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Option reservoir operation during floods

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8470 PRINT:INPUT"PLEASE ENTER NUMBER OF TIMESTEPS FOR GATE OPERATION:-",NOSTEP
8480 IF Q4=2 THEN GOTO 8600
8490 CLS:PRINT"YOU HAVE SELECTED TO DETERMINE A % OUTLET OPENING FOR EACH OUTLET
 AT EACH TIME  STEP"
8500 INPUT"IS THIS CORRECT(Y/N)";Q$
8510 IF Q$="N" THEN GOTO 8430
8520 DIM HGATEOP(NOSTEP+1,GATEHNO)
8530 FOR J2=0 TO NOSTEP
8540 PRINT"TIME STEP ";J2:PRINT
8550 FOR J3=1 TO GATEHNO
8560 PRINT"GATE OPENING FOR GATE ";J3:INPUT"%";HGATEOP(J2,J3)
8570 NEXT J3
8580 NEXT J2
8590 RETURN
8600 CLS:PRINT"YOU HAVE SELECTED TO DETERMINE THE NUMBER OF OUTLETS TO BE OPENED
 AT EACH TIME  INTERVAL":PRINT
8610 INPUT"IS THIS CORRECT (Y/N):";Q$
8620 IF Q$="N" THEN GOTO 8430
8630 DIM HGATEOP(NOSTEP+1)
8640 FOR J2=0 TO NOSTEP
8650 PRINT"NUMBER OF OUTLETS OPEN AT TIME STEP NUMBER";J2:INPUT HGATEOP(J2)
8660 NEXT J2
8670 RETURN
8680 ':DISPLAY OF DATA FILE-----------------------------------------------------
-
8690 FOR ZI=1 TO NZ
8700 ON OPT(ZI) GOSUB 8730,8830,9820,9920
8710 NEXT ZI
8720 RETURN
8730 ':DISPLAY RESERVOIR CHARACTERISTICS-----------------------------------------
-
8740 CLS:PRINT"THE RESEVOIR BASIN CARACTERISTIC IS DESCRIBED BY";NOSTEL;" POINTS
 AS FOLLOWS:"
8750 PRINT:PRINT"                    ELEVATION          STORAGE":QUES=17
8760 FOR I=1 TO NOSTEL
8770 PRINT TAB(20);ELEV(I);TAB(40);STOR(I)
8780 IF I=QUES THEN INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 8810
8790 NEXT I
8800 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
8810 QUES=QUES+19
8820 CLS:PRINT"                    ELEVATION          STORAGE":GOTO 8790
8830 ':DISPLAY SPILLWAY DATA----------------------------------------------------
-
8840 FOR I=1 TO SPILLNO
8850 ON SPILLWAY(I) GOSUB 8890,9040,9100,9220,9420,9630,9720
8860 NEXT I
8870 RETURN
8880 ':BOX CULVERTS-------------------------------------------------------------
-
8890 CLS:PRINT A$:PRINT:QUES=16
8900 PRINT"THIS SPILLWAY COMPONENT CONSISTS OF";CULNO;" CULVERTS WITH THE FOLLOW
ING PROPERTIES:"
8910 PRINT"    NUMBER     WIDTH    HEIGHT    INVERT UNSUBCOEF   SUBCOEF"
8920 FOR I=1 TO CULNO
8930 PRINT I;:PRINT TAB(11);:PRINT USING "####.###";CULWIDTH(I);
8940 PRINT TAB(21);:PRINT USING "####.###";CULHEIGHT(I);
8950 PRINT TAB(31);:PRINT USING "####.###";CULINVERT(I);
8960 PRINT TAB(41);:PRINT USING "##.####";CULUNCOEF(I);
8970 PRINT TAB(51);:PRINT USING "##.####";CULSUBCOEF(I)
8980 IF I=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9010
8990 NEXT I
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9000 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9010 QUES=QUES+19
9020 CLS:PRINT"    NUMBER     WIDTH    HEIGHT    INVERT UNSUBCOEF   SUBCOEF":GOT
O 8990
9030 ':FREE OVERFLOW WIER-----------------------------------------------------
-
9040 CLS:PRINT B$:PRINT
9050 PRINT"WEIR LENGTH=";WIERLENGTH
9060 PRINT"WEIR INVERT LEVEL=";WIERINVERT
9070 PRINT"WEIR DISCHARGE COEFFICIENT=";WIERCOEF
9080 INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9090 ':AUTOMATIC GATES--------------------------------------------------------
-
9100 CLS:PRINT C$:PRINT:QUES=16
9110 PRINT"THIS SPILLWAY COMPONENT CONSISTS OF";GATELNO;" GATES WITH THE FOLLOWI
NG PROPERTIES:":PRINT
9120 PRINT"NO   INVERT      COEFFICIENT WIDTH       HEIGHT      START EL    END
EL"
9130 FOR J=1 TO GATELNO
9140 PRINT J;TAB(5);GATELINVERT(J);TAB(17);GATELCOEF(J);TAB(29);GATELWIDTH(J);
9150 PRINT TAB(41);GATELHEIGHT(J);TAB(53);GATELS(J);TAB(65);GATELE(J)
9160 IF J=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9190
9170 NEXT J
9180 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9190 QUES=QU
9200 CLS:PRI                COEFFICIENT WIDTH       HEIGHT      START EL
END EL":GOTO 9[illegible]
9210 ':MANUAL GATES-----------------------------------------------------------
-
9220 CLS:PRINT D$:PRINT:QUES=16
9230 PRINT"THIS SPILLWAY COMPONENT CONSISTS OF";GATEMNO;" GATES WITH THE FOLLOWI
NG PROPERTIES:":PRINT
9240 PRINT"NO   INVERT      COEFFICIENT WIDTH       HEIGHT    TRAVEL    SPILL CO
EF."
9250 FOR J=1 TO GATEMNO
9260 PRINT J;TAB(5);GATEMINVERT(J);TAB(17);GATEMCOEF(J);TAB(29);GATEMWIDTH(J);
9270 PRINT TAB(41);GATEMSIZE(J);TAB(51);GATEMHEIGHT(J);TAB(61);GATESPILL(J)
9280 IF J=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9310
9290 NEXT J
9300 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9330
9310 QUES=QUES+19
9320 CLS:PRINT"NO   INVERT      COEFFICIENT WIDTH       HEIGHT    TRAVEL    SPIL
L COEF.":GOTO 9240
9330 IF Q1$="U" THEN GOTO 9400
9340 CLS:PRINT"THESE GATES ARE OPERATED BY THE PROGRAM SUBJECT TO THE FOLLOWING
CONSTRAINTS:":PRINT
9350 PRINT"DELAY TIME TO FIRST OPERATION=";GATEMSTART;" HOURS"
9360 PRINT"MAXIMUM NUMBER OF GATES OPERABLE AT ANY ONE TIME=";GATEMSUM
9370 PRINT"MAXIMUM DESIRABLE OUTFLOW RATE=";GATEMFLOW;" m3/s"
9380 PRINT"MAXIMUM ALLOWABLE OUTFLOW RATE INCREASE=";FLOWMESC;" m3/s/h"
9390 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9400 CLS:PRINT"THESE GATES ARE OPERATED BY THE USER. USER GATE REVISION IS DONE
AS A RERUN     OPTION IN THE CALC BLOCK"
9410 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9420 ':MANUAL HIGH PRESSURE OUTLET--------------------------------------------
-
9430 CLS:PRINT E$:PRINT:QUES=16
9440 PRINT"THIS SPILLWAY COMPONENT CONSISTS OF";GATEHNO;" OUTLETS WITH THE FOLLO
WING PROPERTIES:":PRINT
9450 PRINT"NO   INVERT      COEFFICIENT WIDTH       HEIGHT"
9460 FOR J=1 TO GATEHNO
9470 PRINT J;TAB(5);GATEHINVERT(J);TAB(17);GATEHCOEF(J);TAB(29);GATEHWIDTH(J);
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9480 PRINT TAB(41);GATEHHEIGHT(J)
9490 IF J=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9520
9500 NEXT J
9510 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9100
9520 QUES=QUES+19
9530 CLS:PRINT"NO   INVERT      COEFFICIENT WIDTH       HEIGHT":GOTO 9500
9540 IF Q1$="U" THEN GOTO 9610
9550 CLS:PRINT"THESE GATES ARE OPERATED BY THE PROGRAM SUBJECT TO THE FOLLOWING
CONSTRAINTS:":PRINT
9560 PRINT"DELAY TIME TO FIRST OPERATION=";GATEHSTART;" HOURS"
9570 PRINT"MAXIMUM NUMBER OF OUTLETS OPERABLE AT ANY ONE TIME=":GATEHSUM
9580 PRINT"MAXIMUM DESIRABLE OUTFLOW RATE=";GATEHFLOW;" m3/s"
9590 PRINT"MAXIMUM ALLOWABLE OUTFLOW RATE INCREASE=";FLOWHESC;" m3/s/h"
9600 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9610 CLS:PRINT"THESE OUTLETS ARE OPERATED BY THE USER. USER REVISION IS DONE AS
A RERUN       OPTION IN THE CALC BLOCK"
9620 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9630 ':FUSE PLUG----------------------------------------------------------------
-
9640 CLS:PRINT F$:PRINT
9650 PRINT"THIS SPILLWAY COMPONENT HAS THE FOLLOWING PROPERTIES:":PRINT
9660 PRINT"ELEVATION AT START OF WASH=";FUSESTART
9670 PRINT"ELEVATION OF SPILLWAY CREST=";FUSECREST
9680 PRINT"LENGTH OF SPILLWAY=";FUSELENGTH
9690 PRINT"WEIR DISCHARGE COEFFICIENT=";FUSECOEF
9700 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9710 ':USER SPILLWAY------------------------------------------------------------
-
9720 CLS:PRINT G$:PRINT:QUES=16
9730 PRINT"THIS SPILLWAY COMPONENT IS DEFINED BY";PTNOU;" POINTS AS FOLLOWS:":PR
INT
9740 PRINT"ELEVATION          DISCHARGE"
9750 FOR J=1 TO PTNOU
9760 PRINT ELEVU(J);TAB(20);DISCHU(J)
9770 IF J=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 9800
9780 NEXT J
9790 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9800 QUES=QUES+19
9810 CLS:PRINT"ELEVATION          DISCHARGE":GOTO 9780
9820 ':DISPLAY RESERVOIR FLOOD STATUS-------------------------------------------
-
9830 CLS:PRINT"THE FOLLOWING CONDITIONS APPLY TO THE RESERVOIR DURING SIMULATION
:":PRINT
9840 PRINT"WATER LEVEL IN RESERVOIR AT START=";RESSTA
9850 PRINT"FINAL WATER LEVEL REQUIRED=";RESLEV
9860 PRINT"MAXIMUM WATER LEVEL ALLOWED DURING FLOOD=";RESMAX
9870 PRINT"ANALYSIS SENSITIVITY=";LEVSENSE
9880 PRINT"TIME AT START OF ANALYSIS=";STATIME
9890 PRINT"COMPUTATIONAL TIME STEP=";CSTEP
9900 PRINT"NUMBER OF TIME STEPS IN ANALYSIS=";NOSTEP
9910 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
9920 ':DISPLAY INFLOW HYDROGRAPH-----------------------------------------------
-
9930 CLS:PRINT"THE INFLOW HYDROGRAPH IS DEFINED BY";NOHYD;" POINTS AT";ISTEP;" H
OUR INTERVALS AS FOLLOWS:":QUES=17
9940 PRINT"INTERVAL           INFLOW"
9950 FOR J=1 TO NOHYD
9960 PRINT J;TAB(20);INFLOW(J)
9970 IF J=QUES THEN PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10000
9980 NEXT J
9990 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:RETURN
10000 QUES=QUES+19
10010 CLS:PRINT"INTERVAL           INFLOW":GOTO 9980
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LISTING FOR CALC PROGRAM BLOCK

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10 CLEAR:CLS
20 ':GENERAL DEFINITIONS ----------------------------------------------------
30 A$="BOX CULVERTS":B$="FREE OVERFLOW WIER"
40 C$="AUTOMATICALLY CONTROLLED OVERFLOW WEIR"
50 D$="MANUALLY CONTROLLED OVERFLOW WIER"
60 E$="MANUALLY CONTROLLED HIGH PRESSURE OUTLET"
70 F$="FUSEPLUG EMERGENCY SPILLWAY"
80 G$="USER DEFINED SPILLWAY"
90 H$="PLEASE ENTER CORRECT DATA DISK IN DRIVE A"
100 I$="PLEASE REVISE SENSITIVITY AS MODELLING MATRIX TOO LARGE"
110 J$="USER DEFINED SPILLWAY CAPACITY EXCEEDED"
120 K$="JOB ABANDONED****"
130 L$="**********************************************************************
*********"
140 M$="RESERVOIR LEVEL EXCEEDS STORAGE/ELEVATION DATA"
150 N$="RESERVOIR LEVEL EXCEEDS MAXIMUM ALLOWABLE LEVEL"
160 O$="STORAGE-INDICATION CURVE EXCEEDED"
170 P$="DATA SET INCONSISTENT"
180 R$="MAXIMUM DESIRABLE OUTFLOW RATE EXCEEDED"
190 S$="MAXIMUM ALLOWABLE OUTFLOW RATE INCREASE EXCEEDED"
200 ':PROGRAM HEADING -------------------------------------------------------
210 PRINT L$:PRINT
220 PRINT "          FLOOD ROUTING THROUGH DAM WITH MULTIPLE SPILLWAY SYSTEM"
230 PRINT: PRINT "            L. FURSTENBURG  (011-683-1665)
 1985"
240 PRINT:PRINT"          CALCULATION BLOCK":PRINT:PRINT L$:PRINT
250 PRINT"          THE FOLLOWING OPTIONS ARE PROVIDED:-":PRINT
260 PRINT"               1.RUN SIMULATION"
270 PRINT"               2.CHAIN TO DATA"
280 PRINT"               3.CHAIN TO PRES"
290 PRINT"               4.FINISH USING PROGRAM"
300 PRINT:INPUT"          PLEASE SELECT OPTION:-",OPT
310 ON OPT GOSUB 370,330,340,350
320 GOTO 10
330 CHAIN "A:DATA"
340 CHAIN "A:PRES"
350 CLS:END
360 ': ANALYSIS/OUTPUT MODE FIXED -------------------------------------------
370 CLS:PRINT L$
380 INPUT"PLEASE ENTER NAME OF DATA FILE TO BE RUN:-";X$:IF X$="" THEN PRINT CHR
$(7);"A NAME IS REQUIRED":GOTO 380
390 ON ERROR GOTO 440
400 OPEN X$ FOR INPUT AS #1
410 ON ERROR GOTO 0
420 GOSUB 4950
430 CLOSE #1:GOTO 460
440 PRINT"THIS FILE DOES NOT EXIST"
450 RESUME 380
460 FOR I=1 TO SPILLNO
470 IF SPILLWAY (I)=4 THEN GOTO 660
480 IF SPILLWAY (I)=5 THEN GOTO 660
490 NEXT I
500 CLS:PRINT L$:PRINT:PRINT TITLE1$:PRINT TITLE2$:PRINT
510 PRINT "THE SPILLWAY SYSTEM CONTAINS NO MANUAL COMPONENT"
520 PRINT "FLOOD ROUTING SHALL PROCEED NORMALLY"
530 PRINT: PRINT L$: PRINT
540 PRINT "OUTPUT CAN BE PRESENTED ON TWO LEVELS:-"
550 PRINT: PRINT "     1.BASIC OUTPUT"
560 PRINT "     2.EXTENDED OUTPUT"
570 PRINT: INPUT "WHICH LEVEL DO YOU REQUIRE (1/2)"; OTL
580 IF STORIND=0 THEN GOTO 620
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590 GOSUB 980
600 GOSUB 6130
610 RETURN
620 GOSUB 1730
630 GOSUB 2130
640 GOSUB 6130
650 RETURN
660 CLS:PRINT L$:PRINT:PRINT TITLE1$:PRINT TITLE2$:PRINT:PRINT L$:PRINT
670 PRINT "THE SPILLWAY SYSTEM CONTAINS MANUAL COMPONENTS AS FOLLOWS:":PRINT
680 FOR I=1 TO SPILLNO
690 IF SPILLWAY(I)=4 THEN GOSUB 730
700 IF SPILLWAY(I)=5 THEN GOSUB 780
710 NEXT I
720 GOTO 830
730 IF Q1$="U" THEN GOTO 760
740 PRINT D$;" WHICH WILL BE OPERATED BY THE PROGRAM"
750 RETURN
760 PRINT D$;" WHICH WILL BE OPERATED BY THE USER"
770 RETURN
780 IF Q2$="U" THEN GOTO 810
790 PRINT E$;" WHICH WILL BE OPERATED BY THE PROGRAM"
800 RETURN
810 PRINT E$;" WHICH WILL BE OPERATED BY THE USER"
820 RETURN
830 PRINT:INPUT"IS THIS CORRECT (Y/N)";Q$
840 IF Q$="N" THEN PRINT P$:PRINT K$:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO
10
850 IF Q1$="P" THEN GOTO 7270
860 IF Q2$="P" THEN GOTO 7270
870 FOR J1=1 TO SPILLNO
880 IF SPILLWAY(J1)>=1 AND SPILLWAY(J1)<=3 THEN GOTO 940
890 IF SPILLWAY(J1)=7 THEN GOTO 940
900 NEXT J1
910 CLS:PRINT L$:PRINT
920 PRINT"THE SPILLWAY CONTAINS MANUAL COMPONENTS OPERATED BY THE USER"
930 STORIND=1:GOTO 520
940 CLS:PRINT L$:PRINT
950 PRINT"THE SPILLWAY CONTAINS MANUAL COMPONENTS OPERATED BY THE USER"
960 STORIND=0:GOTO 520
970 ':VOLUME BALANCE WITHOUT STORAGE INDICATION CURVE----------
-
980 CLS:PRINT"ITERATIVE SEARCH TECHNIQUE EMPLOYED"
990 DIM INFL(NOSTEP+1),OUTFL(NOSTEP+1),STO(NOSTEP+1)
1000 DIM HT(NOSTEP+1),TIME(NOSTEP+1),BAL(NOSTEP+1)
1010 FOR J1=1 TO SPILLNO
1020 IF SPILLWAY(J1)=4 THEN DIM HGATE(NOSTEP+1),SPILL(NOSTEP+1)
1030 IF SPILLWAY(J1)=5 THEN DIM HGATE(NOSTEP+1)
1040 IF SPILLWAY(J1)=6 THEN DIM FUSE(NOSTEP+1)
1050 NEXT J1
1060 T=-CSTEP
1070 FOR J=0 TO NOSTEP+1
1080 T=T+CSTEP:TIME(J)=T+STATIME
1090 COUNT=INT(T/ISTEP)
1100 IF COUNT>NOHYD THEN INFL(J)=0:GOTO 1120
1110 INFL(J)=INFLOW(COUNT)+(INFLOW(COUNT+1)-INFLOW(COUNT))*(T/ISTEP-COUNT)
1120 NEXT J
1130 HT(0)=RESSTA:ISTEP=3600*ISTEP:CSTEP=3600*CSTEP:STATIME=3600*STATIME
1140 ':CALCULATE VOLUME BALANCE-------------------------------------------
--
1150 PRINT:PRINT"CALCULATING VOLUME BALANCE"
1160 FOR K=0 TO NOSTEP
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1170 PRINT K
1180 FOR I=1 TO NOSTEL
1190 IF HT(K)<=ELEV(I) THEN GOTO 1220
1200 NEXT I
1210 PRINT M$:PRINT K$:END
1220 STO(K)=STOR(I-1)+(STOR(I)-STOR(I-1))*(HT(K)-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
1230 OUTFL(K)=0
1240 FOR I=1 TO SPILLNO
1250 IF SPILLWAY(I)=4 THEN GOSUB 3810:OUTFL(K)=OUTFL(K)+MGATE(K)
1260 IF SPILLWAY(I)=5 THEN GOSUB 4230:OUTFL(K)=OUTFL(K)+HGATE(K)
1270 IF SPILLWAY(I)=6 THEN GOSUB 1590:OUTFL(K)=OUTFL(K)+FUSE(K)
1280 NEXT I
1290 INFLOW=(INFL(K)+INFL(K+1))*CSTEP/2+STO(K)
1300 INCREMENT=1:IF K=0 THEN GOTO 1330
1310 IF HT(K)>HT(K-1) THEN GOTO 1330
1320 HT(K+1)=HT(K)-INCREMENT:GOTO 1340
1330 HT(K+1)=HT(K)+INCREMENT
1340 FOR I=1 TO NOSTEL
1350 IF HT(K+1)<=ELEV(I) THEN GOTO 1380
1360 NEXT I
1370 PRINT M$:PRINT K$:END
1380 STO(K+1)=STOR(I-1)+(STOR(I)-STOR(I-1))*(HT(K+1)-ELEV(I-1))/(ELEV(I)-ELEV(I-
1))
1390 OUTFL(K+1)=0
1400 FOR I=1 TO SPILLNO
1410 IF SPILLWAY(I)=4 THEN GOSUB 4340:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
1420 IF SPILLWAY(I)=5 THEN GOSUB 4740:OUTFL(K+1)=OUTFL(K+1)+HGATE(K+1)
1430 IF SPILLWAY(I)=6 THEN GOSUB 1670:OUTFL(K+1)=OUTFL(K+1)+FUSE(K+1)
1440 NEXT I
1450 OUTFLOW=(OUTFL(K+1)+OUTFL(K))*CSTEP/2+STO(K+1)
1460 A=INFLOW:B=OUTFLOW
1470 IF A<10000 AND B<10000 THEN GOTO 1500
1480 A=A/10:B=B/10
1490 GOTO 1470
1500 IF INT(A)>INT(B) THEN INCREMENT=.8*INCREMENT:HT(K+1)=HT(K+1)+INCREMENT:GOTO
 1340
1510 IF INT(A)<INT(B) THEN INCREMENT=.8*INCREMENT:HT(K+1)=HT(K+1)-INCREMENT:GOTO
 1340
1520 FOR I=1 TO SPILLNO
1530 IF SPILLWAY(I)=4 THEN MGATE(K+1)=0:SPILL(K+1)=0
1540 IF SPILLWAY(I)=5 THEN HGATE(K+1)=0
1550 IF SPILLWAY(I)=6 THEN FUSE(K+1)=0
1560 NEXT I
1570 NEXT K
1580 RETURN
1590 ':FLOW THROUGH FUSEPLUG ADDED----------------------------------------------
--
1600 IF HT(K)<=FUSECREST THEN FUSE(K)=0:RETURN
1610 IF FUSECHECK>0 THEN GOTO 1640
1620 IF HT(K)<=FUSESTART THEN FUSE(K)=0:RETURN
1630 FUSECHECK=1
1640 FUSE(K)=FUSECOEF*FUSELENGTH*(HT(K)-FUSECREST)^1.5
1650 RETURN
1660 ':FLOW THROUGH FUSEPLUG CHECKED--------------------------------------------
--
1670 IF HT(K+1)<=FUSECREST THEN FUSE(K+1)=0:RETURN
1680 IF FUSECHECK>0 THEN GOTO 1710
1690 IF HT(K+1)<=FUSESTART THEN FUSE(K+1)=0:RETURN
1700 FUSECHECK=1
1710 FUSE(K+1)=FUSECOEF*FUSELENGTH*(HT(K+1)-FUSECREST)^1.5
1720 RETURN
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1730 ': CONSTRUCTION OF STORAGE - INDICATION CURVE ----------------------------

1740 CLS:PRINT"CONSTRUCTING STORAGE - INDICATION CURVE"
1750 A=RESMAX-RESLEV: B=RESMAX-RESSTA
1760 IF A<B THEN A=B
1770 C=A/LEVSENSE
1780 IF C>5000 THEN PRINT I$:GOTO 1800
1790 GOTO 1820
1800 INPUT "REVISED ANALYSIS SENSITIVITY REQUIRED:"; LEVSENSE
1810 GOTO 1750
1820 J=1:DIM HEIGHT(C+1),OUTFLOW(C+1)
1830 FOR I=1 TO SPILLNO
1840 ON SPILLWAY(I) GOSUB 1870,1880,1890,1900,1910,1920,1930
1850 NEXT I
1860 GOTO 1940
1870 DIM BOXFLOW(C+1):RETURN
1880 DIM OGEEFLOW(C+1):RETURN
1890 DIM LGATEFLOW(C+1),LGATEOP(NOSTEP+1,GATELNO):RETURN
1900 RETURN
1910 RETURN
1920 DIM FUSEFLOW(C+1):RETURN
1930 DIM USERFLOW(C+1):RETURN
1940 HEIGHT(J-1)=RESMAX-A-LEVSENSE:DIM STORIND(C+1)
1950 HEIGHT(J)=HEIGHT(J-1)+LEVSENSE
1960 OUTFLOW(J)=0
1970 FOR I=1 TO SPILLNO
1980 ON SPILLWAY(I) GOSUB 2930,3050,3100,3330,3350,3370,3410
1990 NEXT I
2000 PRINT J
2010 J=J+1
2020 IF J=(C+1) THEN GOTO 2040
2030 GOTO 1950
2040 FOR J=1 TO C
2050 FOR I=1 TO NOSTEL
2060 IF HEIGHT(J) < ELEV(I) THEN GOTO 2090
2070 NEXT I
2080 PRINT M$: PRINT K$: END
2090 STOR=STOR(I)-(STOR(I)-STOR(I-1))*(ELEV(I)-HEIGHT(J))/(ELEV(I)-ELEV(I-1))
2100 STORIND(J)=STOR+(CSTEP*OUTFLOW(J)/2)*3600
2110 NEXT J
2120 RETURN
2130 ': VOLUME BALANCE ------------------------------------------------------

2140 PRINT:PRINT"CALCULATING VOLUME BALANCE"
2150 DIM INFL(NOSTEP+1),OUTFL(NOSTEP+1),STO(NOSTEP+1),HT(NOSTEP+1)
2160 DIM TIME(NOSTEP+1),BAL(NOSTEP+1)
2170 FOR J1=1 TO SPILLNO
2180 IF SPILLWAY(J1)=3 THEN DIM LGATE(NOSTEP+1)
2190 IF SPILLWAY(J1)=4 THEN DIM MGATE(NOSTEP+1),SPILL(NOSTEP+1)
2200 IF SPILLWAY(J1)=5 THEN DIM MGATE(NOSTEP+1)
2210 IF SPILLWAY(J1)=6 THEN DIM FUSE(NOSTEP+1)
2220 NEXT J1
2230 T=-CSTEP
2240 FOR J=0 TO NOSTEP +1
2250 T=T+CSTEP:TIME(J)=T+STATIME
2260 COUNT=INT(T/ISTEP)
2270 IF COUNT>NOHYD THEN INFL(J)=0:GOTO 2290
2280 INFL(J)=INFLOW(COUNT)+(INFLOW(COUNT+1)-INFLOW(COUNT))*(T/ISTEP-COUNT)
2290 NEXT J
2300 ISTEP=ISTEP*3600:CSTEP=CSTEP*3600:HT(0)=RESSTA
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2310 FOR K=0 TO NOSTEP
2320 PRINT K
2330 FOR I=1 TO NOSTEL
2340 IF HT(K)<=ELEV(I) THEN GOTO 2370
2350 NEXT I
2360 PRINT M$:PRINT K$:END
2370 STO(K)=STOR(I-1)+(STOR(I)-STOR(I-1))*(HT(K)-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
2380 FOR I=1 TO C
2390 IF HT(K)<=HEIGHT(I) THEN GOTO 2420
2400 NEXT I
2410 PRINT N$:PRINT K$:END
2420 OUTFL(K)=OUTFLOW(I-1)+(OUTFLOW(I)-OUTFLOW(I-1))*(HT(K)-HEIGHT(I-1))/(HEIGHT
(I)-HEIGHT(I-1))
2430 FOR J1=1 TO SPILLNO
2440 IF SPILLWAY(J1)=3 THEN GOTO 2470
2450 NEXT J1
2460 GOTO 2480
2470 LGATE(K)=LGATEFLOW(I-1)+(LGATEFLOW(I)-LGATEFLOW(I-1))*(HT(K)-HEIGHT(I-1))/(
HEIGHT(I)-HEIGHT(I-1))
2480 FOR J1=1 TO SPILLNO
2490 IF SPILLWAY(J1)=4 THEN GOSUB 3810:OUTFL(K)=OUTFL(K)+MGATE(K)
2500 IF SPILLWAY(J1)=5 THEN GOSUB 4230:OUTFL(K)=OUTFL(K)+HGATE(K)
2510 IF SPILLWAY(J1)=6 THEN GOSUB 3700:OUTFL(K)=OUTFL(K)+FUSE(K)
2520 NEXT J1
2530 BAL=0
2540 FOR J1=1 TO SPILLNO
2550 IF SPILLWAY(J1)=4 THEN BAL=BAL+MGATE(K)*CSTEP/2
2560 IF SPILLWAY(J1)=5 THEN BAL=BAL+HGATE(K)*CSTEP/2
2570 IF SPILLWAY(J1)=6 THEN BAL=BAL+FUSE(K)*CSTEP/2
2580 NEXT J1
2590 BAL(K)=STO(K)-OUTFL(K)*CSTEP/2+(INFL(K)+INFL(K+1))*CSTEP/2
2600 FOR J=1 TO C
2610 IF BAL(K)<=STORIND(J)+BAL THEN GOTO 2650
2620 NEXT J
2630 PRINT O$:GOSUB 6130
2640 PRINT K$:PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10
2650 HT(K+1)=HEIGHT(J-1)+(HEIGHT(J)-HEIGHT(J-1))*(BAL(K)-STORIND(J-1)-BAL)/(STOR
IND(J)-STORIND(J-1))
2660 BALA=0
2670 FOR J1=1 TO SPILLNO
2680 IF SPILLWAY(J1)=4 THEN GOSUB 4340:BALA=BALA+MGATE(K+1)*CSTEP/2
2690 IF SPILLWAY(J1)=5 THEN GOSUB 4740:BALA=BALA+HGATE(K+1)*CSTEP/2
2700 IF SPILLWAY(J1)=6 THEN GOSUB 4850:BALA=BALA+FUSE(K+1)*CSTEP/2
2710 NEXT J1
2720 FOR J1=1 TO SPILLNO
2730 IF SPILLWAY(J1)>=4 AND SPILLWAY(J1)<=6 THEN GOTO 2770
2740 NEXT J1
2750 NEXT K
2760 RETURN
2770 IF INT(BALA)=INT(BAL) THEN GOTO 2850
2780 BAL=BALA
2790 FOR J1=1 TO SPILLNO
2800 IF SPILLWAY(J1)=4 THEN MGATE(K+1)=0
2810 IF SPILLWAY(J1)=5 THEN HGATE(K+1)=0
2820 IF SPILLWAY(J1)=6 THEN FUSE(K+1)=0
2830 NEXT J1
2840 GOTO 2600
2850 FOR J1=1 TO SPILLNO
2860 IF SPILLWAY(J1)=4 THEN MGATE(K+1)=0
2870 IF SPILLWAY(J1)=5 THEN HGATE(K+1)=0
2880 IF SPILLWAY(J1)=6 THEN FUSE(K+1)=0
```

```
2890 NEXT J1
2900 NEXT K
2910 RETURN
2920 ': BOX CULVERT FLOW ----------------------------------------------------

2930 FOR K=1 TO CULNO
2940 IF HEIGHT(J)>CULINVERT(K) THEN GOSUB 2980
2950 NEXT K
2960 OUTFLOW(J)=OUTFLOW(J)+BOXFLOW(J)
2970 RETURN
2980 H=HEIGHT(J)-CULINVERT(K)
2990 IF H>=1.2*CULHEIGHT(K) GOTO 3020
3000 BOXFLOW(J)=(2/3)*CULUNCOEF(K)*CULWIDTH(K)*H*SQR(6.54*H)+BOXFLOW(J)
3010 RETURN
3020 BOXFLOW(J)=CULSUBCOEF(K)*CULWIDTH(K)*CULHEIGHT(K)*SQR(19.62*(H-CULSUPOEF(K)
*CULHEIGHT(K)))+BOXFLOW(J)
3030 RETURN
3040 ': WIER FLOW ------------------------------------------------------------

3050 IF HEIGHT(J)<=WIERINVERT THEN RETURN
3060 OGEEFLOW(J)=WIERCOEF*WIERLENGTH*((HEIGHT(J)-WIERINVERT)^1.5)
3070 OUTFLOW(J)=OUTFLOW(J)+OGEEFLOW(J)
3080 RETURN
3090 ':AUTOMATIC GATE FLOW---------------------------------------------------

3100 FOR J1=1 TO GATELNO
3110 IF HEIGHT(J)>GATELS(J1) THEN GOSUB 3150
3120 NEXT J1
3130 OUTFLOW(J)=OUTFLOW(J)+LGATEFLOW(J)
3140 RETURN
3150 H=HEIGHT(J)-GATELS(J1)
3160 D=(H/(GATELE(J1)-GATELS(J1)))*GATELHEIGHT(J1)
3170 IF D>GATELHEIGHT(J1) THEN D=GATELHEIGHT(J1)
3180 IF D<=.7*(HEIGHT(J)-GATELINVERT(J1)) THEN GOTO 3220
3190 F=GATELCOEF(J1)*GATELWIDTH(J1)*(HEIGHT(J)-GATELINVERT(J1))^1.5
3200 LGATEFLOW(J)=LGATEFLOW(J)+F
3210 RETURN
3220 H1=HEIGHT(J)-GATELINVERT(J1)
3230 H2=H1-D:R=D/H1
3240 IF R<=.05 THEN C1=.73:GOTO 3290
3250 IF R<=.075 THEN C1=.73-((R-.05)/.025)*.01:GOTO 3290
3260 IF R<=.12 THEN C1=.72-((R-.075)/.045)*.01:GOTO 3290
3270 IF R<=.175 THEN C1=.71-((R-.12 )/.055)*8.999999E-03:GOTO 3290
3280 IF R<=.7 THEN C1=.701-((R-.175)/.525)*.056
3290 F=2.[illegible]*C1*GATELWIDTH(J1)*(H1^1.5-H2^1.5)
3300 LGATE[illegible]=LGATEFLOW(J)+F
3310 RETURN
3320 ':MANUAL GATE FLOW ------------------------------ ----------------------
3330 RETURN
3340 ':MANUAL HIGH PRESSURE GATE FLOW ----------------------------------------
3350 RETURN
3360 ':FUSEPLUG FLOW ---------------------------------------------------------
3370 IF HEIGHT(J)<=FUSECREST THEN RETURN
3380 FUSEFLOW(J)=FUSECOEF*FUSELENGTH*(HEIGHT(J)-FUSECREST)^1.5
3390 RETURN
3400 ':USER SPILLWAY FLOW ----------------------------------------------------
3410 IF HEIGHT(J)>ELEVU(PTNOU) THEN PRINT J$:GOTO 3430
3420 GOTO 3630
3430 SOUND 640,20
3440 PRINT"DO YOU WISH TO EXTEND YOUR SPILLWAY"
3450 INPUT "CAPACITY (Y/N):";Q$
```

```
3460 IF Q$="N" THEN PRINT K$:END
3470 PRINT:INPUT "NUMBER OF DISCHARGE ELEVATION POINTS ADDED :- ",J1
3480 DIM ELEVE(PTNOU+J1), DISCH(PTNOU+J1)
3490 FOR L=1 TO PTNOU
3500 ELEVE(L)=ELEVU(L):DISCH(L)=DISCHU(L)
3510 NEXT L
3520 FOR L=PTNOU+1 TO PTNOU+J1
3530 INPUT "ELEVATION :- ",ELEVE(L)
3540 INPUT "DISCHARGE :  ",DISCH(L)
3550 NEXT L
3560 PTNOU=PTNOU+J1
3570 ERASE ELEVU,DISCHU
3580 DIM ELEVU(PTNOU),DISCHU(PTNOU)
3590 FOR I=1 TO PTNOU
3600 ELEVU(I)=ELEVE(I):DISCHU(I)=DISCH(I)
3610 NEXT I
3620 ERASE ELEVE,DISCH
3630 FOR I=1 TO PTNOU
3640 IF HEIGHT(J)<ELEVU(I) THEN GOTO 3670
3650 NEXT I
3660 RETURN
3670 USERFLOW(J)=DISCHU(I-1)+(DISCHU(I)-DISCHU(I-1))*(HEIGHT(J)-ELEVU(I-1))/(ELE
VU(I)-ELEVU(I-1))
3680 OUTFLOW(J)=OUTFLOW(J)+USERFLOW(J)
3690 RETURN
3700 ': FUSEPLUG FLOW ADDED TO EQUATION ----------------------------------------

3710 IF HT(K)<=FUSECREST THEN FUSE(K)=0:RETURN
3720 IF FUSECHECK>0 THEN GOTO 3750
3730 IF HT(K)<=FUSESTART THEN FUSE(K)=0:RETURN
3740 FUSECHECK=1
3750 FOR I=1 TO C
3760 IF HT(K)<=HEIGHT(I) THEN GOTO 3790
3770 NEXT I
3780 PRINT N$:PRINT K$:END
3790 FUSE(K)=FUSEFLOW(I-1)+(FUSEFLOW(I)-FUSEFLOW(I-1))*(HT(K)-HEIGHT(I-1))/(HEIG
HT(I)-HEIGHT(I-1)):RETURN
3800 ': MANUAL WIER FLOW ADDED TO EQUATION -------------------------------------

3810 IF Q1$="P" THEN RETURN
3820 IF Q3=1 THEN GOTO 3930
3830 IF HT(K)>GATEMINVERT(1) THEN GOTO 3850
3840 RETURN
3850 F=GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K)-GATEMINVERT(1))^1.5
3860 MGATE(K)=F*MGATEOP(K)
3870 IF HT(K)>GATEMINVERT(1)+GATEMSIZE(1) THEN GOTO 3890
3880 RETURN
3890 NOSPIL=GATEMNO-MGATEOP(K)
3900 SPILL(K)=GATESPILL(1)*GATEMWIDTH(1)*NOSPIL*(HT(K)-GATEMINVERT(1)-GATEMSIZE(
1))^1.5
3910 MGATE(K)=MGATE(K)+SPILL(K)
3920 RETURN
3930 FOR J2=1 TO GATEMNO
3940 IF HT(K)>GATEMINVERT(J2) THEN GOSUB 3980
3950 IF HT(K)>GATEMINVERT(J2)+GATEMSIZE(J2) THEN GOSUB 4160
3960 NEXT J2
3970 RETURN
3980 H=HT(K)-GATEMINVERT(J2)
3990 D=MGATEOP(K,J2)*GATEMHEIGHT(J2)/100
4000 IF D=0 THEN RETURN
4010 IF D>GATEMHEIGHT(J2) THEN D=GATEMHEIGHT(J2)
```

```
4020 IF D<=.7*(HT(K)-GATEMINVERT(J2)) THEN GOTO 4060
4030 F=GATEMCOEF(J2)*GATEMWIDTH(J2)*(HT(K)-GATEMINVERT(J2))^1.5
4040 MGATE(K)=MGATE(K)+F
4050 RETURN
4060 H1=HT(K)-GATEMINVERT(J2)
4070 H2=H1-D:R=D/H1
4080 IF R<=.05 THEN C1=.73:GOTO 4130
4090 IF R<=.075 THEN C1=.73-((R-.05)/.025)*.01:GOTO 4130
4100 IF R<=.12 THEN C1=.72-((R-.075)/.045)*.01:GOTO 4130
4110 IF R<=.175 THEN C1=.71-((R-.12)/.055)*8.999999E-03:GOTO 4130
4120 IF R<=.7 THEN C1=.701-((R-.175)/.525)*.056
4130 F=2.953*C1*GATEMWIDTH(J2)*(H1^1.5-H2^1.5)
4140 MGATE(K)=MGATE(K)+F
4150 RETURN
4160 IF MGATEOP(K,J2)>0 THEN RETURN
4170 IF (HT(K)-GATEMINVERT(J2)-GATEMSIZE(J2))<=0 THEN SPILL=0:RETURN
4180 SPILL=GATESPILL(J2)*GATEMWIDTH(J2)*(HT(K)-GATEMINVERT(J2)-GATEMSIZE(J2))^1.
5
4190 MGATE(K)=MGATE(K)+SPILL
4200 SPILL(K)=SPILL(K)+SPILL
4210 RETURN
4220 ':MANUAL HIGH PRESSURE GATE ADDED TO EQUATION --------------------------
4230 IF Q2$="P" THEN RETURN
4240 IF Q4=1 THEN GOTO 4280
4250 F=GATEHCOEF(1)*GATEHWIDTH(1)*GATEHHEIGHT(1)*SQR(ABS(2*9.810001*(HT(K)-GATEH
INVERT(1)+GATEHHEIGHT(1)/2)))
4260 HGATE(K)=HGATE(K)+F*HGATEOP(K)
4270 RETURN
4280 FOR J2=1 TO GATEHNO
4290 F=GATEHCOEF(J2)*GATEHWIDTH(J2)*GATEHHEIGHT(J2)*SQR(2*9.810001*(HT(K)-GATEHI
NVERT(J2)+GATEHHEIGHT(J2)/2))
4300 HGATE(K)=HGATE(K)+F*HGATEOP(K,J2)/100
4310 NEXT J2
4320 RETURN
4330 ':MANUAL WIER FLOW CHECKED ---------------------------------------------
4340 IF Q1$="P" THEN RETURN
4350 IF Q3=1 THEN GOTO 4460
4360 IF HT(K+1)>GATEMINVERT(1) THEN GOTO 4380
4370 RETURN
4380 F=GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K+1)-GATEMINVERT(1))^1.5
4390 MGATE(K+1)=F*MGATEOP(K+1)
4400 IF HT(K+1)>GATEMINVERT(1)+GATEMSIZE(1) THEN GOTO 4420
4410 RETURN
4420 NOSPIL=GATEMNO-MGATEOP(K+1)
4430 SPILL(K+1)=GATESPILL(1)*GATEMWIDTH(1)*NOSPIL*(HT(K+1)-GATEMINVERT(1)-GATEMS
IZE(1))^1.5
4440 MGATE(K+1)=MGATE(K+1)+SPILL(K+1)
4450 RETURN
4460 FOR J2=1 TO GATEMNO
4470 IF HT(K+1)>GATEMINVERT(J2) THEN GOSUB 4510
4480 IF HT(K+1)>GATEMINVERT(J2)+GATEMSIZE(J2) THEN GOSUB 4680
4490 NEXT J2
4500 RETURN
4510 H=HT(K+1)-GATEMINVERT(J2)
4520 D=MGATEOP(K+1,J2)*GATEMHEIGHT(J2)/100
4530 IF D=0 THEN RETURN
4540 IF D<=.7*(HT(K+1)-GATEMINVERT(J2)) THEN GOTO 4580
4550 F=GATEMCOEF(J2)*GATEMWIDTH(J2)*(HT(K+1)-GATEMINVERT(J2))^1.5
4560 MGATE(K+1)=MGATE(K+1)+F
4570 RETURN
4580 H1=HT(K+1)-GATEMINVERT(J2)
```

```
4590 H2=H1-D:R=D/H1
4600 IF R<=.05 THEN C1=.73:GOTO 4650
4610 IF R<=.075 THEN C1=.73-((R-.05)/.025)*.01:GOTO 4650
4620 IF R<=.12 THEN C1=.72-((R-.075)/.045)*.01:GOTO 4650
4630 IF R<=.175 THEN C1=.71-((R-.12)/.055)*8.999999E-03:GOTO 4650
4640 IF R<=.7 THEN C1=.701-((R-.175)/.525)*.056
4650 F=2.953*C1*GATEMWIDTH(J2)*(H1^1.5-H2^1.5)
4660 MGATE(K+1)=MGATE(K+1)+F
4670 RETURN
4680 IF MGATEOP(K+1,J2)>0 THEN RETURN
4690 IF (HT(K+1)-GATEMINVERT(J2)-GATEMSIZE(J2))<=0 THEN SPILL=0:RETURN
4700 SPILL=GATESPILL(J2)*GATEMWIDTH(J2)*(HT(K+1)-GATEMINVERT(J2)-GATEMSIZE(J2))^
1.5
4710 MGATE(K+1)=MGATE(K+1)+SPIL'
4720 RETURN
4730 ':HIGH PRESSURE GATE FLOW CHECKED----------------------------------------
4740 IF Q2$="P" THEN RETURN
4750 IF Q4=1 THEN GOTO 4790
4760 F=GATEHCOEF(I)*GATEHWIDTH(I)*GATEHHEIGHT(I)*SQR(2*9.810001*(HT(K+1)-GATEHIN
VERT(I)+GATEHHEIGHT(I)/2))
4770 HGATE(K+1)=HGATE(K+1)+F*HGATEOP(K+1)
4780 RETURN
4790 FOR J2=1 TO GATEHNO
4800 F=GATEHCOEF(J2)*GATEHWIDTH(J2)*GATEHHEIGHT(J2)*SQR(2*9.810001*(HT(K+1)-GATE
HINVERT(J2)+GATEHHEIGHT(J2)/2))
4810 HGATE(K+1)=HGATE(K+1)+F*HGATEOP(K+1,J2)/100
4820 NEXT J2
4830 RETURN
4840 ':FUSEPLUG FLOW CHECKED-------------------------------------------------
4850 IF HT(K+1)<=FUSECREST THEN FUSE(K+1)=0:RETURN
4860 IF FUSECHECK>0 THEN GOTO 4890
4870 IF HT(K+1)<=FUSESTART THEN FUSE(K+1)=0:RETURN
4880 FUSECHECK=1
4890 FOR I=1 TO C
4900 IF HT(K+1)<=HEIGHT(I) THEN GOTO 4930
4910 NEXT I
4920 PRINT N$:PRINT K$:END
4930 FUSE(K+1)=FUSEFLOW(I-1)+(FUSEFLOW(I)-FUSEFLOW(I-1))*(HT(K+1)-HEIGHT(I-1))/(
HEIGHT(I)-HEIGHT(I-1))
4940 RETURN
4950 ':STORAGE - ELEVATION POINTS FROM DISK ----------------------------------
-
4960 CLS:PRINT L$:PRINT
4970 PRINT:PRINT"READING STORAGE/ELEVATION DATA FROM DISK."
4980 INPUT £1,NOSTEL
4990 DIM ELEV(NOSTEL),STOR(NOSTEL)
5000 FOR I=1 TO NOSTEL
5010 INPUT £1,ELEV(I),STOR(I)
5020 NEXT I
5030 INPUT £1,NOSTEP
5040 ': SPILLWAY DATA FROM DISK ----------------------------------------------

5050 PRINT: PRINT "READING SPILLWAY DATA FROM DISK."
5060 INPUT £1,SPILLNO
5070 DIM SPILLWAY(SPILLNO)
5080 FOR I=1 TO SPILLNO
5090 INPUT £1,SPILLWAY(I)
5100 NEXT I
5110 FOR I=1 TO SPILLNO
5120 ON SPILLWAY(I) GOSUB 5150,5240,5270,5360,5620,5890,5930
5130 NEXT I
```

```
5140 GOTO 6010
5150 ': BOX CULVERT DATA ----------------------------------------------------

5160 INPUT £1,CULNO
5170 DIM CULHEIGHT(CULNO),CULWIDTH(CULNO),CULINVERT(CULNO)
5180 DIM CULUNCOEF(CULNO),CULSUBCOEF(CULNO)
5190 FOR J=1 TO CULNO
5200 INPUT £1,CULWIDTH(J),CULHEIGHT(J),CULINVERT(J)
5210 INPUT £1,CULUNCOEF(J),CULSUBCOEF(J)
5220 NEXT J
5230 RETURN
5240 ': FREE OVERFLOW WIER DATA ---------------------------------------------

5250 INPUT £1,WIERLENGTH,WIERINVERT,WIERCOEF
5260 RETURN
5270 ': AUTOMATIC GATE DATA -------------------------------------------------

5280 INPUT £1,GATELNO
5290 DIM GATELS(GATELNO),GATELE(GATELNO),GATELCOEF(GATELNO)
5300 DIM GATELIVERT(GATELNO),GATELWIDTH(GATELNO),GATELHEIGHT(GATELNO),GATELTIME(
GATELNO)
5310 FOR J=1 TO GATELNO
5320 INPUT £1,GATELS(J),GATELE(J)
5330 INPUT £1,GATELINVERT(J),GATELCOEF(J),GATELWIDTH(J),GATELHEIGHT(J)
5340 NEXT J
5350 RETURN
5360 ': MANUAL GATE DATA ----------------------------------------------------

5370 INPUT £1,GATEMNO
5380 DIM GATEMCOEF(GATEMNO),GATEMINVERT(GATEMNO),GATESPILL(GATEMNO)
5390 DIM GATEMWIDTH(GATEMNO),GATEMHEIGHT(GATEMNO),GATEMSIZE(GATEMNO)
5400 FOR J=1 TO GATEMNO
5410 INPUT £1,GATEMINVERT(J),GATESPILL(J),GATEMCOEF(J),GATEMWIDTH(J)
5420 INPUT £1,GATEMHEIGHT(J),GATEMSIZE(J)
5430 NEXT J
5440 INPUT £1,Q1$
5450 IF Q1$ = "U" THEN GOTO 5480
5460 INPUT £1,GATEMSTART,GATEMSUM,GATEMFLOW,FLOWMESC
5470 RETURN
5480 INPUT £1,Q3
5490 IF Q3=2 THEN GOTO 5570
5500 DIM MGATEOP(NOSTEP+1,GATEMNO)
5510 FOR I=0 TO NOSTEP
5520 FOR J=1 TO GATEMNO
5530 INPUT £1,MGATEOP(I,J)
5540 NEXT J
5550 NEXT I
5560 RETURN
5570 DIM MGATEOP(NOSTEP+1)
5580 FOR I=0 TO NOSTEP
5590 INPUT £1,MGATEOP(I)
5600 NEXT I
5610 RETURN
5620 ': MANUAL HIGH PRESSURE GATE DATA --------------------------------------

5630 INPUT £1,GATEHNO
5640 DIM GATEHCOEF(GATEHNO),GATEHINVERT(GATEHNO)
5650 DIM GATEHWIDTH(GATEHNO),GATEHHEIGHT(GATEHNO)
5660 FOR J=1 TO GATEHNO
5670 INPUT £1,GATEHINVERT(J),GATEHCOEF(J)
5680 INPUT £1,GATEHWIDTH(J),GATEHHEIGHT(J)
```

```
5690 NEXT J
5700 INPUT £1,Q2$
5710 IF Q2$ = "U" THEN GOTO 5750
5720 INPUT £1,GATEHSTART,GATEHSUM
5730 INPUT £1,GATEHFLOW,FLOWHESC
5740 RETURN
5750 INPUT £1,Q4
5760 IF Q4=2 THEN GOTO 5840
5770 DIM HGATEOP(NOSTEP+1,GATEHNO)
5780 FOR I=0 TO NOSTEP
5790 FOR J=1 TO GATEHNO
5800 INPUT £1,HGATEOP(I,J)
5810 NEXT J
5820 NEXT I
5830 RETURN
5840 DIM HGATEOP(NOSTEP+1)
5850 FOR I=0 TO NOSTEP
5860 PRINT £1,HGATEOP(I)
5870 NEXT I
5880 RETURN
5890 ': FUSEPLUG DATA ----------

5900 INPUT £1,FUSESTART,FUSECREST
5910 INPUT £1,FUSELENGTH,FUSECOEF
5920 RETURN
5930 ': USER SPILLWAY DATA ----------

5940 INPUT £1,PTNOU
5950 DIM ELEVU(PTNOU),DISCHU(PTNOU)
5960 FOR J=1 TO PTNOU
5970 INPUT £1,ELEVU(J),DISCHU(J)
5980 NEXT J
5990 RETURN
6000 ':FLOOD DATA READ FROM DISK----------

6010 PRINT:PRINT"READING INFLOW HYDROGRAPH FROM DISK."
6020 INPUT £1,NOHYD,ISTEP
6030 DIM INFLOW(NOHYD+2)
6040 FOR I=0 TO NOHYD
6050 INPUT £1,INFLOW(I)
6060 NEXT I
6070 ':RESERVOIR FLOOD STATUS FROM DISK----------

6080 PRINT:PRINT"READING RESERVOIR STATUS FROM DISK."
6090 INPUT £1,TITLE1$,TITLE2$
6100 INPUT £1,RESSTA,RESLEV,RESMAX,LEVSENSE,STATIME,CSTEP,NOSTEP
6110 CLOSE £1:RETURN
6120 ': STORE RESULTS ON DISK----------

6130 X$=X$+".RES"
6140 PRINT:PRINT"WRITING RESULTS TO DISK"
6150 OPEN X$ FOR OUTPUT AS £1
6160 PRINT £1,TITLE1$
6170 PRINT £1,TITLE2$
6180 PRINT £1,OTL,NOSTEP,SPILLNO
6190 IF OTL=2 THEN GOSUB 6520
6200 GOSUB 6230
6210 CLOSE £1
6220 RETURN
6230 ':STORE CALCULATION RESULTS----------
```

```
6240 FOR I=1 TO SPILLNO
6250 PRINT £1,SPILLWAY(I)
6260 NEXT I
6270 PRINT £1,Q3,Q4
6280 PRINT £1,Q1$
6290 PRINT £1,Q2$
6300 IF Q1$="P" THEN Q3=2
6310 IF Q2$="P" THEN Q4=2
6320 FOR J=0 TO NOSTEP
6330 PRINT £1,TIME(J),INFL(J),OUTFL(J),HT(J),STO(J)
6340 FOR J2=1 TO SPILLNO
6350 IF SPILLWAY(J2)=3 THEN PRINT £1,LGATE(J)
6360 IF SPILLWAY(J2)=4 AND Q3=2 THEN PRINT £1,MGATE(J),SPILL(J),MGATEOP(J)
6370 IF SPILLWAY(J2)=4 AND Q3=1 THEN PRINT £1,MGATE(J),SPILL(J):GOSUB 6470
6380 IF SPILLWAY(J2)=5 AND Q4=2 THEN PRINT £1,MGATE(J),MGATEOP(J)
6390 IF SPILLWAY(J2)=5 AND Q4=1 THEN PRINT £1,MGATE(J):GOSUB 6430
6400 NEXT J2
6410 NEXT J
6420 RETURN
6430 FOR K2=1 TO GATEMNO
6440 PRINT £1,MGATEOP(J,K2)
6450 NEXT K2
6460 RETURN
6470 FOR K2=1 TO GATEMNO
6480 PRINT £1,MGATEOP(J,K2)
6490 NEXT K2
6500 RETURN
6510 ':STORE ADDITIONAL DATA-----------------------------------------------
-
6520 PRINT £1,NOSTEL,SPILLNO
6530 FOR I=1 TO NOSTEL
6540 PRINT £1,ELEV(I),STOR(I)
6550 NEXT I
6560 FOR I=1 TO SPILLNO
6570 PRINT £1,SPILLWAY(I)
6580 ON SPILLWAY(I) GOSUB 6610,6700,6740,6840,7000,7140,7190
6590 NEXT I
6600 RETURN
6610 PRINT £1,CULNO
6620 FOR J=1 TO CULNO
6630 PRINT £1,CULWIDTH(J)
6640 PRINT £1,CULHEIGHT(J)
6650 PRINT £1,CULINVERT(J)
6660 PRINT £1,CULUNCOEF(J)
6670 PRINT £1,CULSUBCOEF(J)
6680 NEXT J
6690 RETURN
6700 PRINT £1,WIERLENGTH
6710 PRINT £1,WIERINVERT
6720 PRINT £1,WIERCOEF
6730 RETURN
6740 PRINT £1,GATELNO
6750 FOR J=1 TO GATELNO
6760 PRINT £1,GATELINVERT(J)
6770 PRINT £1,GATELCOEF(J)
6780 PRINT £1,GATELWIDTH(J)
6790 PRINT £1,GATELHEIGHT(J)
6800 PRINT £1,GATELS(J)
6810 PRINT £1,GATELE(J)
6820 NEXT J
6830 RETURN
```

```
6840 PRINT £1,GATEMNO
6850 FOR J=1 TO GATEMNO
6860 PRINT £1,GATEMINVERT(J)
6870 PRINT £1,GATEMCOEF(J)
6880 PRINT £1,GATEMWIDTH(J)
6890 PRINT £1,GATEMHEIGHT(J)
6900 PRINT £1,GATEMSIZE(J)
6910 PRINT £1,GATESPILL(J)
6920 NEXT J
6930 PRINT £1,Q1$
6940 IF Q1$="U" THEN RETURN
6950 PRINT £1,GATEMSTART
6960 PRINT £1,GATEMSUM
6970 PRINT £1,GATEMFLOW
6980 PRINT £1,FLOWMESC
6990 RETURN
7000 PRINT £1,GATEHNO
7010 FOR J=1 TO GATEHNO
7020 PRINT £1,GATEHINVERT(J)
7030 PRINT £1,GATEHCOEF(J)
7040 PRINT £1,GATEHWIDTH(J)
7050 PRINT £1,GATEHHEIGHT(J)
7060 NEXT J
7070 PRINT £1,Q2$
7080 IF Q2$="U" THEN RETURN
7090 PRINT £1,GATEHSTART
7100 PRINT £1,GATEHSUM
7110 PRINT £1,GATEHFLOW
7120 PRINT £1,FLOWHESC
7130 RETURN
7140 PRINT £1,FUSESTART
7150 PRINT £1,FUSECREST
7160 PRINT £1,FUSELENGTH
7170 PRINT £1,FUSECOEF
7180 RETURN
7190 PRINT £1,PTNOU
7200 FOR J=1 TO PTNOU
7210 PRINT £1,ELEVU(J)
7220 PRINT £1,DISCHU(J)
7230 NEXT J
7240 RETURN
7250 ':PROGRAM CONTROLLED GATES----------
-
7260 ':CALCULATION OF INITIAL VOLUMES----------

7270 CLS:PRINT L$:PRINT:PRINT TITLE1$:PRINT TITLE2$:PRINT
7280 PRINT"THE SPILLWAY CONTAINS MANUAL COMPONENTS OPERATED BY THE PROGRAM"
7290 PRINT"GATE OPERATION SHALL BE OPTIMIZED"
7300 PRINT:PRINT L$:PRINT
7310 I=0
7320 FOR J=1 TO SPILLNO
7330 IF SPILLWAY(J)=4 THEN I=I+1
7340 IF SPILLWAY(J)=5 THEN I=I+1
7350 NEXT J
7360 IF I=1 THEN GOTO 7390
7370 PRINT"THE SPILLWAY CONTAINS TWO MANUAL COMPONENTS. OPTIMIZATION CAN ONLY BE
 DONE ON   ONE MANUAL COMPONENT AT A TIME"
7380 PRINT K$:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10
7390 PRINT"OUTPUT CAN BE PRESENTED ON TWO LEVELS:-":PRINT
7400 PRINT"     1.BASIC OUTPUT"
7410 PRINT"     2.EXTENDED OUTPUT"
```

```
7420 PRINT:INPUT"WHICH LEVEL DO YOU REQUIRE (1/2)";OTL
7430 INVOL=0
7440 FOR I=1 TO NOHYD
7450 INVOL=INVOL+(INFLOW(I)+INFLOW(I-1))*ISTEP*1800
7460 NEXT I
7470 FOR I=1 TO NOSTEL
7480 IF RESSTA<=ELEV(I) THEN GOTO 7510
7490 NEXT I
7500 PRINT:PRINT M$:PRINT K$:END
7510 STOR1=STOR(I-1)+(STOR(I)-STOR(I-1))*(RESSTA-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
7520 FOR I=1 TO NOSTEL
7530 IF RESLEV<=ELEV(I) THEN GOTO 7560
7540 NEXT I
7550 PRINT:PRINT M$:PRINT K$:END
7560 STOR2=STOR(I-1)+(STOR(I)-STOR(I-1))*(RESLEV-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
7570 FOR I=1 TO NOSTEL
7580 IF RESMAX<=ELEV(I) THEN GOTO 7610
7590 NEXT I
7600 PRINT:PRINT M$:PRINT K$:END
7610 STOR3=STOR(I-1)+(STOR(I)-STOR(I-1))*(RESMAX-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
7620 TEMPSTOR=STOR3-STOR2
7630 PERMSTOR=STOR2-STOR1
7640 EXVOL=INVOL-PERMSTOR
7650 IF EXVOL<=0 THEN PRINT"INFLOW VOLUME IS LESS THAN PERMANENT STORAGE AVAILAB
LE":GOTO 7670
7660 GOTO 7680
7670 PRINT"NO FLOODROUTING REQUIRED":PRINT K$:END
7680 FOR J1=1 TO SPILLNO
7690 IF SPILLWAY(J1)>=1 AND SPILLWAY(J1)<=3 THEN [illegible]
7700 IF SPILLWAY(J1)=7 THEN GOTO 7730
7710 NEXT J1
7720 STORIND=1:CLS:PRINT"ITERATIVE SEARCH TECHNIQUE EMPLOYED":GOTO 7740
7730 STORIND=0:GOSUB 1740
7740 T=-CSTEP:DIM TIME(NOSTEP+1),INFL(NOSTEP+1),OUTFL(NOSTEP+1)
7750 DIM STO(NOSTEP+1),HT(NOSTEP+1),BAL(NOSTEP+1)
7760 FOR J1=1 TO SPILLNO
7770 IF SPILLWAY(J1)=4 THEN DIM MGATE(NOSTEP+1),MGATEOP(NOSTEP+1),SPILL(NOSTEP+1
)
7780 IF SPILLWAY(J1)=5 THEN DIM HGATE(NOSTEP+1),HGATEOP(NOSTEP+1)
7790 IF SPILLWAY(J1)=6 THEN DIM FUSE(NOSTEP+1)
7800 NEXT J1
7810 FOR J=0 TO NOSTEP+1
7820 T=T+CSTEP:TIME(J)=T+STATIME
7830 COUNT=INT(T/ISTEP)
7840 IF COUNT>NOHYD THEN INFL(J)=0:GOTO 7860
7850 INFL(J)=INFLOW(COUNT)+(INFLOW(COUNT+1)-INFLOW(COUNT))*(T/ISTEP-COUNT)
7860 NEXT J
7870 HT(0)=RESSTA:ISTEP=3600*ISTEP:CSTEP=3600*CSTEP:STATIME=3600*STATIME
7880 ':CALCULATE VOLUME BALANCE----------  ----------

7890 PRINT:PRINT"CALCULATING VOLUME BALANCE"
7900 OUTVOL=0:TARCHECK=0
7910 FOR J1=1 TO SPILLNO
7920 IF SPILLWAY(J1)=4 THEN T=STATIME+GATESTART#3600:T1=T-STATIME
7930 IF SPILLWAY(J1)=5 THEN T=STATIME+GATESTART#3600:T1=T-STATIME
7940 NEXT J1
7950 FOR I=0 TO NOHYD
7960 IF PEAKA<INFLOW(I) THEN PEAKA=INFLOW(I):PEAK=I
7970 NEXT I
7980 FOR K=0 TO NOSTEP
7990 PRINT K
```

```
8000 IF TARCHECK=1 THEN GOTO 8160
8010 ':CALCULATE TARGET DISCHARGE----------------------------------------------------

8020 I=NOHYD:DISCHVOL=0:REMAIN=0
8030 IF T1<3600*TIME(K)-STATIME THEN T1=3600*TIME(K)-STATIME
8040 IF I*ISTEP<=T1 THEN TARCHECK=1:GOTO 8160
8050 DISCHVOL=INFLOW(I)*(I*ISTEP-T1)
8060 IF I=NOHYD THEN GOTO 8080
8070 REMAIN=REMAIN+(INFLOW(I)+INFLOW(I+1))*ISTEP/2
8080 IF DISCHVOL>=INVOL-REMAIN-PERMSTOR-TEMPSTOR-OUTVOL THEN GOTO 8140
8090 I=I-1:IF I<PEAK THEN GOTO 8110
8100 GOTO 8040
8110 PRINT"TARGET OUTFLOW EXCEEDS INFLOW"
8120 PRINT"GATE CONSTRAINT' TO STRINGENT":GOSUB 6120:PRINT K$
8130 PRINT:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10
8140 EXCESS=INVOL-REMAIN-PERMSTOR-TEMPSTOR-OUTVOL
8150 TARGET=EXCESS/(I*ISTEP-T1)
8160 FOR I=1 TO NOSTEL
8170 IF HT(K)<=ELEV(I) THEN GOTO 8200
8180 NEXT I
8190 PRINT M$:GOSUB 6120:PRINT K$:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10
8200 STO(K)=STOR(I-1)+(STOR(I)-STOR(I-1))*(HT(K)-ELEV(I-1))/(ELEV(I)-ELEV(I-1))
8210 IF STORIND=0 THEN GOTO 8440
8220 GOSUB 10170
8230 TEST=0
8240 IF K=0 THEN GOTO 8350
8250 OUTVOL=OUTVOL+(OUTFL(K)+OUTFL(K-1))*CSTEP/2
8260 FOR I=1 TO SPILLNO
8270 IF SPILLWAY(I)=4 THEN GOTO 8310
8280 IF SPILLWAY(I)=5 THEN GOTO 8350
8290 NEXT I
8300 GOTO 8410
8310 IF OUTFL(K)>GATEMFLOW THEN GOTO 8390
8320 IF K=0 THEN GOTO 8410
8330 IF OUTFL(K)-OUTFL(K-1)>FLOWMESC THEN GOTO 8400
8340 GOTO 8410
8350 IF OUTFL(K)>GATEHFLOW THEN GOTO 8390
8360 IF K=0 THEN GOTO 8410
8370 IF OUTFL(K)-OUTFL(K-1)>FLOWHESC THEN GOTO 8400
8380 GOTO 8410
8390 PRINT R$:GOTO 8410
8400 PRINT S$
8410 NEXT K
8420 GOSUB 6120
8430 RETURN
8440 FOR I=1 TO C
8450 IF HT(K)<=HEIGHT(I) THEN GOTO 8480
8460 NEXT I
8470 PRINT N$:PRINT K$:END
8480 OUTFL(K)=OUTFLOW(I-1)+(OUTFLOW(I)-OUTFLOW(I-1))*(HT(K)-HEIGHT(I-1))/(HEIGHT
(I)-HEIGHT(I-1))
8490 FOR J1=1 TO SPILLNO
8500 IF SPILLWAY(J1)=4 THEN GOSUB 9860:OUTFL(K)=OUTFL(K)+MGATE(K)
8510 IF SPILLWAY(J1)=5 THEN GOSUB 9970:OUTFL(K)=OUTFL(K)+MGATE(K)
8520 IF SPILLWAY(J1)=6 THEN GOSUB 3710:OUTFL(K)=OUTFL(K)+FUSE(K)
8530 NEXT J1
8540 HT(K+1)=2*HT(K)-HT(K-1)
8550 FOR J=1 TO C
8560 IF HT(K+1)<=HEIGHT(J) THEN GOTO 8590
8570 NEXT J
8580 PRINT N$:PRINT K$:END
```

```
8590 OUTFL(K+1)=OUTFLOW(I-1)+(OUTFLOW(I)-OUTFLOW(I-1))*(HT(K+1)-HEIGHT(I-1))/(HE
IGHT(I)-HEIGHT(I-1))
8600 IF TARCHECK=0 THEN GOTO 8670
8610 FOR J1=1 TO SPILLNO
8620 IF SPILLWAY(J1)=4 THEN GOSUB 10020:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
8630 IF SPILLWAY(J1)=5 THEN GOSUB 10120:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
8640 IF SPILLWAY(J1)=6 THEN GOSUB 4850:OUTFL(K+1)=OUTFL(K+1)+FUSE(K+1)
8650 NEXT J1
8660 GOTO 9370
8670 FOR J1=1 TO SPILLNO
8680 IF SPILLWAY(J1)=4 THEN GOSUB 10020:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
8690 IF SPILLWAY(J1)=5 THEN GOSUB 10120:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
8700 IF SPILLWAY(J1)=6 THEN GOSUB 4850:OUTFL(K+1)=OUTFL(K+1)+FUSE(K+1)
8710 NEXT J1
8720 IF TARCHECK=1 THEN GOSUB 10710:GOTO 9370
8730 IF INT(OUTFL(K+1))=INT(TARGET) THEN GOTO 9370
8740 IF OUTFL(K+1)<TARGET THEN GOTO 9080
8750 ':REDUCE FLOW TO ACHIEVE TARGET----------  ----------
-
8760 FOR I=1 TO SPILLNO
8770 IF SPILLWAY(I)=4 THEN GOSUB 8820
8780 IF SPILLWAY(I)=5 THEN GOSUB 8950
8790 NEXT I
8800 GOTO 9370
8810 ':OPERATE MANUAL GATES TO REDUCE FLOW----------

8820 ADJUST=GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K+1)-GATEMINVERT(1))^1.5
8830 DISCREP=OUTFL(K+1)-TARGET
8840 IF DISCREP/ADJUST<=.5 THEN MGATEOP(K+1)=MGATEOP(K):RETURN
8850 COUNT=INT(DISCREP/ADJUST)
8860 IF COUNT>GATEMSUM THEN COUNT=GATEMSUM:GOTO 8910
8870 REMAIN=DISCREP/ADJUST-COUNT
8880 IF REMAIN=<.5 THEN REMAIN=0:GOTO 8900
8890 REMAIN=1
8900 COUNT=COUNT+REMAIN:IF COUNT>GATEMSUM THEN COUNT=GATEMSUM
8910 MGATEOP(K+1)=MGATEOP(K)-COUNT
8920 IF MGATEOP(K+1)<0 THEN MGATEOP(K+1)=0
8930 RETURN
8940 ':OPERATE HIGH PRESSURE OUTLETS TO REDUCE FLOW----------

8950 ADJUST=GATEHCOEF(1)*GATEHWIDTH(1)*GATEHHEIGHT(1)*SQR(ABS(2*9.810001*(HT(K+1
)-GATEHIVERT(1)+GATEHHEIGHT(1)/2)))
8960 DISCREP=OUTFL(K+1)-TARGET
8970 IF ADJUST/DISCREP<=.5 THEN HGATEOP(K+1)=HGATEOP(K):RETURN
8980 COUNT=INT(ADJUST/DISCREP)
8990 IF COUNT>GATEHSUM THEN COUNT=GATEHSUM:GOTO 8910
9000 REM=ADJUST/DISCREP-COUNT
9010 IF REM<=0.5 THEN REM=0:GOTO 7002
9020 REM=1
9030 COUNT=COUNT+REM:IF COUNT>GATEHSUM THEN COUNT=GATEHSUM
9040 HGATEOP(K+1)=HGATEOP(K)-COUNT
9050 IF HGATEOP(K+1)<0 THEN HGATEOP(K+1)=0
9060 RETURN
9070 ':INCREASE FLOW TO ACHIEVE TARGET----------
-
9080 FOR I=1 TO SPILLNO
9090 IF SPILLWAY(I)=4 THEN GOSUB 9140
9100 IF SPILLWAY(I)=5 THEN GOSUB 9260
9110 NEXT I
9120 GOTO 9370
```

```
9130 ':OPERATE MANUAL GATES TO INCREASE FLOW-----------------------------------

9140 ADJUST=GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K+1)-GATEMINVERT(1))^1.5
9150 DISCREP=TARGET-OUTFL(K+1)
9160 IF DISCREP/ADJUST<=.5 THEN MGATEOP(K+1)=MGATEOP(K):RETURN
9170 COUNT=INT(DISCREP/ADJUST)
9180 IF COUNT>GATEMSUM THEN COUNT=GATEMSUM:GOTO 9230
9190 REMAIN=DISCREP/ADJUST-COUNT
9200 IF REMAIN<=.5 THEN REMAIN=0:GOTO 9220
9210 REMAIN=1
9220 COUNT=COUNT+REMAIN:IF COUNT>GATEMSUM THEN COUNT=GATEMSUM
9230 MGATEOP(K+1)=MGATEOP(K)+COUNT
9240 RETURN
9250 ':OPERATE HIGH PRESSURE OUTLETS TO INCREASE FLOW-------------------------

9260 ADJUST=GATEHCOEF(1)*GATEHWIDTH(1)*GATEHHEIGHT(1)*SQR(ABS(2*9.810001*(HT(K+1
)-GATEHIVERT(1)+GATEHHEIGHT(1),2)))
9270 DISCREP=TARGET-OUTFL(K+1)
9280 IF ADJUST/DISCREP<=.5 THEN HGATEOP(K+1)=HGATEOP(K):RETURN
9290 COUNT=INT(ADJUST/DISCREP)
9300 IF COUNT>GATEHSUM THEN COUNT=GATEHSUM:GOTO 9350
9310 REM=ADJUST/DISCREP-COUNT
9320 IF REM<=0.5 THEN REM=0:GOTO 7044
9330 REM=1
9340 COUNT=COUNT+REM:IF COUNT>GATEHSUM THEN COUNT=GATEHSUM
9350 HGATEOP(K+1)=HGATEOP(K)+COUNT
9360 RETURN
9370 ':FIND POSITION ON STORAGE INDICATION CURVE-----------------------------

9380 BAL(K)=STO(K)-OUTFL(K)*CSTEP/2+(INFL(K)+INFL(K+1))*CSTEP/2
9390 BAL=0
9400 FOR J1=1 TO SPILLNO
9410 IF SPILLWAY(J1)=4 THEN GOSUB 10020:BAL=BAL+MGATE(K+1)*CSTEP/2
9420 IF SPILLWAY(J1)=5 THEN GOSUB 10120:BAL=BAL+HGATE(K+1)*CSTEP/2
9430 IF SPILLWAY(J1)=6 THEN GOSUB 4850:BAL=BAL+FUSE(K+1)*CSTEP/2
9440 NEXT J1
9450 FOR J=1 TO C
9460 IF BAL(K)<=STORIND(J)+BAL THEN GOTO 9490
9470 NEXT J
9480 PRINT O$:PRINT K$:END
9490 HT(K+1)=HEIGHT(J-1)+(HEIGHT(J)-HEIGHT(J-1))*(BAL(K)-STORIND(J-1)-BAL)/(STOR
IND(J)-STORIND(J-1))
9500 BALA=0
9510 FOR J1=1 TO SPILLNO
9520 IF SPILLWAY(J1)=4 THEN GOSUB 10020:BALA=BALA+MGATE(K+1)*CSTEP/2
9530 IF SPILLWAY(J1)=5 THEN GOSUB 10120:BALA=BALA+HGATE(K+1)*CSTEP/2
9540 IF SPILLWAY(J1)=6 THEN GOSUB 4850:BALA=BALA+FUSE(K+1)*CSTEP/2
9550 NEXT J1
9560 FOR J1=1 TO SPILLNO
9570 IF SPILLWAY(J1)=4 THEN MGATE(K+1)=0
9580 IF SPILLWAY(J1)=5 THEN HGATE(K+1)=0
9590 IF SPILLWAY(J1)=6 THEN FUSE(K+1)=0
9600 NEXT J1
9610 IF INT(BALA)=INT(BAL) THEN GOTO 9640
9620 BAL=BALA
9630 GOTO 9450
9640 IF TARCHECK=1 THEN GOSUB 10710
9650 IF K=0 THEN GOTO 9760
9660 OUTVOL=OUTVOL+(OUTFL(K)+OUTFL(K-1))*CSTEP/2
9670 FOR I=1 TO SPILLNO
9680 IF SPILLWAY(I)=4 THEN GOTO 9720
```

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9690 IF SPILLWAY(I)=5 THEN GOTO 9760
9700 NEXT I
9710 GOTO 9820
9720 IF OUTFL(K)>GATEMFLOW THEN GOTO 9800
9730 IF K=0 THEN GOTO 9820
9740 IF OUTFL(K)-OUTFL(K-1)>FLOWMESC THEN GOTO 9810
9750 GOTO 9820
9760 IF OUTFL(K)>GATEHFLOW THEN GOTO 9800
9770 IF K=0 THEN GOTO 9820
9780 IF OUTFL(K)-OUTFL(K-1)>FLOWHESC THEN GOTO 9810
9790 GOTO 9820
9800 PRINT R$:GOTO 9820
9810 PRINT S$
9820 NEXT K
9830 GOSUB 6120
9840 RETURN
9850 ':MANUAL WEIR FLOW ADDED TO EQUATION-----------------------------------
-
9860 IF Q1$="U" THEN RETURN
9870 IF TIME(K)<T/3600 THEN MGATE(K)=0:RETURN
9880 IF HT(K)<=GATEMINVERT(1) THEN MGATE(K)=0:RETURN
9890 F=GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K)-GATEMINVERT(1))^1.5
9900 MGATE(K)=MGATEOP(K)*F
9910 IF HT(K)<=GATEMINVERT(1)+GATEMSIZE(1) THEN RETURN
9920 NOSPIL=GATEMNO-MGATEOP(K)
9930 IF (HT(K)-GATEMINVERT(1)-GATEMSIZE(1))<=0 THEN SPILL(K)=0:RETURN
9940 SPILL(K)=GATESPILL(1)*GATEMWIDTH(1)*NOSPIL*(HT(K)-GATEMINVERT(1)-GATEMSIZE(
1))^1.5
9950 MGATE(K)=MGATE(K)+SPILL(K):RETURN
9960 ':MANUAL HIGH PRESSURE FLOW ADDED TO EQUATION-----------------------------

9970 IF Q2$="U" THEN RETURN
9980 IF TIME(K)<T/3600 THEN HGATE(K)=0:RETURN
9990 F=GATEHCOEF(1)*GATEHWIDTH(1)*GATEHHEIGHT(1)*SQR(ABS(2*9.810001*(HT(K)-GATEH
INVERT(1)+GATEHHEIGHT(1)/2)))
10000 HGATE(K)=F*HGATEOP(K):RETURN
10010 ':MANUAL WEIR FLOW ADJUSTMENT-----------------------------------------
--
10020 IF Q1$="U" THEN RETURN
10030 IF TIME(K+1)<T/3600 THEN MGATE(K+1)=0:RETURN
10040 IF HT(K+1)<=GATEMINVERT(1) THEN MGATE(K+1)=0:RETURN
10050 MGATE(K+1)=MGATEOP(K)*GATEMCOEF(1)*GATEMWIDTH(1)*(HT(K+1)-GATEMINVERT(1))^
1.5
10060 IF HT(K+1)<=GATEMINVERT(1)+GATEMSIZE(1) THEN RETURN
10070 NOSPIL=GATEMNO-MGATEOP(K)
10080 IF (HT(K+1)-GATEMINVERT(1)-GATEMSIZE(1))<=0 THEN SPILL(K+1)=0:RETURN
10090 SPILL(K+1)=GATESPILL(1)*GATEMWIDTH(1)*NOSPIL*(HT(K+1)-GATEMINVERT(1)-GATEM
SIZE(1))^1.5
10100 MGATE(K+1)=MGATE(K+1)+SPILL(K+1):RETURN
10110 ':MANUAL HIGH PRESSURE FLOW ADJUSTMENT--------------------------------
--
10120 IF Q2$="U" THEN RETURN
10130 IF TIME(K+1)<T/3600 THEN HGATE(K+1)=0:RETURN
10140 F=GATEHCOEF(1)*GATEHWIDTH(1)*GATEHHEIGHT(1)*SQR(ABS(2*9.810001*(HT(K+1)-GA
TEHINVERT(1)+GATEHHEIGHT(1)/2)))
10150 HGATE(K+1)=F*HGATEOP(K):RETURN
10160 ':VOLUME BALANCE WITHOUT STORAGE INDICATION  CURVE---------------------
-
10170 OUTFL(K)=0
10180 FOR J=1 TO SPILLNO
10190 IF SPILLWAY(J)=4 THEN MGATEOP(K+1)=MGATEOP(K)
```

```
10200 IF SPILLWAY(J)=5 THEN HGATEOP(K+1)=HGATEOP(K)
10210 NEXT J
10220 FOR J1=1 TO SPILLNO
10230 IF SPILLWAY(J1)=4 THEN GOSUB 9860:OUTFL(K)=OUTFL(K)+MGATE(K)
10240 IF SPILLWAY(J1)=5 THEN GOSUB 9970:OUTFL(K)=OUTFL(K)+HGATE(K)
10250 IF SPILLWAY(J1)=6 THEN GOSUB 3710:OUTFL(K)=OUTFL(K)+FUSE(K)
10260 NEXT J1
10270 INFLOW=(INFL(K)+INFL(K+1))*CSTEP/2+STO(K)
10280 INCREMENT=1:IF K=0 THEN GOTO 10310
10290 IF HT(K)>HT(K-1) THEN GOTO 10310
10300 HT(K+1)=HT(K)-INCREMENT:GOTO 10320
10310 HT(K+1)=HT(K)+INCREMENT
10320 FOR I=1 TO NOSTEL
10330 IF HT(K+1)<=ELEV(I) THEN GOTO 10360
10340 NEXT I
10350 PRINT M$:GOSUB 6120:PRINT K$:INPUT"PRESS ANY KEY TO CONTINUE:-",Q$:GOTO 10

10360 STO(K+1)=STOR(I-1)+(STOR(I)-STOR(I-1))*(HT(K+1)-ELEV(I-1))/(ELEV(I)-ELEV(I
-1))
10370 OUTFL(K+1)=0
10380 FOR I=1 TO SPILLNO
10390 IF SPILLWAY(I)=4 THEN GOSUB 10020:OUTFL(K+1)=OUTFL(K+1)+MGATE(K+1)
10400 IF SPILLWAY(I)=5 THEN GOSUB 10120:OUTFL(K+1)=OUTFL(K+1)+HGATE(K+1)
10410 IF SPILLWAY(I)=6 THEN GOSUB 4850:OUTFL(K+1)=OUTFL(K+1)+FUSE(K+1)
10420 NEXT I
10430 OUTFLOW=(OUTFL(K+1)+OUTFL(K))*CSTEP/2+STO(K+1)
10440 A=INFLOW:B=OUTFLOW
10450 IF A<10000 AND B<10000 THEN GOTO 10480
10460 A=A/10:B=B/10
10470 GOTO 10450
10480 IF INT(A)>INT(B) THEN INCREMENT=.8*INCREMENT:HT(K+1)=HT(K+1)+INCREMENT:SPI
LL(K+1)=0:GOTO 10320
10490 IF INT(A)<INT(B) THEN INCREMENT=.8*INCREMENT:HT(K+1)=HT(K+1)-INCREMENT:SPI
LL(K+1)=0:GOTO 10320
10500 IF TARCHECK=1 THEN GOSUB 10710
10510 IF INT(OUTFL(K+1))=INT(TARGET) THEN RETURN
10520 IF OUTFL(K+1)<TARGET THEN GOTO 10620
10530 IF TEST=1 THEN RETURN
10540 TEST=1:INCREMENT=1
10550 FOR J=1 TO SPILLNO
10560 IF SPILLWAY(J)=4 AND TIME(K+1)<GATEMSTART THEN RETURN
10570 IF SPILLWAY(J)=4 THEN GOSUB 8820
10580 IF SPILLWAY(J)=5 AND TIME(K+1)<GATEHSTART THEN RETURN
10590 IF SPILLWAY(J)=5 THEN GOSUB 8950
10600 NEXT J
10610 GOTO 10320
10620 IF TEST=1 THEN RETURN
10630 TEST=1:INCREMENT=1
10640 FOR J=1 TO SPILLNO
10650 IF SPILLWAY(J)=4 AND TIME(K+1)<GATEMSTART THEN RETURN
10660 IF SPILLWAY(J)=4 THEN GOSUB 9140
10670 IF SPILLWAY(J)=5 AND TIME(K+1)<GATEHSTART THEN RETURN
10680 IF SPILLWAY(J)=5 THEN GOSUB 9260
10690 NEXT J
10700 GOTO 10320
10710 ':TARGET FLOW FOR RECEDING LIMB OF OUTFLOW HYDROGRAPH----------

10720 DISVOL=INVOL-OUTVOL-PERMSTOR
10730 IF DISVOL<=0 THEN TARGET=0:RETURN
10740 TT=2*DISVOL/OUTFL(K-1)
10750 TARGET=OUTFL(K-1)*(1-CSTEP/TT)
10760 RETURN
```

LISTING FOR PRES PROGRAM BLOCK

```
10 CLEAR:CLS
20 ':GENERAL DEFINITIONS ----------------------------------------------------
30 A$="BOX CULVERTS":B$="FREE OVERFLOW WIER"
40 C$="AUTOMATICALLY CONTROLLED OVERFLOW WIER"
50 D$="MANUALLY CONTROLLED OVERFLOW WEIR"
60 E$="MANUALLY CONTROLLED HIGH PRESSURE OUTLET"
70 F$="FUSEPLUG EMERGENCY SPILLWAY"
80 G$="USER DEFINED SPILLWAY"
90 H$="PLEASE ENTER CORRECT DATA DISK IN DRIVE A"
100 I$="PLEASE REVISE SENSITIVITY AS MODELLING MATRIX TOO LARGE"
110 J$="USER DEFINED SPILLWAY CAPACITY EXCEEDED"
120 K$="JOB ABANDONED****"
130 L$="**********************************************************************
********"
140 M$="RESERVOIR LEVEL EXCEEDS STORAGE/ELEVATION DATA"
150 N$="RESERVOIR LEVEL EXCEEDS MAXIMUM ALLOWABLE LEVEL"
160 O$="STORAGE-INDICATION CURVE EXCEEDED"
170 P$="DATA SET INCONSISTENT"
180 ':PROGRAM HEADING-----------------------------------------------------
-
190 PRINT L$:PRINT
200 PRINT"          FLOOD ROUTING THROUGH DAM WITH MULTIPLE SPILLWAY SYSTEM"
210 PRINT:PRINT"          L. FURSTENBURG   (011-683-1665)                    1
985"
220 PRINT:PRINT"          PRESENTATION BLOCK":PRINT:PRINT L$:PRINT
230 PRINT"          THE FOLLOWING OPTIONS ARE PROVIDED:-":PRINT
240 PRINT"               1.PRINT RESULTS ON
250 PRINT"               2.PRINT RESULTS
260 PRINT"               3.CHAIN TO DATA"
270 PRINT"               4.CHAIN TO CALC"
280 PRINT"               5.FINISH
290 PRINT:INPUT"          PLEASE SELECT OPTION:-",OPT1
300 ON OPT1 GOSUB 360,360,320,330,340
310 GOTO 10
320 CHAIN "A:DATA"
330 CHAIN "A:CALC"
340 CLS:END
350 ':READ DATA FILE FROM DISK--------------------------------------------
-
360 CLS:PRINT L$
370 INPUT"PLEASE ENTER NAME OF DATA FILE RESULTS TO BE PRESENTED:-",X$:IF X$=""
THEN PRINT CHR$(7);"A NAME IS REQUIRED":GOTO 370
380 X$=I$+".RES"
390 ON ERROR GOTO 440
400 OPEN X$ FOR INPUT AS £1
410 ON ERROR GOTO 0
420 GOSUB 520
430 CLOSE £1:GOTO 460
440 PRINT"THIS FILE DOES NOT EXIST"
450 RESUME 370
460 ':PRINT DATA FILE ON CORRECT DEVICE-----------------------------------
-
470 IF OPT1=1 THEN GOTO 510
480 IF OPT1=2 THEN GOTO 500
490 PRINT P$:PRINT K$:END
500 OPEN "LPT1:" FOR OUTPUT AS £1:PRINT £1,CHR$(27);"C";CHR$(70):GOTO 1420
510 OPEN "SCRN:" FOR OUTPUT AS £1:GOTO 1420
520 ':READING RESULTS FROM DISK-------------------------------------------

530 PRINT:PRINT"READING RESULTS FROM DISK"
540 INPUT £1,TITLE1$,TITLE2$,DTL,NOSTEP,SPILLNO
```

```
550 IF OTL=2 THEN GOSUB 880
560 GOSUB 590
570 CLOSE £1
580 RETURN
590 ':READ CALCULATION RESULTS-------------------------------------------------

600 FOR I=1 TO SPILLNO
610 INPUT £1,SPILLWAY(I)
620 NEXT I
630 INPUT £1,Q3,Q4,Q1$,Q2$
640 IF Q1$="P" THEN Q3=2
650 IF Q2$="P" THEN Q4=2
660 DIM TIME(NOSTEP),INFL(NOSTEP),OUTFL(NOSTEP),HT(NOSTEP),STO(NOSTEP),MGATEOP(N
OSTEP)
670 DIM LGATE(NOSTEP),MGATE(NOSTEP),HGATE(NOSTEP),SPILL(NOSTEP),HGATEOP(NOSTEP)
680 FOR J=0 TO NOSTEP
690 INPUT £1,TIME(J),INFL(J),OUTFL(J),HT(J),STO(J)
700 FOR J2=1 TO SPILLNO
710 IF SPILLWAY(J2)=3 THEN INPUT £1,LGATE(J)
720 IF SPILLWAY(J2)=4 AND Q3=2 THEN INPUT £1,MGATE(J),SPILL(J),MGATEOP(J)
730 IF SPILLWAY(J2)=4 AND Q3=1 THEN INPUT £1,MGATE(J),SPILL(J):GOSUB 830
740 IF SPILLWAY(J2)=5 AND Q4=2 THEN INPUT £1,HGATE(J),HGATEOP(J)
750 IF SPILLWAY(J2)=5 AND Q4=1 THEN INPUT £1,HGATE(J):GOSUB 790
760 NEXT J2
770 NEXT J
780 RETURN
790 FOR K2=1 TO GATEHNO
800 INPUT £1,HGATEOP(J,K2)
810 NEXT K2
820 RETURN
830 FOR K2=1 TO GATEMNO
840 INPUT £1,MGATEOP(J,K2)
850 NEXT K2
860 RETURN
870 ':READ ADDITIONAL DATA-----------------------------------------------------
880 INPUT £1,NOSTEL,SPILLNO
890 DIM ELEV(NOSTEL),STOR(NOSTEL)
900 FOR I=1 TO NOSTEL
910 INPUT £1,ELEV(I),STOR(I)
920 NEXT I
930 FOR I=1 TO SPILLNO
940 INPUT £1,SPILLWAY(I)
950 ON SPILLWAY(I) GOSUB 980,1050,1070,1150,1250,1340,1360
960 NEXT I
970 RETURN
980 INPUT £1,CULNO
990 DIM CULWIDTH(CULNO),CULHEIGHT(CULNO),CULINVERT(CULNO)
1000 DIM CULUNCOEF(CULNO),CULSUBCOEF(CULNO)
1010 FOR J=1 TO CULNO
1020 INPUT £1,CULWIDTH(J),CULHEIGHT(J),CULINVERT(J),CULUNCOEF(J),CULSUBCOEF(J)
1030 NEXT J
1040 RETURN
1050 INPUT £1,WIERLENGTH,WIERINVERT,WIERCOEF
1060 RETURN
1070 INPUT £1,GATELNO
1080 DIM GATELINVERT(GATELNO),GATELCOEF(GATELNO),GATELWIDTH(GATELNO)
1090 DIM GATELHEIGHT(GATELNO),GATELS(GATELNO),GATELE(GATELNO)
1100 FOR J=1 TO GATELNO
1110 INPUT £1,GATELINVERT(J),GATELCOEF(J),GATELWIDTH(J)
1120 INPUT £1,GATELHEIGHT(J),GATELS(J),GATELE(J)
1130 NEXT J
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Author Furstenburg Leon
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