CHAPTER 34

SWAT INPUT DATA: SEPTWQ.DAT

Information of water quality or effluent characteristics required to simulate different types of Onsite Wastewater Systems (OWSs) is stored in the septic water quality database. The database file distributed with SWAT includes water quality data for most of conventional, advanced, and failing septic systems. Information contained in the septic water quality database is septic tank effluent flow rate for per capita and effluent characteristics of various septic systems. The database is developed based on the field data summarized by Siegrist et al. (2005), McCray et al. (2005) and OWTS 201 (2005).

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

Variable name	Definition
TITLE	The first four lines of septwq.dat file are reserved for user comments. The title lines are not processed by the model and may be left blank. Required.

IST

Array storage number for a specific septic type

IST	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: Soil absorption system
b: Recirculating sand filter

Required.

Variable name	Definition
SPTNAME	Abridged name of a septic system

sptname	Definition
GCON	Generic type conventional system
GADV	Generic type advanced system
COND	Septic tank with conventional drainfield
SAS1	Septic tank with SAS[a] type 1
SAS2	Septic tank with SAS type 2
SAS3	Septic tank with in-tank N removal and SAS
SAS4	Septic tank with effluent N removal recycle
SAS5	Septic tank with corrugated plastic trickling Filter
SAS6	Septic tank with open-cell form trickling filter
SPF1	Single pass sand filter 1
SPF2	Single pass sand filter 2
SPF3	Single pass sand filter 3
SPF4	Single pass sand filter 4
RCF1	At grade recirculating sand filter
RCF2	Maryland style RSF[b]
RCF3	RSF
CWT1	Septic tank w/ constructed wetland and surface water discharge
CWT2	Municipal wastewater w/ constructed wetland and surface water discharge 1
CWT3	Municipal wastewater w/ constructed wetland and surface water discharge 2
CWT4	Municipal wastewater w/ constructed wetland
CWT5	Municipal wastewater w/ lagoon and constructed wetland
BFL1	Waterloo biofilter (plastic media) 1
BFL2	Waterloo biofilter (plastic media) 2
BFL3	Peat biofilter
TXF1	Recirculating textile filter
TXF2	Foam or textile filter effluent
GFL1	Septic, recirculating gravel filter, UV disinfection
USPT	Untreated Effluent - Texas A&M reference

a: Sand absorption system
b: Recirculating sand filter

Optional.

Variable name	Definition
SPTFULLNAME	Full name of a septic system This description is not used by the model and is present to assist the user in differentiating between septic systems. Optional.
IDSPTTYPE	Type of a septic system. There are three types of septic systems: conventional, advanced, and failing system. idspttype of 1 represents a conventional system, 2 is for an advanced system, and 3 indicates a system with no pretreatment. Generic systems for conventional and advanced types are available in case system specific information is not available. There are is three conventional and 22 advanced systems available in the septic water quality database. A system with no pretreatment is also defined as a type in the database. User can define a failing system in two ways: 1) set up a septic HRU as failing from the beginning of the simulation by defining *isep_opt* parameter as zero in *.sep files, or 2) a septic HRU turns failing during the simulation for any type of systems as a septic HRU gets clogged and hydraulic failure occurs. Septic systems constructed in areas of thin vadose zone may not operate successfully as groundwater table fluctuates. An advanced septic system has an advanced pretreatment system such as filters or recycling operations. Septic water quality database includes water quality information for 28 types of onsite septic systems. Required.

Variable name	Definition
SPTQ	Septic tank effluent (STE) flow rate (m^3/capita/day). McCray et al. (2005) proposed 0.227 m^3/capita/day as the median value for USA based on the data collected from various sources.

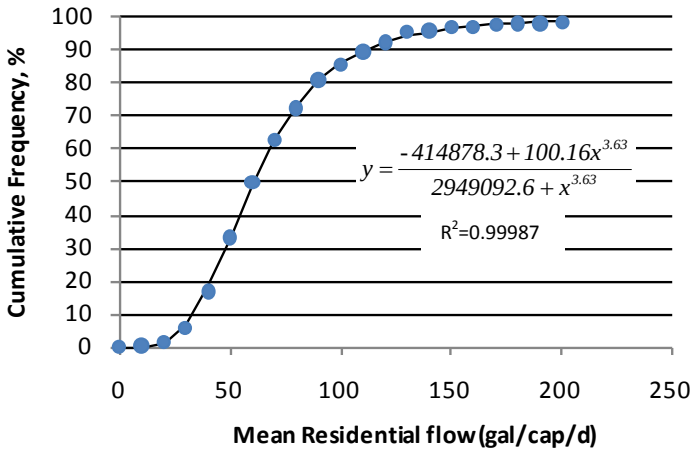

Figure 34.1 Cumulative frequency distribution for residential septic tank effluent flow rate (after McCray et al., 2005)

BOD	7 day Biochemical oxygen demand in STE (mg/L). BOD for a conventional system is typically 170 mg/L. The value varies greatly for different types of septic systems (See Table A-1 of Siegrist et al., 2005). Required.
TSS	Total suspended solids in STE (mg/L). TSS for a conventional system is typically 75 mg/L. The value varies greatly for different types of septic systems (See Table A-1 of Siegrist et al., 2005). Required.
TN	Total nitrogen in STE (mg-N/L). TN for a conventional system is typically 70 mg-N/L (ranging 12~453 mg-N/L). The value varies greatly for different types of septic systems (See Table A-1 of Siegrist et al., 2005). Required.

Variable name	Definition
NH_4	Ammonium nitrogen in STE (mg-N/L). NH_4 for a conventional system is typically 60 mg-N/L (ranging 17~78 mg-N/L). The value varies greatly for different types of septic systems (See Table A-1 of Siegrist et al., 2005).

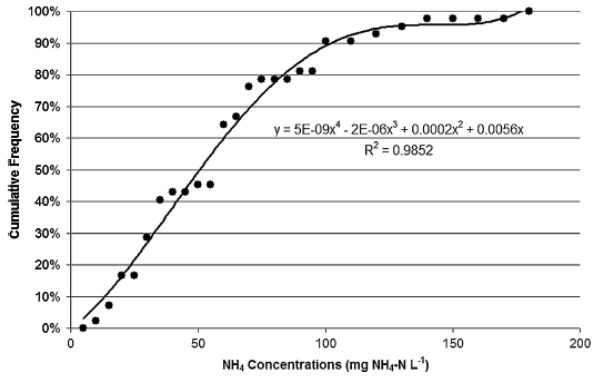

Figure 34.2 Cumulative frequency distribution for ammonium concentration in the septic tank effluent flow rate (after McCray et al., 2005)

Required.

NO_3	Nitrate nitrogen in STE (mg-N/L). NO_3 for a conventional system ranges 0~1.94 mg-N/L. The value varies for different types of septic systems (See Table A-1 of Siegrist et al., 2005).

Required.

NO_2	Nitrite nitrogen in STE (mg-N/L). NO_2 for a conventional system is typically very low.

Required.

ORGN	Organic nitrogen in STE (mg-N/L). ORGN for a conventional system ranges 9.4~15 mg-N/L.

Required.

TP	Total phosphorus in STE (mg-P/L). TP for a conventional system is typically 10 mg-P/L. The value varies for different types of septic systems (See Table A-1 of Siegrist et al., 2005).

Required.

Variable name	Definition
PO_4	Phosphate phosphorus in STE (mg-P/L). PO_4 for a conventional system is typically 9 mg-P/L (ranging 1.2~21.8 mg-P/L).

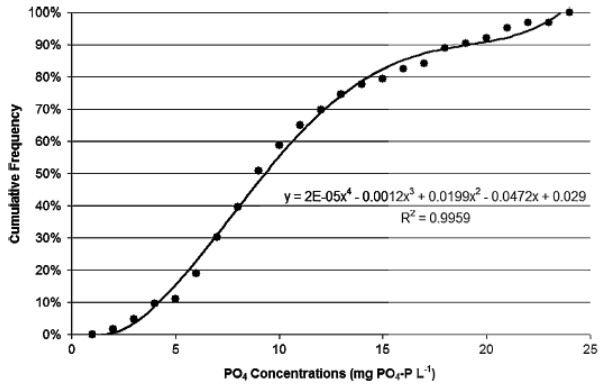

Figure 34.3 Cumulative frequency distribution for phosphate concentration in the septic tank effluent flow rate (after McCray et al., 2005)

	Required.
ORGP	Organic phosphorus in STE (mg-P/L). ORGP for a conventional system is typically 1 mg-p/L.
	Required.
FCOLI	Total number of fecal coliform in STE (cfu/100mL). FCOLI for a conventional system is typically 1E7 cfu/100mL. The value varies greatly for different types of septic systems (See Table A-1 of Siegrist et al., 2005).
	Required.

The format of the septic database input file is:

Variable name	Line #	Format	F90 Format
TITLE	1-4	Character	a80
IST	5	Integer	i3
SPTNAME	5	Character	a4
SPTFULLNAME	5	Character	a70
IDSPTTYPE	5	Integer	i4
SPTQ	6	Real	f8.3
BOD	6	Real	f8.3
TSS	6	Real	f8.3
TN	6	Real	f8.3
NH_4	6	Real	f8.3
NO_3	6	Real	f8.3
NO_2	6	Real	f8.3
ORGN	6	Real	f8.3
TP	6	Real	f8.3
PO_4	6	Real	f8.3
ORGP	7	Real	f8.3
FCOLI	7	Real	f11.1

Septic data for each septic system type is listed in three lines (e.g. lines 5-7 for GCON type) for 28 system types.

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.

OWTS 201 (2005) Texas Corporative Extension, The Texas A&M University System