

The Enclaves Projected 6-Foot Sea Level Rise



-  Subject Property
-  0-to-6-Foot Projected Sea Level Rise

THE ENCLAVES
56655 ROUTE 25 (AKA MAIN ROAD)
SOUTHOLD, NEW YORK
TAX MAP: 1000-063.00-03.00-015.000

BURBS NITROGEN LOADING MODEL

PREPARED FOR:

Andrew V. Giambertone & Associates
62 Elm Street
Huntington, New York 11743

PREPARED BY:



P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716
Phone: 631-589-6353
Fax: 631-589-8705

Bryan Grogan, PE – Vice President

bgrogan@pwgrosser.com

PWGC Project Number: AVG1803

MARCH 2019

Purpose

The purpose of this report is to document the findings of a nitrogen mass balance prediction performed by P.W. Grosser Consulting (PWGC) for the evaluation of environmental impacts of the proposed restaurant and hotel development. The proposed development includes 6.75 acres of currently developed property in the Town of Southold, Suffolk County, New York. The project area is located north of Main Road, and is approximately 1,000 feet north of Town Creek/Southold Harbor. The proposed development consists of a 74 seat restaurant and 44 unit hotel.

Nitrogen Mass Balance Prediction

PWGC has evaluated the expected nitrogen loading to groundwater under several land use scenarios using the BURBS model. The BURBS model, developed at Cornell University by Hughes et al. (1985), is a computer simulation program that computes the potential impact of various land use on groundwater within a community due to nitrogen. Cornell University has developed this model for specific application on Long Island. For comparative purposes, PWGC has prepared a BURBS computation for four land use scenarios: historic conditions, existing conditions, alternate plan and proposed development plan. Based on PWGC's experience, this program will predict a conservative estimate of nitrogen recharged to groundwater. It calculates loadings from wastewater, turf/landscaped land, natural land, runoff from impervious surfaces and atmospheric deposition. Each of these parameters is discussed and model parameters are defined.

There are 18 parameters used in the BURBS model:

1. Fraction of Land in Turf
2. Fraction of Land which is impervious
3. Average persons per dwelling
4. Housing density
5. Precipitation rate
6. Water recharged from turf
7. Water recharged from natural land
8. Evaporation from impervious surface
9. Runoff from impervious recharged
10. Home water use per person
11. Nitrogen concentration in precipitation
12. Nitrogen concentration in water used
13. Turf fertilization rate
14. Fraction of nitrogen leached from turf
15. Fraction of wastewater N lost as gas
16. Wastewater fraction removed by Sewer
17. Nitrogen per person in wastewater
18. Nitrogen removal rate of natural land.

Determining Constant Parameter Values

These parameters were constant across all scenarios: items 5-12, 14, and 16-19. Note that in some cases, certain parameters do not apply, but are still considered constant. For instance, the water recharged from turf is considered a constant parameter even in scenarios where there is no turf area. These parameters are summarized in Table 1, below:

Table 1 – BURBS Constant Parameters

BURBS Parameters	Burbs Inputs	Units
5. Precipitation rate	47	inches/year
6. Water recharged from turf	35.25	fraction
7. Water recharged from natural land	23.5	fraction
8. Evaporation from impervious surface	0.1	gallons/day
9. Runoff from impervious recharged	1	fraction
10. Home water use per person	100	gallons/day
11. Nitrogen concentration in precip.	0.71	lbs/1000 sq ft
12. Nitrogen concentration in water used	5.18	fraction
14. Fraction of nitrogen leached from turf	0.3	fraction
16. Wastewater fraction removed by Sewer	0	fraction
17. Nitrogen per person in wastewater	10	lbs/year
18. Nitrogen removal rate of natural land	0.9	fraction

Precipitation Rate (5)

The annual average precipitation in inches (BURBS). A value of 47 inches was used for this project. This is a typical rainfall amount for Long Island.

Water recharged from Turf (6)

The amount of water per unit area of turf which drains to groundwater (BURBS). Based upon PWGCs experience and Long Island geology, approximately 50% of rainfall is recharged. However, to account for the turf areas being irrigated and the possibility of soil saturation the recharge percentage was increased to 75%. Therefore, 35.25 inches per year was used for water recharged from turf.

Water recharged from Natural Land (7)

The amount of water per unit area of turf which drains to groundwater (BURBS). Based upon PWGCs experience and Long Island geology, approximately 50% of rainfall is recharged. Therefore, 23.50 inches per year was used for water recharged from natural land.

Evaporation from Impervious Surfaces (8)

The fraction of precipitation falling on impervious surface assumed to evaporate (BURBS). A value of .1 was used for each of the models run. This amount is recommended by the BURBS parameter description.

Runoff from Impervious Recharged (9)

The fraction of the runoff which is recharged through recharge basins, ponds, etc (BURBS). Evaporation is subtracted. All the runoff for this project area will be directed to the subsurface. Therefore, a value of 1 was used in each of the models run.

Home Water Use per Person (10)

Average in-home use of water (BURBS). The value used here was 100 gallons per person. This value was based on the Suffolk County Department of Health Services (SCDHS) estimate of 300 gallons of water use per day per single family home. Using the NP&V value of 2.5 persons per dwelling (rounding up to

3), and dividing by the number of persons per dwelling, yields approximately 100 gallons used per person. This is conservative estimate and includes all water uses such as bathing, sanitary, irrigation, etc.

Nitrogen Concentration in Precipitation (11)

Average concentration. The Burbs models recommends using data from the closest weather station where nitrogen tests were taken (BURBS). An average value of 0.71 mg/L was used in each of the BURBS models run. This was derived from the National Atmospheric Deposition Program NTN Site NY96 - Cedar Beach, Southold, New York. Concentration of nitrate (NO₃) were given as an annual average for the years 2003 through 2017, ranging from 0.43 mg/L to 0.92 mg/l.

Nitrogen Concentration in Water Used (12)

Average concentration in water used in homes (BURBS). A value of 5.18 mg/L was used when running each of the models. This value was taken from the *Suffolk County Water Authority (SCWA) 2018 Drinking Water Quality Report – Distribution Area 30, p. 45*.

Fraction of Nitrogen Leached from Turf (14)

The fraction of nitrogen applied from fertilizer, precipitation, etc. which leached to groundwater. The BURBS model recommends 0.35 for sandy soil if clippings are removed, or 0.5 if clippings are left on turf. We used 0.30, a comparable value, from the Long Island Nitrogen Loading Model.

Fraction of Wastewater Removed by Sewer (16)

The efficiency of sewer systems. If no sewers are present, use 0 (BURBS). There are no sewers present at this site, thus the fraction of wastewater removed by sewers is 0.

Nitrogen per Person in Wastewater (17)

The average in the United States is 10 pounds per person per day (BURBS). This value was used when running the BURBS model in all scenarios.

Nitrogen Removal Rate of Natural Land (18)

The fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent (BURBS). Based upon the recommendations made by the BURBS parameter description, a value of 0.9 was used for all scenarios.

Determining Variable Parameter Values

These parameters vary by scenario: items 1-4, 13 and 15. These parameters are summarized in Table 2, see below:

Table 2– BURBS Variable Parameters

56655 Route 25 Southold, NY	Area	BURBS Inputs						
		1. Fraction Turf	2. Fraction Impervious	3. Average Persons Per Dwelling	Number of Dwellings	4. Housing Density	13. Turf/Agriculture Fertilization Rate	15. Fraction of wastewater N lost as gas
Scenario	acre	fraction	fraction	persons	dwellings	dwellings /acre	lbs./1000 sq ft	fraction
Historic Conditions	6.75	0.87	0	3	1	0.15	1.86	0.50
Existing Conditions	6.75	0.14	0.02	3	1	0.15	2.04	0.50
Alternate Plan	6.75	0.34	0.66	3	13.45	1.99	2.04	0.50
Proposed Development	6.75	0.53	0.44	3	29.40	4.35	2.04	0.85

Fraction of Land in Turf, Impervious, and Natural (1, 2)

The fraction of land in turf refers to areas maintained as lawn. The fraction of land which is impervious is the sum of roof areas, driveways, and roads. Both the fraction of land in turf and impervious must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of the fraction in turf and impervious, thus the sum of these must be less than 1 (BURBS). The historic land area was estimated from historical aerials found on the Suffolk County government website. In the existing conditions scenario, all area was classified as natural area. For the proposed development and alternate plan, the land areas were derived from the proposed grading and drainage plans.

Average Persons per Dwelling and House Density (3, 4)

The average number of people living in each house or dwelling unit (BURBS) and the housing density, the number of dwelling units per acre (BURBS) are part of the wastewater calculations in the BURBS model. For the historic scenario, housing data was not available, so we assumed that there is no dwellings and no wastewater. For the existing scenario, there is 1 dwelling with 3 people that produces 300 gallons per day.

For the proposed and alternate scenarios, these values (items 3 and 4) were calculated based on the expected gallons of wastewater generated per day. The number of dwellings was then back calculated based on the assumption that there are 300 gallons/day/dwelling – (see Home Water Use per Person (10)). For the alternative scenario, we expect 4,035 gallons per day. Given that there are 300 gallons/day/dwelling we would then have 13.45 dwellings (2 dwellings/acre). For the proposed scenario, we expect 8,820 gallons per day, which means that there would be 29.4 dwellings at 300 gallons/day/dwelling (4.35 dwellings/acre). The average persons per dwelling, number of dwellings, and housing density values therefore do not represent the actual circumstance, but rather are used to ensure that it agrees with the expected gallons/day of wastewater produced.

Turf Fertilization Rate (13)

Average yearly nitrogen application rate expected from residential turf (BURBS). PWGC used 2.04 lbs/1000 sqft for the turf fertilization rate, which is the calculated rate according to the Long Island Nitrogen Action Plans (LINAP) Nitrogen Loading Model (NLM) for residential application.

Fraction of Wastewater Nitrogen Lost as Gas (15)

Fraction of nitrogen in wastewater which volatilizes or is converted to gaseous nitrogen through denitrification. Roughly 0.5 under Long Island, New York conditions (BURBS [5]). The proposed development will utilize advanced onsite wastewater treatment systems. Based upon the nitrogen removal efficiency of these systems of 85%, a value of 0.85 was used for the proposed development. For the alternative plan a value of 0.5 was used since there will not be an advanced onsite wastewater treatment system.

Summary of BURBS Model Results

As described above, PWGC utilized the BURBS model to estimate the nitrogen output from the four scenarios: historic conditions, existing conditions, alternate plan and proposed development plan. The BURBS model predicts nitrogen leached to groundwater independent of land area (i.e.: lbs N/acre/year). In order to calculate the estimated mass of nitrogen leached to groundwater, the acreage of each of the project components is multiplied by the model output, yielding pounds of nitrogen per year. The total N leached and the N concentration in each scenario is summarized in Table 3, see below:

Table 3– BURBS Results Summary

56655 Route 25 Southold, NY	Sources of N Leached				Total N Leached		N Concentration
	Turf	Natural Land	Waste Water	Impervious Runoff	lbs/acre/yr	lbs./yr	mg/L
Scenario	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs./yr	mg/L
Historic Conditions	22.98	0.10	2.57	0	25.66	173.28	3.30
Existing Conditions	4.00	0.64	2.57	0.14	7.35	49.67	1.24
Alternate Plan	9.84	0	34.58	4.99	49.41	333.74	4.55
Proposed Development	15.24	0.02	22.68	3.35	41.30	278.91	3.28

The detailed model calculations are shown in Attachment A.

We expect the alternate scenario to have the highest total N leached, 333.74 lbs./year, and then proposed scenario with 278.91 lbs./year (16% less). The existing scenario was calculated to leach 49.67 lbs./year and the historic scenario is was calculated to produce 173.28 lbs./year, mostly from farmland (turf). The ranking of N concentration matches the ranking of N concentration, from highest to lowest: alternate, proposed, historic, and existing.

Although the proposed scenario has more dwellings than the alternate (greater calculated wastewater discharge) the fraction of wastewater N lost as gas is higher, so the N leached from wastewater is higher in the alternate plan scenario. With more turf land in the proposed scenario, the N leached from turf is higher than the alternate plan. The N leached from impervious runoff is comparable in the proposed and alternate scenarios.

Resources

“Historical Aerials.” *Suffolk County Government*, www.suffolkcounty.gov/Departments/Economic-Development-and-Planning/Planning-and-Environment/Cartography-and-GIS/Historical-Aerials

Suffolk County Water Authority (SCWA) 2018 Drinking Water Quality Report – Distribution Area 30, p. 45.

Attachment A – Detailed BURBS Model Calculations

"Enclaves"
Historic Conidtions

Welcome to BURBS

A Lotus 1-2-3 spreadsheet for calculating the impact of residential development on the nitrate concentration in groundwater.

<<<< Center for Environmental Research, Cornell University >>>>
Ithaca, N.Y. 1985

There are 9 pages:

	A	B	C	D	E	F	G	H	I	J	
1	+-----+										
Press the "Alt"	š	Welcome	š	Instructions	š	Definitions					
key with one	š	(you are here)	š	<Alt> I	š	(3 pages)					
letter	20	+-----+									
to switch	š	Parameters	š	Results	š	<Alt> D					
sections.	š	<Alt> P	š	<Alt> R	š						
40	+-----+										
Special	š	Calculations	š				š				
Commands:	š	<Alt> C	š				š				
60	+-----+										
<Alt> W = results + parameters on split screen						š	Bibliography				
<Alt> U = undo split screen				<Alt> G = graphs			+-----	<Alt> B	+-----		

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.87	fraction
2. Fraction of land which is impervious	0.00	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	0.15	dwellings/acre
5. Precipitation rate	47.00	inches/year
6. Water recharged from turf	35.25	inches/year
7. Water recharged from natural land	23.50	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.71	mg/l
12. Nitrogen concentration in water used	5.18	mg/l
13. Turf fertilization rate	1.86	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.50	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.13	
Population Density	0.44	people/acre
Nitrogen addition from precipitation	7.57	lbs/acre/year
N content of wastewater incl. water used	11.58	lbs/person/year

LABELS FOR GRAPH

Turf	Overall
Natural	Nitrate
Sewage	Conc. =
Runoff	3.3
	mg / liter

"Enclaves"
Historic Conidtions

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	30.5	89%	23.0	90%
Natural Land	3.2	9%	0.1	0%
Wastewater	0.6	2%	2.6	10%
Impervious Runoff	0.0	0%	0.0	0%
TOTAL	34.3		25.7	

Nitrogen concentration in recharge 3.30 mg/l

Graphs of the data can be accessed by typing <Alt> G.
Select a graph, then type "Q" to exit graph menu.

"Enclaves"
Existing Conidtions

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sections.	š	<Alt> P	š	<Alt> R	š						
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Special	š	Calculations	š				š				
Commands:	š	<Alt> C	š				š				
60	+-----+										
<Alt> W = results + parameters on split screen							š	Bibliography			
<Alt> U = undo split screen				<Alt> G = graphs			+-----	<Alt> B	+-----		

DATA - Enter a values for each parameter:

- | | | |
|--|--------|----------------|
| 1. Fraction of land in turf | 0.14 | fraction |
| 2. Fraction of land which is impervious | 0.02 | fraction |
| 3. Average persons per dwelling | 3.00 | people |
| 4. Housing density | 0.15 | dwellings/acre |
| 5. Precipitation rate | 47.00 | inches/year |
| 6. Water recharged from turf | 35.25 | inches/year |
| 7. Water recharged from natural land | 23.50 | inches/year |
| 8. Evaporation from impervious surface | 0.10 | fraction |
| 9. Runoff from impervious recharged | 1.00 | fraction |
| 10. Home water use per person | 100.00 | gallons/day |
| 11. Nitrogen concentration in precip. | 0.71 | mg/l |
| 12. Nitrogen concentration in water used | 5.18 | mg/l |
| 13. Turf fertilization rate | 2.04 | lbs/1000 sq ft |
| 14. Fraction of nitrogen leached from turf | 0.30 | fraction |
| 15. Fraction of wastewater N lost as gas | 0.50 | fraction |
| 16. Wastewater fraction removed by Sewer | 0.00 | fraction |
| 17. Nitrogen per person in wastewater | 10.00 | lbs/year |
| 18. Nitrogen removal rate of natural land | 0.90 | fraction |

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.84	
Population Density	0.44	people/acre
Nitrogen addition from precipitation	7.57	lbs/acre/year
N content of wastewater incl. water used	11.58	lbs/person/year

LABELS FOR GRAPH

Turf	Overall
Natural	Nitrate
Sewage	Conc. =
Runoff	1.2
	mg / liter

"Enclaves"
Existing Conidtions

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

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There are several predefined graphs which you can use.

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RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	4.9	19%	4.0	54%
Natural Land	19.8	76%	0.6	9%
Wastewater	0.6	2%	2.6	35%
Impervious Runoff	0.8	3%	0.1	2%
TOTAL	26.1		7.4	

Nitrogen concentration in recharge 1.24 mg/l

Graphs of the data can be accessed by typing <Alt> G.
Select a graph, then type "Q" to exit graph menu.

"Enclaves"
Alternate Plan

Welcome to BURBS

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Commands:	š	<Alt> C	š				š				
<Alt> W = results + parameters on split screen	60	+-----+									
<Alt> U = undo split screen							š	Bibliography			
<Alt> G = graphs							+-----	<Alt> B	+-----		

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.34	fraction
2. Fraction of land which is impervious	0.66	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	1.99	dwellings/acre
5. Precipitation rate	47.00	inches/year
6. Water recharged from turf	35.25	inches/year
7. Water recharged from natural land	23.50	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.71	mg/l
12. Nitrogen concentration in water used	5.18	mg/l
13. Turf fertilization rate	2.04	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.50	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.00	
Population Density	5.97	people/acre
Nitrogen addition from precipitation	7.57	lbs/acre/year
N content of wastewater incl. water used	11.58	lbs/person/year

LABELS FOR GRAPH

Turf		Overall
Natural		Nitrate
Sewage		Conc. =
Runoff		4.5
		mg / liter

"Enclaves"
Alternate Plan

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

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RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	12.0	25%	9.8	20%
Natural Land	0.0	0%	0.0	0%
Wastewater	8.0	17%	34.6	70%
Impervious Runoff	27.9	58%	5.0	10%
TOTAL	47.9		49.4	
Nitrogen concentration in recharge			4.5	mg/l

Graphs of the data can be accessed by typing <Alt> G.
Select a graph, then type "Q" to exit graph menu.

"Enclaves"
Proposed Development

Welcome to BURBS

A Lotus 1-2-3 spreadsheet for calculating the impact of residential development on the nitrate concentration in groundwater.

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Commands:	š	<Alt> C	š				š				
<Alt> W = results + parameters on split screen	60	+-----+									
<Alt> U = undo split screen							š	Bibliography			
<Alt> G = graphs							+-----	<Alt> B	+-----		

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.53	fraction
2. Fraction of land which is impervious	0.44	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	4.35	dwellings/acre
5. Precipitation rate	47.00	inches/year
6. Water recharged from turf	35.25	inches/year
7. Water recharged from natural land	23.50	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.71	mg/l
12. Nitrogen concentration in water used	5.18	mg/l
13. Turf fertilization rate	2.04	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.85	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.03	
Population Density	13.06	people/acre
Nitrogen addition from precipitation	7.57	lbs/acre/year
N content of wastewater incl. water used	11.58	lbs/person/year

LABELS FOR GRAPH

Turf		Overall
Natural		Nitrate
Sewage		Conc. =
Runoff		3.3
		mg / liter

"Enclaves"

Parameter Definitions

1. Fraction of land in turf - refers to area maintained as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

"Enclaves"

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