CHAPTER 35

SWAT INPUT DATA: .SEP

The Onsite Wastewater Systems (OWSs) input file contains information related to a diversity of features of OWSs within the subbasin. Data contained in the septic input file are: type of septic system, geometry of biozone, characteristics of biomass, and bio-physical reaction coefficients occurring in the biozone (Adapted from Siegrist et al., 2005).

Following is a brief description of the variables in the septic input file. They are listed in the order they appear within the file.

Variable name	Definition
TITLE	The first two lines of .sep file are reserved for user comments. The title line is not processed by the model and may be left blank.

ISEP_TYP The type of septic system

Type	Definition
1	Generic type conventional system
2	Generic type advanced system
3	Septic tank with conventional drainfield
4	Septic tank with SAS[a] type 1
5	Septic tank with SAS type 2
6	Septic tank with in-tank N removal and SAS
7	Septic tank with effluent N removal recycle
8	Septic tank with corrugated plastic trickling Filter
9	Septic tank with open-cell form trickling filter
10	Single pass sand filter 1
11	Single pass sand filter 2
12	Single pass sand filter 3
13	Single pass sand filter 4
14	At grade recirculating sand filter
15	Maryland style RSF[b]
16	RSF
17	Septic tank w/ constructed wetland and surface water discharge
18	Municipal wastewater w/ constructed wetland and surface water discharge 1
19	Municipal wastewater w/ constructed wetland and surface water discharge 2
20	Municipal wastewater w/ constructed wetland
21	Municipal wastewater w/ lagoon and constructed wetland
22	Waterloo biofilter (plastic media) 1
23	Waterloo biofilter (plastic media) 2
24	Peat biofilter
25	Recirculating textile filter
26	Foam or textile filter effluent
27	Septic, recirculating gravel filter, UV disinfection
28	Untreated Effluent - Texas A&M reference

a: Sand absorption system

b: Recirculating sand filter

Variable name	Definition
ISEP_IYR	Year the septic system became operational (eg 1980). If 0 is input for *isep_iyr*, the model assumes the septic system is in operation at the beginning of the simulation Required.
ISEP_OPT	Initial septic HRU operational condition. User can define the default condition of a septic HRU as either active (sep_opt=1), failing (sep_opt=2), or non-septic (sep_opt=0). An active system automatically becomes failing as biozone layer gets clogged over time. A failing system turns to an active system after user specified "number of days for rehabilitation" defined by *isep_tfail*. Required.
SEP_CAP	Number of permanent residents in the house. SEP_cap for a typical US residence is 2.5 and ranges 1~10000. Required.
BZ_AREA	Average area of drainfield of individual septic systems (m^2). Typically recommended drainfield area per person is about 40 to 70 (m^2). This varies from state to state in the United States. For a household with 2.5 people, generally a drainfield area of 100 (m^2) is recommended. User can modify the bz_area based on the number of people in a household. The bz_area and sep_cap may be modified appropriately to study the effects of larger population size using septic systems. Required
ISEP_TFAIL	Time until failing systems gets fixed (days). An active system becomes failing as the biozone gets clogged and hydraulic failure occurs. A failing system automatically turns active during the simulation and septic parameters are re-initialized to default values after the user specified number of days (days assigned for isep_tfail) for rehabilitation. The default value for *isep_tfail* is 70 days but it can range between 10~100000 days. For testing long term failure, isep_tfail can be increased as per the failing duration. isep_opt should be set at 2 for simulating failing conditions.. Required.

Variable name	Definition
BZ_Z	Depth to the top of biozone layer from the ground surface (mm). The thickness includes top soil layer and septic tank effluent (STE) distribution chamber including perforated pipe. The default is 500mm and the depth typically ranges between 10-10000mm. Required.
BZ_THK	Thickness of the biozone layer (mm). The biozone layer is thin soil layer underneath the STE distribution chamber where pollutants are degraded by naturally existing live biomass bacteria. The default thickness is 50mm and ranges 5~100mm. Required.
SEP_STRM_ DIST	Distance to the stream from the septic HRU (km) Currently not available.
SEP_DEN	Number of septic systems per square kilometer. Currently not available.
BIO_BD	Density of biomass (kg/m^3), typically in the range of 900~1100 kg/m^3. The default is 1000 kg/m^3. Required.
COEFF_BOD_ DC	BOD decay rate coefficient. Biozone BOD coefficient is normalized by the volume of biomass in the formula. The default value is 0.5 and the value ranges 0.1~ 5. Required.
COEFF_BOD_ CONV	A conversion factor representing the proportion of mass bacterial growth and mass BOD degraded in the STE. The default value is 0.32 and the value ranges 0.1~ 0.5. Required.
COEFF_FC1	Linear coefficient for calculation of field capacity in the biozone. The default value is 30 and the value ranges 0~ 50. Required.

Variable name	Definition
COEFF_FC2	Exponential coefficient for calculation of field capacity in the biozone. The default value is 0.8 and the value ranges 0.5~ 1. Required.
COEFF_FECAL	Fecal coliform bacteria decay rate coefficient. Biozone fecal coliform coefficient is normalized by the volume of biomass in the formula. The default value is 1.3 and the value ranges 0.5~ 2. Required.
COEFF_PLQ	Conversion factor for plaque from total dissolved solids. The default value is 0.1 and the value ranges 0.08~ 0.95. Required.
COEFF_MRT	Mortality rate coefficient. The default value is 0.5 and the value ranges 0.01~ 1. Required.
COEFF_RSP	Respiration rate coefficient. The default value is 0.16 and the value ranges 0.01~ 1. Required.
COEFF_SLG1	Linear coefficient for calculating the rate of biomass sloughing. The default value is 0.3 and the value ranges 0.01~ 0.5. Required.
COEFF_SLG2	Exponential coefficient for calculating the rate of biomass sloughing. The default value is 0.5 and the value ranges 0.1~ 2.5. Required.
COEFF_NITR	Nitrification rate coefficient. Biozone nitrification rate coefficient is normalized by the volume of biomass in the formula. The default value is 1.5 and the value ranges 0.1~ 300. Required.

Variable name	Definition
COEFF_DENITR	Denitrification rate coefficient. Biozone denitrification rate coefficient is normalized by the volume of biomass in the formula. The default value is 0.32 and the value ranges 0.1~50. Required.
COEFF_PDISTRB	Linear P sorption distribution coefficient (L/kg). The default value is 128 and the value ranges 1.4~478. Required.
COEFF_PSORPMAX	Maximum P sorption capacity (mg P/kg Soil). The default value is 850 and the value ranges 0~17600. Required.
COEFF_SOLPSLP	Slope of the linear effluent soluble P equation. The default value is 0.04 and the value ranges 0~0.3. Required.
COEFF_SOLPINTC	Intercept of the linear effluent soluble P equation. The default value is 3.1 and the value ranges 0~10. Required.

The septic input file is free format. However, it is advised that the free format variables be placed within 13th space and description for each variable follows on the same line with either comma separated or a tab space. Values for variables classified as integers should not include a decimal while values for variables classified as reals must contain a decimal point. A blank space denotes the end of an input value.

The format of the septic input file is:

Variable name	Line #	Format	F90 Format
TITLE	1	Character	a80
TITLE	2	Character	a80
ISEP_TYP	3	Integer	Free
ISEP_IYR	4	Integer	Free
ISEP_OPT	5	Integer	Free
SEP_CAP	6	Real	Free
BZ_AREA	7	Real	Free
ISEP_TFAIL	9	Integer	Free
BZ_Z	10	Real	Free
BZ_THK	11	Real	Free
SEP_STRM_DIST	12	Real	Free
SEP_DEN	13	Real	Free
BIO_BD	14	Real	Free
COEFF_BOD_DC	15	Real	Free
COEFF_BOD_CONV	16	Real	Free
COEFF_FC1	17	Real	Free
COEFF_FC2	18	Real	Free
COEFF_FECAL	19	Real	Free
COEFF_PLQ	20	Real	Free
COEFF_MRT	21	Real	Free
COEFF_RSP	22	Real	Free
COEFF_SLG1	23	Real	Free
COEFF_SLG2	24	Real	Free
COEFF_NITR	25	Real	Free
COEFF_DENITR	24	Real	Free
COEFF_PDISTRB	25	Real	Free
COEFF_PSORPMAX	25	Real	Free
COEFF_SOLPSLP	26	Real	Free
COEFF_SOLPINTC	27	Real	Free

REFERENCES

McCray, J. E., S. L. Kirkland, R. L. Siegrist and G. D. Thyne (2005). "Model Parameters for Simulating Fate and Transport of On-Site Wastewater Nutrients." Ground Water **43**(4): 628-639.

Siegrist, R. L., J. McCray, L. Weintraub, C. Chen, J. Bagdol, P. Lemonds, S. Van Cuyk, K. Lowe, R. Goldstein and J. Rada (2005). Quantifying Site-Scale Processes and Watershed-Scale Cumulative Effects of Decentralized Wastewater Systems, Project No. WU-HT-00-27. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the Colorado School of Mines.