

**Appendix J-9**  
**SONIR Model Results: Alternative 6**

# SIMULATION OF NITROGEN IN RECHARGE (SONIR)

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

NAME OF PROJECT

Indian Hills - Alternative 6  
Fort Salonga, NY

DATA INPUT FIELD

<b>A Site Recharge Parameters</b>			<b>B Nitrogen Budget Parameters</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	Area of Site	151.08	acres	1	Persons per Dwelling	2.93	persons
2	Precipitation Rate	49.90	inches	2	Nitrogen per Person per Year	10.0	lbs
3	Acreage of Fertilized Landscaping	46.17	acres	3	a. Sanitary Nitrogen Leaching Rate	84%	percent
4	Fraction of Land in above	0.306	fraction	3	b. Treated Sanitary Nitrogen Leaching Rate	100%	percent
5	Evapotranspiration from above	21.20	inches	4	Fertilized Landscaping	46.17	acres
6	Runoff from above	0.50	inches	5	Fertilizer Application Rate (for above)	2.04	lbs/1000 sq ft
7	Acreage of Unfertilized Landscaping	66.88	acres	6	Fertilizer Nitrogen Leaching Rate (for above)	30%	percent
8	Fraction of above	0.443	fraction	7	Fertilized Land (other, if applicable)	0.00	acres
9	Evapotranspiration from above	21.20	inches	8	Fertilizer Application Rate (for above)	0.00	lbs/1000 sq ft
10	Runoff from above	0.50	inches	9	Fertilizer Nitrogen Leaching Rate (for above)	0%	percent
11	Acreage of Unvegetated/Dirt Roads	1.28	acres	10	Outdoor Cat Population	0.19	pets/dwelling
12	Fraction of above	0.008	fraction	11	Cat Waste Nitrogen Load	3.22	lbs/pet/year
13	Evapotranspiration from above	21.20	inches	12	Outdoor Dog Population	0.35	pets/dwelling
14	Runoff from above	0.00	inches	13	Dog Waste Nitrogen Load	4.29	lbs/pet/year
15	Acreage of Water/Ponds	3.70	acres	14	Pet Waste Nitrogen Leaching Rate	25%	percent
16	Fraction of Site in above	0.024	fraction	15	Area of Land Irrigated	46.17	acres
17	Evaporation from above	30.00	inches	16	Irrigation Rate	24.00	inches
18	Makeup Water (if applicable)	0.00	inches	17	Irrigation Nitrogen Leaching Rate	10%	percent
19	Acreage of Natural	24.01	acres	18	Atmospheric Nitrogen Application/Load	0.04	lbs/1000 sq ft
20	Fraction of above	0.159	fraction	19	Atmos. N Leaching Rate (Natural/Wetlands)	25%	percent
21	Evapotranspiration from above	21.20	inches	20	Atmos. N Leaching Rate (Turf/Landscaped)	20%	percent
22	Runoff from above	0.50	inches	21	Atmos. N. Leaching Rate (Ag; Imperv; Other)	40%	percent
23	Acreage of Impervious/Paved/Bldgs	9.04	acres	22	Nitrogen in Water Supply	2.00	mg/l
24	Fraction of Land in above	0.060	fraction	23	Nitrogen in Sanitary Flow	50.00	mg/l
25	Evapotrans. from above	4.99	inches				
26	Runoff from Impervious	0.00	inches				
27	Acreage of Other	0.00	acres				
28	Fraction of Land in above	0.000	fraction				
29	Evapotrans. from above	21.20	inches				
30	Runoff from above	0.00	inches				
31	Acreage of Land Irrigated	46.17	acres				
32	Fraction of Land Irrigated	0.306	fraction				
33	Irrigation Rate	24.00	inches				
34	Number of Dwellings	98	units				
35	Water Use per Dwelling	300	gal/day				
36	Wastewater Design Flow (clubhouse)	600	gal/day				
				<b>C Comments</b>			
				1) Please refer to user manual for data input instructions; updated per LINAP.			
				Total Acreage Check			
						151.1	100%



**Indian Hills - Alternative 6**

**SITE RECHARGE COMPUTATIONS**

<b>A Fertilized Landscaping</b>			<b>B Unfertilized Landscaping</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	A = Fraction of Land in Cover Type	0.306	fraction	1	A = Fraction of Land in Cover Type	0.443	fraction
2	P = Precipitation Rate	49.90	inches	2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	21.20	inches	3	E = Evapotranspiration Rate	21.20	inches
4	Q = Runoff Rate	0.50	inches	4	Q = Runoff Rate	0.50	inches
5	R(a) = P - (E + Q)	28.20	inches	5	R(b) = P - (E + Q)	28.20	inches
6	R(A) = R(a) x A	8.62	inches	6	R(B) = R(b) x A	12.48	inches

<b>C Unvegetated/Dirt Roads</b>			<b>D Water/Ponds</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	A = Fraction of Land in Cover Type	0.008	fraction	1	A = Fraction of Site in Water	0.024	fraction
2	P = Precipitation Rate	49.90	inches	2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	21.20	inches	3	E = Evaporation Rate	30.00	inches
4	Q = Runoff Rate	0.00	inches	4	Q = Runoff Rate	0.00	inches
5	R(c) = P - (E + Q)	28.70	inches	5	M = Makeup Water	0.00	inches
6	R(C) = R(c) x A	0.24	inches	6	R(d) = {P - (E+Q)} - M	19.90	inches
				7	R(D) = R(d) x A	0.49	inches

<b>E Natural</b>			<b>F Impervious/Paved/Roads</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	A = Fraction of Land in Cover Type	0.159	fraction	1	A = Fraction of Land in Cover Type	0.060	fraction
2	P = Precipitation Rate	49.90	inches	2	P = Precipitation Rate	49.90	inches
3	E = Evapotranspiration Rate	21.20	inches	3	E = Evapotranspiration Rate	4.99	inches
4	Q = Runoff Rate	0.50	inches	4	Q = Runoff Rate	0.00	inches
5	R(e) = P - (E + Q)	28.20	inches	5	R(f) = P - (E + Q)	44.91	inches
6	R(E) = R(e) x A	4.48	inches	6	R(F) = R(f) x A	2.69	inches

<b>G Other</b>			<b>H Irrigation Recharge</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	A = Fraction of Land in Cover Type	0.000	fraction	1	A = Fraction of Land Irrigated	0.306	fraction
2	P = Precipitation Rate	49.90	inches	2	I = Irrigation Rate	24.00	inches
3	E = Evapotranspiration Rate	21.20	inches	3	E = Evaptranspiration Rate	21.40	inches
4	Q = Runoff Rate	0.00	inches	4	Q = Runoff Rate	0.00	inches
5	R(g) = P - (E + Q)	28.70	inches	5	R(h) = I - (E + Q)	2.60	inches
6	R(G) = R(g) x A	0.00	inches	6	R(H) = R(h) x A	0.79	inches

<b>I Wastewater Recharge</b>			<b>J Runoff Recharge</b>				
	<b>Value</b>	<b>Units</b>		<b>Value</b>	<b>Units</b>		
1	WDF = Wastewater Design Flow	600	gal/day	1	Q(A) = Runoff from Landscaped	0.153	inches
2	WDF = Wastewater Design Flow	29,280	cu ft/yr	2	Q(B) = Runoff from Unfertilized Landscaping	0.221	inches
3	A = Area of Site	6,581,045	sq ft	3	Q(C) = Runoff from Unvegetated	0.000	inches
4	R(j) = WDF/A	0.00	feet	4	Q(E) = Runoff from Natural	0.079	inches
5	R(I) = Wastewater Recharge	0.05	inches	5	Q(H) = Runoff from Other	0.000	inches
				6	Q(I) = Runoff from Irrigation	0.00	inches
				7	Q(tot) = Q(A)+Q(B)+Q(C)+Q(E)+Q(H)+Q(I)	0.45	inches

<b>Total Site Recharge</b>		
R(T) =	R(A)+R(B)+R(C)+R(D)+R(E)+R(F)+R(G)+R(H)+R(I)+R(J)+Q(tot)	
<b>R(T) =</b>	<b>30.30</b>	<b>inches</b>



**SIMULATION OF NITROGEN IN RECHARGE (SONIR)**

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

**Indian Hills - Alternative 6**

**SITE NITROGEN BUDGET**

<b>A</b>	<b>Sanitary Nitrogen-Residential</b>	<b>Value</b>	<b>Units</b>
1	Number of Dwellings	98	units
2	Persons per Dwelling	2.93	capita
3	P = Population	287.14	capita
4	N = Nitrogen per person	10	lbs
6	N = (total; pre loss/removal)	2871.4	lbs
7	LR = Leaching Rate	84%	percent
8	N(S) = P x N x LR	2411.98	lbs
9	N = loss/removal	459.42	lbs

<b>C</b>	<b>Sanitary Nitrogen (Wastewater Design Flow)</b>		
1	CF = Commercial/STP Flow	600	gal/day
2	CF = Commercial/STP Flow	828,915	liters/yr
5	N =Nitrogen	50.00	mg/l
6	N = Nitrogen	91.39	lbs
7	LR = Leaching Rate	84%	percent
8	N(S) = CF x N x LR	34,814,430	milligrams
9	N(S) = Sanitary Nitrogen	76.77	lbs
10	N = loss/removal	14.62	lbs

<b>E</b>	<b>Fertilized Land (Fertilized Landscaping)</b>		
1	A = Area of Land Fertilized	2,011,165	sq ft
2	AR = Application Rate	2.04	lbs/1000 sf
3	N(T) = Nitrogen (total applied)	4102.78	lbs
4	LR = Leaching Rate	30%	percent
5	N(F1) = A x AR x LR	1230.83	lbs
6	N = loss/removal	2871.94	lbs

<b>G</b>	<b>Atmospheric Nitrogen (existing condition)</b>		
1	Application Load	0.041	lbs/1000 sf
2	Area of Natural/Wetlands/1000 sf	4,120	1000 sf
3	Leaching Rate	25%	percent
4	Atmos. N Load-1 (natural/wetlands)	42.23	lbs/year
5	Area of turf/landscaped/1000 sf	2,011	1000 sf
6	Leaching Rate	20%	percent
7	Atmos. N Load-2 (golf/turf)	16.49	lbs/year
8	Area of Impervious/Agricult/1000 sf	394	1000 sf
9	Leaching Rate	40%	percent
10	Atmos. N Load-3 (ag; imperv; other)	6.46	lbs/year
11	N(at) = N Load 1 + 2 +3	65.18	lbs
12	N = loss/removal	202.35	lbs

<b>B</b>	<b>Cat Waste Nitrogen</b>	<b>Value</b>	<b>Units</b>
1	Number of Cats per Dwelling	0.19	cats/dwelling
2	Number of Cats (Cats/dwelling x dwellings)	18	cats
3	Cat Waste Nitrogen Load	3.22	lbs/cat/year
4	N(p) = AR x cats x Adjustment (if applicable)	58.38	lbs/year
5	LR = Leaching Rate	25%	percent
6	N(P) = N(p) x LR	14.59	lbs
7	N = (loss/removal)	43.78	lbs

<b>B'</b>	<b>Dog Waste Nitrogen</b>	<b>Value</b>	<b>Units</b>
1	Number of Dogs per Dwelling	0.35	dogs/dwelling
2	Number of Dogs (Dogs/dwelling x dwellings)	34	dogs
3	Dog Waste Nitrogen Load	4.29	lbs/dog/year
4	N(p) = AR x dogs x Adjustment (if applicable)	147.15	lbs/year
5	LR = Leaching Rate	25%	percent
6	N(P) = N(p) x LR	36.79	lbs
7	N = (loss/removal)	110.36	lbs

<b>D</b>	<b>Water Supply Nitrogen (other than wastewater, if applicable)</b>		
1	WDF = Wastewater Design Flow	0	gal/day
2	WDF = Wastewater Design Flow	0	liters/yr
3	N = Nitrogen in Water Supply	50.00	mg/l
4	N(WW) = WDF x N	0	milligrams
5	N(WW) = Wastewater Nitrogen	0.00	lbs

<b>F</b>	<b>Fertilized Land (Unfertilized Landscaping)</b>		
1	A = Area of Land Fertilized 2	0	sq ft
2	AR = Application Rate	0.00	lbs/1000 sf
3	N(T) = Nitrogen (total applied)	0.00	lbs
4	LR = Leaching Rate	0%	percent
5	N(F2) = A x AR x LR	0.00	lbs
6	N = loss/removal	0.00	lbs

<b>H</b>	<b>Irrigation Nitrogen</b>		
1	R = Irrigation Recharge (inches)	0.79	inches
2	R = Irrigation Rate (feet)	0.0662	feet
3	A = Area of Land Irrigated	1,045,440	sq ft
4	R(I) = R(irr) x A	69,222	cu ft
5	R(I) = Site Irrigation (liters)	1,960,367	liters
6	N = Nitrogen in Water Supply	2.00	mg/l
7	N(T) = Nitrogen (total applied)	8.65	lbs
8	LR = Leaching Rate	10%	percent
9	N(irr) = R(I) x N x LR	392,073	milligrams
10	N(irr) = Irrigation Nitrogen	0.86	lbs
11	N = loss/removal	7.78	lbs

<b>Total Site Nitrogen</b>	
N=	N(S) + N(P) + N(WW) + N(F1) + N(F2) + N(ppt) + N(irr)
<b>N=</b>	<b>3,837.00</b> lbs



**SIMULATION OF NITROGEN IN RECHARGE (SONIR)**

NELSON, POPE & VOORHIS, LLC MICROCOMPUTER MODEL

**NAME OF PROJECT**

**Indian Hills - Alternative 6  
Fort Salonga, NY**

**FINAL COMPUTATIONS**

<i>A</i>	<i>Nitrogen in Recharge (concentr.)</i>	<i>Value</i>	<i>Units</i>
1	N = Total Nitrogen (lbs)	3,837.00	lbs
2	N = Total Nitrogen (milligrams)	1,741,999,779	milligrams
3	R(T) = Total Recharge (inches)	30.30	inches
4	R(T) = Total Recharge (feet)	2.53	feet
5	A = Area of Site	6,581,045	sq ft
6	R = R(T) x A	16,618,440	cu ft
7	R = Site Recharge Volume	470,634,216	liters
9	NR = N/R	3.70	mg/l

CONCENTRATION OF NITROGEN IN RECHARGE	<b>3.70</b>
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<i>A</i>	<i>Nitrogen in Recharge</i>	<i>Value</i>	<i>Units</i>
1	N = Total Nitrogen (lbs)	3,837.00	lbs
2	N = Total Nitrogen (milligrams)	1,741,999,779	milligrams
3	R(T) = Total Recharge (inches)	30.30	inches
4	R(T) = Total Recharge (feet)	2.53	feet
5	A = Area of Site	6,581,045	sq ft
6	R = R(T) x A	16,618,440	cu ft
7	R = Site Recharge Volume	470,634,216	liters
9	NR = N/R	3.70	mg/l

<i>Conversions used in SONIR</i>	
Acres x 43,560 = Square Feet	Gallons x 0.1337 = Cubic Feet
Cubic Feet x 7.48052 = Gallons	Gallons x 3.785 = Liters
Cubic Feet x 28.32 = Liters	Grams / 1,000 = Milligrams
Days x 365 = Years	Grams x 0.002205 = Pounds
Feet x 12 = Inches	Milligrams / 1,000 = Grams

<i>B</i>	<i>Site Recharge Summary</i>	<i>Value</i>	<i>Units</i>
1	R(T) = Total Site Recharge	30.30	inches/yr
2	R = Site Recharge Volume	16,618,440	cu ft/yr
3	R = Site Recharge Volume	124,314,572	gal/yr
4	R = Site Recharge Volume	124.31	MG/yr

<u>Nitrogen Load Summary - On-Site</u>	<u>Load</u>	<u>Percent</u>
Sanitary Nitrogen (On-Site Wastewater)	2,488.74	64.86%
Fertilized Landscaping	1230.83	32.08%
Dog Waste Nitrogen	36.79	0.96%
Cat Waste Nitrogen	14.59	0.38%
Atmospheric Nitrogen	65.18	1.70%
Irrigation Nitrogen	0.86	0.02%
Total Pounds Nitrogen	3,837.00	100.00%

