



U.S. ARMY

CE-QUAL-W2 MODEL SETUP II CONTROL FILE

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US Army Corps
of Engineers



Environmental Systems
Modeling Team



ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER

What is the control file?

- The control file is a central file that holds most model parameters.
- Information is separated into *cards*. (Punch cards were originally used to input data into computers.)



Cards: How they appear in the manual – 128 Cards

Title (TITLE C).....	Structure Elevation (E STRUC).....	W2 Linkage File Output – (Vector Plot) (VPL PLOT).....	Fe(II) and FeOOH.....	Sediment Compartment (SEDIMENT).....
Grid Dimensions (GRID).....	Structure Width (W STRUC).....	Vector Plot Date (VPL DATE).....	Mn(II) and MnO2.....	SOD Temperature Rate Multipliers (SOD RATE).....
Inflow/Outflow Dimensions (IN/OUTFLOW).....	Pipes (PIPES).....	Vector Plot Frequency (VPL FREQ).....	Algal Rates (ALGAL RATE).....	Zero-Order Sediment Oxygen Demand (S DEMAND).....
Constituent Dimensions (CONSTITUENTS).....	Upstream Pipe (PIPE UP).....	Contour Plot (CPL PLOT).....	Algal Temperature Rate Coefficients (ALG TEMP).....	Reaeration (REAERAT).....
Miscellaneous (MISCELL).....	Downstream Pipe (PIPE DOWN).....	Contour Plot Dates (CPL DATE).....	Algal Stoichiometry (ALG STOICH).....	Restart Input Filename (RSI FILE).....
Time Control (TIME CON).....	Spillways (SPILLWAYS).....	Contour Plot Frequency (CPL FREQ).....	Epiphyte/Periphyton Control (EPIPHYTE).....	Withdrawal Filename (QWD FILE).....
Timestep Control (DLT CON).....	Upstream Spillways (SPILL UP).....	Kinetic Flux Output (FLUXES).....	Epiphyte/Periphyton Print (EPI PRINT).....	Gate Outflow Filename (QGT FILE).....
Timestep Date (DLT DATE).....	Downstream Spillways (SPILL DOWN).....	Kinetic Flux Date (KFL DATE).....	Epiphyte/Periphyton Initial Density (EPI INI).....	Wind Sheltering Filename (WSC FILE).....
Maximum Timestep (DLT MAX).....	Spillway Dissolved Gas (SPILL GAS).....	Kinetic Flux Frequency (FLX FREQ).....	Epiphyte/Periphyton Rate (EPI RATE).....	Dynamic Shading Filename (SHD FILE).....
Timestep Fraction (DLT FRN).....	Gates (GATES).....	Time Series Plot (TSR PLOT).....	Epiphyte/Periphyton Half-Saturation (EPI HALF).....	Bathymetry Filename (BTH FILE).....
Timestep Limitations (DLT LIMIT).....	Gate Weir (GATE WEIR).....	Time Series Date (TSR DATE).....	Epiphyte/Periphyton Temperature Rate Coefficients (EPI TEMP).....	Meteorology Filename (MET FILE).....
Branch Geometry (BRANCH G).....	Upstream Gate (GATE UP).....	Time Series Frequency (TSR FREQ).....	Epiphyte/Periphyton Stoichiometry (EPI STOICH).....	Light Extinction Filename (EXT FILE).....
Waterbody Definition (LOCATION).....	Downstream Gate (GATE DOWN).....	Time Series Segment (TSR SEG).....	Zooplankton Rate (ZOO RATE).....	Atmospheric Deposition Filename (ATD FILE).....
Initial Conditions (INIT CND).....	Gate Dissolved Gas (GATE GAS).....	Time Series Elevation (TSR ELEV).....	Zooplankton Algal Preference (ZOO ALGP).....	Vertical Profile Filename (VPR FILE).....
Calculations (CALCULAT).....	Pumps 1 (PUMPS 1).....	Water Level Output (WL OUT).....	Zooplankton Zooplankton Preference (ZOO ZOO).....	Longitudinal Profile Filename (LPR FILE).....
Dead Sea (DEAD SEA).....	Pumps 2 (PUMPS 2).....	Flow Balance Output (FB OUT).....	Zooplankton Temperature Rate Coefficients (ZOO TEMP).....	Branch Inflow Filename (QIN FILE).....
Interpolation (INTERPOL).....	Internal Weir Segment Location (WEIR SEG).....	N and P Mass Balance Output (NPB OUT).....	Zooplankton Stoichiometry (ZOO STOICH).....	Branch Inflow Temperature Filename (TIN FILE).....
Heat Exchange (HEAT EXCH).....	Internal Weir Top Layer (WEIR TOP).....	Withdrawal Output (WITH OUT).....	Macrophyte Control (MACROPHYT).....	Branch Inflow Constituent Filename (CIN FILE).....
Ice Cover (ICE COVER).....	Internal Weir Bottom Layer (WEIR BOT).....	Withdrawal Output Date (WDO DATE).....	Macrophyte Print (MAC PRINT).....	Branch Outflow Filename (QOT FILE).....
Transport Scheme (TRANSPORT).....	Withdrawal Interpolation (WD INT).....	Withdrawal Output Frequency (WDO FREQ).....	Macrophyte Initial Concentration (MAC INI).....	Tributary Inflow Filename (QTR FILE).....
Hydraulic Coefficients (HYD COEF).....	Withdrawal Segment (WD SEG).....	Withdrawal Output Segment (WITH SEG).....	Macrophyte Rate (MAC RATE).....	Tributary Inflow Temperature Filename (TTR FILE).....
Vertical Eddy Viscosity (EDDY VISC).....	Withdrawal Elevation (WD ELEV).....	Restart (RESTART).....	Macrophyte Sediments (MAC SED).....	Tributary Inflow Concentration Filename (CTR FILE).....
Number of Structures (N STRUC).....	Withdrawal Top Layer (WD TOP).....	Restart Date (RSO DATE).....	Macrophyte Distribution (MAC DIST).....	Distributed Tributary Inflow Filename (QDT FILE).....
Structure Interpolation (STR INT).....	Withdrawal Bottom Layer (WD BOT).....	Restart Frequency (RSO FREQ).....	Macrophyte Drag (MAC DRAG).....	Distributed Tributary Inflow Temperature Filename (TDT FILE).....
Structure Top Selective Withdrawal Limit (STR TOP).....	Tributary Inflow Placement (TRIB PLACE).....	Constituent Computations (CST COMP).....	Macrophyte Temperature Rate Coefficients (MAC TEMP).....	Distributed Tributary Inflow Concentration Filename (CDT FILE).....
Structure Bottom Selective Withdrawal Limit (STR BOT).....	Tributary Interpolation (TRIB INT).....	Atmospheric Deposition (ATMDEP).....	Macrophyte Stoichiometry (MAC STOICH).....	Precipitation Filename (PRE FILE).....
Sink Type (SINK TYPE).....	Tributary Segment (TRIB SEG).....	Active Constituents (CST ACTIVE).....	Dissolved Organic Matter (DOM).....	Precipitation Temperature Filename (TPR FILE).....
	Tributary Inflow Top Elevation (TRIB TOP).....	Derived Constituents (CST DERIVE).....	Particulate Organic Matter (POM).....	Precipitation Concentration Filename (CPR FILE).....
	Tributary Inflow Bottom Elevation (ELEV BOT).....	Constituent Kinetic Fluxes (CST FLUX).....	Organic Matter Stoichiometry (OM STOICH).....	External Upstream Head Filename (EUH FILE).....
	Distributed Tributaries (DST TRIB).....	Constituent Initial Concentration (CST ICON).....	Organic Matter Temperature Rate Multipliers (OM RATE).....	External Upstream Head Temperature Filename (TUH FILE).....
	Hydrodynamic Output Control (HYD PRINT).....	Constituent Output (CST PRINT).....	Turbidity and Secchi Disk (TURBSEC).....	External Upstream Head Concentration Filename (CUH FILE).....
	Snapshot Print (SNP PRINT).....	Inflow Active Constituent Control (CIN CON).....	Carbonaceous Biochemical Oxygen Demand (CBOD).....	External Downstream Head Filename (EDH FILE).....
	Snapshot Dates (SNP DATE).....	Tributary Active Constituent Control (CTR CON).....	CBOD Stoichiometry (CBOD STOICH).....	External Downstream Head Temperature Filename (TDH FILE).....
	Snapshot Frequency (SNP FREQ).....	Distributed Trib Active Constituent (CDT CON).....	Inorganic Phosphorus (PHOSPHOR).....	External Downstream Head Concentration Filename (CDH FILE).....
	Snapshot Segments (SNP SEG).....	Precipitation Active Constituent Control (CPR CON).....	Ammonium (AMMONIUM).....	Time Series Plot Filename (TSR FILE).....
	Screen Print (SCR PRNT).....	Extinction Coefficient (EX COEF).....	Ammonium Temperature Rate Multipliers (NH4 RATE).....	Withdrawal Output Filename (WDO FILE).....
	Screen Dates (SCR DATE).....	Algal Extinction (ALG EX).....	Nitrate (NITRATE).....	Sample Control Input File.....
	Screen Frequency (SCR FREQ).....	Zooplankton Extinction (ZOO EX).....	Nitrate Temperature Rate Multipliers (NO3 RATE).....	
	Profile Plot (PRF PLOT).....	Macrophyte Extinction (MAC EX).....	Silica (SILICA).....	
	Profile Date (PRF DATE).....	Generic Constituent (GENERIC).....	Sediment Carbon Dioxide Release (SED CO2).....	
	Profile Frequency (PRF FREQ).....	Suspended Solids (S SOLIDS).....	Oxygen Stoichiometry 1 (STOICH 1).....	
	Profile Segment (PRF SEG).....	Bacteria.....	Oxygen Stoichiometry 2 (STOICH 2).....	
	Spreadsheet Profile Plot (SPR PLOT).....	H2S.....	Oxygen Stoichiometry 3 (STOICH 3).....	
	Spreadsheet Profile Date (SPR DATE).....	CH4.....	Oxygen Stoichiometry 4 (STOICH 4).....	
	Spreadsheet Profile Frequency (SPR FREQ).....		Oxygen Stoichiometry 5 (STOICH 5).....	
	Spreadsheet Profile Segment (SPR SEG).....		Oxygen Limit (O2 LIMIT).....	

What kind of stuff does the control file contain?

1. Physical dimensions (GRID Card)
 - NWB – Number of waterbodies
 - NBR – Number of branches
 - IMX – Maximum number of segments
 - KMX – Maximum number of vertical layers
2. Physical features (INFLOW/OUTFLOW card)
 - NTR – Number of tributaries
 - NST – Number of structures
 - NIW – Number of internal weirs
 - NWD – Number of withdrawals
 - NGT – Number of gates
 - NSP – Number of spillways
 - NPI – Number of pipes
 - NPU – Number of pumps
3. What we are modeling? (CONSTITUENTS card)
 - NGC – Number of generic constituents
 - NSS – Number of suspended solids groups
 - NAL – Number of algal groups
 - NEP – Number of epiphyton groups
 - NBOD – Number of BOD groups
 - NMC – Number of macrophyte groups
 - NZP – Number of zooplankton groups



External References:

1. Include file names for input and output files
 - Meteorological input or timeseries output...
2. Have on/off switches for accessory modules
 - Fish habitat, sediment-diagenesis

Time Series Inputs

Boundary conditions, meteorological inputs, etc.

File names - global	FILE NAMES	
QWD FILE QWDFN - withdrawals	qwd.npt	
QGT FILE QGTFN - gate	qgt.npt	
WSC FILE WSCFN - wind sheltering	wsc.npt	
SHD FILE SHDFN - shading	shade.npt	
VPLFN - W2 post output, DSI W2Post output file	degray.w2l	
Waterbody Dependent File names	WB1	WB2
BTHFN bathymetry file	bth1.csv	
METFN meteorological file	met.npt	
EXTFN light extinction	ext_1.npt	
ATMDEPFN atmospheric deposition file name	atm_deposition_wb1.csv	
VPRFN vertical profile	vpr.npt	
LPRFN longitudinal profile	lpr.npt	
SNPFN snapshot	snp.opt	
PRFFN profile output	prf.opt	
CPLFN contour plot output	cpl.opt	
SPRFN spreadsheet output	spr.csv	
FLXFN flux output	flx.opt	
Branch Dependent File Names	BR1	BR2
QJNFN branch inflow	qin_br1_equal.npt	
TJNFN branch temp inflow	tin_br1.npt	
CJNFN branch conc inflow	cin_br1.csv	
QOTFN branch structure outflow	qot_br1_equal.npt	
QDTFN Distributed flow file	qin_br1.npt	
TDTFN Distributed temperature file	tdt_br1.npt	
CDTFN Distributed concentration file	cdt_br1.npt	
PREFN Precipitation flow file	pre_br1.npt	
TPRFN Precipitation temperature file	tpr_br1.npt	
CPRFN Precipitation concentration file	cpr_br1.npt	
EUHFN Upstream head file	euh_br1.npt	
TUHFN Upstream temperature file	tuh_br1.npt	
CUHFN Upstream concentration file	cuh_br1.npt	
EDHFN Downstream head file	edh_br1.npt	
TDHFN Downstream temperature file	tdh_br1.npt	
CDHFN Downstream concentration file	cdh_br1.npt	
END OF FILE		

t... > DeGray Reservoir with sediment diagen...			
Name	Date modified	Type	Size
atm_deposition_wb1.csv	7/26/2022 6:56 PM	Comma Separate...	1 KB
bth1.csv	7/26/2022 6:56 PM	Comma Separate...	15 KB
cin_br1.csv	7/26/2022 6:56 PM	Comma Separate...	4 KB
con_converter.py	7/27/2022 10:20 AM	Python File	1 KB
dynpump1.npt	7/26/2022 6:56 PM	NPT File	1 KB
dynselective1.npt	7/26/2022 6:56 PM	NPT File	1 KB
el_stats.opt	7/26/2022 6:56 PM	OPT File	1 KB
met.npt	7/26/2022 6:56 PM	NPT File	144 KB
prf_dam.npt	7/26/2022 6:56 PM	NPT File	117 KB
qgt.npt	7/26/2022 6:56 PM	NPT File	1 KB
qin_br1.npt	7/26/2022 6:56 PM	NPT File	6 KB
qin_br1_equal.npt	7/26/2022 6:56 PM	NPT File	1 KB
qot_br1.npt	7/26/2022 6:56 PM	NPT File	7 KB
qot_br1_equal.npt	7/26/2022 6:56 PM	NPT File	1 KB
qwb.opt	7/26/2022 6:56 PM	OPT File	1 KB
shade.npt	7/26/2022 6:56 PM	NPT File	1 KB
tin_br1.npt	7/26/2022 6:56 PM	NPT File	7 KB
vpr.npt	7/26/2022 6:56 PM	NPT File	2 KB
w2_aerate.npt	7/26/2022 6:56 PM	NPT File	1 KB
w2_Algae_Toxin.csv	7/26/2022 6:56 PM	Comma Separate...	1 KB
w2_AlgaeMigration.csv	7/26/2022 6:56 PM	Comma Separate...	7 KB
w2_con.csv	7/26/2022 6:56 PM	Comma Separate...	110 KB
w2_con_DeGray4.5.xlsm	7/26/2022 6:56 PM	Microsoft Excel M...	280 KB
w2_diagenesis.npt	7/26/2022 6:56 PM	NPT File	9 KB
w2_envirprf.npt	7/26/2022 6:56 PM	NPT File	3 KB
w2_habitat.npt	7/26/2022 6:56 PM	NPT File	1 KB
w2_lake_river_contour.csv	7/26/2022 6:56 PM	Comma Separate...	1 KB
w2_multiple_WB.npt	7/26/2022 6:56 PM	NPT File	1 KB
w2_selective.npt	7/26/2022 6:56 PM	NPT File	2 KB
w2_systdg.npt	7/26/2022 6:56 PM	NPT File	2 KB
w2_TDTarget.csv	7/26/2022 6:56 PM	Comma Separate...	2 KB
w2_tecplotbr.csv	7/26/2022 6:56 PM	Comma Separate...	1 KB
wsc.npt	7/26/2022 6:56 PM	NPT File	1 KB

Accessory Modules Controlled in w2_con

- SELECTC suggests outlet controls based on water temperature
- HABITATC calculates volume of fish habitat based on dissolved oxygen
- ENVIRPC calculates amount of time and volume that reservoir meets certain conditions (i.e., constituent within certain range)
- AERATEC allows user to add oxygen mass to simulate aerator
- INITUWL calculates an initial velocity and normal depth for any non-zero slope waterbody
- ORGCC controls whether carbon is used as the metric for organic matter constituents such as LDOM, RDOM, etc.
- SED_DIAG controls flux of constituents and temperature between sediment and waterbody
- AVERTM turns algal vertical migration on/off
- w2_Algae_Toxin.csv – controlled by ON/OFF switch in ACTIVE CONSTITUENT card, ratio of toxin production for different algal types
- atm_deposition_wb1.csv – controlled by ON/OFF switch in ACTIVE CONSTITUENT card, sets atmospheric mass input for various constituents
- w2_tecplotbr.csv – controlled by ON/OFF switch in the CPL PLOT card, controls which branches to output

Accessory Modules Controlled by Presence in File Directory

- w2_constriction.csv – specifies maximum width between segments, affects right-hand-side face – manual part 3, page 316
- w2_particle.csv – specifies parameters to compute particle transport – manual part 3, page 456
- w2_multiple_WB.npt – provides details for running simulations with multiple waterbodies – manual part 3, page 467
- w2_systdg.npt – sets parameters for setting up total dissolved gas modeling – manual part 3, page 345
- w2_TDGTarget.csv – sets spillway operation parameters that adjust based on TDG target – manual part 3, page 349
- w2_lake_river_contour.csv – sets parameters for contour plots that vary over time – manual part 3, page 396

How does a control file look?

- CE-QUAL-W2 Versions 3.7, 4.0, 4.1, and 4.2 all use .npt input files (ASCII files):

```

w2_con.npt - Notepad
File Edit Format View Help
| W2 Model Version 3.72/4.0

TITLE C .....TITLE.....
Degray Reservoir - March 4 through December 27, 1980
Degray Reservoir - March 4 through December 27, 1980
Density placed inflow, point sink outflow
Default hydraulic coefficients
Default light absorption/extinction coefficients
Testing sensitivity of temperature predictions to vertical resolution
2 m layer heights

GRID          NWB      NBR      IMX      KMX      NPROC  CLOSEC
              1        1        32        36         1      OFF

IN/OUTFL      NTR      NST      NIW      NWD      NGT      NSP      NPI      NPU
              0        1        0        0        0        0        0        0

CONSTITU      NGC      NSS      NAL      NEP      NBOD      NMC      NZP
              3        1        1        1        0        0        1

MISCELL      NDAY  SELECTC  HABTATC  ENVIRPC  AERATEC  INITUWL
              100    OFF      ON      ON      OFF      OFF

TIME CON      TMSTRT  TMEND      YEAR
              64.5000  358.700    1980

DLT CON      NDT      DLTMIN  DLTINTR
              1      1.00000    OFF

DLT DATE      DLTD      DLTD      DLTD      DLTD      DLTD      DLTD      DLTD      DLTD
              64.50

DLT MAX      DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX
              3600.00
  
```


.npt file version

- 8-character width per entry

INIT CND	TEMPI	ICEI	WTYPEC	GRIDC						
WB 1	-1.0000	0.00000	FRESH	RECT						
CALCULAT	VBC	EBC	MBC	PQC	EVC	PRC				
WB 1	OFF	OFF	OFF	ON	OFF	OFF				
DEAD SEA	WINDC	QINC	QOUTC	HEATC						
WB 1	ON	ON	ON	ON						
INTERPOL	QINIC	DTRIC	HDIC							
BR1	ON	OFF	OFF							
HEAT EXCH	SLHTC	SROC	RHEVAP	METIC	FETCHC	AFW	BFW	CFW	WINDH	
WB 1	ET	OFF	OFF	ON	OFF	9.20000	0.46000	2.00000	10.0000	
ICE COVE	ICEC	SLICEC	ALBEDO	HWICE	BICE	GICE	ICEMIN	ICET2		
WB 1	OFF	DETAIL	0.25000	10.0000	0.60000	0.07000	0.05000	3.00000		
TRANSPOR	SLTRC	THETA								
WB 1	ULTIMATE	0.50000								
HYD COEF	AX	DX	CBHE	TSED	FI	TSEDF	FRICC	Z0		
WB 1	1.00000	1.00000	0.3	14.0000	0.00000	0.00000	CHEZY	0.001		
EDDY VISC	AZC	AZSLC	AZMAX	FBC	E	ARODI	STRCKLR	BOUNDFR	TKECAL	
WB 1	TKE	IMP	1.00000	3	9.535	0.430	24.0	10.0	IMP	
N STRUC	NSTR									
BR1	1									
STR INT	STRIC	STRIC	STRIC	STRIC	STRIC	STRIC	STRIC	STRIC	STRIC	
BR 1	ON									
STR TOP	KTSTR	KTSTR	KTSTR	KTSTR	KTSTR	KTSTR	KTSTR	KTSTR	KTSTR	
BR1	2									

Fixed-Width (*.npt) File Version

- Setting which WQ constituents are computed in the model

CST	COMP	CCC	LIMC	CUF
		ON	ON	3
CST	ACTIVE	CAC		
TDS		ON		
Gen1		ON		
Gen2		ON		
Gen3		ON		
ISS1		ON		
PO4		ON		
NH4		ON		
NO3		ON		
DSI		OFF		
PSI		OFF		
FE		ON		
LDOM		ON		
RDOM		ON		
LPOM		ON		
RPOM		OFF		
ALG1		ON		
DO		ON		
TIC		ON		
ALK		ON		
Z001		OFF		
LDOM_P		OFF		
RDOM_P		OFF		
LPOM_P		OFF		
RPOM_P		OFF		
LDOM_N		OFF		
RDOM_N		OFF		
LPOM_N		OFF		
RPOM_N		OFF		

Version 4.5 User Interface

The most up-to-date user interface is an .xslm file (m=macro). The macro converts the excel into an .csv file which is readable by the model.

Note COL A and B are not written out to w2_con.csv file format	CE-QUAL-W2 v	4.5											
	Control File v	4.5											
Fixed length of file except when more than 5 alg	TITLE C	Title comments: next 10 lines											
5 macrophytes, 5 structures, 5 periphyton group	Any comment - this is written only to the SNP file	"Bonneville Dam, Columbia River"											
The # of rows though changes with the # of active water quality constituents.		"CRSO TRANSITION MODEL 2011-2015"											
Do not change the file tab name for this sheet since the output file name is tied to the name of t		"NAVD88 -> NGVD29+3.3"											
NWB: # of waterbodies		"GATE GAS GASGTC = ON, SYSTDG is ON"											
NBR: number of branches		"N2, DO -> TDG"											
IMX: maximum number of segments including inactive segments	Export to CSV file	""											
KMX: maximum number of vertical layers including inactive layers (top and bott		""											
NPROC: # of processors (INACTIVE at this time)		""											
CLOSEC: close dialog box after executing if =ON		"Zhong Zhang"											
NTR: number of tributaries		"7/2021"											
NST: maximum # of structures in a branch													
NIW: # of internal weirs	GRID/NPROC/CLOSE DIALOG BOX	NWB	NBR	IMX	KMX	NPROC	CLOSEC						
NWD: # of withdrawals		1	1	77	56	1	ON						
NGT: # of gates													
NSP: # of spillways	IN/OUTFLOW	NTR	NST	NIW	NWD	NGT	NSP	NPI	NPU				
NPI: # of pipes		0	0	0	0	20	0	0	0				
NPU: # of pumps or water level control rules													
NGC: # of generic water quality constituents	CONSTITUENTS	NGC	NSS	NAL	NEP	NBOD	NMC	NZP					
Do not change bolded headers in COL C - these are checked by the program		0	0	0	0	0	0	0					
NDAY:Maximum number of output dates or timestep related changes													
SELECTC:Turn ON/OFF/USGS automatic port selection f	MISCELLANEOUS	NDAY	SELECTC	HABTATC	ENVIRPC	AERATEC	INITUWL	ORGCC	SED_DIAG				
HABITATC:Turn ON/OFF habitat analyses for fish and eutrophication variables		100	OFF	OFF	OFF	OFF	OFF	OFF	OFF				
ENVIRPC:Turn ON/OFF environmental performance criteria													
AERATEC:Turn ON/OFF aeration to waterbody with diss	TIME CON	TMSTRT	TMEND	YEAR									
INITUWL:Turn ON/OFF initial water surface slope and v	These are computed from formula in Column A--	40544.000	40909.000	1900									
ORGCC simulates the organic matter as C rather than organic matter													
Fill in these with real dates and the Julian dates	DLT CON	NDLT	DLTMIN	DLTINTER									
TMSTRT	Time step control parameters	1	1	OFF									
1/1/2011 0:00													

Version 4.5 User Interface

- *.xslm control file interface for the .csv control file
- Orientation changed from .npt: Parameters now sorted by row; waterbody/branch by columns.

	JBDN downstream branch of waterbody	1				
INIT CND		WB1	WB2	WB3	WB4	WB5
T2I - initial temperature oC		-1				
ICEI - initial ice thickness, m		0				
WTYPEC - waterbody type FRESH or SALT		FRESH				
GRIDC - grid RECT or TRAP (not used at present)		RECT				
CALCULATION		WB1	WB2	WB3	WB4	WB5
VBC - volume balance computation		ON				
EBC - energy balance computation		OFF				
MBC - mass balance computation		ON				
PQC - Turn ON or OFF placement of inflows by density		ON				
EVC - Turn ON or OFF evaporation water loss		OFF				
PRC - Turn ON or OFF precipitation on water surface		OFF				
DEAD SEA - only for code testing		WB1	WB2	WB3	WB4	WB5
WINDC- turns ON or OFF all wind		ON				
QINC- turns ON or OFF all inflows		ON				
QOUTC-turns ON or OFF all outflows		ON				
HEATC-turns ON or OFF all surface heat transfer		ON				
INTERPOLATION		BR1	BR2	BR3	BR4	BR5
QINIC- interpolate inflows		ON				
DTRIC-interpolate distributed tributary inflows		OFF				
HDIC-interpolate elevations for head boundary condition		OFF				
HEAT EXCHANGE		WB1	WB2	WB3	WB4	WB5
H SLHTC - Heat computations - Equilibrium (ET) or Term-by-term (TERM)		TERM				
SROC - Read in Short wave solar radiation ON or OFF		OFF				
RHEVAP - Use Ryan-Harleman Evap Model - for cooling ponds ON or OFF		OFF				
METIC - Interpolate meteorological data ON or OFF		ON				

Version 4.5 User Interface

Both methods read the same .csv file, but notepad will show number of empty rows read in.

The image displays two side-by-side windows showing the same data file, 'w2_con.csv', demonstrating how different applications interpret empty rows.

Excel Window (Left): The file is opened as a table with 36 rows and 12 columns. The data is structured as follows:

	A	B	C	D	E	F	G	H	I	J	K	L
1	CE-QUAL-W2 Version		4.5									
2	Control File version		4.5	w2_con45.csv								
3	Title comments: next 10 lines											
4	Degray Re	1980										
5	Degray Re	1980										
6	Density pl.	point sink outflow										
7	Default hydraulic coefficients											
8	Default light absorption/extinction coefficients											
9	Testing sensitivity of temperature predictions to vertical resolution											
10	2 m layer heights											
11												
12												
13												
14												
15	NWB	NBR	IMX	KMX	NPROC	CLOSEC						
16		1	1	32	36	1	OFF					
17												
18	NTR	NST	NIW	NWD	NGT	NSP	NPI	NPU				
19	0	0	1	0	0	0	0	0	0			
20												
21	NGC	NSS	NAL	NEP	NBOD	NMC	NZP					
22		3	1	1	1	0	0	1				
23												
24	NDAY	SELECTC	HABTATC	ENVIRPC	AERATEC	INITUWL	ORGCC	SED_DIAG				
25	100	OFF	ON	ON	OFF	OFF	OFF	OFF				
26												
27	TMSTRT	TMEND	YEAR									
28	64.5	358.7	1980									
29												
30	NDLT	DLTMIN	DLTINTER									
31		1	1	OFF								
32												
33	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD	DLTD
34		64.5										
35												
36	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX	DLTMAX

Notepad Window (Right): The same file is opened as a plain text document. It shows the raw data, including many empty lines and commas, which are not interpreted as table structure by Notepad.

The Notepad window shows the following text (truncated for brevity):

```

CE-QUAL-W2 Version,,4.5,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Control File version,,4.5,w2_con45.csv,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Title comments: next 10 lines,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Degray Reservoir - March 4 through December 27, 1980,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Degray Reservoir - March 4 through December 27, 1980,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Density placed inflow, point sink outflow,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Default hydraulic coefficients,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Default light absorption/extinction coefficients,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Testing sensitivity of temperature predictions to vertical resolution,,,,,,,,,,,,,
2 m layer heights,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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NWB, NBR, IMX, KMX, NPROC, CLOSEC,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1,1,32,36,1,OFF,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
NTR, NST, NIW, NWD, NGT, NSP, NPI, NPU,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
0,1,0,0,0,0,0,0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
NGC, NSS, NAL, NEP, NBOD, NMC, NZP,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
3,1,1,1,0,0,1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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NDAY,SELECTC,HABTATC,ENVIRPC,AERATEC,INITUWL,ORGCC,SED_DIAG,,,,,,,,,,,,,,,,,,,,,
100,OFF,ON,ON,OFF,OFF,OFF,OFF,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
TMSTRT, TMEND, YEAR,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
64.5, 358.7, 1980,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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NDLT,DLTMIN, DLTINTER,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1,1,OFF,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,
64.5,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,DLTMAX,
3600,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD,DLTD
  
```

Version 4.5 User Interface

File explorer: where all external file inputs live for a model, including the control file:

Exam... > DeGray Reservoir with sediment diagenes...				
Search DeGray Reservoir with sediment diage...				
Name	Date modified	Type	Size	
w2_aerate.npt	5/31/2022 6:34 PM	NPT File		
w2_Algae_Toxin	5/31/2022 6:34 PM	Microsoft Excel Com...		
w2_AlgaeMigration	5/31/2022 6:34 PM	Microsoft Excel Com...		
w2_con	5/31/2022 7:29 PM	Microsoft Excel Com...	1	
w2_con_DeGray_pasted	5/31/2022 7:29 PM	Microsoft Excel Macr...	2	
w2_con_DeGray4.5	5/31/2022 6:34 PM	Microsoft Excel Macr...	2	
w2_diagenesis.npt	5/31/2022 6:34 PM	NPT File		
w2_envirprf.npt	5/31/2022 6:34 PM	NPT File		
w2_habitat.npt	5/31/2022 6:34 PM	NPT File		
w2_lake_river_contour	5/31/2022 6:34 PM	Microsoft Excel Com...		
w2_multiple_WB.npt	5/31/2022 6:34 PM	NPT File		
w2_selective.npt	5/31/2022 6:34 PM	NPT File		
w2_systdg.npt	5/31/2022 6:34 PM	NPT File		

Fortran code: assigns CON a file number, checks the name of variable CONFN, and then reads in file number 10 in specific patterns based on whether in .npt or .csv file format.

```
INTEGER      :: CON=10,
```

```
IF (CONFN=='w2_con.npt') THEN
```

```

READ (CON, '(/(:8X,A8,2F8.0,2I8))') (PPUC(JP),  ETPU(JP),  EBP(JP),  KTPU(JP),  KBPU(JP),  JP=1,NPU)
READ (CON, '(/(:8X,9I8))') (IWR(JW),  JW=1,NIW)
READ (CON, '(/(:8X,9F8.0))') (EKTWR(JW),  JW=1,NIW) ! SW 3/18/16
READ (CON, '(/(:8X,9F8.0))') (EKBWR(JW),  JW=1,NIW) ! SW 3/18/16
READ (CON, '(/(:8X,9A8))') (WDIC(JW),  JW=1,NWD)
READ (CON, '(/(:8X,9I8))') (IWD(JW),  JW=1,NWD)
READ (CON, '(/(:8X,9F8.0))') (EWD(JW),  JW=1,NWD)
READ (CON, '(/(:8X,9I8))') (KTWD(JW),  JW=1,NWD)
READ (CON, '(/(:8X,9I8))') (KBWD(JW),  JW=1,NWD); TRC= ' ' ! SW 9/27/13 INITIALIZATION SINCE ALLOCATION IS TO NTRT
READ (CON, '(/(:8X,9A8))') (TRC(JT),  JT=1,NTR)
READ (CON, '(/(:8X,9A8))') (TRIC(JT),  JT=1,NTR)

```

```
ELSE ! w2_con.csv file format
```

```

READ (CON,*) (PPUC(JP),  JP=1,NPU);PPUC=ADJUSTR(PPUC)
READ (CON,*) (ETPU(JP),  JP=1,NPU)
READ (CON,*) (EBPU(JP),  JP=1,NPU)
READ (CON,*) (KTPU(JP),  JP=1,NPU)
READ (CON,*) (KBPU(JP),  JP=1,NPU)
READ (CON,*)
READ (CON,*)

```

```

READ (CON,*) (IWR(JW),  JW=1,NIW)
READ (CON,*) (EKTWR(JW),  JW=1,NIW)

```


Cards: How they appear in the .xlsm – 80 Cards

1	Grid Dimensions	21	Eddy Viscosity	41	Flow Balance Output	61	Algal Rates
2	Inflow/Outflow Dimensions	22	Structures For Each Branch	42	N and P Mass Balance Output	62	Epiphyton
3	Constituent Dimensions	23	Pipes	43	Iron Constituents Output	63	Epiphyton Rates
4	Miscellaneous	24	Spillways	44	Restart	64	Zooplankton Rates
5	Time Control	25	Gates	45	Constituent Computations	65	Macrophytes
6	Timestep Control	26	Pumps	46	Atmospheric Deposition	66	Macrophyte Rates
7	Timestep Date	27	Internal Weir	47	Concentration State Variables	67	Dissolved Organic Matter
8	Maximum Timestep	28	Withdrawal	48	Derived Concentration State Variables	68	Particulate Organic Matter
9	Timestep Fraction	29	Trib Placement	49	Concentration State Variables Flux	69	Organic Matter Stoichiometry
10	Timestep Limitations	30	Distributed Trib	50	Extinction Coefficients	70	Turbidity
11	Branch Grid	31	Hydraulic Print	51	Algal Extinction	71	CBOD
12	Location	32	Snapshot Print	52	Zooplankton Extinction	72	Nutrients
13	Initial Conditions	33	Screen Print	53	Macrophyte Extinction	73	Sediment CO2
14	Calculation	34	Profile Output	54	Generic Constituent	74	Oxygen Limit
15	Dead Sea	35	Spreadsheet Output	55	Suspended Solids	75	SOD Rates
16	Interpolation	36	DSI W2Linkage	56	Bacteria	76	SOD Demand Zero Order
17	Heat Exchange	37	Contour Plot Output	57	Hydrogen Sulfide	77	Reaeration
18	Ice Cover	38	Fluxes	58	Methane	78	File Names – Global
19	Transport Scheme	39	Timeseries Plot Output	59	Iron Constituents	79	Waterbody Dependent File Names
20	Hydraulic Coefficients	40	Water Level Output	60	Manganese Constituents	80	Branch Dependent File Names

Grid Dimensions
Inflow/Outflow Dimensions
Constituent Dimensions
Miscellaneous
Time Control
Timestep Control
Timestep Date
Maximum Timestep
Timestep Fraction
Timestep Limitations
Branch Grid
Location
Initial Conditions
Calculation
Dead Sea
Interpolation
Heat Exchange
Ice Cover
Transport Scheme
Hydraulic Coefficients

2

NGC

Integer

Number of generic constituents

Eddy Viscosity
Structures For Each Branch
Pipes
Spillways
Gates
Pumps
Internal Weir
Withdrawal
Trib Placement
Distributed Trib
Hydraulic Print
Snapshot Print
Screen Print
Profile Output
Spreadsheet Output
DSI W2Linkage
Contour Plot Output
Fluxes
Timeseries Plot Output
Water Level Output

3

NCPL

Integer

Number of contour plot dates



Flow Balance Output
N and P Mass Balance Output
Iron Constituents Output
Restart
Constituent Computations
Atmospheric Deposition
Concentration State Variables
Derived Concentration State Variables
Concentration State Variables Flux
Extinction Coefficients
Algal Extinction
Zooplankton Extinction
Macrophyte Extinction
Generic Constituent
Suspended Solids
Bacteria
Hydrogen Sulfide
Methane
Iron Constituents
Manganese Constituents



3

NRSO

Integer

Number of restart dates

Algal Rates
Epiphyton
Epiphyton Rates
Zooplankton Rates
Macrophytes
Macrophyte Rates
Dissolved Organic Matter
Particulate Organic Matter
Organic Matter Stoichiometry
Turbidity
CBOD
Nutrients
Sediment CO2
Oxygen Limit
SOD Rates
SOD Demand Zero Order
Reaeration
File Names – Global
Waterbody Dependent File Names
Branch Dependent File Names



2	MP	Real	0.005	Stoichiometric equivalent between macrophyte biomass and phosphorus
---	----	------	-------	---

Grid Dimensions
Inflow/Outflow Dimensions
Constituent Dimensions
Miscellaneous
Time Control
Timestep Control
Timestep Date
Maximum Timestep
Timestep Fraction
Timestep Limitations
Branch Grid
Location
Initial Conditions
Calculation
Dead Sea
Interpolation
Heat Exchange
Ice Cover
Transport Scheme
Hydraulic Coefficients



2

NDT

Integer

Number of timestep intervals

Eddy Viscosity
 Structures For Each Branch
 Pipes
 Spillways
 Gates
 Pumps
 Internal Weir
 Withdrawal
 Trib Placement
 Distributed Trib
 Hydraulic Print
 Snapshot Print
 Screen Print
 Profile Output
 Spreadsheet Output
 DSI W2Linkage
 Contour Plot Output
 Fluxes
 Timeseries Plot Output
 Water Level Output



2	PDGTC	Character	DISTR	Specifies how inflows enter the downstream gate segment, DISTR, DENSITY, or SPECIFY
---	-------	-----------	-------	---

Flow Balance Output
N and P Mass Balance Output
Iron Constituents Output
Restart
Constituent Computations
Atmospheric Deposition
Concentration State Variables
Derived Concentration State Variables
Concentration State Variables Flux
Extinction Coefficients
Algal Extinction
Zooplankton Extinction
Macrophyte Extinction
Generic Constituent
Suspended Solids
Bacteria
Hydrogen Sulfide
Methane
Iron Constituents
Manganese Constituents

2

H2SR

Real

Sediment release rate of H2S, a fraction of SOD for the zero order SOD model only [-]



Algal Rates					
Epiphyton					
Epiphyton Rates					
Zooplankton Rates					
Macrophytes					
Macrophyte Rates	2-10	PREFZ	Real	0.0	Preference factor of zooplankton for zooplankton (dimensionless) from 0 to 1.
Dissolved Organic Matter					
Particulate Organic Matter					
Organic Matter Stoichiometry					
Turbidity					
CBOD					
Nutrients					
Sediment CO2					
Oxygen Limit					
SOD Rates					
SOD Demand Zero Order					
Reaeration					
File Names – Global					
Waterbody Dependent File Names					
Branch Dependent File Names					

Grid Dimensions
Inflow/Outflow Dimensions
Constituent Dimensions
Miscellaneous
Time Control
Timestep Control
Timestep Date
Maximum Timestep
Timestep Fraction
Timestep Limitations
Branch Grid
Location
Initial Conditions
Calculation
Dead Sea
Interpolation
Heat Exchange
Ice Cover
Transport Scheme
Hydraulic Coefficients

2

VBC

Character

ON

Volume balance calculation, ON or OFF



Eddy Viscosity
Structures For Each Branch
Pipes
Spillways
Gates
Pumps
Internal Weir
Withdrawal
Trib Placement
Distributed Trib
Hydraulic Print
Snapshot Print
Screen Print
Profile Output
Spreadsheet Output
DSI W2Linkage
Contour Plot Output
Fluxes
Timeseries Plot Output
Water Level Output

2

FLXC

Character

OFF

Specifies if information is sent to the kinetic flux output file, ON or OFF



Flow Balance Output
N and P Mass Balance Output
Iron Constituents Output
Restart
Constituent Computations
Atmospheric Deposition
Concentration State Variables
Derived Concentration State Variables
Concentration State Variables Flux
Extinction Coefficients
Algal Extinction
Zooplankton Extinction
Macrophyte Extinction
Generic Constituent
Suspended Solids
Bacteria
Hydrogen Sulfide
Methane
Iron Constituents
Manganese Constituents



2	CCC	Character	OFF	Specifies if constituents are computed, ON or OFF
---	-----	-----------	-----	---

Algal Rates
Epiphyton
Epiphyton Rates
Zooplankton Rates
Macrophytes
Macrophyte Rates
Dissolved Organic Matter
Particulate Organic Matter
Organic Matter Stoichiometry
Turbidity
CBOD
Nutrients
Sediment CO2
Oxygen Limit
SOD Rates
SOD Demand Zero Order
Reaeration
File Names – Global
Waterbody Dependent File Names
Branch Dependent File Names

2	PO4R	Real	0.001	Sediment release rate of phosphorus, fraction of SOD
---	------	------	-------	--



Grid Dimensions
Inflow/Outflow Dimensions
Constituent Dimensions
Miscellaneous
Time Control
Timestep Control
Timestep Date
Maximum Timestep
Timestep Fraction
Timestep Limitations
Branch Grid
Location
Initial Conditions
Calculation
Dead Sea
Interpolation
Heat Exchange
Ice Cover
Transport Scheme
Hydraulic Coefficients

8

FRICC

Character

CHEZY

Bottom friction solution, MANN or CHEZY

Eddy Viscosity ←

Structures For Each Branch

2

AZC

Character

TKE

Form of vertical turbulence closure algorithm, NICK, PARAB, RNG, W2, W2N, TKE, or TKE1

Pipes

Spillways

Gates

Pumps

Internal Weir

Withdrawal

Trib Placement

Distributed Trib

Hydraulic Print

Snapshot Print

Screen Print

Profile Output

Spreadsheet Output

DSI W2Linkage

Contour Plot Output

Fluxes

Timeseries Plot Output

Water Level Output

Flow Balance Output
N and P Mass Balance Output
Iron Constituents Output
Restart
Constituent Computations
Atmospheric Deposition
Concentration State Variables
Derived Concentration State Variables
Concentration State Variables Flux
Extinction Coefficients
Algal Extinction
Zooplankton Extinction
Macrophyte Extinction
Generic Constituent
Suspended Solids
Bacteria
Hydrogen Sulfide
Methane
Iron Constituents
Manganese Constituents

3

SEDRC

Real

OFF

Turns ON or OFF sediment resuspension



Algal Rates
Epiphyton
Epiphyton Rates
Zooplankton Rates
Macrophytes
Macrophyte Rates
Dissolved Organic Matter
Particulate Organic Matter
Organic Matter Stoichiometry
Turbidity
CBOD
Nutrients
Sediment CO2
Oxygen Limit
SOD Rates
SOD Demand Zero Order
Reaeration
File Names – Global
Waterbody Dependent File Names
Branch Dependent File Names

9	MINKL	Real	0.0	This is the minimum gas transfer coefficient in units of m/d for LAKES and units of day ⁻¹ for RIVER/ESTUARY
---	-------	------	-----	---



Model Setup: Control File - Questions?

