VS2DRT input line	Conditions	Variables	Description
Line Group A			
A-1		TITL	80-character problem description.
A-2		TMAX	Maximum simulation time.
		STIM	Initial time (usually set to 0).
		ANG	Angle by which grid is to be tilted, degrees. (Note: ANG must be between -90 and +90 degrees, ANG = 0 for no tilting, see Healy, 1990, for further discussion.)
A-3		ZUNIT	Units used for length, “m” for meters. NOTE ON UNITS: If only flow is being simulated, then any length and time units may be used. If solute transport is simulated, then meters must be used for length, grams must be used for mass, and any unit can be used for time. If heat transport is simulated, then meters must be used for length, seconds must be used for time, and Joules must be used for heat.
		TUNIT	Units used for time, “sec” for seconds.
		CUNX	Units used for mass, “gram” for grams.
		HUNX	Units used for heat, “J” for Joules.
A-4		NXR	Number of cells in horizontal or radial direction.
		NLY	Number of cells in vertical direction.
A-5		NRECH	Number of recharge periods. (NOTE: Set NRECH to a negative number [-1 times actual number of recharge periods] to output binary values of head and concentration at selected observation times to file fort.12. Selecting this option allows the simulation to be restarted at any observation time; however, it may require a large amount of disk storage space.)
		NUMT	Maximum number of time steps. (NOTE: If enhanced precision in print out to file 9 and file 11 is desired, set NUMT equal to a negative number; that is, multiply actual maximum number of time steps by –1.)
A-6		RAD	Logical variable, RAD=T if radial coordinates are used; otherwise RAD=F.
		ITSTOP	Logical variable, ITSTOP=T if simulation is to terminate after ITMAX iterations in one time step; otherwise ITSTOP=F.

		HEAT	Logical variable, HEAT=T if heat transport is to be simulated; otherwise HEAT=F.
		SOLUTE	Logical variable, SOLUTE=T if reactive transport is to be simulated; otherwise SOLUTE=F.
A-7	SOLUTE=T	CHEMFILE	PHREEQC input file name.
A-8	SOLUTE=T	DATABASEFILE	Thermodynamics database file name.
A-9	SOLUTE=T	PREFIX	Prefix name.
A-10	SOLUTE=T or HEAT=T	CIS	Logical variable, CIS=T if centered-in-space differencing is to be used; CIS=F if backward-in-space differencing is to be used for transport equation.
		CIT	Logical variable, CIT=T if centered-in-time differencing is to be used; CIT=F if backward-in-time or fully implicit differencing is to be used.
A-11	SOLUTE=T	INPRXZ	Controls printing to the *chem.xz.tsv files. Set INPRXZ=1 for output to these files or INPRXZ=0 for no output.
A-12		F11P	Logical variable, F11P=T if concentration, head, moisture content, and saturation at selected observation points are to be written to file 11 at end of each time step; otherwise F11P=F.
		F7P	Logical variable, F7P=T if fluxes through selected boundary faces are output to file07.out for each time step (boundary faces are specified on input lines B-33 to B-35); otherwise F7P=F.
		F8P	Logical variable, F8P=T if output of pressure heads, concentrations (if SOLUTE=T), and temperatures (if HEAT=T) to file 8 is desired at selected observation times; otherwise F8P=F.
		F9P	Logical variable, F9P=T if one-line mass balance summary for each time step is to be written to file 9; otherwise F9P=F.
		F6P	Logical variable F6P=T if mass balance is to be written to file 6 for each time step; otherwise F6P=F if mass balance is to be written to file 6 only at observation times and ends of recharge periods.
A-13		THPT	Logical variable, THPT=T if volumetric moisture contents are to be written to file 6; otherwise THPT=F.
		SPNT	Logical variable, SPNT=T if saturations are to be written to file 6; otherwise SPNT=F.
		PPNT	Logical variable PPNT=T if pressure heads are to be written to file 6; otherwise PPNT=F.

		HPNT	Logical variable, HPNT=T if total heads are to be written to file 6; otherwise HPNT=F.
		VPNT	Logical variable, VPNT=T if velocities are to be written to file 6; otherwise VPNT=F.
A-14		IFAC	IFAC=0 if grid spacing in horizontal (or radial) direction is to be read in for each column and multiplied by FACX. IFAC=1 if all horizontal grid spacing is to be constant and equal to FACX. IFAC=2 if horizontal grid spacing is variable, with spacing for the first two columns equal to FACX and the spacing for each subsequent column equal to XMULT times the spacing of the previous column, until the spacing equals XMAX, whereupon spacing becomes constant at XMAX.
		FACX	Cell spacing parameter in horizontal (or radial) direction. If IFAC=0, constant multiplier for grid spacing read on line A-15, unitless. If IFAC=1, grid spacing, L. If IFAC=2, initial grid spacing used with multiplier read on line A-16, L.
A-15	IFAC=0	(DXR(K),K=1,NXR)	Grid spacing in horizontal or radial direction. Number of entries must equal NXR, L.
A-16	IFAC=2	XMULT	Multiplier by which the width of each cell is increased from that of the previous cell. Initial width is FACX.
		XMAX	Maximum allowed horizontal or radial spacing, L.
A-17		JFAC	JFAC=0 if grid spacing in vertical direction is to be read in for each row and multiplied by FACZ. JFAC=1 if all vertical grid spacing is to be constant and equal to FACZ. JFAC=2 if vertical grid spacing is variable, with spacing for the first two rows equal to FACZ and the spacing for each subsequent row equal to ZMULT times the spacing at the previous row, until spacing equals ZMAX, whereupon spacing becomes constant at ZMAX.
		FACZ	Cell spacing parameter in vertical direction. If JFAC=0, constant multiplier for vertical grid spacing read on line A-18, unitless. If JFAC=1, vertical grid spacing, L.

			If JFAC=2, initial vertical spacing used with multiplier read on line A-19, L.
A-18	JFAC=0	(DELZ(K),K=1,NLY)	Grid spacing in vertical direction; number of entries must equal NLY, L.
A-19	JFAC=2	ZMULT	Multiplier by which each cell is increased from that of previous cell. Initial spacing is FACZ.
		ZMAX	Maximum allowed vertical spacing, L.
A-20	F8P=T	NPLT	Number of elapsed times at which to write pressure heads, temperatures, and concentrations to file 8 and heads, temperatures, concentrations, saturations, moisture contents, and/or velocities to file 6.
A-21	F8P=T	(PLTIM(K),K=1,NPLT)	Elapsed times at which pressure heads, temperatures, and concentrations are written to file 8, and heads, concentrations, temperatures, saturations, velocities, and/or moisture contents to file 6, T.
A-22	F11P=T	NOBS	Number of observation points for which heads, temperatures, concentrations, moisture contents, and saturations are to be written to file 11. (NOTE: Set NOBS equal to a negative number [-1 times number of observation points] if output to file 11 is desired only at selected output times rather than at each time step.)
A-23	F11P=T	(ROW(N), COL(N), N=1,NOBS)	Row and column number for each observation.
A-24	F9P=T	NMB9	Total number of mass balance components written to file 9; number must be less than 73. (NOTE: Set NMB9 equal to a negative number [-1 times number of components] if output to file 9 is desired only at selected output times rather than at each time step.)
A-25	F9P=T	(MB9(K),K=1,NMB9)	The index number of each mass balance component to be written to file 9. See table 7, from p. 66, in Healy (1990) listed at end of these instructions.
Line Group B			
B-1		EPS	Head closure criterion for iterative solution of flow equation, L.
		HMAX	Relaxation parameter for iterative solution. See discussion in Lappala and others (1987) for more detail. Value is generally in the range of 0.4 to 1.2.

		WUS	Weighting option for inter-cell relative hydraulic conductivity: WUS=1 for full upstream weighting. WUS=0.5 for arithmetic mean. WUS=0.0 for geometric mean.
B-2	HEAT=T	EPS1	Temperature closure criterion for iterative solution of the heat transport equation, °C.
		EPS2	Velocity closure criterion for outer iteration loop at each time step, L/T.
B-3	SOLUTE=T	EPS3	Concentration closure criterion for iterative solution of transport equation, M/L^3.
B-4		MINIT	Minimum number of iterations per time step.
		ITMAX	Maximum number of iterations per time step.
B-5		PHRD	Logical variable, PHRD=T if initial conditions are read in as pressure heads; PHRD=F if initial conditions are read in as moisture contents.
B-6		NTEX	Number of textural classes or lithologies having different values of hydraulic conductivity, specific storage, and (or) constants in the functional relations among pressure head, relative conductivity, and moisture content.
		NPROP	Number of flow properties to be read in for each textural class. When using Brooks and Corey, van Genuchten or Nimmo-Rossi functions, set NPROP=6; when using Haverkamp functions, set NPROP=8. When using tabulated data, set NPROP=6 plus number of data points in table. [For example, if the number of pressure heads in the table is equal to N1, then set NPROP=3*(N1+1)+3.]
B-7		HFT	Hydraulic function type, HFT=0 for Brooks-Corey; HFT=1 for van Genuchten; HFT=2 for Haverkamp; HFT=3 for tabular data; and HFT=4 for Rossi-Nimmo.
B8 through B11 are repeated for each of NTEX texture classes			
B-8		ITEX	Index to textural class.
B-9		ANIZ(ITEX),(HK(ITEX,I), I=1,NPROP)	
		ANIZ(ITEX)	Ratio of hydraulic conductivity in the z-coordinate direction to that in the x-coordinate direction for textural class ITEX.
		HK(ITEX,1)	Saturated hydraulic conductivity (K) in the x-coordinate direction for

			class ITEX, L/T.
		HK(ITEX,2)	Specific storage (Ss) for class ITEX, L^{-1}.
		HK(ITEX,3)	Porosity (ϕ) for class ITEX. MUST BE >0.
			Definitions for the remaining sequential values are dependent upon which functional relation is selected to represent the nonlinear coefficients. Five different functional relations are allowed as defined by HFT: (0) Brooks-Corey, (1) van Genuchten, (2) Haverkamp, (3) tabular data, and (4) Rossi-Nimmo. In the following descriptions, definitions for the different functional relations are indexed by the above numbers. For tabular data, all pressure heads are input first (in decreasing order from the largest to the smallest), all relative hydraulic conductivities are then input in the same order, followed by all moisture contents. See Healy (1990) and Lappala and others (1987) for additional details.
		HK(ITEX,4)	(0) h_b, Brooks-Corey bubbling pressure head (must be less than 0), L. (1) α, van Genuchten alpha. NOTE: α is as defined by van Genuchten (1980) and is the negative reciprocal of α' used in earlier versions (prior to version 3.0) of VS2DT, L. (2) A', Haverkamp parameter (must be less than 0.0), L. (3) Largest pressure head in table. (4) Ψ_0, Rossi-Nimmo parameter.
		HK(ITEX,5)	(0) Residual moisture content (θ_r). (1) Residual moisture content (θ_r). (2) Residual moisture content (θ_r). (3) Second largest pressure head in table. (4) Ψ_D, Rossi-Nimmo parameter.
		HK(ITEX,6)	(0) λ, Brooks-Corey pore-size distribution index. (1) n, van Genuchten parameter, β' in Healy (1990) and Lappala and others (1987). (2) B', Haverkamp parameter. (3) Third largest pressure head in table. (4) λ, Rossi-Nimmo parameter.
		HK(ITEX,7)	(0) Not used. (1) Not used.

			(2) α, Haverkamp parameter (must be less than 0.0), L. (3) Fourth largest pressure head in table. (4) Not used.
		HK(ITEX,8)	(0) Not used. (1) Not used. (2) β, Haverkamp parameter. (3) Fifth largest pressure head in table. (4) Not used. For functional relations (0), (1), (2), and (4) no further values are required on this line for this textural class. For tabular data (3), data input continues as follows:
		HK(ITEX,9)	Next largest pressure head in table.
		HK(ITEX,N1+3)	Minimum pressure head in table. Here N1=Number of pressure heads in table; NPROP=3*(N1+1)+3.
		HK(ITEX,N1+4)	Always input a value of 99.
		HK(ITEX,N1+5)	Relative hydraulic conductivity corresponding to first pressure head.
		HK(ITEX,N1+6)	Relative hydraulic conductivity corresponding to second pressure head.
		…	
		HK(ITEX,2*N1+4)	Relative hydraulic conductivity corresponding to smallest pressure head.
		HK(ITEX,2*N1+5)	Always input a value of 99.
		HK(ITEX,2*N1+6)	Moisture content corresponding to first pressure head.
		HK(ITEX,2*N1+7)	Moisture content corresponding to second pressure head.
		HK(ITEX,3*N1+5)	Moisture content corresponding to smallest pressure head.
		HK(ITEX,3*N1+6)	Always input a value of 99.
			Regardless of which functional relation is selected there must be NPROP+1 values for B9; data can extend to multiple lines.
B-10	HEAT=T	(HT(ITEX,I),I=1,6)	
		HT(ITEX,1)	Longitudinal dispersivity (α_L), m. NOTE: Heat and solute dispersivities should be given identical values.
		HT(ITEX,2)	Transverse dispersivity (α_T), m.
		HT(ITEX,3)	Heat capacity of dry solids (C_s), J/(m^3 °C).
		HT(ITEX,4)	Thermal conductivity of water sediment at residual moisture content,

			$K_T(\theta_r)$, W/(m°C), where W=J/sec.
		HT(ITEX,5)	Thermal conductivity of water sediment at full saturation, $K_T(\phi)$, W/(m°C).
		HT(ITEX,6)	Heat capacity of water (C_w), which is the product of density times specific heat of water, J/(m^3 °C).
B-11	SOLUTE=T	(HS(ITEX,I),I=1,3)	
		HS(ITEX,1)	Longitudinal dispersivity (α_L), m. NOTE: Heat and solute dispersivities should be given identical values.
		HS(ITEX,2)	Transverse dispersivity (α_T), m.
		HS(ITEX,3)	Molecular diffusion coefficient, D_m, m^2/T.
B-12		IROW	If IROW=0, textural classes are read for each row. This option is preferable if many rows differ from the others. If IROW=1, textural classes are read in by blocks of rows, each block consisting of all the rows in sequence consisting of uniform properties or uniform properties separated by vertical interface.
B-13	IROW=0	((JTEX(J,I),I=1,NXR),J=1,NLY)	Indices for textural class for each node, read in row by row. There must be NXR*NLY entries.
			Line set B-14 is present only if IROW = 1. As many groups of B-14 variables as are needed to completely cover the grid are required. The final group of variables for this set must have IR = NXR and JBT = NLY.
B-14	IROW=1	IL	Left hand column for which texture class applies. Must equal 1 or IR (from previous line set) + 1.
		IR	Right hand column for which texture class applies. Final IR for sequence of rows must equal NXR.
		JBT	Bottom row of all rows for which the column designations apply. JBT must not be increased from its initial or previous value until IR=NXR.
		JRD	Texture class within block.
			Note: As an example, for a column of uniform material: IL=1, IR=NXR, JBT=NLY, and JRD=texture class designation for the column material. One line will represent the set for this example.
B-15		IREAD	If IREAD=0, all initial conditions in terms of pressure head or moisture content as determined by the value of PHRD are set equal to FACTOR.

			If IREAD=1, all initial conditions are read from file IU in user-designated format and multiplied by FACTOR. If IREAD=2 initial conditions are defined in terms of pressure head, and an equilibrium profile is specified above a free-water surface at a depth of DWTX until a pressure head of HMIN is reached. All pressure heads above this are set to HMIN. If IREAD=3 initial heads and concentrations are read unformatted from file fort.13 for continuation of a previous simulation beginning at time STIM (line A-2).
		FACTOR	Multiplier or constant value, depending on value of IREAD, for initial conditions.
B-16	IREAD=2	DWTX	Depth to free-water surface above which an equilibrium profile is computed, L.
		HMIN	Minimum pressure head to limit height of equilibrium profile, L. Must be negative.
B-17	IREAD=1	IU	Unit number from which initial head or moisture content values are to be read.
		IFMT	Fortran format to be used in reading initial values from unit IU. Must be enclosed in quotation marks, for example '(10X,E10.3)'.
B-18		BCIT	Logical variable, BCIT=T if evaporation is to be simulated at any time during the simulation; otherwise BCIT=F.
		ETSIM	Logical variable, ETSIM=T if evapotranspiration (plant-root extraction) is to be simulated at any time during the simulation.
			Note: The reader is cautioned on the use of evaporation and evapotranspiration in heat transport simulations with VS2DRT. These processes can influence and be influenced by soil temperature. As described in Lappala and others (1987) and implemented in VS2DRT, these processes are simplistically assumed to be isothermal. Users should evaluate the ramifications of this assumption in their applications. If these processes are an integral component of an application, then use of another numerical model that treats evaporation and evapotranspiration as nontisothermal processes may be warranted.
B-19	BCIT=T or	NPV	Number of ET periods to be simulated. NPV values for each variable

	ETSIM=T		required for the evaporation and (or) evapotranspiration options must be entered on the following lines. If ET variables are held constant throughout the simulation code, NPV = 1. (NOTE: Set NPV equal to a negative number [-1 times number of ET periods] if solute uptake by plant roots is not allowed; otherwise, solute is removed from the domain by root uptake.)
		ETCYC	Length of each ET period, T.
B-20	BCIT=T	(PEVAL(I),I=1,NPV)	Potential evaporation rate (PEV) at beginning of each ET period. Number of entries must equal NPV, L/T. (To conform with the sign convention used in most existing equations for potential evaporation, all entries must be greater than or equal to 0. The program multiplies all nonzero entries by -1 so that the evaporative flux is treated as a sink rather than a source.)
B-21	BCIT=T	(RDC(1,I),I=1,NPV)	Surface resistance to evaporation (SRES) at beginning of ET period, L^{-1}. For a uniform soil, SRES is equal to the reciprocal of the distance from the top active node to land surface, or 2/DELZ(2). If a surface crust is present, SRES may be decreased to account for the added resistance to water movement through the crust. Number of entries must equal NPV.
B-22	BCIT=T	(RDC(2,I),I=1,NPV)	Pressure potential of the atmosphere (HA) at beginning of each ET period; may be estimated using equation 6 of Lappala and others (1987), L. Number of entries must equal NPV.
B-23	ETSIM=T	(PTVAL(I),I=1,NPV)	Potential evapotranspiration rate (PET) at beginning of each ET period, L/T. Number of entries must equal NPV. As with PEV, all values must be greater than or equal to 0.
B-24	ETSIM=T	(RDC(3,I),I=1,NPV)	Rooting depth at beginning of each ET period, L. Number of entries must equal NPV.
B-25	ETSIM=T	(RDC(4,I),I=1,NPV)	Root activity at base of root zone at beginning of each ET period, L^{-2}. Number of entries must equal NPV.
B-26	ETSIM=T	(RDC(5,I),I=1,NPV)	Root activity at top of root zone at beginning of each ET period, L^{-2}. Number of entries must equal NPV. Note: Values for root activity generally are determined empirically, but typically range from 0 to $3x10^{4}$ m/m^3. As programmed, root activity varies linearly from land surface to the base of the root zone, and its distribution with depth

			at any time is represented by a trapezoid. In general, root activities will be greater at land surface than at the base of the root zone.
B-27	ETSIM=T	(RDC(6,I),I=1,NPV)	Pressure head in roots (HROOT) at beginning of each ET period, L. Number of entries must equal NPV.
B-28	HEAT=T	IREAD	If IREAD=0, initial temperature are set equal to FACTOR. If IREAD=1, all initial temperature read from file IU in user designated format and multiplied by FACTOR.
		FACTOR	Multiplier or constant value, depending on value of IREAD, for initial temperature.
B-29	HEAT=T and IREAD=1	IU	Unit number from which initial temperature is to be read.
		IFMT	Fortran format to be used in reading initial temperature values from unit IU. Must be enclosed in quotation marks, for example '(10X, E10.3)'.
B-30	SOLUTE=T	IREAD	If IREAD=0 initial solution, pure phase assemblage, exchange, surface, gas, solid phase assemblage and kinetics, as defined in CHEMFILE, are uniform for all cells and set by INSOL. If IREAD=1 initial solution, pure phase assemblage, exchange, surface, gas, solid phase assemblage and kinetics read for each cell.
B-31	SOLUTE=T and IREAD=0	(INSOL1(I),I=1,7)	
		INSOL1(1)	SOLUTION number.
		INSOL1(2)	EQUILIBRIUM_PHASES number, if there are no EQUILIBRIUM_PHASES reactants, then set the default value of -1.
		INSOL1(3)	EXCHANGE number, if there are no EXCHANGE reactants, then set the default value of -1.
		INSOL1(4)	SURFACE number, if there are no SURFACE reactants, then set the default value of -1.
		INSOL1(5)	GAS_PHASE number, if there are no GAS_PHASE reactants, then set the default value of -1.
		INSOL1(6)	SOLID_SOLUTIONS number, if there are no SOLID_SOLUTIONS reactants, then set the default value of -1.
		INSOL1(7)	KINETICS number, if there are no KINETICS reactants, then set the default value of -1.
B-32	SOLUTE=T and	(INDSOL(J,I,1) , I=1,NXR),J=1,NLY)	Initial SOLUTION number read at all nodes row wise.

	IREAD=1	(INDSOL(J,I,2) , I=1,NXR),J=1,NLY)	EQUILIBRIUM_PHASES number read at all nodes row wise. If there is no EQUILIBRIUM_PHASES for a cell, set default value of -1.
		(INDSOL(J,I,3) , I=1,NXR),J=1,NLY)	EXCHANGE number read at all nodes row wise. If there is no EXCHANGE for a cell, set default value of -1.
		(INDSOL(J,I,4) , I=1,NXR),J=1,NLY)	SURFACE number read at all nodes row wise. If there is no SURFACE for a cell, set default value of -1.
		(INDSOL(J,I,5) , I=1,NXR),J=1,NLY)	GAS_PHASE number read at all nodes row wise. If there is no GAS_PHASE for a cell, set default value of -1.
		(INDSOL(J,I,6) , I=1,NXR),J=1,NLY)	SOLID_SOLUTIONS number read at all nodes row wise. If there is no SOLID_SOLUTIONS for a cell, set default value of -1.
		(INDSOL(J,I,7) , I=1,NXR),J=1,NLY)	KINETICS number read at all nodes row wise. If there is no KINETICS for a cell, set default value of -1.
B-33	FP7=T	NUMBF	Number of boundary faces for which fluxes will be calculated and output to file file07.out.
		MAXCELLS	Maximum number of cells on any boundary face.
B-34 and B-35 must be repeated NUMBF times.			
B-34	FP7=T	IDBF	Boundary face identifier (integer).
		NUMCELLS	Number of finite difference cells on this boundary face.
B-35	FP7=T	(ROW(N),COL(N),N=1,NUMCELLS)	Row and column number of each cell on this boundary face.
Line Group C			
C-1		TPER	Length of this recharge period, T.
		DELT	Length of initial time step for this period, T.
C-2		TMLT	Multiplier for time step length.
		DLTMX	Maximum allowed length of time step, T.
		DLTMIN	Minimum allowed length of time step, T.
		TRED	Factor by which time-step length is reduced if convergence is not obtained in ITMAX iterations. Values usually should be in the range 0.1 to 0.5. If no reduction of time-step length is desired, input a value of 0.0.
C-3		DSMAX	Maximum allowed change in head per time step for this period, L.
		STERR	Steady-state head criterion; when the maximum change in head between successive time steps is less than STERR, the program assumes that steady state has been reached for this period and advances to next recharge period, L.

C-4		POND	Maximum allowed height of ponded water for constant flux nodes. See Lappala and other (1987) for detailed discussion of POND, L.
C-5		PRNT	Logical variable, PRNT=T if heads, temperatures, concentration, moisture contents, and (or) saturations are to be printed to file 6 after each time step; PRNT=F if they are to be written to file 6 only at observation times and ends of recharge periods.
C-6		BCIT	Logical variable, BCIT=T if evaporation is to be simulated for this recharge period; otherwise BCIT=F.
		ETSIM	Logical variable, ETSIM=T if evapotranspiration (plant-root extraction) is to be simulated for this recharge period; otherwise ETSIM=F.
		SEEP	Logical variable, SEEP=T if seepage faces are to be simulated for this recharge period; otherwise SEEP=F.
C-7	SEEP=T	NFCS	Number of possible seepage faces. Line sets C-8 and C-9 must be repeated NFCS times
C-8 and C-9 must be repeated NFCS times.			
C-8	SEEP=T	JJ	Number of nodes on the possible seepage face.
		JLAST	Number of the node which initially represents the highest node of the seep; value can range from 0 (bottom of the face) up to JJ (top of the face).
C-9	SEEP=T	((JSPX(L,J,K),L=2,3),J=1,JJ)	Row and column of each cell on possible seepage face, in order from the lowest to the highest elevation; JJ pairs of values are required.
C-10		IBC	Code for reading in boundary conditions by individual node (IBC=0) or by row or column (IBC=1). Only one code may be used for each recharge period, and all boundary conditions for period must be input in the sequence for that code.
C-11	IBC=0 and (HEAT=T or SOLUTE=T)	JJ	Row number of node.
		NN	Column number of node.
		NTX	Node type identifier for boundary conditions. NTX=0 for no specified boundary (needed for resetting some nodes after initial recharge period); NTX=1 for specified pressure head; NTX=2 for specified flux per unit horizontal surface area in units of L/T;

			NTX=3 for possible seepage face; NTX=4 for specified total head; NTX=5 for evaporation; NTX=6 for specified volumetric flow in units of L^3/T; NTX=7 for gravity drain. (The gravity drain boundary condition allows gravity driven vertical flow out of the domain assuming a unit vertical hydraulic gradient. Flow into the domain cannot occur.)
		PFDUM	Specified head for NTX=1 or 4 or specified flux for NTX=2 or 6. If codes 0, 3, 5, or 7 are specified, the line should contain a dummy value for PFDUM or should be terminated after NTX by a blank and a slash (/).
C-12	IBC=0 and HEAT=T	NTT	Node type identifier for heat transport boundary conditions. NTT=0 for no specified boundary; NTT=1 for specified temperature.
		TF	Specified temperature for NTT=1 or NTX=1, 2, 4, 6, or 7.
C-13	IBC=0 and SOLUTE=T	NTC	Node type identifier for reactive transport boundary conditions. NTC=0 for no specified boundary; NTC=1 for specified concentration.
		INSBC1	Solution number of boundary solution.
C-14	IBC=0 and HEAT=F and SOLUTE=F	JJ	Same as C-11.
		NN	Same as C-11.
		NTX	Same as C-11.
		PFDUM	Same as C-11.
C-15	IBC=1	JJT	Top node of row or column of nodes sharing same boundary condition.
		JJB	Bottom node of row or column of nodes having same boundary condition. JJB will equal JJT if a boundary row is being read.
		NNL	Left column in row or column of nodes having same boundary condition.
		NNR	Right column of row or column of nodes having same boundary condition. NNR will equal NNL if a boundary column is being read in.
		NTX	Same as line C-11.
		PFDUM	Same as line C-11.
C-16	IBC=1 and	NTT	Same as line C-12.

	HEAT=T	TF	Same as line C-12.
C-17	IBC=1 and SOLUTE=T	NTC	Same as line C-13.
		INSBC1	Same as line C-13.
C-18	IBC=1 and HEAT=F and SOLUTE=F	JJT	Same as line C-15.
		JJB	Same as line C-15.
		NNL	Same as line C-15.
		NNR	Same as line C-15.
		NTX	Same as line C-15.
		PFDUM	
C-19		999999 /	Designated end of recharge period. Must be included after line C-17 or C-18 data for each recharge period. Two C-19 lines must be included after final recharge period. Line must always be entered as 999999 /.

Table 7.--Index of Mass-Balance Components for Output to File 9

Index
Number Component
1 Flow in across specified head boundaries -total for simulation
2 Flow in across specified head boundaries -total for time step
3 Flow in across specified head boundaries -rate for time step
4 Flow out across specified head boundaries -total for simulation
5 Flow out across specified head boundaries -total for time step

6 Flow out across specified head boundaries -rate for time step
7 Flow in across specified flux boundaries -total for simulation
8 Flow in across specified flux boundaries -total for time step
9 Flow in across specified flux boundaries -rate for time step
10 Flow out across specified flux boundaries -total for simulation
11 Flow out across specified flux boundaries -total for time step
12 Flow out across specified flux boundaries -rate for time step
13 Total flow in -total for simulation
14 Total flow in -total for time step
15 Total flow in -rate for time step
16 Total flow out -total for simulation
17 Total flow out -total for time step
18 Total flow out -rate for time step
19 Evaporation -total for simulation
20 Evaporation -total for time step
21 Evaporation -rate for time step
22 Transpiration -total for simulation
23 Transpiration -total for time step
24 Transpiration -rate for time step
25 Evaporation + Transpiration -total for simulation
26 Evaporation + Transpiration –total for time step
27 Evaporation + Transpiration -rate for time step
28 Change in fluid stored in domain -total for simulation
29 Change in fluid stored in domain -total for time step
30 Change in fluid stored in domain -rate for time step
31 Fluid volumetric balance -total for simulation
32 Fluid volumetric balance -total for time step
33 Fluid volumetric balance -rate for time step
34 Energy/solute flux in across specified pressure head boundaries -total for simulation
35 Energy/solute flux in across specified pressure head boundaries -total for time step
36 Energy/solute flux in across specified pressure head boundaries -rate for time step
37 Energy/solute flux out across specified pressure head boundaries -total for simulation
38 Energy/solute flux out across specified pressure head boundaries -total for time step
39 Energy/solute flux out across specified pressure head boundaries -rate for time step
40 Energy/solute flux in across specified flux boundaries -total for simulation

41 Energy/solute flux in across specified flux boundaries -total for time step
42 Energy/solute flux in across specified flux boundaries -rate for time step
43 Energy/solute flux out across specified flux boundaries -total for simulation
44 Energy/solute flux out across specified flux boundaries -total for time step
45 Energy/solute flux out across specified flux boundaries -rate for time step
46 Conductive/Dispersive flux in across specified flux boundaries -total for simulation
47 Conductive/Dispersive flux in across specified flux boundaries -total for time step
48 Conductive/Dispersive flux in across specified flux boundaries -rate for time step
49 Conductive/Dispersive flux out across specified flux boundaries -total for simulation
50 Conductive/Dispersive flux out across specified flux boundaries -total for time step
51 Conductive/Dispersive flux out across specified flux boundaries -rate for time step
52 Total Energy/solute flux in -total for simulation
53 Total Energy/solute flux in -total for time step
54 Total Energy/solute flux in -rate for time step
55 Total Energy/solute flux out -total for simulation
56 Total Energy/solute flux out -total for time step
57 Total Energy/solute flux out -rate for time step
58 Energy/solute flux out through evapotranspiration -total for simulation
59 Energy/solute flux out through evapotranspiration -total for time step
60 Energy/solute flux out through evapotranspiration -rate for time step
67 Change in Energy/solute stored in domain -total for simulation
68 Change in Energy/solute stored in domain -total for time step
69 Change in Energy/solute stored in domain –rate for time step
70 Energy/solute mass balance -total for simulation
71 Energy/solute mass balance -total for time step
72 Energy/solute mass balance -rate for time step