricultural fields.

Six species identified in the review of the OHSA are listed as SAR under the provincial *ESA* including Eastern Spiny Softshell (*Apalone spinifera*), common snapping turtle (*Chelydra serpentine*), Blanding's Turtle (*Emydoidea blandingii*), Five-lined Skink (*Plestiodon fasciatus*), Eastern Foxsnake (*Pantherophis gloydi* pop. 2) and Butler's Gartersnake (*Thamnophis butleri*). Further information on SAR is discussed in Section 2.4.

2.3 Aquatic Ecosystem

The proposed Project site is located approximately 3.4 km east from the shore of the St. Clair River. It is situated in the St. Clair River watershed and falls under the jurisdiction of the St. Clair Region Conservation Authority (SCRCA).The St. Clair River has been designated an Area of Concern (AOC) under the United States and Canada Great Lakes Water Quality Agreement and triggered the development of comprehensive cleanup plans (Remedial Action Plans or RAPs).

An open municipal ditch drain, identified as Government Drain #10, traverses the proposed Project site in a northwest to southeast direction. Government Drain #10 originates approximately 2.7 km north of the proposed Project Site, and drains to Clay Creek approximately 1.8 km southeast of the proposed Project Site. Various other municipal drains in the vicinity of the Site drain to Government Drain #10 upstream and downstream of the proposed Project Site, prior to its confluence with Clay Creek. Clay Creek drains to the St. Clair River approximately 5 km southwest of the proposed Project Site. Clay Creek, Government Drain #10 and all other drainage courses near the site are depicted in Figure 2-2.

The Clay Creek subwatershed is 56.65 km^2 in area, with 82.7 km of open watercourse, 4.4 km of which is natural stream, with the remaining 78.3 km being municipal drains (SCRCA, 2009).Within the boundaries of the proposed Project Site, Government Drain #10 is classified as a Type C drain (permanent flow, warm water, with no sportfish, sensitive species or sensitive communities) according to the Department of Fisheries and Oceans (DFO) municipal drain classification system (SCRCA, 2009). A small section of Clay Creek directly downstream of the confluence of Government Drain #10, is classified as a natural watercourse, with the remaining downstream and upstream areas being classified as Type E (warm water, top predators present, no channelization within 10 years) (SCRCA, 2009).

Aquatic life within the St. Clair River is diverse with 91 species of resident and migrant fish, with at least 46 species utilizing the river for spawning and nursery habitat. The coldwater fish community is largely composed of exotic species (Rainbow and Brown Trout, Chinook, Coho Salmon and Rainbow Smelt). Important members of the coolwater fish community are Lake Sturgeon, Northern Pike, Muskellunge, Walleye and Yellow Perch. The warmwater community includes Longnose Gar, Brownfin, Smallmouth Bass, Largemouth Bass, White Bass, Channel Catfish, Suckers and several species of minnows and sunfishes (Friends of St. Clair River, 2010).

One location near White Line on Clay Creek was electrofished by SCRCA in 2000; the sampled location was several kilometers downstream of the proposed Project site. Fish species captured at this location are included in Table 2-4. Furthermore, in response to AMEC's request for fisheries information, the MNR provided a list of fish species known to be present within the Clay Creek system; these species have also been included in Table 2-4. The MNR confirmed that Clay Creek is classified as a warmwater watercourse, with low fish and fish habitat sensitivity.

SCRCA has also collected benthic invertebrate samples at two locations on Clay Creek, one near Bickford Line (south of the confluence of Clay Creek with Government Drain #10 and approximately 3 km downstream from the Project site), and one near White Line. Nine samples were collected between 2002 and 2008, and had an average Hilsonhoff Family Biotic Index (FBI) value of 6.87 (range 5.50 to 7.49), which is considered Poor (SCRCA, 2009).

Table 2-4: Clay Creek Fish Species

Common Name	Scientific Name
Northern Pike [1]	*Esox lucius*
Pumpkinseed[1,2]	*Lepomis gibbosus*
Green Sunfish[1,2]	*Lepomis cyanellus*
Golden Shiner[1]	*Notemigonus crysoleucas*
Spotfin Shiner[1]	*Cyprinella spiloptera*
White Sucker[1,2]	*Catostomus commersoni*
Central Mudminnow[1,2]	*Umbra limi*
Brown Bullhead [2]	*Ameiurus nebulosus*
Common Carp [2]	*Cyprinus carpio carpio*
Bluegill [2]	*Lepomis macrochirus*
Common Shiner [2]	*Luxilus cornutus*
Spottail Shiner [2]	*Notropis hudsonius*
Tadpole Madtom[2]	*Noturus gyrinus*
Fathead Minnow [2]	*Pimephales promelas*
Black Crappie [2]	*Pomoxis nigromaculatus*
Freshwater Drum [2]	*Aplodinotus grunniens*

Source: [1]SCRCA, 2009 (St. Clair River Watershed Plan)
[2]MNR, 2012 (correspondence, Appendix C)

SCRCA has collected surface water samples at a location near White Line between 2005 and 2008. All of the water samples exceeded the Interim Provincial Water Quality Objective (PWQO) for phosphorus, with the majority more than triple the objective (SCRCA, 2009). All samples had chloride concentrations that were well below the Environment Canada guideline for toxicity to sensitive species (SCRCA, 2009). Some (13%) of the samples collected exceeded the modified Canadian Council of Ministries of the Environment (CCME) Canadian Environmental Quality Guidelines for nitrate (SCRCA, 2009). Water samples from Clay Creek had turbidity ranging from 5.1 mg/L to 190 mg/L; 34% of the samples had levels above 50 mg/L (SCRCA, 2009).

The East Site was visited on September 10, 2012 by AMEC to confirm secondary source information with regard to aquatic features. Specifically, site reconnaissance included verification of flow (i.e. permanent or intermittent drainage), infield water quality, and stream morphological assessment. Government Drain #10 is within the boundary of the East Site and transects the property as it flows from northwest to southeast toward Highway 40. Air temperature at the time of the site reconnaissance was 18 °C with sun and partial cloud cover. Government Drain #10 was investigated along it's entirely within the property boundary as shown in Figure 2-2. The drain was assessed for morphological and water quality

characteristics at three specific and representative locations (GD-1, GD-2 and GD-3) (Figure 2-2). These results are provided in Table 2-5.

Infield water quality parameters were recorded and included conductivity, temperature, pH and total dissolved solids (TDS). Values for these parameters were 636 µS/cm, 17.1 °C, 7.73 pH units and 318 ppm, respectively and generally were characteristic of an agricultural drainage.

Table 2-5: Watercourse and Drainage Feature Morphology

Watercourse / Drain	Location	Wetted Width (m)	Wetted Depth (m)	Bankfull Width (m)	Bankfull Depth (m)	Velocity (cm/s)	Floodprone Width (m)	Associated Culvert type and diameter (m)
Government Drain #10	GD-1	1.80	0.18	3.94	0.89	ND	13.0	Double CSP (1 m)
Government Drain #10	GD-2	2.49	0.28	4.34	0.99	ND	8.5	CSP (1.23 m)
Government Drain #10	GD-3	0.33	0.10	3.23	1.12	ND	9.0	none

ND – Not Detectable
CSP – Corrugated Steel Pipe

Government Drain #10 was assessed at the western property line of the East Site where Alton Drain is received through a 0.3 m diameter CSP culvert.At this location, Government Drain #10 is conveyed under the Canadian National Railway corridor by double 1.0 m diameter CSP culverts. Widths and depths of the drain channel are provided in Table 2-5. Substrates at this location consist of clay with detritus and leaf litter. Aquatic vegetation included lesser duckweed and soft-stem bulrush which provided aquatic cover. Riparian vegetation was dominated by willow (*Salix* sp.), Canada thistle (*Circium arvense*), goldenrods (*Solidago* spp.), and common milkweed.

GD-2 (Figure 2-2) was located at the existing agricultural crossing of Government Drain #10 on the East Site, which is also where the proposed crossing for the project will be situated. The existing CSP culvert has a diameter of 1.2 m. No discernable flow was detectable through the culvert at the time of the site visit. Ephemeral pools were observed on the upstream (northwest side of the culvert with similar vegetation present as described above for GD-1. However, downstream of the culvert the channel is choked by European common reed (*Phragmites australis*) and the channel was dry on September 10, 2012. The substrate here was clay with a trace of sand and detritus.