VIII.3.3-DWOPER DYNAMIC WAVE ROUTING OPERATION

Identifier: DWOPER

Operation Number: 21

Parameter Array: The Fortran identifier used for the Parameter array is PO. The contents of the PO array are:

Position	Contents
1	Operation version number
2	Maximum number of locks and dams on any river (NLADJ)
3	Total number of output time series in the system (NSRR)
4	Total number of gaging stations in the system (NRTT)
5	Total number of cross sections in the system (NBB)
6	Total number of locks and dams on any river (NLADD)
7	Maximum number of values in the Manning's n table (NCML)
8	Maximum number of values in the table of active topwidths versus elevations (NCS)
9	Maximum number of lateral inflows on any river (NQLJ)
10	Maximum number of values in the table of inactive topwidths versus elevations (NCSS)
11	Maximum number of rows in the matrix
12	Total number of lateral flows in the system (NTQL)
13	Total number of dummy stations created in the system when using the automatic calibration option (IDUM)
14*	Coefficient of wind stress (JN values)
15	Discharge tolerance in the Newton Iteration technique
16	Discharge tolerance in the tributary scheme
17	Depth tolerance in the Newton Iteration technique
18	Theta weighting factor used in the finite difference technique

Position	Contents
19	Ratio of (time to center of gravity/time to peak) for a specified hydrograph
20	Gage correction to convert stages at the downstream boundary of the main river to Mean Sea Level (MSL) datum
21	Depth tolerance for boundary hydrographs to determine if extrapolation is used to obtain values for the next time step
22	Hourly data time interval of observed data
23*	Time series identifier for downstream boundary (8 characters)
24	Maximum number of iterations allowed in the Newton-Raphson Iteration procedure for solving the system of nonlinear equations
25	Total number of rivers in the system (JN)
26	Print indicator: 0 = no information will be printed 1 = computed water surface elevations, velocities and discharges will be printed >1 = system level debug will be printed
27	Type of hydrographs to be plotted indicator: 0 = nothing will plotted 1 = water surface elevation (MSL) hydrographs will be plotted 2 = discharge hydrographs will be plotted 3 = stage hydrographs will be plotted
28	Indicator if equation of motion terms will be printed: 0 = nothing will be printed 1 = the terms of the equation of motion will be printed
29	Total number of values in the Manning's n versus stage or discharge table
30	Total number of values in the active topwidths versus water surface elevations table
31	Total number of values in the inactive topwidths versus water surface elevations table
32	Type of extrapolation used in Newton Iteration procedure to determine estimates of unknowns: 0 = no extrapolation 1 = linear extrapolation

Position	Contents
	2 = parabolic extrapolation
33	Automatic calibration option: 0 = no automatic calibration >0 = sequence number of the first computed stage value (in the computed stage hydrograph) which will be used in the statistics needed in the automatic calibration for determining Manning's n
34	Last computed stage value which will be used for the statistics needed in the automatic calibration technique - if blank the last value of the observed stage hydrograph will be used
35	Indicator if inflow hydrograph is defined: 0 = specified inflow hydrographs will be generated with a mathematical function >0 = specified inflow hydrographs will be supplied by the user
36	Rating Curve indicator: 0 = no empirical Rating Curves in the system >0 = empirical Rating Curves are in the system
37	Ratio of peak value of specified hydrograph to initial value of hydrograph
38	Average bottom slope of main river
39	Acceleration factor used in solving tributary junction problem
40	Computational time step
41	Time from initial steady flow to peak of specified upstream boundary hydrograph
42	Data type code for downstream boundary time series
43*	Wind velocity (positive if directed upstream or negative if directed downstream) (JN values)
44*	Acute angle that wind makes with the channel axis (JN values)
45	Factor to convert units describing the locations of the cross sections along the routing reach to feet
46	Initial steady discharge or water surface elevation at the upstream boundary
47*	Acute angle that the tributary makes with the main river at the confluence (JN values)

Position	Contents
48*	Final width of the levee crevasse (NWJJ values)
49*	Gage correction to convert stages at the upstream boundary of each river to MSL datum (JN values)
50*	Water surface elevation when the levee starts to fail (NWJ values)
51*	Final water surface elevation of bottom of levee crevasse (NWJ values)
52*	Elevation referenced to MSL of the top of the levee where weir-flow occurs (NWJJ values)
53*	Downstream boundary condition switch for each river (JN values): 0 = tide hydrograph 1 = stage hydrograph 2 = discharge hydrograph (on main river) or 2 = levee overtopping simulation in which overflow is ponded beyond levees (on tributaries) 3 = single valued Rating Curve 4 = loop valued Rating Curve 5 = normal flow computed from Manning's equation (S_f=S_o)
54*	Upstream boundary condition switch for each river (JN values): 1 = stage hydrograph 2 = discharge hydrograph
55*	Message written at the end of the data input (80 characters)
56*	Total number of cross sections on each river (JN values)
57*	Total number of cross sections on each river with inactive storage (JN values)
58*	Sequence number of cross section on main river where each tributary enters (JN values)
59*	Manning's n is a function of stage or discharge switches for each river (JN values): 0 = Manning's n is a function of stage 1 = Manning's n is a function of discharge
60*	Total number of lateral flows on each river (JN values)
61*	Total number of different Manning's n reaches on each river (JN values)

Position	Contents
62*	Total number of cross sections on each river where hydrographs will be plotted (JN values)
63*	Total number of locks and dams on each river (JN values)
64*	Total number of △x reaches in the system where levee overtopping and/or failure may occur
65*	Flood elevation referenced to MSL of each observed cross section (NRTT values)
66*	Time from start of levee failure until the breach is its maximum size (NWJJ values)
67*	Data type code for each upstream boundary time series (JN values)
68*	Weir-flow discharge coefficient for each reach where weir-flow may occur (NWJJ values)
69*	Identifier for downstream empirical Rating Curve
70*	Critical tailwater elevation referenced to MSL at the downstream face of each lock and dam (NLADD values)
71*	Expansion - contraction coefficient for each cross section (NBB values)
72*	Gage correction to convert the observed stages on each river to MSL (NRTT values)
73*	Sequence number of cross section at the upstream end of each △ x reach in which a lock and dam is located (NLADD values)
74*	Sequence number of downstream most cross section in each subreach that has same Manning's n value (NCMM values)
75*	Sequence number of each cross section with inactive storage (NSSS values where NSSS is the summation of all the NCSS1(J) values)
76*	Sequence number of each cross section where hydrographs will be plotted (NRTT values)
77*	Sequence number of each △x reach in which levee overtopping and/or failure may occur (NWJJ values)
78*	Headwater pool elevation referenced to MSL at the upstream face of each lock and dam (NLADD values)
79*	Time series identifier for each upstream boundary (JN

Position	Contents
	values)
80*	Data type code for each time series containing gate control switches (NLDM values)
81*	Data type code for each time series containing target pool elevations (NLDM values)
82*	Data type code for each time series containing lateral flows (NTQL values)
83*	Data type code for each time series containing observed data (NRTT values)
84*	Distance of each cross section from the mouth of the channel (NBB values)
85*	Channel cross-sectional area (active) below each topwidth for each cross section (NBB*NCS values)
86*	Channel cross-sectional area (inactive) below each topwidth for each cross section with off-channel storage (NSSS*NCSS values)
87*	Active area topwidths for each cross section (NBB*NCS values)
88*	Inactive area topwidths for each cross section with off-channel storage (NSSS*NCSS values)
89*	Manning's n values in the Manning's n table (NCMM*NCML values)
90*	Elevations referenced to MSL corresponding to the active area topwidths (NBB*NCS values)
91*	Elevations referenced to MSL corresponding to the inactive area topwidths (NSSS*NCSS values)
92*	Time series identifier for gate control switches (NLDM values)
93*	Sequence number of cross section immediately upstream of each lateral flow (NTQL values)
94*	Time series identifier for each cross section with target pool elevations (NLDM values)
95*	Time series identifier for each cross section with lateral flow (NTQL values)
96*	Time series identifier for each observed cross section or plotting station (NRTT values)

Position	Contents
97*	Elevations referenced to MSL or discharges used in the Manning's n table (NCMM*NCML values)
98*	Levee failure switch (NWJJ values): 0 = no levee failure occurs 1 = levee failure occurs
99*	Time of levee failure (NWJJ values)
100	Availability of observed data switch: 0 = no observed data available for plotting and statistics 1 = observed data available for plotting and statistics 2 = observed data available and computed stages will be adjusted (slices same as YQCM) 3 = observed data available and computed stages will be adjusted (slices are read-in)
101	Total number of $\triangle t$ time step intervals at which computed values are stored for plotting and printing
102	Maximum number of cross sections on any river
103	Hourly data time interval for output time series
104*	Total number of output time series on each river (NSRR values)
105*	Time series identifier for each output time series (NSRR values)
106*	Data type code for each output time series (NSRR values)
107*	Sequence number of each cross section where output time series data will be stored (NSRR values)
108*	Type of data switch for output time series (NSRR values): 1 = output time series is stage 2 = output time series is discharge
109*	Total number of cross sections with flow diversions on each river (JN values)
110*	Sequence number of each cross section with flow diversions (NTVD values)
111*	Time series identifier for each cross section with flow diversion (NTVD values)
112*	Data type code for each time series containing flow diversion (NTVD values)

Position	Contents
113	Total number of cross sections that have flow diversion in the system (NTDV)
114*	Minimum value at the upstream boundary on each river (JN values)
115	Total number of actual flow diversions in the system - this parameter is not reset to one if there are none
116	Total number of actual locks and dams in the system requiring time series data - this parameter is not reset to one if there are none (NLDM)
117	Total amount of space used in the PO array
118	Total number of $\triangle x$ reaches that have levee overtopping and/or failure (NWJJ values)
119	Total number of dummy stations created in the system when using the automatic calibration option
120	Gage correction to convert water surface elevations in the output time series to stages (NSRR values)
121	Starting location of initial discharges in the CO array
122	Starting location of initial lateral flows in the CO array
123	Starting location of initial percents of flow diverted in the CO array
124	Starting location of initial target pool elevations in the CO array
125	Starting location of initial gate control switches in the CO array
126	Total amount of space used in the CO array
127	Total amount of working space needed in the D array
128	Starting location of GZPL
129-137	Unused
138	Time series identifier for NOS tide
139	Data type code of NOS tide time series
140	Name of the river with the tidal boundary downstream

Position	Contents
141	Time series identifier for adjusted tide time series
142	Data type code for adjusted tide time series
143*	Parameters indicating if slices are discharges or elevations on each river (JN values)
144*	Elevation or discharge slices (NSLICE values)
145*	RMS error used on falling limb of hydrograph in each slice (JN*NSLICE*NRTT values)
146*	Bias corresponding to RMS error on falling limb of hydrograph in each slice (JN*NRTT*NSLICE values)
147*	RMS error used on rising limbs of hydrograph in each slice (JN*NRTT*NSLICE values)
148*	Bias corresponds to RMS overall error on rising limbs of hydrograph (JN*NRTT*NSLICE values)
149*	Time series identifier for each adjusted stage time series (JN*NRTT values)
150*	Data type code for each adjusted stage time series (JN*NRTT values)
151	Total number of slices into which the adjusted will be divided
151-200	Unused
201+	Contents of arrays with '*' after the array position

'*' indicates the value stored is the starting position in the PO array.

Carryover Array: The Fortran identifier used for the carryover array is CO. The contents of the CO array are:

Position	Contents
1	Initial water surface elevations referenced to MSL (NBB values)
CO(121)*	Initial discharges (NBB values)
122*	Initial lateral inflows (NTQL values)
123*	Initial percent of flow diverted (JNTD values)
124*	Initial target pool elevations (NLADD values)

125* Initial gate control switches (NLADD values)

126+ Contents of arrays with '*' after the array position

'*' indicates the value stored is the starting position in the CO array.

Subroutines Names and Functions: Subroutines associated with this Operation are:

Subroutine	Function
PIN21	Set up temporary space for integer input values and stores in PO array
EX21	Execute the Operation
PRC21	Print information in the CO array
PRP21	Print information in the PO array
PUC21	Punch information in PO AND CO arrays
COX21	Do carryover transfer for the Operation
ADJTS21	Generate adjusted stage time series based on observed and computed time series
ARRY21	Print the contents of the PO or CO array in real, integer and alphanumeric formats
BDRY21	Compute coefficients used in Newton-Raphson iterative solution for boundary conditions
BLINIT21	Initialize blend information for tide
BLNDTD21	Generates adjusted tide time series by blending the observed and NOS tide time series
BWCM21	Set up Manning's n values to be used in backwater computations
BWTR21	Do backwater computations
CARD21	Input cards and store in PO and CO arrays
CHAN21	Fill the cross-sectional area array space
CKHILO21	Generate the high and low information for tide
CONV21	Convert values from real to integer
DVRG21	Compute the flow to be diverted

Subroutine	Function
DWAC21	Do automatic calibration
DWSM21	Do computations producing a simulated run
ENGL21	Do units conversions
FRCT21	Determine correct Manning's n and its derivative
GETBAL21	Compute the balance (difference) between the NOS and observed tide at the peaks and valleys
GETLAG21	Lag the NOS tide time series
INBI21	Determine initial conditions at internal boundaries
INCD21	Compute initial conditions
INCM21	Compute Manning's n if zero values are given
INTP21	Interpolate between time steps
INTR21	Compute coefficients used in Newton-Raphson iterative solution of unsteady flow equations for all subreaches
LATQ21	Compute lateral flow
LCAT21	Compute the location of a given variable in the PO, CO or Z array
LOWQ21	Check to see if the initial conditions fall below the minimum values specified
MTRX21	Compute the Gaussian Elimination Matrix solution associated with Newton-Raphson iterative solution of unsteady flow equations
NONC21	Set inflow equal to outflow when the maximum number of extrapolations have been exceeded due to nonconvergence
OPCM21	Calculate the optimum Manning's n value used in the automatic calibration procedure
PLOT21	Plot specified hydrographs
PRCL21	Convert observed stages to water surface elevations referenced to Mean Sea Level
PREP21	Prepare data to be used in DWSM21 subroutine
PRTS21	Print output time series arrays
RATC21	Interpolate the internal boundary Rating Curve

Subroutine	Function
	discharge to get WSEL
REDI21	Read integer input arrays
RSET21	Renumber values to allow for calculations on individual reaches used in the automatic calibration procedure
SAVC21	Save Carryover
SECT21	Compute cross-sectional areas and topwidths
SETBAL21	Generate the balance (difference) between the NOS and observed tide and the corresponding time of occurrence
STAT21	Compute the bias and root mean square errors on the observed versus computed hydrographs
STRC21	Store the contents of the Rating Curve into dummy space
TDFILL21	Fill the missing observed and the future tide values
TDINT21	Initialize peaks and valleys of tide and time sequences
TDINTP21	Interpolate between high and low balances
TERP21	Interpolate between time steps to get proper stages and discharges for plotting and statistics
UNDO21	Convert time series hydrographs back to their original forms
WERQ21	Compute weir-flow for levee overtopping
WMUP21	Check to see if the initial conditions are at steady state conditions
WPLT21	Determine which hydrographs are to be plotted

SUBROUTINE PIN21 (PO,IPO,LEFTP,IUSEP,CO,LEFTC,IUSEC,WORK,LEFTW)

Function: This is the input subroutine for Operation DWOPER. This subroutine inputs all cards for the Operation and fills the PO and CO arrays.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
PO	Output	R*4	Variable	Contains parameters and other information
IPO	Output	I*4	Variable	Contains PO array in integer form
LEFTP	Input	I*4	Variable	Maximum space available for PO array
IUSEP	Output	I*4	Variable	Amount of space used by PO array
CO	Output	R*4	Variable	Contains carryover values
LEFTC	Input	I*4	Variable	Maximum space available in CO array
IUSEC	Output	I*4	Variable	Amount of space used by CO array
WORK	Output	I*4	Variable	Integer working space
LEFTW	Output	I*4	Variable	Maximum space available for WORK array

SUBROUTINE PRP21 (PO,KD,KU,NB,NCM,NCSSS,NCSS1,NJUN,NNYQ,
NQL,NRCM1,NRT1,NT,NWJ,NUMLAD,NWJX,LAD,LQ,NSTR,NST,
NDIV,LDIV,KTYP,NQSL)

Function: This subroutine prints the PO array for Operation DWOPER.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
PO	Input	R*4	Variable	Contains parameters and other information
KD	Input	I*4	Variable	Downstream boundary condition switch for each river
KU	Input	I*4	Variable	Upstream boundary condition switch for each river
NB	Input	I*4	Variable	Total number of cross sections on each river
NCM	Input	I*4	Variable	Sequence number of downstream most cross section in each subreach with same Manning's n value
NCSSS	Input	I*4	Variable	Sequence number of each cross section with inactive storage
NCSS1	Input	I*4	Variable	Total number of cross sections on each river with inactive storage
NJUN	Input	I*4	Variable	Sequence number of cross section on main river where each tributary enters
NNYQ	Input	I*4	Variable	Manning's n is a function of stage or discharge switch for each river
NQL	Input	I*4	Variable	Total number of lateral flows on each river
NRCM1	Input	I*4	Variable	Total number of different Manning's n reaches on each river
NRT1	Input	I*4	Variable	Total number of cross sections on each river where hydrographs will be plotted
NT	Input	I*4	Variable	Sequence number of each cross section where plotting will be

Variable	Input/ Output	Type	Dimension	Description
				done
NWJ	Input	I*4	Variable	Total number of △x reaches on each river where levee overtopping and/or failure may occur
NUMLAD	Input	I*4	Variable	Total number of locks and dams on each river
NWJX	Input	I*4	Variable	Sequence number of each △x reach in which levee overtopping and/or failure may occur
LAD	Input	I*4	Variable	Sequence number of cross section at the upstream end of each △x reach in which a lock and dam are located
LQ	Input	I*4	Variable	Sequence number of cross section immediately upstream of each lateral flow point
NSTR	Input	I*4	Variable	Total number of output time series on each river
NST	Input	I*4	Variable	Sequence number of cross section where each output time series data will be stored
NDIV	Input	I*4	Variable	Total number of flow diversions on each river
LDIV	Input	I*4	Variable	Sequence number of each cross section with a flow diversion
KTYP	Input	I*4	Variable	Parameter indicating whether the output time series is stage (KTYP=1) or discharge (KTYP=2)
NQSL	Input	I*4	Variable	Parameters indicating whether the slices are stages or discharges for each river

SUBROUTINE PRC21 (PO,CO,NB,NQL,NDIV,NUMLAD,IWTI,LAD)

Function: This subroutine prints the carryover array for Operation DWOPER.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
PO	Input	R*4	Variable	Parameter array
CO	Input	R*4	Variable	Carryover array
NB	Input	I*4	Variable	Total number of cross sections on each river
NQL	Input	I*4	Variable	Total number of lateral inflow on each river
NDIV	Input	I*4	Variable	Total number of flow diversions on each river
NUMLAD	Input	I*4	Variable	Total number of lock and dams on each river
IWTI	Input	I*4	Variable	Initial gate control switches for each lock and dam - if IWTI=0, the gates are in control; if IWTI=1, the gates are not in operation
LAD	Input	I*4	Variable	Sequence number of cross section at the upstream end of each $\triangle x$ reach in which a lock and dam are located

SUBROUTINE PUC21 (PO,CO,KD,KU,NB,NCM,NCSSS,NCSS1,NJUN,NNYQ,NQL,
NRCM1,NRT1,NT,NWJ,NUMLAD,NWJX,LAD,LQ,NSTR,NST,NDIV,
LDIV,KTYP,IWTI,NQSL)

Function: This subroutine outputs the data input cards for Operation DWOPER.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
PO	Input	R*4	Variable	Contains parameters and other information
CO	Input	R*4	Variable	Contains carryover values
KD	Input	I*4	Variable	Downstream boundary condition switch for each river
KU	Input	I*4	Variable	Upstream boundary condition switch for each river
NB	Input	I*4	Variable	Total number of cross sections on each river
NCM	Input	I*4	Variable	Sequence number of downstream most cross section in each subreach with same Manning's n value
NCSSS	Input	I*4	Variable	Sequence number of each cross section with inactive storage
NCSS1	Input	I*4	Variable	Total number of cross sections on each river with inactive storage
NJUN	Input	I*4	Variable	Sequence number of cross section on main river where each tributary enters
NNYQ	Input	I*4	Variable	Manning's n is a function of stage or discharge switch for each river
NQL	Input	I*4	Variable	Total number of lateral flows on each river
NRCM1	Input	I*4	Variable	Total number of different Manning's n reaches on each river
NRT1	Input	I*4	Variable	Total number of cross sections on each river where hydrographs will be plotted

Variable	Input/ Output	Type	Dimension	Description
NT	Input	I*4	Variable	Sequence number of each cross section where plotting may be done
NWJ	Input	I*4	Variable	Total number of △x reaches on each river where levee overtopping and/or failure may occur
NUMLAD	Input	I*4	Variable	Total number of locks and dams on each river
NWJX	Input	I*4	Variable	Sequence number of cross section at the upstream end of each △x reach where levee overtopping and/or failure may occur
LAD	Input	I*4	Variable	Sequence number of cross section immediately upstream of each lock and dam
LQ	Input	I*4	Variable	Sequence number of cross section immediately upstream of each lateral flow
NSTR	Input	I*4	Variable	Total number of output time series on each river
NST	Input	I*4	Variable	Sequence number of each cross section where output time series data will be stored
NDIV	Input	I*4	Variable	Total number of cross sections on each river with flow diversion
LDIV	Input	I*4	Variable	Sequence number of each cross section with flow diversion
KTYP	Input	I*4	Variable	Parameter indicating whether the output time series is stage (KTYP=1) or discharge (KTYP=2)
IWTI	Input	I*4	Variable	Initial gate control switches for each lock and dam - if IWTI=0, the gates are in control; if IWTI=1, the gates are not in operation
NQSL	Input	I*4	Variable	Parameter indicating whether slices are stages or discharges for each river

Variable	Input/ Output	Type	Dimension	Description

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SUBROUTINE EX21 (PO,IPO,CO,DTH,FFS,FS,QA,TII,T1,YA,STN,LOSTN,QLJ,
                 LOQLJ,ST1,LOST1,XITWT,LOXIWT,POOLTS,LOPLTS,QL,
                 LOQL,QLT,QTC,LOQTC,STC,LOSTC,STT,LOSTT,Z,NB,XDIV,
                 LOXDIV,QLSTR,LOQLS,QSTR,LOQSR,TO,ITWT,LOIWT,POOLT,
                 LOPLT,DIV,LODIV,XNOS,LONOS,TIDE,LOTID,STE,LOSTE,
                 IRF,LEFTZ)
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Function: This is the execution subroutine for Operation DWOPER.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
PO	Input	R*4	Variable	Contains parameters and other information
IPO	Input	I*4	Variable	Contains the PO array in integer form
CO	Input	R*4	Variable	Contains carryover values
DTH	Output	R*4	Variable	△t for observed hydrograph
FFS	Output	R*4	Variable	Observed hydrograph to be plotted
FS	Output	R*4	Variable	Computed hydrograph to be plotted
QA	Output	R*4	Variable	Average flow in an automatic calibration reach
TII	Output	R*4	Variable	Time array for observed hydrograph
T1	Output	R*4	Variable	Time array for plotted hydrograph
YA	Output	R*4	Variable	Average stage in an automatic calibration reach
STN	Input	R*4	Variable	Time series at the downstream boundary
LOSTN	Output	I*4	1	Starting location of time series in STN array
QLJ	Output	R*4	Variable	Time series containing discharges at each tributary junction when using the automatic calibration option
LOQLJ	Input	I*4	Variable	Starting locations of time series in QLJ array

Variable	Input/ Output	Type	Dimension	Description
ST1	Input	R*4	Variable	Time series at each upstream boundary
LOST1	Input	I*4	Variable	Starting locations of time series in ST1 array
XITWT	Input	I*4	Variable	Time series containing gate control switches
LOXIWT	Input	I*4	Variable	Starting locations of time series in XITWT array
POOLTS	Input	R*4	Variable	Time series containing target pool elevations
LOPLTS	Input	I*4	Variable	Starting locations of time series in POOLT array
QL	Input	R*4	Variable	Time series containing lateral flows
LOQL	Input	I*4	Variable	Starting locations of time series in QL array
QLT	Output	R*4	Variable	Time series containing lateral flows (temporary array)
LOQLT	Input	I*4	Variable	Starting locations of time series in QLT array
QTC	Output	R*4	Variable	Time series containing computed discharges
LOQTC	Input	I*4	Variable	Starting locations of time series in QTC array
STC	Output	R*4	Variable	Time series containing computed water surface elevations
LOSTC	Input	I*4	Variable	Starting locations of time series in STC array
STT	Input	R*4	Variable	Time series containing observed data
LOSTT	Input	I*4	Variable	Starting locations of time series in STT array
Z	Output	R*4	Variable	Working space
NB	Input	I*4	Variable	Total number of cross sections on each river

Variable	Input/ Output	Type	Dimension	Description
XDIV	Input	R*4	Variable	Time series containing the percent of flow to be diverted from the channel
LOXDIV	Input	I*4	Variable	Starting locations of time series in XDIV array
QLSTR	Output	R*4	Variable	Time series containing lateral outflow produced by flow diversion
LOQLS	Input	I*4	Variable	Starting locations of time series in QLSTR array
QSTR	Output	R*4	Variable	Output time series
LOQSR	Input	I*4	Variable	Starting locations of time series in QSTR array
TO	Output	R*4	Variable	Time array for output time series
ITWT	Input	I*4	Variable	Time series containing gate control switches (dummy array)
LOIWT	Input	I*4	Variable	Starting locations of time series in ITWT array (dummy array)
POOLT	Input	R*4	Variable	Time series containing target pool elevations (dummy array)
LOPLT	Input	I*4	Variable	Starting locations of time series in POOLT array (dummy array)
DIV	Input	R*4	Variable	Time series containing the percent of flow to be diverted from the channel (dummy array)
LODIV	Input	I*4	Variable	Starting locations of time series in DIV array (dummy array)
XNOS	Input	R*4	Variable	Time series containing NOS tide
LONOS	Input	I*4	1	Starting location of times series in XNOS array
TIDE	Output	R*4	Variable	Time series containing adjusted tide
LOTID	Input	I*4	1	Starting location of time series in TIDE array
STE	Output	R*4	Variable	Time series containing adjusted stages

Variable	Input/ Output	Type	Dimension	Description
LOSTE	Input	I*4	Variable	Starting locations of time series in STE array
IRF	Output	I*4	Variable	Switches indicating if stage is on rising or falling limb of hydrograph
LEFTZ	Input	I*4	Variable	Maximum amount of space available for Z array

SUBROUTINE COX21 (POLD,IPOLD,COLD,PONEW,IPONEW,CONEW)

Function: This is the carryover transfer subroutine for Operation DWOPER.

Argument List:

Variable	Input/ Output	Type	Dimension	Description
POLD	Input	R*4	Variable	Contains old parameter values
IPOLD	Input	I*4	Variable	Contains old parameter values in integer form
COLD	Input	R*4	Variable	Contains old carryover values
PONEW	Input	R*4	Variable	Contains new parameter values
IPONEW	Input	I*4	Variable	Contains new parameter values in integer form
CONEW	Output	R*4	Variable	Contains new carryover values

SUBROUTINE TAB21
(T,LEFT,IUSET,NXT,LP,P,LC,TS,MTS,NWORK,NDD,LWORK,IDT)

Function: This is the Operations Table entry subroutine for Operation DWOPER.

Argument List: The arguments for this subroutine are similar to the arguments for the Operation Table entry subroutines for other Operations. A description of the arguments is contained in Section VIII.4.2-TAB.

Operation Table Array: The contents of the T array are:

Position	Contents
1	Operation number
2	Location in the T array of the next Operation
3	Location in the P array of the parameters for this Operation
4	Location in the C array of the carryover for this Operation
5	Location in the P array of the Rating Curve identifier (zero if none)
6	Location in the P array of variable NB (note that this location is relative to the start of the second portion of the P array for this Operation)
7	Location in the T array where the location in the D array for variable XDIV is stored (work space)
8	Location in the T array where the location in the D array for variable POOLT is stored (work space)
9	Location in the T array where the location in the D array for variable ITWT is stored (work space)
10	Location in the D array of variable DTH (work space)
11	Location in the D array of variable FFS (work space)
12	Location in the D array of variable FS (work space)
13	Location in the D array of variable QA (work space)
14	Location in the D array of variable TII (work space)
15	Location in the D array of variable T1 (work space)

Position	Contents
16	Location in the D array of variable YA (work space)
17	Location in the D array of variable TO (work space)
18	Location in the T array where the location in the D array for variable QLJ is stored (work space)
19	Location in the T array where the location in the D array for variable QLT is stored (work space)
20	Location in the T array where the location in the D array for variable QTC is stored (work space)
21	Location in the T array where the location in the D array for variable STC is stored (work space)
22	Location in the T array where the location in the D array for variable QLSTR is stored (work space)
23	Location in the T array where the location in the D array for variable STN is stored (input time series)
24	Location in the T array where the location in the D array for variable ST1 is stored (input time series)
25	Location in the T array where the location in the D array for variable ITWTS is stored (input time series)
26	Location in the T array where the location in the D array for variable POOLTS is stored (input time series)
27	Location in the T array where the location in the D array for variable QL is stored (some input time series, some work space)
28	Location in the T array where the location in the D array for variable STT is stored (some input time series, some work space)
29	Location in the T array where the location in the D array for variable QSTR is stored (output time series)
30	Location in the T array where the location in the D array for variable DIV is stored (input time series)
31	Location of the start of working space in the D array after all DWOPER time series have been allocated
32	Total number of Rating Curves in the Operation
33	Location in the T array where the location in the D

Position	Contents
	array for variable XNOS is stored (input time series)
34	Location in the T array where the location in the D array for variable TIDE is stored (output time series)
35	Location in the T array where the location in the D array for variable STE is stored (output time series)
36	Location in the T array where the location in the D array for variable IRF is stored (work array)
37-END	Locations in the D array for various DWOPER arrays (note that there are more than one time series for most arrays)