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January 1980

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Finney, Brad A.; Bowles, David S.; and Windham, Michael P., "User Manual for the Probabilistic Stream Simulation and Assessment Model (PSSAM)" (1980). *Reports*. Paper 490.

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USER MANUAL FOR THE PROBABILISTIC
STREAM SIMULATION AND ASSES-
MENT MODEL (PSSAM)

by

Brad A. Finney, David S. Bowles
and Michael P. Windham

Supplement to UWRL/Q-79/06

(WR-239)

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February 1980

APPENDIX A: Input Data Formats for Program PSSAM

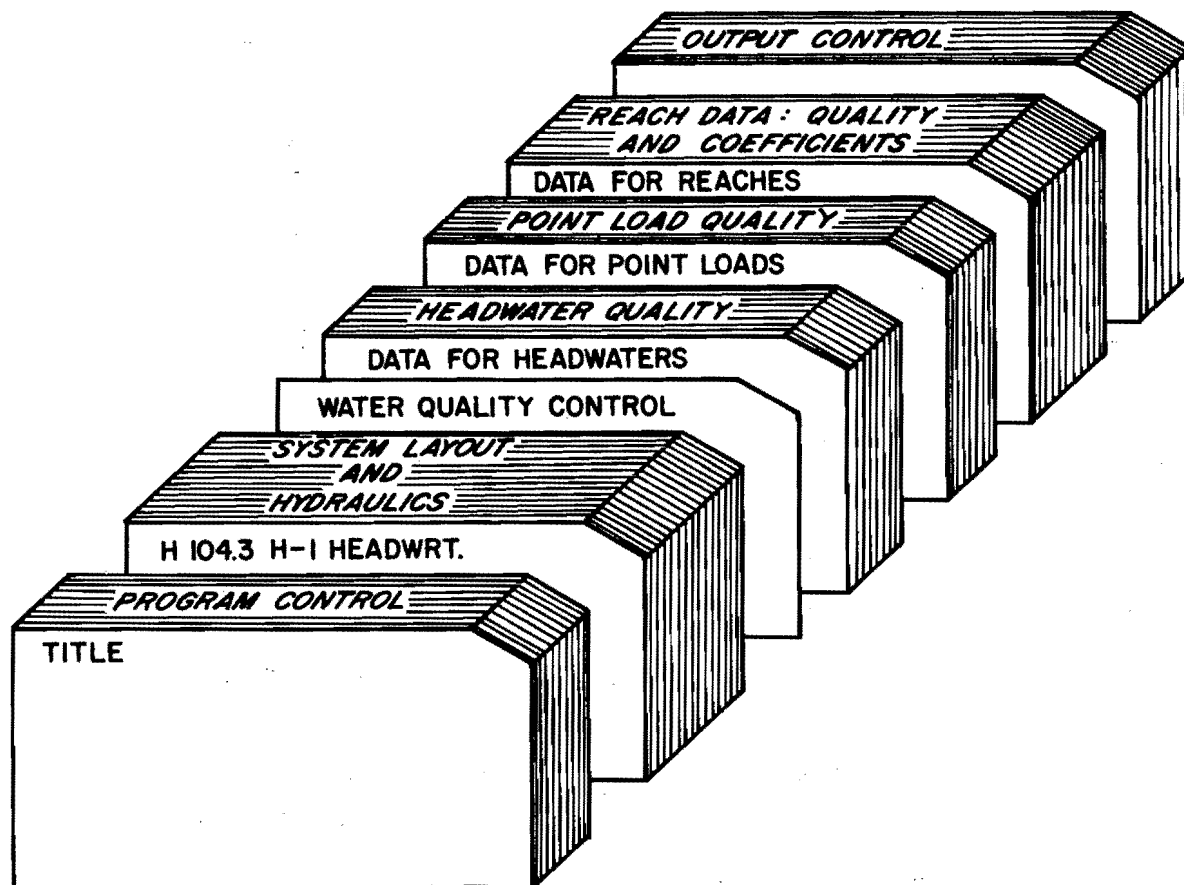


Figure A.1. Typical data deck setup for PSSAM.

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
Program Control	1	1-80	20A4	TITLE (I)	Title of run
	2	1-80	20A4	SUBTL (I)	Subtitle of run
	3	1-2	I2	IOPRUN	Run option = 1: thru flow balance = 2: thru water quality coefficients = 3: complete run
	3	3-4	I2	ICVI	Metric conversion for input data = blank: all input is metric = 1: all input is English
	3	5-6	I2	ICVO	English conversion for output = blank: all output will be metric = 1: all output will be English
	3	7-8	I2	IOPECH	Echo input data = blank: echo input = 1: do not echo input data
	3	9-10	I2	IOPSUM	Summary option = blank: write summary for both hydraulics and quality = 1: write summary for hydraulics only = 2: write summary for quality only
	3	11-12	I2	IOPWRT	Output option = blank: write responses when calculated = 1: sort output by stream segment
	3	14	I1	IOPGW	Groundwater outflow option = blank: QG is modeled like QS = 1: QG is modeled as a fraction of stream flow

System Layout and Hydraulics: input formats are shown in Table A-1.

IFLAG

H = headwater (considered the start of a new reach)
R = start of a new reach
J = junction: just downstream from a tributary junction (considered as the start of a new reach)
L = point load
D = point diversion
C = check point (output desired at this point)
B = branch point: just upstream from a tributary junction
E = reach in which evaporation is significant (considered as the start of a new reach)
T = terminal downstream point in the system

X = upstream distance to the point (miles or kilometers)

XID = point identification code

Description = point description

Column 31 = S: suppresses output for computer generated points

DX = maximum downstream element length; if the next downstream point is a greater distance away intermediate points will be generated

Q = for H or L: flow for headwater or point load (ft³/sec or m³/sec)
= for E: evaporation (ft³/sec/mile or m³/sec/kilometer)

QS = lateral surface inflow (+) or outflow (-) (ft³/sec/mile or m³/sec/kilometer)

QG = lateral groundwater inflow (+) or outflow (-) (ft³/sec/mile or m³/sec/kilometer)
= for IOPFLO = 1: outflow (-) (fraction of mainstream flow/mile or per kilometer)

S = average slope of stream bed (dimensionless)

n = Manning's coefficient

CQV = θ_1 in the equation $V = \theta_1 Q^{\theta_2}$

EQV = θ_2 in the equation $V = \theta_1 Q^{\theta_2}$

CAR = θ_3 in the equation $R = \theta_3 A^{\theta_4}$

EAR = θ_4 in the equation $R = \theta_3 A^{\theta_4}$

IOPRAD = E: use equations above to calculate hydraulic radius
= Ø: (blank) use Manning's equation to calculate hydraulic radius

Table A-1. Input format for system layout and hydraulics.

Symbol	IFLAG	Type of Point	X	Distance to Point (miles or km)	XID	Abbreviated Identification Symbol	Descript.	Point Identification Description	AI	If = S, Suppress Output for Computer Generated Calculation Points	DX	Maximum Downstream Element Length (miles or km)	Q	Point Flow & Evap. (cfs or cms) (cfs/mile or cms/km)	QS	Lateral Surface Inflow Downstream Reach (cfs/mile or cms/km)	QG	Lateral Groundwater Inflow Downstream Reach (cfs/mile or cms/km)	S	Slope of Downstream Reach	n	Manning's Coefficient for Downstream Reach	CQV	Flow to Velocity Coefficient Downstream Reach	EQV	Flow to Velocity Exponent, Downstream Reach	CAR	Area to Hydraulic Radius Coefficient Downstream Reach	EAR	Area to Hydraulic Radius Exponent Downstream Reach	IOPRAD	Flow to Hydraulic Radius Option. E = Empirical, ϕ = Mannings		
Format	A1	1	F7.0	2	A4	9	A2, 4A4	13	AI	31	F3.0	32	F5.0	35	F5.0	40	F5.0	45	F5.5	50	F5.5	55	F5.0	60	F5.0	65	F5.0	70	F5.0	75	AI	80		
Beginning Column																																		
Headwater	H		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Reach	R		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Junction	J		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Point Load	L		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Point Diversion	D		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Check Point	C		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Branch Point	B		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Evaporation	E		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Terminal	T		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Data Segment	Card No. In Data Segment	Format	Symbol	Description
Water Quality Control	1	Format Free	NR	Number of grid points for BOD (max. = 201)
	1	Format Free	RMIN	Value of BOD at grid point 1
	1	Format Free	RMAX	Value of BOD at grid point NR
	1	Format Free	NS	Number of grid points for transformed variable (max. = 201)
	1	Format Free	SMIN	Value of S at grid point 1
	1	Format Free	SMAX	Value of S at grid point NS
	1	Format Free	X2MIN	Value of DO at grid point 1
	1	Format Free	X2MAX	Value of DO at grid point NR
	1	Format Free	DTMAX	Maximum step size for finite difference algorithm (sec.)
1	Format Free	IWTPDF	Output option of PDF of BOD and DO = 0: Output PDF of BOD and DO = 1: No output	

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
Headwater Quality	1	1-18	A4		"DATA FOR HEADWATER"
	2	1-4	A4		Headwater identification code
	2	11-20	F10.0	XMO(1)	Mean BOD concentration at headwater (mg/l)
	2	21-30	F10.0	XMO(3)	Variance of BOD concentration at headwater (mg/l) ²
	2	31-40	F10.0	XMO(2)	Mean of DO concentration at headwater (mg/l)
	2	41-50	F10.0	XMO(5)	Variance of DO concentration at headwater (mg/l) ²
	2	51-60	F10.0	XMO(4)	Covariance of BOD-DO concentration at headwater (mg/l) ²
Point Load Quality	1	1-20			"DATA FOR POINT LOADS"
	2				Same format as for headwater. Repeat card 2 for each point load. If there are no point loads, omit this section.

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
Reach Data: Quality and Coefficients	1	1-16			"DATA FOR REACHES"
	2	1-17			"WATER TEMPERATURE"
	3	1-10	F10.0	CTEMP(1)	Water temperature for reach 1 (°C)
		11-20	F10.0	CTEMP(2)	Water temperature for reach 2 (°C)
		21-30	F10.0	CTEMP(3)	Water temperature for reach 3 (°C)
		· · ·			
	71-80	F10.0	CTEMP(8)	Water temperature for reach 8 (°C)	
					(Use as many cards like 3 as necessary to include all reaches)
	4	1-17			"BOD DIFFUSE INPUT"
	5	1-4	A4		Reach identification code
5	11-20	F10.0	CS(1,1)	Concentration of BOD in lateral surface inflow for reach 1 (mg/l)	
5	21-30	F10.0	CS(3,1)	Variance of the white noise process for lateral inflow of BOD for reach 1 (mg/l/sec) ²	

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
	5	31-40	F10.0	CG(1,1)	Concentration of BOD in lateral ground inflow for reach 1 (mg/l)
	5	41-50	F10.0	CG(3,1)	Variance parameter of the white noise process for lateral ground inflow of BOD for reach 1 (mg/l/sec) ²
	5	51-60	F10.0	COEF(1,7,1)	Leach rate of BOD for reach 1 (g/m ² /day)
	5	61-70	F10.0	COEF(3,7,1)	Variance parameter of the white noise process for BOD leach rate for reach 1 (g/m ² /day ²) ² (Use as many cards like 5 as necessary to include all reaches)
	6	1-25			"BOD EQUATION COEFFICIENTS"
	7	1-4	A4		Reach identification code
		11-20	F10.0	COEF(1,1,1)	$\beta_{1,1}$ for reach 1 (1/day)
		21-30	F10.0	COEF(3,1,1)	Standard deviation parameter of the white noise process for $\beta_{1,1}$ for reach 1 (percent of $\beta_{1,1}$)

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
	7	31-40	F10.0	COEF(1,2,1)	First-order decay rate ($\beta_{1,1}$) for reach 1 (1/day)
	7	41-50	F10.0	COEF(3,2,1)	Standard deviation parameter of the white noise process for $\beta_{2,1}$ for reach 1 (percent of $\beta_{2,1}$) (Use as many cards like 7 as necessary to include all reaches)
	8	1-16			"DO DIFFUSE INPUT"
	9				Same as card 5 except for DO
	10	1-24			"DO EQUATION COEFFICIENTS"
	11	1-4	A4		Reach identification code
	11	11-20	F10.0	COEF(2,1,1)	First-order removal rate ($\beta_{1,2}$) for reach 1 (1/day). If left blank, program will calculate reaeration
	11	21-30	F10.0	COEF(4,1,1)	Standard deviation parameter of the white noise process for $\beta_{2,1}$ for reach 1 (percent of $\beta_{2,1}$)

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
	11	31-40	F10.0	COEF(2,2,1)	Dissolved oxygen saturation ($\beta_{2,2}$) for reach 1 (mg/l) OPTIONAL: If COEF(2,2,1) is the negative of the elevation of reach 1 in km, the gram will calculate $\beta_{2,2}$
	11	41-50	F10.0	COEF(2,3,1)	Net oxygen production by phytoplankton ($\beta_{2,3}$) for reach 1 (mg/l/day)
	11	51-60	F10.0	COEF(4,3,1)	Standard deviation parameter of white noise process for $\beta_{2,3}$ for reach 1 (percent $\beta_{2,3}$)
	11	61-70	F10.0	COEF(2,4,1)	Benthic uptake of oxygen ($\beta_{2,4}$) for reach 1 (g/m ² /day)/(mgO ₂ /l)
	11	71-80	F10.0	COEF(4,4,1)	Standard deviation parameter of white noise process for $\beta_{2,4}$ for reach 1 (percent $\beta_{2,4}$) (Use as many cards like 11 as necessary to include all reaches.)

Data Segment	Card No. in Data Segment	Column	Format	Symbol	Description
Output Control	1	1-6	A6	TITPDF(1,1)	Output file title for marginal pdf of BOD at Calculation Point 1
	1	7-12	A6	TITPDF(1,2)	Output file title for marginal pdf of BOD at calculation point 2
		.			
		:			
		.			
	1	73-78	A6	TITPDF(1,13)	Output file title for marginal pdf of BOD at calculation point 13 (Use as many cards like 1 as necessary to include all calculation points)
	2				Same as 1 except for marginal pdf of DO
	3				Same as 1 except for joint pdf of BOD-DO

NOTE: All output file titles must be followed by a "."

APPENDIX B: Listing of Program PSSAM

```

100 C*      PROBABILISTIC STREAM SIMULATION AND ASSESSMENT MODEL (PSSAM)
200 C*
300 FILE 5(KIND=DISK,TITLE='SSANDATA',FILETYPE=8)
400 FILE 6(MAXRECSIZE=22)
500 FILE 7=FILE7
600 FILE 31(KIND=DISK,MAXRECSIZE=3,BLOCKSIZE=36,AREAS=1000,AREASIZE=36,
700      *   SAVEFACTOR=99,TITLE='DUM1')
800 FILE 32(KIND=DISK,MAXRECSIZE=3,BLOCKSIZE=36,AREAS=1000,AREASIZE=36,
900      *   SAVEFACTOR=99,TITLE='DUM2')
1000 FILE 33(KIND=DISK,MAXRECSIZE=10,BLOCKSIZE=60,AREAS=1000,AREASIZE=60,
1100      *   SAVEFACTOR=99,TITLE='DUM3')
1200      COMMON Q(500),X(500),XID(500),ABAR(500),RBAR(500),VBAR(500)
1300      *,IFLAG(500),NR,NW,TITLE(20),SUBTL(20),ZL(12,150),QL(150),QD(150)
1400      *,QS(100),QB(100),CS(12,100),CG(12,100),G(12,10),IV(12,10),NTD(12)
1500      *,ICODE(12),CODE(12),IPARAM(12),CHW(15,12),ZO(12),Z(12),NTI(12)
1600      *,IFORM(12,50),B(12,50),E(12,50),ET(12,50),C(12),ZJUNC(12),NCON
1700      *,NEND,NREACH,NHDW,NLOAD,NDIRV,NPTL,NRLM,NLDL,NITL,ZD(12,500)
1800      *,COEF(12,7,100),MAXHD,MAXBR,NCOE(12),NCONU(12),CX(12),CTEMP(100)
1900      *,NCOEFL,QEVAP(100),RAVEV(100),RAVED(100),ISOLVE
2000      DIMENSION TBL1(10)
2100      DATA TBL1/1HH,1HR,1HJ,1HL,1HD,1HC,1HB,1HE,1HT,1HS/
2200 C*      NR IS THE READ DEVICE AND NW IS THE WRITE DEVICE
2300      NR=5
2400      NW=6
2500 C*      NPTL IS THE NPOINT LIMIT, NRLM THE NO. OF REACH
2600 C*      LIMIT, NLDL THE MAX. NO. OF LOAPS ALSO THE MAX. NO.
2700 C*      OF DIVERSIONS, NITL THE MAX, NO. OF TERMS ALLOWED.
2800      NPTL=500
2900      NRLM=100
3000      NLDL=150
3100      NITL=50
3200      MAXHD=1
3300      MAXBR=14
3400      NCOEFL=7
3500      10 CALL CONTRL(TBL1)
3600      GOTO 10
3700      END
3800      SUBROUTINE CONTRL(TBL1)
3900      COMMON Q(500),X(500),XID(500),ABAR(500),RBAR(500),VBAR(500)
4000      *,IFLAG(500),NR,NW,TITLE(20),SUBTL(20),ZL(12,150),QL(150),QD(150)
4100      *,QS(100),QB(100),CS(12,100),CG(12,100),G(12,10),IV(12,10),NTD(12)
4200      *,ICODE(12),CODE(12),IPARAM(12),CHW(15,12),ZO(12),Z(12),NTI(12)
4300      *,IFORM(12,50),B(12,50),E(12,50),ET(12,50),C(12),ZJUNC(12),NCON
4400      *,NEND,NREACH,NHDW,NLOAD,NDIRV,NPTL,NRLM,NLDL,NITL,ZB(12,500)
4500      *,COEF(12,7,100),MAXHD,MAXBR,NCOE(12),NCONU(12),CX(12),CTEMP(100)
4600      *,NCOEFL,QEVAP(100),RAVEV(100),RAVED(100),ISOLVE
4700      COMMON/S/ NSEG(15),ISST(15,15),ISED(15,15),IRR(15,15),IJJ(15,15)
4800      *,ILL(15,15)
4900      DIMENSION TBL1(10),XLF(201,201),XLFXX(201,201),SX2GRD(201,201)
5000      DIMENSION ZB(15,12),IJCO(15)

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5100      1 CALL HYBRAU(IOPRUN,NPOINT,ICVI,ICVO,IOPECH,IOPSUN,TBL1,IOPVRT)
5200      2 IF(IOPRUN.EQ.1) STOP
5300      CALL QUALIN(NR,NW,TITLE,SUBTL,NLOAD,COEF,IOPECH,ZL,NREACH,CS,C6,
5400      *          RAVEV,RAVED,CTEMP,IOPSUN,DTMAX,NPOINT)
5500      IF(IOPRUN.EQ.2) STOP
5600      DO 6 I=1,12
5700      ZO(I)=0.
5800      6 CONTINUE
5900      IU=0
6000      ID=0
6100      IL=0
6200      IH=0
6300      IR=0
6400      IJ=0
6500      IB=0
6600      NSTOP=NPOINT-1
6700      IPP=0
6800      DO 100 IP=1,NSTOP
6900      IFL=IFLAG(IP)
7000 C*
7100 C*      CALL PROGRAM THAT LINKS HYDRAULICS TO THE NUMERICAL SOLUTION
7200 C*      TO THE PDF OF BOD AND DO SUBROUTINES
7300 C*
7400      IF(IFL.EQ.1.OR.IFL.EQ.2)IRDUM=IR+1
7500      CALL LINK(IP,IRDUM,GS,G6,CS,C6,ABAR,RBAR,COEF)
7600      GOTO(101,102,108,103,104,107,108,102,108,107,107),IFL
7700 101      CONTINUE
7800 C*
7900 C*      HEADWATER
8000 C*
8100      IH=IH+1
8200      CALL INITCD(XLF,XLFX,SX2GRD,ZO,NW)
8300 102      CONTINUE
8400 C*
8500 C*      HEAD OF REACH
8600 C*
8700      IR=IR+1
8800      GO TO 107
8900 103      CONTINUE
9000 C*
9100 C*      POINT LOAD
9200 C*
9300      IL=IL+1
9400      CALL LOAD(Q(IP),QL(IL),ZL(1,IL),ZL(2,IL),ZL(3,IL),ZL(4,IL),
9500      *          ZL(5,IL),XLF,XLFX,SX2GRD,ZO)
9600      GO TO 107
9700 104      CONTINUE
9800 C*
9900 C*      POINT DIVERSION
10000 C*

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```

10100      ID=ID+1
10200 107  CONTINUE
10300 C+
10400 C+  ALL OF THE ABOVE PLUS CALCULATION AND CHECK POINT
10500 C+
10600      DO 135 I=1,5
10700      ZD(I,IP)=ZO(I)
10800 135  CONTINUE
10900 C+
11000 C+  SOLVE FOR PDF AT NEXT TIME
11100 C+
11200      IPP1=IP+1
11300      TIME=(X(IP)-X(IPP1))*1000./VBAR(IP)
11400      IF(IFL.NE.9.AND.IDPWRT.EQ.0)CALL WRPT(1,IP,IW,ICV0)
11500      CALL PDF(TIME,XLF,XLFX,SX2GRD,ZO,DTMAX,IP,NW)
11600      IF(IFL.NE.9.AND.IDPWRT.EQ.0)CALL WRPT(1,IP,IW,ICV0)
11700 100  CONTINUE
11800      DO 145 I=1,5
11900      ZD(I,NPOINT)=ZO(I)
12000 145  CONTINUE
12100      IF(IDPWRT.EQ.0) GO TO 513
12200      CALL TITL(TITLE,SUBTL,NW)
12300      WRITE(NW,551)
12400 551  FORMAT(/,33X,'BOD',17X,'DO',11X,'BOD-DO',/,2X,'PNT  DISTANCE',
12500      *      3X,'ID',2(7X,'MEAN',6X,'VAR'),7X,'COV')
12600      DO 512 IH=1,NHDW
12700      N1=NSEG(IH)
12800      DO 514 I=1,N1
12900      N2=ISST(IH,I)
13000      N3=ISEB(IH,I)
13100      IR=IRR(IH,I)
13200      DO 516 IP=N2,N3
13300      IF(ICV0.GT.0) X(IP)=X(IP)*.62137119
13400      IFL=IFLAG(IP)
13500      GOTO(560,561,561,520,520,520,520,561,520,516,520),IFL
13600 560  IR=IR+1
13700      WRITE(NW,570) IR,IH
13800 570  FORMAT(1H0 // 1H0,'REACH#',I3,4X,'HEADWATER',I3)
13900      GOTO 520
14000 561  IR=IR+1
14100      WRITE(NW,571) IR
14200 571  FORMAT(1H0,'REACH#',I3)
14300      WRITE(NW,553)IP,X(IP),XID(IP),ZD(1,IP),ZD(3,IP),ZD(2,IP),
14400      *      ZD(5,IP),ZD(4,IP)
14500 553  FORMAT(1H ,I4,F10.2,2X,A4,5F10.3)
14600      GOTO 516
14700 520  WRITE(NW,552)IP,X(IP),XID(IP),ZD(1,IP),ZD(3,IP),ZD(2,IP),
14800      *      ZD(5,IP),ZD(4,IP)
14900 552  FORMAT(1H0,I4,F10.2,2X,A4,5F10.3)
15000 516  CONTINUE

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15100 514 CONTINUE
15200 512 CONTINUE
15300 GO TO 515
15400 513 CALL WRPT(1,NPOINT,IW,ICVO)
15500 515 CONTINUE
15600 STOP
15700 108 WRITE(6,601) IP,IFL
15800 601 FORMAT(1H /// 1H ,72HERROR IN SUBROUTINE CONTRL, MAY BE CP TYPE,
15900 *STOP AT STATEMENT 108, IP= ,I3,3X, 4HIFL=,I3)
16000 STOP
16100 END
16200 SUBROUTINE HYDRAU(IOPRUN,NPOINT,ICVI,ICVO,IOPECH,IOPSUM,TBL1,
16300 *IOPURT)
16400 COMMON Q(500),X(500),XID(500),ABAR(500),RBAR(500),VBAR(500)
16500 *,IFLAG(500),NR,NW,TITLE(20),SUBTL(20),ZL(12,150),QL(150),QD(150)
16600 *,QS(100),QG(100),CS(12,100),CB(12,100),G(12,10),IV(12,10),NTD(12)
16700 *,ICODE(12),CODE(12),IPARAM(12),CHW(15,12),ZO(12),Z(12),NTI(12)
16800 *,IFORM(12,50),B(12,50),E(12,50),ET(12,50),C(12),ZJUNC(12),NCON
16900 *,NEND,NREACH,NHDW,NLOAD,NDIRV,NPTL,NRLM,NLDL,NITL,ZD(12,500)
17000 *,COEF(12,7,100),MAXHD,MAXBR,NCOE(12),NCONU(12),CX(12),CTEMP(100)
17100 *,NCOEFL,QEVAP(100),RAVEV(100),RAVED(100),ISOLVE
17200 DIMENSION TBL(14),TBL1(10),IJCO(15)
17300 COMMON/S/ NSEG(15),ISST(15,15),ISED(15,15),IRR(15,15),IJJ(15,15)
17400 * ,ILL(15,15)
17500 DATA DATA1,END/3HICP,4HENDR/
17600 C* READ TITLE AND SUBTITLE CARDS
17700 1 READ(NR,202) (TITLE(I),I=1,20)
17800 IF(TITLE(1).EQ.'ENDJ') STOP
17900 READ(NR,202) (SUBTL(I),I=1,20)
18000 202 FORMAT(20A4)
18100 CALL TITL(TITLE,SUBTL,NW)
18200 READ(NR,203) IOPRUN,ICVI,ICVO,IOPECH,IOPSUM,IOPURT
18300 * ,IOPGW
18400 203 FORMAT(7I2)
18500 WRITE(NW,204) IOPRUN,ICVI,ICVO,IOPECH,IOPSUM,IOPURT,IOPGW
18600 204 FORMAT(9H0IOPRUN =I2,5X6HICVI =I2,5X6HICVO =I2,5X8HIOPECH =I2,
18700 *5X,8HIOPSUM =,I2,5X,8HIOPURT =,I2,5X,'IOPGW=',I2)
18800 C*(TBL1) H R J L D C B E T S
18900 C* 1 2 3 4 5 6 7 8 9 10
19000 IF(IOPECH.NE.1) WRITE(NW,600)
19100 600 FORMAT(1H0,4HCARD,1X,8HDISTANCE,1X,20HNMEMONIC DESCRIPTION,1X,5HPR
19200 *INT,1X,5HDELTA,3X,4HFLOW,3X,7HLATERAL,2X,7HLATERAL,3X,5HSLOPE,3X,7
19300 *HMANNING,4X,3HVEL,6X,3HVEL,5X,4HHYDR,5X,4HHYDR,3X,4HHYDR/1H ,4HCOD
19400 *E,32X,4HCODE,16X,7HSURFACE,2X,6HGROUND,14X,3H N ,5X,4HCOEF,6X,3HEX
19500 *P,6X,4HCOEF,5X,3HEXP,4X,3HOPT/1H ,58X,4HFLOW,4X,4HFLOW/)
19600 IP=0
19700 IH=0
19800 IR=0
19900 IJ=0
20000 IL=0

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20100      ID=0
20200      IB=0
20300      IBB=0
20400      ITERM=0
20500      IS=1
20600      IE=2
20700      IID1=0
20800      IID2=1
20900      400 CALL SYSDAT(IS,ICVI,IOPECH,TBL1,ZL,NR,NU,IOPGW)
21000      150 IP=IP+1
21100      IF(IP.LE.NPTL) GO TO 152
21200      WRITE(6,250)
21300      250 FORMAT(46H THE NUMBER OF CALCULATION POINTS EXCEEDS NPTL)
21400      STOP
21500      152 CALL SYSDAT(IE,ICVI,IOPECH,TBL1,ZL,NR,NU,IOPGW)
21600      X(IP)=ZL(IS,2)
21700      IFLAG(IP)=ZL(IS,1)+0.1
21800      IFL=IFLAG(IP)
21900      IF(IFL.LE.3.OR.IFL.EQ.8)XINC=ZL(IS,10)
22000      XEND=ZL(IE,2)
22100      XID(IP)=ZL(IS,3)
22200      IID1=IID1+1
22300      IF(IID1.LE.NRLM) GOTO 15
22400      IID1=1
22500      IID2=IID2+1
22600      15 DO 20 K=4,8
22700      20 COEF(K,IID2,IID1)=ZL(IS,K)
22800      160 IF(XINC.LT..01) GOTO 10
22900      XRUN=X(IP)-XINC*1.10
23000      IF(XRUN.LT.XEND) GOTO 10
23100      DELX=XINC*1000.
23200      GOTO 11
23300      10 DELX=(X(IP)-XEND)*1000.
23400      IFP1=ZL(IE,1)+0.1
23500      IF(IFP1.EQ.9) ITERM=1
23600      XRUN=-1000.
23700      11 IF(DELX.GE.0.0) GO TO 12
23800      WRITE( 6,205) XID(IP),IP,X(IP),DELX
23900      205 FORMAT(1H0,'CHECK FOR INCREASING MILEAGE IN THE DOWNSTREAM'
24000      *      , ' DIRECTION NEAR ',A4 / 1H , 'IP =',I4,5X, 'X(IP) =',
24100      *      ,F12.3, ' KM',5X, 'DELX =',E11.3, ' M')
24200      STOP
24300      12 IFL=IFLAG(IP)
24400      GO TO (101,102,103,104,105,106,107,102,108,106,106),IFL
24500      101 IH=IH+1
24600      IR=IR+1
24700      Q(IP)=ZL(IS,11)
24800      GO TO 110
24900      102 IR=IR+1
25000      Q(IP)=QEND

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25100      GO TO 114
25200      103 IR=IR+1
25300      K=IJCO(IB)
25400      Q(IP)=QEND+Q(K)
25500      IB=IB-1
25600      XTEST=ABS(X(IP)-X(K))/X(IP)
25700      IF(XTEST.LT.0.1) GOTO 114
25800      WRITE(NW,260) XID(IP),X(IP),X(K)
25900      260 FORMAT(1H0,'AT ',A4,', RIVER MILES AT JUNCTION,',F8.2
26000      *      ', DO NOT MATCH BRANCH,',F8.2)
26100      IOPRUN=1
26200      GO TO 114
26300      110 IF(IH.LE.MAXHD) GO TO 114
26400      WRITE(6,251)
26500      251 FORMAT(51H THE MAXIMUM NUMBER OF HEADWATERS HAS BEEN EXCEEDED)
26600      STOP
26700      114 IF(IR.LE.NRLM) GO TO 115
26800      WRITE(NW,252)
26900      252 FORMAT(48H THE MAXIMUM NUMBER OF REACHES HAS BEEN EXCEEDED)
27000      STOP
27100      115 QS(IR)=ZL(IS,12)*0.001
27200      QG(IR)=ZL(IS,13)*0.001
27300      IF(IFL.EQ.8) GOTO 702
27400      QEVAP(IR)=0.0
27500      GOTO 704
27600      702 QEVAP(IR) = ZL(IS,11)*0.001
27700      704 CONTINUE
27800      IFLICP=ZL(IS,9)+0.1
27900      SLOPE=ZL(IS,14)
28000      CHAN=ZL(IS,15)
28100      CBV=ZL(IS,16)
28200      EQV=ZL(IS,17)
28300      CAR=ZL(IS,18)
28400      EAR=ZL(IS,19)
28500      IOPRAD=ZL(IS,20)+0.1
28600      LID2=IID2
28700      LID1=IID1
28800      COEF(1,LID2,LID1)=0.
28900      COEF(2,LID2,LID1)=0.
29000      COEF(10,LID2,LID1)=0.
29100      IF(IR-1.NE.0) RAVEV(IR-1)=RAVEV(IR-1)/XNPPR
29200      IF(IR-1.NE.0) RAVED(IR-1)=RAVED(IR-1)/XNPPR
29300      XNPPR=0.0
29400      RAVEV(IR)=0.0
29500      RAVED(IR)=0.0
29600      GO TO 120
29700      104 IL=IL+1
29800      IF(IL.LE.NLDL) GO TO 116
29900      WRITE(NW,253)
30000      253 FORMAT(46H THE MAXIMUM NUMBER OF LOADS HAS BEEN EXCEEDED)

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30100      STOP
30200      116 QL(IL)=ZL(IS,11)
30300      Q(IP)=QEND+ZL(IS,11)
30400      COEF(3,IID2,IID1)=ZL(IS,11)
30500      GO TO 120
30600      105 ID=ID+1
30700      IF(ID.LE.NLDL) GO TO 117
30800      WRITE(NW,254)
30900      254 FORMAT(51H THE MAXIMUM NUMBER OF DIVERSIONS HAS BEEN EXCEEDED)
31000      STOP
31100      117 QD(ID)=ZL(IS,11)
31200      Q(IP)=QEND-ZL(IS,11)
31300      COEF(3,IID2,IID1)=ZL(IS,11)
31400      GO TO 120
31500      106 Q(IP)=QEND
31600      GO TO 120
31700      107 WRITE(6,256)
31800      256 FORMAT(61H COMPUTED GO TO HAS SENCED A BRANCH POINT, IT SHOULD NOT
31900      * HAVE)
32000      STOP
32100      120 IF(QG(IR).LT.0.0.AND.IOPGW.EQ.1)GOTO 200
32200      COEF(1,LID2,LID1)=QS(IR)*DELX+COEF(1,LID2,LID1)
32300      COEF(2,LID2,LID1)=QG(IR)*DELX+COEF(2,LID2,LID1)
32400      COEF(10,LID2,LID1)=-QEVAP(IR)*DELX+COEF(10,LID2,LID1)
32500      QEND=Q(IP)+(QS(IR)+QG(IR)-QEVAP(IR))*DELX
32600      QBAR=(Q(IP)+QEND)*.5
32700      GO TO 125
32800      200 QG(IR)=QG(IR)/100.
32900      FAC=EXP(QG(IR)*DELX)
33000      QEND=Q(IP)*FAC+(1.0-FAC)*(QS(IR)-QEVAP(IR))/(-QG(IR))
33100      IF(DELX.GT.0.0) GOTO 530
33200      QBAR=Q(IP)
33300      GOTO 532
33400      530 QBAR=(Q(IP)*(FAC-1.0)+(QS(IR)-QEVAP(IR))*((FAC-1.0)/QG(IR)
33500      * -DELX))/(DELX+QG(IR))
33600      532 COEF(1,LID2,LID1)=QS(IR)*DELX+COEF(1,LID2,LID1)
33700      COEF(2,LID2,LID1)=QEND-Q(IP)-QS(IR)*DELX+COEF(2,LID2,LID1)
33800      125 IF(Q(IP).GT.0.0) GO TO 126
33900      534 WRITE(NW,127) IP,X(IP),Q(IP),QBAR
34000      127 FORMAT(1H0,'FLOW IS LE 0.0, IP=',I4,5X,'X(IP)=' ,F11.3,5X,'Q(IP)='
34100      * ,E11.3,5X,'QBAR=' ,E11.3)
34200      IOPRUN=1
34300      Q(IP)=1.0E-6
34400      QBAR=1.0E-6
34500      126 IF(QBAR.LE.0.0)GOTO 534
34600      VBAR(IP)=CQV*QBAR**EQV
34700      IF(VBAR(IP))25,25,26
34800      25 ABAR(IP)=0.
34900      IOPRUN=1
35000      WRITE(NW,210) IP,XID(IP),VBAR(IP)

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35100 210 FORMAT(1H0,'ERROR: VBAR(IP) LE 0. IP=',I4,5X,A4,5X,'VBAR(IP)='
35200 * ,E11.3)
35300 GOTO 27
35400 26 ABAR(IP)=QBAR/VBAR(IP)
35500 27 COEF(9,IID2,IID1)=SLOPE
35600 IF(IOPRAD.EQ.1) GO TO 130
35700 IF(SLOPE.GT.0.0)GOTO 536
35800 WRITE(NW,538)SLOPE
35900 538 FORMAT(1H0,'ERROR: SLOPE =',E12.3)
36000 RBAR(IP)=1.0EB
36100 IOPRUN=1
36200 GOTO 136
36300 536 RBAR(IP)=(CMAN*VBAR(IP)/SQRT(SLOPE))*1.5
36400 GO TO 136
36500 130 RBAR(IP)=CAR*ABAR(IP)**EAR
36600 136 XNPPR=XNPPR+DELX
36700 RAVEV(IR)=RAVEV(IR)+VBAR(IP)*DELX
36800 RAVED(IR)=RAVED(IR)+RBAR(IP)*DELX
36900 IF(XRUN.GT.XEND) GOTO 140
37000 IF(ITERM.EQ.1) GO TO 108
37100 320 IDUM=IE
37200 IE=IS
37300 IS=IDUM
37400 IF(IFIX(ZL(IS,1)+0.1).NE.7) GO TO 150
37500 IP=IP+1
37600 IFLAG(IP)=ZL(IS,1)+0.1
37700 X(IP)=ZL(IS,2)
37800 XID(IP)=ZL(IS,3)
37900 IID1=IID1+1
38000 IF(IID1.LE.NRLN) GO TO 122
38100 IID1=1
38200 IID2=IID2+1
38300 122 DO 121 K=4,8
38400 121 COEF(K,IID2,IID1)=ZL(IS,K)
38500 IB=IB+1
38600 IBB=IBB+1
38700 IF(IBB.LE.MAXBR) GO TO 118
38800 WRITE(NW,255)
38900 255 FORMAT(49H THE MAXIMUM NUMBER OF BRANCHES HAS BEEN EXCEEDED)
39000 STOP
39100 118 Q(IP)=QEND
39200 IJCO(IB)=IP
39300 GO TO 400
39400 140 IP=IP+1
39500 IFLAG(IP)=IFLICP
39600 X(IP)=X(IP-1)-DELX*.001
39700 XID(IP)=DATA1
39800 IID1=IID1+1
39900 IF(IID1.LE.NRLN) GOTO 160
40000 IID1=1

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40100      IID2=IID2+1
40200    141 GO TO 160
40300    108 IP=IP+1
40400      IF(IP.LE.NPTL) GO TO 119
40500      WRITE(NW,250)
40600    119 CONTINUE
40700      IFLAG(IP)=9
40800      X(IP)=ZL(IE,2)
40900      XID(IP)=ZL(IE,3)
41000      IID1=IID1+1
41100      IF(IID1.LE.NRLN) GOTO 112
41200      IID1=1
41300      IID2=IID2+1
41400    112 DO 113 K=4,8
41500    113 COEF(K,IID2,IID1)=ZL(IE,K)
41600      Q(IP)=QEND
41700      VBAR(IP)=VBAR(IP-1)
41800      RBAR(IP)=RBAR(IP-1)
41900      ABAR(IP)=ABAR(IP-1)
42000      RAVEV(IR)=RAVEV(IR)/XNPPR
42100      RAVED(IR)=RAVED(IR)/XNPPR
42200      NPOINT=IP
42300      NREACH=IR
42400      NHDW=IH
42500      NLOAD=IL
42600      NDIRV=ID
42700 C*
42800 C*
42900 C*
43000      IH=0
43100      IR=0
43200      IJ=0
43300      IB=0
43400      IL=0
43500      DO 610 IP=1,NPOINT
43600      IFL=IFLAG(IP)
43700      GO TO (501,502,503,504,500,500,507,502,508,500,500),IFL
43800    501 IH=IH+1
43900      IR=IR+1
44000      IX=IH
44100      NSEG(IH)=1
44200      IY=1
44300      IRR(IX,IY)=IR-1
44400      IJJ(IX,IY)=IJ
44500      ILL(IX,IY)=IL
44600      ISST(IX,IY)=IP
44700      GO TO 500
44800    502 IR=IR+1
44900      GO TO 500
45000    503 IJ=IJ+1

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SORT POINTS FOR OUTPUT BY TRIBUTARY


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45100      IR=IR+1
45200      ISED(IX,IY)=IP-1
45300      IX=IJCO(IB)
45400      IB=IB-1
45500      NSEG(IX)=NSEG(IX)+1
45600      IY=NSEG(IX)
45700      ISST(IX,IY)=IP
45800      IRR(IX,IY)=IR-1
45900      IJJ(IX,IY)=IJ-1
46000      ILL(IX,IY)=IL
46100      GO TO 500
46200      504 IL=IL+1
46300      GO TO 500
46400      507 IB=IB+1
46500      ISED(IX,IY)=IP
46600      IJCO(IB)=IX
46700      500 CONTINUE
46800      610 CONTINUE
46900      508 ISED(IX,IY)=IP
47000      IF(IOPSUM.GT.1) GO TO 151
47100      CALL SUNSYS(NPOINT,ICVO,IOPWRT)
47200      151 RETURN
47300      END
47400      SUBROUTINE QUALIN(NRD,NW,TITLE,SUBTL,WLOAD,COEF,IOPECH,ZL,NREACH,
47500      *          CS,CG,RAVEV,RAVED,CTEMP,IOPSUM,DTHAX,NPOINT)
47600      COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
47700      *          FNX1(201),FNX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
47800      *          X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
47900      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
48000      *          VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
48100      *          RB,B22,XM(5),XM(5),DXM(5),TERN(9),TITPDF(3,100)
48200      DIMENSION TITLE(20),SUBTL(20),COEF(12,7,100),ZL(12,150),
48300      *          CS(12,100),CG(12,100),RAVEV(100),RAVED(100),CTEMP(100)
48400      CALL TITL(TITLE,SUBTL,NW)
48500      WRITE(NW,2100)
48600      2100 FORMAT(//,1X,'PROBABILISTIC STREAM SIMULATION AND ASSESSMENT ',
48700      *          'MODEL, PSSAN',//)
48800      C*
48900      C* READ IN INFO FOR NUMERICAL SOLUTION OF PDF
49000      C*
49100      READ(NRD,/)NR,RMIN,RMAX,NS,SMIN,SMAX,X2MIN,X2MAX,DTHAX,IWTPDF
49200      WRITE(NW,2200)NR,RMIN,RMAX,NS,SMIN,SMAX,X2MIN,X2MAX,DTHAX,IWTPDF
49300      2200 FORMAT(///,1X,'NR=',I3,3X,'RMIN=',F7.3,3X,'RMAX=',F7.3,3X,
49400      *          'NS=',I3,3X,'SMIN=',F7.3,3X,'SMAX=',F7.3,3X,/,1X,'X2MIN=',
49500      *          F7.3,3X,'X2MAX=',F7.3,3X,'DTHAX=',F10.2,'(SEC)',3X,
49600      *          'IWTPDF=',I2,//)
49700      NRM1=NR-1
49800      NSM1=NS-1
49900      DR=(RMAX-RMIN)/FLOAT(NRM1)
50000      DS=(SMAX-SMIN)/FLOAT(NSM1)

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50100      DX2=(X2MAX-X2MIN)/FLOAT(NRM1)
50200      R(1)=RMIN
50300      S(1)=SMIN
50400      X2(1)=X2MIN
50500      DO 10 I=2,NR
50600      IM1=I-1
50700      R(I)=R(IM1)+DR
50800      X2(I)=X2(IM1)+DX2
50900 10    CONTINUE
51000      DO 20 I=2,NS
51100      S(I)=S(I-1)+DS
51200 20    CONTINUE
51300 C*
51400 C*    READ HEADWATER HEADING CARD
51500 C*
51600      READ(NRD,1100)(COEF(12,1,J),J=1,10)
51700 1100  FORMAT(10A4)
51800      IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
51900 2300  FORMAT(////,1X,10A4)
52000 C*
52100 C*    READ HEADWATER DATA
52200 C*
52300      READ(NRD,1200)COEF(12,1,1),XMO(1),XMO(3),XMO(2),XMO(5),XMO(4)
52400 1200  FORMAT(A4,6X,7F10.0)
52500      IF(IOPECH.EQ.0)WRITE(NW,2400)
52600 2400  FORMAT(/,17X,'BOD',19X,'BO',12X,'BOD-DO',/,12X,'MEAN',6X,
52700      *      'VAR',8X,'MEAN',6X,'VAR',8X,'COV')
52800      IF(IOPECH.EQ.0)WRITE(NW,2500)COEF(12,1,1),XMO(1),XMO(3),
52900      *      XMO(2),XMO(5),XMO(4)
53000 2500  FORMAT(1X,A4,4X,2(F8.4,2X),1X,2(F8.4,2X),1X,F8.4)
53100      IF(NLOAD.LE.0)GO TO 35
53200 C*
53300 C*    READ IN POINT LOAD HEADING CARD
53400 C*
53500      READ(NRD,1100)(COEF(12,1,J),J=1,10)
53600      IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
53700      IF(IOPECH.EQ.0)WRITE(NW,2400)
53800 C*
53900 C*    READ POINT LOAD DATA
54000 C*
54100      DO 30 I=1,NLOAD
54200      READ(NRD,1200)COEF(12,1,1),ZL(1,I),ZL(3,I),ZL(2,I),ZL(5,I),
54300      *      ZL(4,I)
54400      IF(IOPECH.EQ.0)WRITE(NW,2500)COEF(12,1,1),ZL(1,I),ZL(3,I),
54500      *      ZL(2,I),ZL(5,I),ZL(4,I)
54600 30    CONTINUE
54700 35    CONTINUE
54800 C*
54900 C*    READ REACHES HEADING AND WATER TEMPERATURE CARD
55000 C*

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55100      DO 40 I=1,2
55200      READ(NRD,1100)(COEF(12,1,J),J=1,10)
55300      IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
55400 40    CONTINUE
55500 C*
55600 C*    READ REACH TEMPERATURE
55700 C*
55800      READ(NRD,1300)(CTEMP(I),I=1,NREACH)
55900 1300  FORMAT(8F10.0)
56000      IF(IOPECH.EQ.0)WRITE(NW,2600)(CTEMP(I),I=1,NREACH)
56100 2600  FORMAT(13(3X,B(F6.2,2X),/))
56200 C*
56300 C*    READ BOD DIFFUSE INPUT HEADING CARD
56400 C*
56500      READ(NRD,1100)(COEF(12,1,J),J=1,10)
56600      IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
56700 C*
56800 C*    READ IN REACH ID,XS1,UXS1,XG1,UXG1,L1,VL1 FOR EACH REACH
56900 C*
57000      IF(IOPECH.EQ.0)WRITE(NW,2700)
57100 2700  FORMAT(/,14X,'SURFACE',12X,'GROUND',14X,'LEACH',/,6X,
57200      *      3(5X,'DET',4X,'VAR WNP'))
57300      DO 50 I=1,NREACH
57400      READ(NRD,1200)COEF(12,1,1),CS(1,I),CS(3,I),CG(1,I),CG(3,I),
57500      *      COEF(1,7,I),COEF(3,7,I)
57600      IF(IOPECH.EQ.0)WRITE(NW,2800)COEF(12,1,1),CS(1,I),CS(3,I),
57700      *      CG(1,I),CG(3,I),COEF(1,7,I),COEF(3,7,I)
57800 2800  FORMAT(1X,A4,1X,3(3X,F7.4,2X,F7.4))
57900 50    CONTINUE
58000 C*
58100 C*    READ BOD COEFFICIENTS HEADING CARD
58200 C*
58300      READ(NRD,1100)(COEF(12,1,J),J=1,10)
58400      IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
58500      IF(IOPECH.EQ.0)WRITE(NW,2900)
58600 2900  FORMAT(/,13X,'BETA 1,1',8X,'BETA 1,2',/,11X,'DET',2X,
58700      *      'STD WNP',4X,'DET'2X,'STD WNP')
58800      IF(IOPECH.EQ.0)WRITE(NW,4100)
58900 4100  FORMAT(16X,'PERCENT',9X,'PERCENT')
59000 C*
59100 C*    READ B11,VB11,B12,VB12 FOR EACH REACH
59200 C*
59300      DO 60 I=1,NREACH
59400      READ(NRD,1200)COEF(12,1,1),COEF(1,1,I),COEF(3,1,I),COEF(1,2,I),
59500      *      COEF(3,2,I)
59600      IF(IOPECH.EQ.0)WRITE(NW,4200)COEF(12,1,1),COEF(1,1,I),
59700      *      COEF(3,1,I),COEF(1,2,I),COEF(3,2,I)
59800 4200  FORMAT(1X,A4,1X,2(3X,F6.3,2X,F5.2))
59900 60    CONTINUE
60000 C*

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60100 C*   READ DO DIFFUSE INPUT HEADING CARD
60200 C*
60300     READ(NRD,1100)(COEF(12,1,J),J=1,10)
60400     IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
60500     IF(IOPECH.EQ.0)WRITE(NW,2700)
60600 C*
60700 C*   READ XS2,VXS2,XG2,VXG2,L2,VL2 FOR EACH REACH
60800 C*
60900     DO 70 I=1,NREACH
61000     READ(NRD,1200)COEF(12,1,1),CS(2,I),CS(4,I),CG(2,I),CG(4,I),
61100     *           COEF(2,7,I),COEF(4,7,I)
61200     IF(IOPECH.EQ.0)WRITE(NW,2800)COEF(12,1,1),CS(2,I),CS(4,I),
61300     *           CG(2,I),CG(4,I),COEF(2,7,I),
61400     *           COEF(4,7,I)
61500 70   CONTINUE
61600 C*
61700 C*   READ DO COEFFICIENT HEADING CARD
61800 C*
61900     READ(NRD,1100)(COEF(12,1,J),J=1,10)
62000     IF(IOPECH.EQ.0)WRITE(NW,2300)(COEF(12,1,J),J=1,10)
62100     IF(IOPECH.EQ.0)WRITE(NW,4300)
62200 4300  FORMAT(/,13X,'BETA 2,1  BETA 2,2  BETA 2,3',8X,'BETA 2,4',
62300     *       /,11X,'DET STD WNP',9X,2(4X,'DET STD WNP'))
62400     IF(IOPECH.EQ.0)WRITE(NW,4400)
62500 4400  FORMAT(16X,'PERCENT',9X,2(9X,'PERCENT'))
62600 C*
62700 C*   READ B21,VB21,B22,B23,VB23,B24,VB24 FOR EACH REACH
62800 C*
62900     DO 80 I=1,NREACH
63000     READ(NRD,1200)COEF(12,1,1),COEF(2,1,I),COEF(4,1,I),COEF(2,2,I),
63100     *           COEF(2,3,I),COEF(4,3,I),COEF(2,4,I),COEF(4,4,I)
63200     IF(IOPECH.EQ.0)WRITE(NW,4500)COEF(12,1,1),COEF(2,1,I),COEF(4,1,I),
63300     *           COEF(2,2,I),COEF(2,3,I),COEF(4,3,I),
63400     *           COEF(2,4,I),COEF(4,4,I)
63500 4500  FORMAT(1X,A4,4X,F6.3,2X,F5.2,3X,F6.3,2(3X,F6.3,2X,F5.2))
63600 80   CONTINUE
63700 C*
63800 C*   SOLVE FOR (IF NECESSARY) AND TEMPERATURE ADJUST REAERATION
63900 C*   COEFFICIENT DO SATURATION AND FIRST-ORDER BOD DECAY RATE
64000 C*
64100     DO 100 I=1,NREACH
64200     IF(COEF(2,1,I).GT.1.E-10)80 TO 90
64300 C*
64400 C*   NEED TO CALCULATE REAERATION COEFFICIENT
64500 C*
64600     XX1=RAVEV(I)**0.0607
64700     XX2=RAVED(I)**1.689
64800     COEF(2,1,I)=5.58*XX1/XX2
64900 90   CONTINUE
65000 C*

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65100 C*   TEMPERATURE ADJUST REAERATION AND FIRST-ORDFER BOD COEFFICIENT
65200 C*
65300     T=CTEMP(I)
65400     COEF(2,1,I)=COEF(2,1,I)*(1.0159**(T-20.))
65500     COEF(1,1,I)=COEF(1,1,I)*(1.047**(T-20.))
65600     IF(COEF(2,2,I).GT.1.E-10)GO TO 100
65700 C*
65800 C*   CALCULATE DO SATURATION AT TEMPERATURE T
65900 C*
66000     TF=T*1.8+32.
66100     DOS=24.89-0.4259*TF+0.003734*TF*TF-0.00001328*TF**3
66200     COEF(2,2,I)=ABS(COEF(2,2,I)*1000.)
66300     COEF(2,2,I)=DOS*EXP(-(.03418*COEF(2,2,I))/
66400     *           (288.-0.006496*COEF(2,2,I)))
66500 100   CONTINUE
66600 C*
66700 C*   CALCULATE VARIANCE OF WHITE NOISE PROCESS FOR COEFFICIENTS
66800 C*
66900     DO 110 I=1,NREACH
67000     COEF(3,1,I)=COEF(3,1,I)*COEF(1,1,I)/100.
67100     COEF(3,2,I)=COEF(3,2,I)*COEF(1,2,I)/100.
67200     COEF(4,1,I)=COEF(4,1,I)*COEF(2,1,I)/100.
67300     COEF(4,3,I)=COEF(4,3,I)*COEF(2,3,I)/100.
67400     COEF(4,4,I)=COEF(4,4,I)*COEF(2,4,I)/100.
67500 110   CONTINUE
67600     IF(IOPSUM.NE.0.AND.IOPSUM.NE.2)RETURN
67700 C*
67800 C*   OUTPUT TEMPERATURE CORRECTED WATER QUALITY COEFFICIENTS
67900 C*
68000     WRITE(NW,4600)
68100 4600  FORMAT(1H1,////,10X,'TEMPERATURE CORRECTED WATER QUALITY ',
68200     *           'COEFFICIENTS',//,18X,'BOD')
68300     WRITE(NW,2900)
68400     WRITE(NW,4700)
68500 4700  FORMAT('+','REACH')
68600     DO 120 I=1,NREACH
68700     WRITE(NW,4800)I,COEF(1,1,I),COEF(3,1,I),COEF(1,2,I),COEF(3,2,I)
68800 4800  FORMAT(1X,13,2X,2(3X,F6.3,2X,F5.3))
68900 120   CONTINUE
69000     WRITE(NW,4900)
69100 4900  FORMAT(////,31X,'DO')
69200     WRITE(NW,4300)
69300     WRITE(NW,4700)
69400     DO 130 I=1,NREACH
69500     WRITE(NW,5100)I,COEF(2,1,I),COEF(4,1,I),COEF(2,2,I),COEF(2,3,I),
69600     *           COEF(4,3,I),COEF(2,4,I),COEF(4,4,I)
69700 5100  FORMAT(1X,13,5X,F6.3,2X,F5.3,3X,F6.3,2(3X,F6.3,2X,F5.3))
69800 130   CONTINUE
69900 C*
70000 C*   CONVERT NOISE STD TO VARIANCE

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70100 C*
70200      DO 140 I=1,NREACH
70300      COEF(3,1,I)=COEF(3,1,I)**2
70400      COEF(3,2,I)=COEF(3,2,I)**2
70500      COEF(4,1,I)=COEF(4,1,I)**2
70600      COEF(4,3,I)=COEF(4,3,I)**2
70700      COEF(4,4,I)=COEF(4,4,I)**2
70800 140      CONTINUE
70900 C*
71000 C*      CONVERT UNITS OF WATER QUALITY COEFFICIENTS TO SEC.
71100 C*
71200      X=86400.
71300      DO 160 IR=1,NREACH
71400      DO 150 I=1,4
71500      COEF(I,1,IR)=COEF(I,1,IR)/X
71600      COEF(I,7,IR)=COEF(I,7,IR)/X
71700 150      CONTINUE
71800      COEF(1,2,IR)=COEF(1,2,IR)/X
71900      COEF(3,2,IR)=COEF(3,2,IR)/X
72000      COEF(2,3,IR)=COEF(2,3,IR)/X
72100      COEF(4,3,IR)=COEF(4,3,IR)/X
72200      COEF(2,4,IR)=COEF(2,4,IR)/X
72300      COEF(4,4,IR)=COEF(4,4,IR)/X
72400 160      CONTINUE
72500      IF(IWTPDF.EQ.1)GO TO 180
72600 C*
72700 C*      READ OUTPUT FILE TITLE FOR MARGINAL AND JOINT PDF
72800 C*
72900      DO 170 I=1,3
73000      READ(NRD,1400)(TITPDF(I,J),J=1,NPOINT)
73100 1400      FORMAT(13A6)
73200 170      CONTINUE
73300 180      CONTINUE
73400      RETURN
73500      END
73600      SUBROUTINE SYSDAT(I,ICONV,IOPECH,TBL1,ZL,NR,NW,IOPGW)
73700      DIMENSION TBL1(10),ZL(12,150)
73800      1 READ(NR,100)(ZL(I,K),K=1,20)
73900 100 FORMAT(A1,F7.0,A4,A2,4A4,A1,F3.0,3F5.0,2F5.4,4F5.0,A1)
74000      IF(IOPECH.NE.1)
74100      *WRITE(NW,2) (ZL(I,K),K=1,20)
74200      2 FORMAT(1H0,2X,A1,1X,F8.2,1X,A4,A2,4A4,2X,A1,2X,F6.2,3(1X,F8.2),6(1
74300      *X,F8.4),2X,A1)
74400      IF(ICONV.NE.1)GO TO 5
74500      ZL(I,2)=ZL(I,2)*1.60934
74600      ZL(I,10)=ZL(I,10)*1.60934
74700      ZL(I,16)=ZL(I,16)*0.3048*(35.31467**ZL(I,17))
74800      ZL(I,18)=ZL(I,18)*0.3048*(10.76391**ZL(I,19))
74900      5 CONTINUE
75000      DO 10 K=1,9

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75100      IF(TBL1(K).EQ.ZL(I,1)) GO TO 12
75200      10 CONTINUE
75300      WRITE(NW,3) ZL(I,1)
75400      WRITE(NW,2)(ZL(I,K),K=1,20)
75500      3 FORMAT(1X36HERROR IN INPUT DATA. ALPHA CODE OF A1,11H IS ILLEGAL)
75600      STOP
75700      12 ZL(I,1)=K
75800      IF(ICNV.NE.1)GOTO 33
75900      IF(K.EQ.8) GOTO 35
76000      ZL(I,11)=ZL(I,11)*0.028317
76100      GOTO 37
76200      35 ZL(I,11)=ZL(I,11)*0.017595
76300      37 ZL(I,12)=ZL(I,12)*0.017595
76400      IF(ZL(I,13).LT.0.0.AND.IOPGW.EQ.1) GOTO 39
76500      ZL(I,13)=ZL(I,13)*0.017595
76600      GOTO 33
76700      39 ZL(I,13)=ZL(I,13)*0.621376
76800      33 CONTINUE
76900      IF(ZL(I,9).EQ.TBL1(10)) GO TO 15
77000      ZL(I,9)=11.0
77100      GO TO 20
77200      15 ZL(I,9)=10.0
77300      20 IF(ZL(I,20).EQ.TBL1(8)) GO TO 25
77400      ZL(I,20)=0.0
77500      GO TO 30
77600      25 ZL(I,20)=1.0
77700      30 CONTINUE
77800      RETURN
77900      END
78000      SUBROUTINE SUMSYS(NPOINT,ICVD,IOPWRT)
78100      COMMON Q(500),X(500),XID(500),ABAR(500),RBAR(500),VBAR(500)
78200      *,IFLAG(500),NR,NW,TITLE(20),SUBTL(20),ZL(12,150),QL(150),QD(150)
78300      *,QS(100),QB(100),CS(12,100),CG(12,100),G(12,10),IV(12,10),MTD(12)
78400      *,ICODE(12),CODE(12),IPARAM(12),CHW(15,12),Z0(12),Z(12),NTI(12)
78500      *,IFORN(12,50),B(12,50),E(12,50),ET(12,50),C(12),ZJUNC(12),NCON
78600      *,NEND,NREACH,NHDW,NLOAD,NDIRV,NPTL,NRLH,NLDL,NITL,ZD(12,500)
78700      *,COEF(12,7,100),MAXHD,MAXBR,NCOE(12),NCONU(12),CX(12),CTEMP(100)
78800      *,NCOEFL,QEVAP(100),RAVEV(100),RAVED(100),ISOLVE
78900      COMMON/S/ NSEG(15),ISST(15,15),ISED(15,15),IRR(15,15),IJJ(15,15)
79000      *,ILL(15,15)
79100      CALL TITL(TITLE,SUBTL,NW)
79200      WRITE(NW,100)
79300      100 FORMAT(1H0,25X,29HSUMMARY OF SYSTEM FLOW LAYOUT/)
79400      WRITE(NW,101)
79500      101 FORMAT(53X,62HLATERAL LATERAL MAIN- MAIN- MAIN- MAIN
79600      *- MAIN-, ' AVE. AVE.')
79700      WRITE(NW,102)
79800      102 FORMAT(1H ,115HPT. F. ID IDENTIFICATION DISTANCE INPUT
79900      * SURFACE GROUND STREAM STREAM STREAM STREAM STREAM,
80000      * ' REACH REACH')

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80100      WRITE(NW,103)
80200  103 FORMAT(1H ,114H      CODE      FLOW
80300      * FLOW      FLOW      FLOW      VEL.      AREA      H. RAD.  SLOPE,
80400      *'  VEL.  H.RAD.' )
80500      IF(ICVD.EQ.0) GO TO 1
80600      WRITE(NW,104)
80700  104 FORMAT(1H ,105H
80800      * (CFS)      (CFS)      (CFS)      (FPS)      (SQF)      (MILES) (CFS)
80900      *'(FPS) (FT)')
81000      GO TO 2
81100      1 WRITE(NW,105)
81200  105 FORMAT(1H ,105H
81300      * (CMS)      (CMS)      (CMS)      (MPS)      (SQM)      (KM)      (CMS)
81400      *'(MPS) (M)')
81500      2 CONTINUE
81600      DO 504 IR=1,NREACH
81700      IF(ICVD.EQ.0) GOTO 506
81800      ZD(1,IR)=RAVEV(IR)*3.2808399
81900      ZD(2,IR)=RAVED(IR)*3.2808399
82000      GOTO 504
82100  506 ZD(1,IR)=RAVEV(IR)
82200      ZD(2,IR)=RAVED(IR)
82300  504 CONTINUE
82400      IH=0
82500      NHD=NHDW
82600      IF(IOPURT.EQ.0) NHD=1
82700      DO 7 IHH=1,NHD
82800      N1=NSEG(IHH)
82900      IF(IOPURT.EQ.0) N1=1
83000      DO 6 III=1,N1
83100      N2=ISST(IHH,III)
83200      N3=ISED(IHH,III)
83300      IR=IRR(IHH,III)
83400      IJ=IJJ(IHH,III)
83500      IF(IOPURT.GT.0) GO TO 10
83600      N2=1
83700      N3=NPOINT
83800      IR=0
83900      IJ=0
84000      10 IID1=N2-1
84100      IID2=1
84200      DO 5 IP=N2,N3
84300      IID1=IID1+1
84400      20 IF(IID1.LE.NRLM) GO TO 3
84500      IID1=IID1-NRLM
84600      IID2=IID2+1
84700      GO TO 20
84800      3 CONTINUE
84900      IFL=IFLAG(IP)
85000      IF(ICVD.EQ.0) GO TO 4

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85100      XE=X(IP)*.62137119
85200      QE=Q(IP)* 35.314667
85300      VE=VBAR(IP)*3.2808399
85400      AE=ABAR(IP)*10.763910
85500      RE=RBAR(IP)*3.2808399
85600      COE1=COEF(1,IID2,IID1)*35.314667
85700      COE2=COEF(2,IID2,IID1)*35.314667
85800      COE3=COEF(3,IID2,IID1)*35.314667
85900      COE10=COEF(10,IID2,IID1)*35.314667
86000      COE9=COEF(9,IID2,IID1)
86100      GO TO (200,201,202,203,203,204,206,208,206,5,205),IFL
86200      4 GO TO (300,301,302,303,303,304,306,308,306,5,305),IFL
86300      200 IH=IH+1
86400      IR=IR+1
86500      30 WRITE(NW,106) IR,IH,ZD(1,IR),ZD(2,IR)
86600      106 FORMAT(1H0 / 1H , 'REACH',I4,5X, 'HEADWATER',I3,90X,F7.3,1X,F7.3)
86700      40 WRITE(NW,107) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,QE,COE1,
86800      *COE2,QE,VE,AE,RE,COE9
86900      107 FORMAT(1H ,I3,I2,2X,A4,1X,A2,4A4,F9.2,F11.4,F9.4,F10.4,F11.4,F9.3,
87000      *F9.2,F9.2,F9.5)
87100      GO TO 5
87200      201 IR=IR+1
87300      WRITE(NW,108) IR,ZD(1,IR),ZD(2,IR)
87400      108 FORMAT(1H0, 'REACH',I4,107X,F7.3,1X,F7.3)
87500      WRITE(NW,109)IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,COE1,COE2
87600      *,QE,VE,AE,RE,COE9
87700      109 FORMAT(1H ,I3,I2,2X,A4,1X,A2,4A4,F9.2,11X,F9.4,F10.4,F11.4,F9.3,F9
87800      *.2,F9.2,F9.5)
87900      GO TO 5
88000      202 IJ=IJ+1
88100      IR=IR+1
88200      WRITE(NW,110) IR,IJ,ZD(1,IR),ZD(2,IR)
88300      110 FORMAT(1H0, 'REACH',I4,5X, 'JUNCTION',I3,91X,F7.3,1X,F7.3)
88400      WRITE(NW,109) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,COE1,COE
88500      *2,QE,VE,AE,RE,COE9
88600      GO TO 5
88700      203 IF(IFL.EQ.5)COE3=-COE3
88800      WRITE(NW,111) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,COE3,QE,
88900      *VE,AE,RE,COE9
89000      111 FORMAT(1H ,I3,I2,2X,A4,1X,A2,4A4,F9.2,F11.4,19X,F11.4,F9.3,2F9.2,F
89100      *9.5)
89200      GO TO 5
89300      204 WRITE(NW,112) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,QE,VE,AE
89400      *,RE,COE9
89500      112 FORMAT(1H ,I3,I2,2X,A4,1X,A2,4A4,F9.2,30X,F11.4,F9.3,2F9.2,F9.5)
89600      GO TO 5
89700      205 WRITE(NW,113)IP,IFL,XID(IP),XE,QE,VE,AE,RE,COE9
89800      113 FORMAT(1H ,I3,I2,2X,A4,19X,F9.2,30X,F11.4,F9.3,2F9.2,F9.5)
89900      GO TO 5
90000      206 WRITE(NW,114) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,QE

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90100 114 FORMAT(1H ,I3,I2,2X,A4,1X,A2,4A4,F9.2,30X,F11.4)
90200 GO TO 5
90300 208 IR=IR+1
90400 WRITE(NW,550)IR,ZD(1,IR),ZD(2,IR)
90500 550 FORMAT(1H0,'REACH',I4,3X,'EVAPORATION',93X,F7.3,1X,F7.3)
90600 WRITE(NW,107) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),XE,COE10
90700 *,COE1,COE2,OE,VE,AE,RE,COE9
90800 GOTO 5
90900 300 IH=IH+1
91000 IR=IR+1
91100 50 WRITE(NW,106) IR,IH,ZD(1,IR),ZD(2,IR)
91200 60 WRITE(NW,107)IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP), Q(IP)
91300 *,COEF(1,IID2,IID1),COEF(2,IID2,IID1),Q(IP),VBAR(IP),ABAR(IP),RBAR(
91400 *IP),COEF(9,IID2,IID1)
91500 GO TO 5
91600 301 IR=IR+1
91700 WRITE(NW,108) IR,ZD(1,IR),ZD(2,IR)
91800 WRITE(NW,109) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP)
91900 *,COEF(1,IID2,IID1),COEF(2,IID2,IID1),Q(IP),VBAR(IP),ABAR(IP),RBAR(
92000 *IP),COEF(9,IID2,IID1)
92100 GO TO 5
92200 302 IJ=IJ+1
92300 IR=IR+1
92400 WRITE(NW,110) IR,IJ,ZD(1,IR),ZD(2,IR)
92500 WRITE(NW,109) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP)
92600 *,COEF(1,IID2,IID1),COEF(2,IID2,IID1),Q(IP),VBAR(IP),ABAR(IP),RBAR(
92700 *IP),COEF(9,IID2,IID1)
92800 GO TO 5
92900 303 IF(IFL.EQ.5)COEF(3,IID2,IID1)=-COEF(3,IID2,IID1)
93000 WRITE(NW,111)IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP),COEF(3
93100 *,IID2,IID1),Q(IP),VBAR(IP),ABAR(IP),RBAR(IP),COEF(9,IID2,IID1)
93200 GO TO 5
93300 304 WRITE(NW,112) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP),Q(IP)
93400 *,VBAR(IP),ABAR(IP),RBAR(IP),COEF(9,IID2,IID1)
93500 GO TO 5
93600 305 WRITE(NW,113)IP,IFL,XID(IP),X(IP),Q(IP),VBAR(IP),ABAR(IP),RBAR(IP)
93700 *,COEF(9,IID2,IID1)
93800 GO TO 5
93900 306 WRITE(NW,114) IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP),Q(IP)
94000 GOTO 5
94100 308 IR=IR+1
94200 WRITE(NW,550)IR,ZD(1,IR),ZD(2,IR)
94300 QQQQ=COEF(10,IID2,IID1)
94400 WRITE(NW,107)IP,IFL,XID(IP),(COEF(K,IID2,IID1),K=4,8),X(IP), QQQQ
94500 *,COEF(1,IID2,IID1),COEF(2,IID2,IID1),Q(IP),VBAR(IP),ABAR(IP),RBAR(
94600 *IP),COEF(9,IID2,IID1)
94700 5 CONTINUE
94800 6 CONTINUE
94900 7 CONTINUE
95000 WRITE(NW,502) NPOINT,NREACH,NHDW,NLOAD,NDIRV

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95100 502 FORMAT(1H0,'NPOINT =',I4,5X,'NREACH =',I3,5X,'NHWD =',I3,5X
95200 *      ',NLOAD =',I3,5X,'NDIRV =',I3)
95300   RETURN
95400   END
95500   SUBROUTINE TITL(T,S,NW)
95600   DIMENSION T(1),S(1)
95700   WRITE(NW,100)(T(I),I=1,20)
95800 100 FORMAT(1H120A4)
95900   WRITE(NW,101)(S(I),I=1,20)
96000 101 FORMAT(1X20A4)
96100   RETURN
96200   END
96300   SUBROUTINE WRPT(L,IP,IW,ICVD)
96400   COMMON Q(500),X(500),XID(500),ABAR(500),RBAR(500),VBAR(500)
96500 * ,IFLAG(500),NR,NW,TITLE(20),SUBTL(20),ZL(12,150),QL(150),QD(150)
96600 * ,QS(100),QG(100),CS(12,100),CG(12,100),G(12,10),IV(12,10),NTD(12)
96700 * ,ICODE(12),CODE(12),IPARAN(12),CHW(15,12),ZD(12),Z(12),NTI(12)
96800 * ,IFORN(12,50),B(12,50),E(12,50),ET(12,50),C(12),ZJUNC(12),NCON
96900 * ,NEND,NREACH,NHDW,NLOAD,NDIRV,NPTL,NRLM,NLDL,NITL,ZD(12,500)
97000 * ,COEF(12,7,100),MAXHD,MAXBR,NCOE(12),NCONU(12),CX(12),CTEMP(100)
97100 * ,NCOEFL,QEVAP(100),RAVEV(100),RAVED(100),ISOLVE
97200   IF(IW.NE.0) GO TO 10
97300   IW=1
97400   CALL TITL(TITLE,SUBTL,NW)
97500   WRITE(NW,101)
97600 101 FORMAT(//,33X,'BOD',17X,'BO',11X,'BOD-DO',/,2X,'PNT  DISTANCE',
97700 *      3X,'ID',2(7X,'MEAN',6X,'VAR'),7X,'COV')
97800 10  CONTINUE
97900   DUMX=X(IP)
98000   IF(ICVD.GT.0)DUMX=DUMX*0.62137119
98100   WRITE(NW,102)IP,DUMX,XID(IP),ZD(1,IP),ZD(3,ID),ZD(2,IP),
98200 *      ZD(5,IP),ZD(4,IP)
98300 102 FORMAT(1H0,I4,F10.2,2X,A4,5F10.3)
98400   RETURN
98500   END
98600   SUBROUTINE LINK(IP,IR,QQS,QQG,CS,CG,ABAR,RBAR,COEF)
98700   COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
98800 *      FMX1(201),FMX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
98900 *      X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IUTPDF
99000   COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
99100 *      VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
99200 *      RB,B22,XH0(5),XH(5),DXH(5),TERM(9),TITPDF(3,100)
99300   DIMENSION QQS(100),QQG(100),CS(12,100),CG(12,100),ABAR(500),
99400 *      RBAR(500),COEF(12,7,100)
99500   QS=QQS(IR)/ABAR(IP)
99600   QG=QQG(IR)/ABAR(IP)
99700   XS1=CS(1,IR)
99800   XG1=CG(1,IR)
99900   XS2=CS(2,IR)
100000   XG2=CG(2,IR)

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100100      RB=RBAR(IP)
100200      B22=COEF(2,2,IR)
100300      XLQ=(QBS(IR)+QBG(IR))/ABAR(IP)
100400      AA(1,1)=- (COEF(1,1,IR)+COEF(1,2,IR)+XLQ)
100500      AA(2,1)=- (COEF(1,1,IR))
100600      AA(2,2)=- (COEF(2,1,IR)+COEF(2,4,IR)/RB+XLQ)
100700      U(1)=COEF(1,7,IR)/RB+QS*XS1+QG*XG1
100800      U(2)=COEF(2,1,IR)*B22+COEF(2,3,IR)+COEF(2,7,IR)/RB+
100900      *      QS*XS2+QG*XG2
101000      VB11=COEF(3,1,IR)
101100      VB12=COEF(3,2,IR)
101200      VL1=COEF(3,7,IR)
101300      VXS1=CS(3,IR)
101400      VXG1=CG(3,IR)
101500      VB21=COEF(4,1,IR)
101600      VB23=COEF(4,3,IR)
101700      VB24=COEF(4,4,IR)
101800      VL2=COEF(4,7,IR)
101900      VXS2=CS(4,IR)
102000      VXG2=CG(4,IR)
102100      C1=VL1/(RB**2)+(QS**2)*VXS1+(QG**2)*VXG1
102200      P=SQRT(C1/(VB11+VB12))
102300      RETURN
102400      END
102500      SUBROUTINE PDF(TIME,XLF,XLFX,SX2GRD,ZO,DTHAX,IPZ,NW)
102600      COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSN1,DS,S(201),DX2,X2(201),
102700      *      FNX1(201),FNX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
102800      *      X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
102900      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
103000      *      VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
103100      *      RB,B22,XM(5),XN(5),DXM(5),TERM(9),TITPDF(3,100)
103200      DIMENSION A(201),B(201),C(201,201),D(201),E(201,201),
103300      *      G(201,201),H(201,201),XLF(201,201),XLFT1(201),
103400      *      XLFT2(201,201),CR1(201),
103500      *      CR2(201),CR3(201),CS1(201,201),CS2(201,201),
103600      *      CS3(201,201),DUM1(201),DUM2(201),DUM3(201),A1(201),
103700      *      A2(201),A3(201,201),A4(201,201),RHS(201),
103800      *      SX2GRD(201,201),XLFX(201,201),XS2GRD(201,201),ZO(12)
103900      XX2(X,Y)=X+(VB11/(VB11+VB12))*(Y-P*ATAN(Y/P))
104000      IF(TIME.GT.(2.*DTHAX))GO TO 10
104100      NT=1
104200      DT=TIME/2.
104300      GO TO 20
104400 10    CONTINUE
104500      NT=INT(TIME/(2.*DTHAX)+1.)
104600      DT=TIME/FLOAT(2.*NT)
104700 20    CONTINUE
104800 C*
104900 C*      DEFINE SOME VARIABLES
105000 C*

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105100      CALL TERMS
105200 C*
105300 C*      SET UP A,B,C,D,F,G,H MATRIX
105400 C*
105500      F=VB11+VB12+VB21+VB24/(RB**2)-AA(1,1)-AA(2,2)
105600      A5=F*DT
105700      DO 210 I=1, NR
105800      X1=R(I)
105900      A(I)=((X1**2)*(VB11+VB12)+VL1/(RB**2)+(QS**2)*VXS1+(QG**2)
106000      *                                     *VXG1)/2.
106100      B(I)=((X1**2)*VB11)/2.
106200      D(I)=2.*X1*(VB11+VB12)-(X1*AA(1,1)+U(1))
106300      A1(I)=DT*D(I)/(2.*DR)
106400      A2(I)=DT*A(I)/(DR**2)
106500 210    CONTINUE
106600      DO 230 J=1, NS
106700      Y1=S(J)
106800      DO 220 I=1, NR
106900      X1=R(I)
107000      Z2=XX2(Y1, X1)
107100      C(I, J)=((X1**2)*VB11+((-Z2+B22)**2)*VB21+(Z2**2)*VB24/(RB**2)+
107200      *      VL2/(RB**2)+(QS**2)*VXS2+(QG**2)*VXG2+VB23)/2.
107300      E(I, J)=2.*((Z2-B22)*VB21+Z2*VB24/(RB**2)+X1*VB11)
107400      *      -(X1*AA(2,1)+Z2*AA(2,2)+U(2))
107500      G(I, J)=(-(B(I)**2)/A(I))+C(I, J)
107600      H(I, J)=(X1/A(I))*(B(I)*(VB11+VB12)-A(I)*VB11)-D(I)*B(I)/A(I)
107700      *      +E(I, J)
107800      A3(I, J)=DT*H(I, J)/(2.*DS)
107900      A4(I, J)=DT*G(I, J)/(DS**2)
108000 220    CONTINUE
108100 230    CONTINUE
108200 C*
108300 C*      SET UP COEFFICIENT VECTORS FOR WHEN IMPLICIT IN R
108400 C*
108500      DO 240 I=2, NRM1
108600      CR1(I)=A1(I)-A2(I)
108700      CR2(I)=1.+2.*A2(I)
108800      CR3(I)=-A1(I)-A2(I)
108900 240    CONTINUE
109000 C*
109100 C*      SET UP COEFFICIENT VECTORS FOR WHEN IMPLICIT IN S
109200 C*
109300      DO 260 J=2, NSM1
109400      DO 250 I=2, NRM1
109500      CS1(I, J)=A3(I, J)-A4(I, J)
109600      CS2(I, J)=1.+2.*A4(I, J)
109700      CS3(I, J)=-A3(I, J)-A4(I, J)
109800 250    CONTINUE
109900 260    CONTINUE
110000 C*

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110100 C*   LOOP ON TIME
110200 C*
110300     DO 410 IT=1,NT
110400 C*
110500 C*   FIRST IMPLICIT IN R SO LOOP ON S
110600 C*
110700     DO 290 J=2,NSM1
110800       JM1=J-1
110900       JP1=J+1
111000 C*
111100 C*   SET UP RHS
111200 C*
111300     DO 270 I=2,NRM1
111400       RHS(I)=XLF(I,JM1)*(-A3(I,J)+A4(I,J))+
111500     *   XLF(I,J)*(1.0-2.0*A4(I,J)+A5)+
111600     *   XLF(I,JP1)*(A3(I,J)+A4(I,J))
111700 270   CONTINUE
111800       RHS(2)=RHS(2)-XLF(1,J)*(A1(2)-A2(2))
111900       RHS(NRM1)=RHS(NRM1)-XLF(NR,J)*(-A1(NRM1)-A2(NRM1))
112000 C*
112100 C*   SOLVE FOR XLF AT NEXT TIME
112200 C*
112300     CALL TRIBAG(2,NRM1,CR1,CR2,CR3,RHS,XLFT1)
112400     DO 280 I=2,NRM1
112500       XLFT2(I,J)=XLFT1(I)
112600       IF(XLFT2(I,J).LE.1.E-9)XLFT2(I,J)=0.
112700 280   CONTINUE
112800 290   CONTINUE
112900     DO 300 J=2,NSM1
113000     DO 300 I=2,NRM1
113100       XLF(I,J)=XLFT2(I,J)
113200 300   CONTINUE
113300     CALL MOMENT
113400 C*
113500 C*   NOW IMPLICIT IN S SO LOOP ON R
113600 C*
113700     DO 330 I=2,NRM1
113800       IM1=I-1
113900       IP1=I+1
114000 C*
114100 C*   SET UP RHS AND FILL BUNNY COEFFICIENT VECTORS
114200 C*
114300     DO 310 J=2,NSM1
114400       RHS(J)=XLF(IM1,J)*(-A1(I)+A2(I))+
114500     *   XLF(I,J)*(1.-2.*A2(I)+A5)+
114600     *   XLF(IP1,J)*(A1(I)+A2(I))
114700       DUM1(J)=CS1(I,J)
114800       DUM2(J)=CS2(I,J)
114900       DUM3(J)=CS3(I,J)
115000 310   CONTINUE

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115100      RHS(2)=RHS(2)-XLF(I,1)*CS1(I,2)
115200      RHS(NSM1)=RHS(NSM1)-XLF(I,NS)*CS3(I,NSM1)
115300 C*
115400 C*      SOLVE OF XLF AT NEXT TIME
115500 C*
115600      CALL TRIDAG(2,NSM1,DUM1,DUM2,DUM3,RHS,XLFT1)
115700      DO 320 J=2,NSM1
115800      XLFT2(I,J)=XLFT1(J)
115900      IF(XLFT2(I,J).LE.1.E-9)XLFT2(I,J)=0.
116000 320      CONTINUE
116100 330      CONTINUE
116200      DO 340 J=2,NSM1
116300      DO 340 I=2,NSM1
116400      XLF(I,J)=XLFT2(I,J)
116500 340      CONTINUE
116600      CALL MOMENT
116700 410      CONTINUE
116800 C*
116900 C*      CALL OUTPUT ROUTINES
117000 C*
117100      CALL CONVRT(SX2GRD,XLF,XLFXX,X2,NR,NS,NR)
117200      CALL STAT(XLF,XLFXX,IPZ,NW)
117300      DO 440 I=1,5
117400      ZO(I)=XMO(I)
117500 440      CONTINUE
117600      RETURN
117700      END
117800      SUBROUTINE INITCO(XLF,XLFXX,SX2GRD,ZO,NW)
117900      COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
118000      *      FHX1(201),FHX2(201),FHS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
118100      *      X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
118200      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
118300      *      VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
118400      *      RB,B22,XM0(5),XM(5),DXM(5),TERM(9),TITPDF(3,100)
118500      DIMENSION XLF(201,201),XLFXX(201,201),SX2GRD(201,201),ZO(12)
118600      STOX2(Z2,Z1)=Z2+(VB11/(VB11+VB12))*(Z1-P*ATAN(Z1/P))
118700      X1MEAN=XM0(1)
118800      X1STD=SQRT(XM0(3))
118900      X2MEAN=XM0(2)
119000      X2STD=SQRT(XM0(5))
119100      COVX=XM0(4)
119200      DO 10 J=1,NS
119300      DO 10 I=1,NR
119400      XLF(I,J)=0.
119500      XLFXX(I,J)=0.
119600 10      CONTINUE
119700      TOT=0.
119800      ROWSQ=(COVX/(X1STD*X2STD))*2
119900      DUM1=1./(2.*3.141592653589*X1STD*X2STD*SQRT(1.-ROWSQ))
120000      DUM2=-1./(2.*(1.-ROWSQ))

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120100      DUM3=2.*SQRT(ROWSQ)
120200      DO 30 J=2,NSM1
120300      DO 20 I=2,NRM1
120400      TX2=STOX2(S(J),R(I))
120500      TERM2=(TX2-X2MEAN)/X2STD
120600      TERM3=TERM2*TERM2
120700      TERM1=(R(I)-X1MEAN)/X1STD
120800      XLF(I,J)=DUM1*(EXP(DUM2*(TERM1*TERM1-DUM3*TERM1*TERM2+TERM3)))
120900      IF(XLF(I,J).LE.1.E-12)XLF(I,J)=0.
121000 20    CONTINUE
121100 30    CONTINUE
121200      DO 40 J=1,NS
121300      DO 40 I=1,NR
121400      SX2GRD(I,J)=STOX2(S(J),R(I))
121500 40    CONTINUE
121600      DO 50 I=1,5
121700      Z0(I)=XMO(I)
121800 50    CONTINUE
121900      DO 70 J=1,NR
122000      TERM2=(X2(J)-X2MEAN)/X2STD
122100      TERM3=TERM2*TERM2
122200      DO 60 I=1,NR
122300      TERM1=(R(I)-X1MEAN)/X1STD
122400      XLFXX(I,J)=DUM1*(EXP(DUM2*(TERM1*TERM1-DUM3*TERM1*TERM2+TERM3)))
122500      IF(XLFXX(I,J).LE.1.E-12)XLFXX(I,J)=0.
122600 60    CONTINUE
122700 70    CONTINUE
122800      CALL STAT(XLF,XLFXX,0,NW)
122900      RETURN
123000      END
123100      SUBROUTINE DTABLE(X,Y,TABLE,N,M)
123200      DIMENSION X(201),Y(201),TABLE(201,201)
123300 C*
123400 C*      DTABLE COMPUTES THE FINITE DIVIDED DIFFERENCES OF
123500 C*      Y(1)...Y(N) FOR ALL THE ORDERS M OR LESS AND STORES THEM
123600 C*      IN THE LOWER TRIANGULAR PORTION OF THE FIRST M COLUMNS OF
123700 C*      THE FIRST N-1 ROWS OF THE MATRIX TABLE.
123800 C*
123900 C*
124000 C*      CALCULATE FIRST ORDER DIFFERENCES
124100 C*
124200      NM1=N-1
124300      DO 10 I=1,NM1
124400      TABLE(I,1)=(Y(I+1)-Y(I))/(X(I+1)-X(I))
124500 10    CONTINUE
124600      IF(M.LE.1)RETURN
124700 C*
124800 C*      CALCULATE HIGHER ORDER DIFFERENCES
124900 C*
125000      DO 20 J=2,M

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125100      DO 20 I=J,NM1
125200      ISUM=I+1-J
125300      TABLE(I,J)=(TABLE(I,J-1)-TABLE(I-1,J-1))/(X(I+1)-X(ISUM))
125400 20    CONTINUE
125500      RETURN
125600      END
125700      FUNCTION FNEWT(X,Y,TABLE,N,M,IDEG,XARG)
125800      DIMENSION X(201),Y(201),TABLE(201,201)
125900 C*
126000 C*      FNEWT ASSUMES THAT X(1)..X(N) ARE IN ASCENDING ORDER AND FIRST
126100 C*      SCANS THE X VECTOR TO DETERMIN WHICH ELEMENT IS NEAREST (.GE.)
126200 C*      THE INTERPOLATION ARGUMENT, XARG. THE IDEG+1 BASE POINTS NEEDED
126300 C*      FOR THE EVALUATION OF THE DIVIDED-DIFFERENCE POLYNOMIAL OF
126400 C*      DEGREE IDEG+1 ARE THEN CENTERED ABOUT THE CHOSEN ELEMENT WITH
126500 C*      THE LARGEST HAVING THE SUBSCRIPT MAX. IT IS ASSUMED THE THE
126600 C*      FIRST M DIVIDED DIFFERENCES HAVE BEEN COMPUTED BY THE
126700 C*      SUBROUTINE DTABLE AND ARE ALREADY PRESENT IN THE MATRIX TABLE.
126800 C*      MAX IS CHECKED TO INSURE THAT ALL REQUIRED BASE POINTS ARE
126900 C*      AVAILABLE, AND THE INTERPOLANT VALUE IS COMPUTED USING
127000 C*      NESTED POLYNOMIAL EVALUATION. THE INTERPOLANT IS RETURNED
127100 C*      AS THE VALUE OF THE FUNCTION.
127200 C*
127300 C*
127400 C*      SEARCH X VECTOR FOR ELEMEN .GE. XARG
127500 C*
127600      IF(XARG.GT.X(1).AND.XARG.LT.X(N))GO TO 5
127700      FNEWT=0.
127800      RETURN
127900 5      CONTINUE
128000      DO 10 I=1,N
128100      II=I
128200      IF(I.EQ.N.OR.XARG.LE.X(I))GO TO 20
128300 10      CONTINUE
128400 20      CONTINUE
128500      MAX=II+IDEG/2
128600 C*
128700 C*      INSURE THAT ALL REQUIRED DIFFERENCES ARE IN TABLE
128800 C*
128900      IF(MAX.LE.IDEG)MAX=IDEG+1
129000      IF(MAX.GT.N)MAX=N
129100 C*
129200 C*      COMPUTE INTERPOLANT VALUE
129300 C*
129400      YEST=TABLE(MAX-1,IDEG)
129500      IF(IDEG.LE.1)GO TO 40
129600      IDEGM1=IDEG-1
129700      DO 30 I=1,IDEGM1
129800      ISUB1=MAX-I
129900      ISUB2=IDEG-I
130000      YEST=YEST+(XARG-X(ISUB1))+TABLE(ISUB1-1,ISUB2)

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130100 30 CONTINUE
130200 40 CONTINUE
130300 ISUB1=MAX-IDE6
130400 FNEWT=YEST*(XARG-X(ISUB1))+Y(ISUB1)
130500 RETURN
130600 END
130700 SUBROUTINE TRIDAG(IF,L,A,B,C,D,V)
130800 DIMENSION A(201),B(201),C(201),D(201),V(201),BETA(202),GAMMA(202)
130900 C*
131000 C* SUBROUTINE FOR SOLVING A SYSTEM OF LINEAR SIMULTANOUS
131100 C* EQUATIONS HAVING A TRIDIAGONAL COEFFICIENT MATRIX.
131200 C* THE EQUATIONS ARE NUMBERED IF THROUGH L, AND THEIR
131300 C* SUB-DIAGONAL, DIAGONAL, AND SUPER-DIAGONAL COEFFICIENTS
131400 C* ARE STORED IN THE ARRAYS A,B,AND C. THE RIGHT HAND
131500 C* SIDE IS STORED IN ARRAY D. THE COMPUTED SOLUTION VECTOR
131600 C* V(IF)...V(L) IS STORED IN ARRAY V.
131700 C*
131800 C*
131900 C* COMPUTE INTERMEDIATE ARRAYS BETA AND GAMMA
132000 C*
132100 BETA(IF)=B(IF)
132200 GAMMA(IF)=D(IF)/BETA(IF)
132300 IFP1=IF+1
132400 DO 10 I=IFP1,L
132500 IM1=I-1
132600 BETA(I)=B(I)-A(I)*C(IM1)/BETA(IM1)
132700 GAMMA(I)=(D(I)-A(I)*GAMMA(IM1))/BETA(I)
132800 10 CONTINUE
132900 C*
133000 C* COMPUTE FINAL SOLUTION VECTOR V
133100 C*
133200 V(L)=GAMMA(L)
133300 LAST=L-IF
133400 DO 20 K=1,LAST
133500 I=L-K
133600 V(I)=GAMMA(I)-C(I)*V(I+1)/BETA(I)
133700 20 CONTINUE
133800 RETURN
133900 END
134000 SUBROUTINE CONVRT(GRD,XLF1,XLF2,Z,NR,N1,N2)
134100 DIMENSION GRD(201,201),XLF1(201,201),XLF2(201,201),Z(201)
134200 DIMENSION DUMGRD(201),DUMXLF(201),TABLE(201,201)
134300 DO 30 I=1,NR
134400 DO 10 J=1,N1
134500 DUMGRD(J)=GRD(I,J)
134600 DUMXLF(J)=XLF1(I,J)
134700 10 CONTINUE
134800 C*
134900 C* CALCULATE DIVIDED DIFFERENCES
135000 C*

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135100      N=10
135200      IF(M.GE.N1)M=N1-1
135300      CALL DTABLE(DUMGRD,DUMXLF,TABLE,N1,M)
135400 C*
135500 C*      DETERMINE XLF2 AT Z VALUES BY INTERPOLATION USING
135600 C*      FUNCTION FNEUT
135700      DO 20 J=1,N2
135800      XLF2(I,J)=FNEUT(DUMGRD,DUMXLF,TABLE,N1,M,N,Z(J))
135900      IF(XLF2(I,J).LE.1.E-12)XLF2(I,J)=0.
136000 20      CONTINUE
136100 30      CONTINUE
136200      RETURN
136300      END
136400      SUBROUTINE TERMS
136500      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
136600 *              VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
136700 *              RB,B22,XM0(5),XM(5),DXM(5),TERM(9),TITPDF(3,100)
136800      TERM(1)=2.*AA(1,1)
136900      TERM(2)=VB11+VB12
137000      TERM(3)=VL1/(RB**2)+(QS**2)*VXS1+(QG**2)*VXG1
137100      TERM(4)=AA(2,2)+AA(1,1)
137200      TERM(5)=2.*AA(2,1)
137300      TERM(6)=2.*AA(2,2)
137400      TERM(7)=VB21+VB24/(RB**2)
137500      TERM(8)=2.*B22*VB21
137600      TERM(9)=(B22**2)*VB21+VB23+VL2/(RB**2)+(QS**2)*VXS2
137700 *              +(QG**2)*VXG2
137800      RETURN
137900      END
138000      SUBROUTINE MOMENT
138100      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
138200 *              VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
138300 *              RB,B22,XM0(5),XM(5),DXM(5),TERM(9),TITPDF(3,100)
138400      REAL K
138500      DIMENSION K(5,4)
138600      DO 10 I=1,5
138700      XM(I)=XM0(I)
138800 10      CONTINUE
138900      CALL DRV
139000      DO 20 I=1,5
139100      K(I,1)=DT*DXM(I)
139200      XM(I)=XM0(I)+K(I,1)/2.
139300 20      CONTINUE
139400      CALL DRV
139500      DO 30 I=1,5
139600      K(I,2)=DT*DXM(I)
139700      XM(I)=XM0(I)+K(I,2)/2.
139800 30      CONTINUE
139900      CALL DRV
140000      DO 40 I=1,5

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140100      K(I,3)=DT*DXM(I)
140200      XM(I)=XMO(I)+K(I,3)
140300  40    CONTINUE
140400      CALL DRV
140500      DO 50 I=1,5
140600      K(I,4)=DT*DXM(I)
140700      XMO(I)=XMO(I)+(K(I,1)+2.*(K(I,2)+K(I,3))+K(I,4))/6.
140800  50    CONTINUE
140900      RETURN
141000      END
141100      SUBROUTINE DRV
141200      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
141300      *          VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
141400      *          RB,B22,XMO(5),XM(5),DXM(5),TERM(9),TITPDF(3,100)
141500      TERM10=XM(3)+XM(1)**2
141600      DXM(1)=AA(1,1)*XM(1)+U(1)
141700      DXM(2)=AA(2,1)*XM(1)+AA(2,2)*XM(2)+U(2)
141800      DXM(3)=TERM(1)*XM(3)+TERM(2)*TERM10+TERM(3)
141900      DXM(4)=AA(2,1)*XM(3)+TERM(4)*XM(4)+VB11*TERM10
142000      DXM(5)=TERM(5)*XM(4)+TERM(6)*XM(5)+VB11*TERM10
142100      *          +TERM(7)*(XM(5)+XM(2)**2)-TERM(8)*XM(2)+TERM(9)
142200      RETURN
142300      END
142400      SUBROUTINE STAT(XLF,XLFX,IPZ,NW)
142500      COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
142600      *          FNX1(201),FNX2(201),FNS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
142700      *          X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IUTPDF
142800      COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
142900      *          VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
143000      *          RB,B22,XMO(5),XM(5),DXM(5),TERM(9),TITPDF(3,100)
143100      DIMENSION XLF(201,201),XLFX(201,201)
143200      II=IPZ+1
143300      WRITE(NW,2000)II
143400  2000    FORMAT(1H1,///,1X,'MARGINAL DENSITY AT POINT ',I3)
143500      SX1=0.
143600      SX2=0.
143700      SSQX1=0.
143800      SSQX2=0.
143900      TOTX1=0.
144000      TOTX2=0.
144100      DO 20 I=1,NR
144200      FNX1(I)=0.
144300      DO 10 J=1,NRM1
144400      FNX1(I)=FNX1(I)+(XLFXX(I,J)+XLFXX(I,J+1))*DX2/2.
144500  10    CONTINUE
144600  20    CONTINUE
144700      DO 40 J=1,NR
144800      FNX2(J)=0.
144900      DO 30 I=1,NRM1
145000      FNX2(J)=FNX2(J)+(XLFXX(I,J)+XLFXX(I+1,J))*DR/2.

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145100 30 CONTINUE
145200 40 CONTINUE
145300 DO 50 I=1,NRM1
145400 IP1=I+1
145500 VX1=VAL(R(I),FMX1(I),FMX1(IP1),DR)
145600 VX2=VAL(X2(I),FMX2(I),FMX2(IP1),DX2)
145700 DUMX1=(FMX1(I)+FMX1(IP1))*DR/2.
145800 DUMX2=(FMX2(I)+FMX2(IP1))*DX2/2.
145900 SX1=SX1+VX1*DUMX1
146000 SX2=SX2+VX2*DUMX2
146100 SSQX1=SSQX1+(VX1**2)*DUMX1
146200 SSQX2=SSQX2+(VX2**2)*DUMX2
146300 TOTX1=TOTX1+DUMX1
146400 TOTX2=TOTX2+DUMX2
146500 50 CONTINUE
146600 X1MEAN=SX1/TOTX1
146700 X2MEAN=SX2/TOTX2
146800 X1VAR=SSQX1/TOTX1-X1MEAN**2
146900 X2VAR=SSQX2/TOTX2-X2MEAN**2
147000 CALL COV(XLFXX)
147100 DO 70 J=1,NS
147200 FMS(J)=0.
147300 DO 60 I=1,NRM1
147400 FMS(J)=FMS(J)+(XLF(I,J)+XLF(I+1,J))*DR/2.
147500 60 CONTINUE
147600 70 CONTINUE
147700 TOTS=0.
147800 DO 80 J=1,NSM1
147900 TOTS=TOTS+(FMS(J)+FMS(J+1))*DS/2.
148000 80 CONTINUE
148100 CALL OUT(NW)
148200 WRITE(6,2100)XMO(1),X1MEAN,XMO(3),X1VAR,XMO(2),X2MEAN,XMO(5),
148300 * X2VAR,XMO(4),COVX
148400 2100 FORMAT(//,16X,'MOMENT',/,15X,'EQUATIONS',5X,'PDF',/,1X,'X1 MEAN',
148500 * 7X,2(F8.4,3X),/,1X,'X1 VARIANCE',3X,2(F8.4,3X),/,1X,
148600 * 'X2 MEAN',7X,2(F8.4,3X),/,1X,'X2 VARIANCE',3X,2(F8.4,3X),
148700 * /,1X,'COV(X1,X2)',4X,2(F8.4,3X),//)
148800 IF(IWTPDF.NE.1)CALL WRTPDF(II,XLFXX)
148900 RETURN
149000 END
149100 SUBROUTINE COV(XLFXX)
149200 COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
149300 * FMX1(201),FMX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
149400 * X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
149500 COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
149600 * VB24,VL2,VXS2,VXG2,VB23,QS,QG,XS1,XG1,XS2,XG2,
149700 * RB,B22,XMO(5),XM(5),DXH(5),TERM(9),TITPDF(3,100)
149800 DIMENSION XLFXX(201,201)
149900 COVX=0.
150000 DUM=DR*DX2/4.

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150100      DO 20 J=1, NRH1
150200      JP1=J+1
150300      DO 10 I=1, NRH1
150400      IP1=I+1
150500      VX1=(VAL(R(I), XLFXX(I, J), XLFXX(IP1, J), DR)+
150600      *      VAL(R(I), XLFXX(I, JP1), XLFXX(IP1, JP1), DR))/2.-X1NEAN
150700      VX2=(VAL(X2(J), XLFXX(I, J), XLFXX(I, JP1), DX2)+
150800      *      VAL(X2(J), XLFXX(IP1, J), XLFXX(IP1, JP1), DX2))/2.-X2NEAN
150900      COVX=COVX+VX1+VX2*DUM*(XLFXX(I, J)+XLFXX(IP1, J)+XLFXX(I, JP1)
151000      *      +XLFXX(IP1, JP1))
151100 10    CONTINUE
151200 20    CONTINUE
151300      RETURN
151400      END
151500      FUNCTION VAL(X, A, B, D)
151600      IF(A.NE.B)GO TO 10
151700      VAL=X+D/2.
151800      RETURN
151900 10    CONTINUE
152000      TERM=SQRT(B.*(A**2+B**2))
152100      VAL=X+(-4.*A+TERM)/((4.*(B-A))/D)
152200      RETURN
152300      END
152400      SUBROUTINE LOAD(ZO, ZQB, X1LMEN, X2LMEN, X1LVAR, COVL, X2LVAR,
152500      *      XLF, XLFXX, SX2GRD, ZO)
152600      COMMON /PDF/ NR, NRH1, DR, R(201), NS, NSH1, DS, S(201), DX2, X2(201),
152700      *      FNX1(201), FNX2(201), FNS(201), P, X1NEAN, X1STD, X2NEAN, X2STD,
152800      *      X1VAR, TOTX1, X2VAR, TOTX2, COVX, TOTS, IRPLT, ISPLT, INTPDF
152900      COMMON /MOMENT/ DT, AA(2, 2), U(2), VB11, VB12, VL1, VXS1, VXG1, VB21,
153000      *      VB24, VL2, VXS2, VXG2, VB23, QS, QG, XS1, XG1, XS2, XG2,
153100      *      RB, B22, XM(5), XN(5), DXN(5), TERM(9), TITPDF(3, 100)
153200      DIMENSION XLF(201, 201), XLFXX(201, 201), SX2GRD(201, 201), ZO(12)
153300      DIMENSION XLFL(201, 201), TR(201), TX2(201), X2SGRD(201, 201)
153400      DIMENSION Z(15), U(15)
153500      DATA Z/O., .201194094, -.201194094, .394151347, -.394151347,
153600      *      .570972173, -.570972173, .724417731, -.724417731,
153700      *      .848206583, -.848206583, .937273392, -.937273392,
153800      *      .987992518, -.987992518/
153900      DATA U/.202578242, .198431485, .198431485, .186161000, .186161000,
154000      *      .166269206, .166269206, .139570678, .139570678, .107159220,
154100      *      .107159220, .070366047, .070366047, .030753242, .030753242/
154200      X2TOS(Z2, Z1)=Z2-(VB11/(VB11+VB12))*(Z1-P*ATAN(Z1/P))
154300      STOXX2(Z2, Z1)=Z2+(VB11/(VB11+VB12))*(Z1-P*ATAN(Z1/P))
154400      QA=(ZQ-ZQB)/ZQ
154500      QB=ZQB/ZQ
154600      X1LSTD=SQRT(X1LVAR)
154700      X2LSTD=SQRT(X2LVAR)
154800      GRDSCL=9.
154900      TDR=DR
155000      TDX2=DX2

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155100      DO 10 I=1,NR
155200      TR(I)=R(I)
155300      TX2(I)=X2(I)
155400 10    CONTINUE
155500      XM0(1)=QA*XM0(1)+QB*X1LMEN
155600      XM0(2)=QA*XM0(2)+QB*X2LMEN
155700      XM0(3)=QA**2*XM0(3)+(QB*X1LSTD)**2
155800      XM0(4)=QA**2*XM0(4)+QB**2*COVL
155900      XM0(5)=QA**2*XM0(5)+(QB*X2LSTD)**2
156000      DO 20 J=1,NR
156100      DO 20 I=1,NR
156200      XLF(I,J)=0.
156300 20    CONTINUE
156400      RMIN=INT(XM0(1)-GRDSCL*SQRT(XM0(3))+.5)
156500      RMAX=INT(XM0(1)+GRDSCL*SQRT(XM0(3))+.5)
156600      DR=(RMAX-RMIN)/FLOAT(NRM1)
156700      X2MIN=INT(XM0(2)-GRDSCL*SQRT(XM0(5))+.5)
156800      X2MAX=INT(XM0(2)+GRDSCL*SQRT(XM0(5))+.5)
156900      DX2=(X2MAX-X2MIN)/FLOAT(NRM1)
157000      R(1)=RMIN
157100      X2(1)=X2MIN
157200      DO 30 I=2,NR
157300      IM1=I-1
157400      R(I)=R(IM1)+DR
157500      X2(I)=X2(IM1)+DX2
157600 30    CONTINUE
157700      SMIN=INT(X2TOS(X2MIN,RMAX)-.5)
157800      SMAX=INT(X2TOS(X2MAX,RMIN)+.5)
157900      DS=(SMAX-SMIN)/FLOAT(NSM1)
158000      S(1)=SMIN
158100      DO 40 I=2,NS
158200      S(I)=S(I-1)+DS
158300 40    CONTINUE
158400      DO 50 J=1,NS
158500      DO 50 I=1,NR
158600      SX2GRD(I,J)=STOX2(S(J),R(I))
158700 50    CONTINUE
158800      ROWSQ=(COVL/(X1LSTD*X2LSTD))**2
158900      DUM1=1./(2.*3.141592653589*X1LSTD*X2LSTD*SQRT(1.-ROWSQ))
159000      DUM2=-1./(2.*(1.-ROWSQ))
159100      DUM3=2.*SQRT(ROWSQ)
159200      AI1=INT(X2LMEN-6.7*X2LSTD+.5)
159300      BI1=INT(X2LMEN+6.7*X2LSTD+.5)
159400      AI2=INT(X1LMEN-6.7*X1LSTD+.5)
159500      BI2=INT(X1LMEN+6.7*X1LSTD+.5)
159600      DO 140 IY2=2,NRM1
159700      Y2=X2(IY2)
159800      DO 130 JJ=1,15
159900      X4=(Z(JJ)*(BI1-AI1)+BI1+AI1)/2.
160000      C2=(Y2-QB*X4)/QA

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160100      IF(C2.LE.TX2(2).OR.C2.GE.TX2(NRM1))GO TO 130
160200      J=(C2-TX2(1))/TDX2+1.
160300      JP1=J+1
160400      BETA=(C2-TX2(J))/(TX2(JP1)-TX2(J))
160500      OMB=1.-BETA
160600      TERM2=(X4-X2LMEN)/X2LSTD
160700      TERM3=TERM2+TERM2
160800      DO 120 IY1=2,NRM1
160900      Y1=R(IY1)
161000      DO 110 II=1,15
161100      X3=(Z(II)*(BI2-AI2)+BI2+AI2)/2.
161200      C1=(Y1-OB*X3)/QA
161300      I=(C1-TR(1))/TDR+1.
161400      IF(XLFX(I,J).LE.1.E-12)GO TO 110
161500      IP1=I+1
161600      ALPHA=(C1-TR(I))/(TR(IP1)-TR(I))
161700      OMA=1.-ALPHA
161800      TERM1=(X3-X1LMEN)/X1LSTD
161900      FX3X4=DUM1*(EXP(DUM2*(TERM1+TERM1-DUM3*TERM1+TERM2+TERM3)))
162000      IF(FX3X4.LE.1.E-12)GO TO 110
162100      XLF(IY1,IY2)=XLF(IY1,IY2)+W(II)*W(JJ)*FX3X4*
162200      *      (OMA*OMB*XLFX(I,J)+BETA*OMA*XLFX(I,JP1))+
162300      *      ALPHA*OMB*XLFX(IP1,J)+ALPHA*BETA*XLFX(IP1,JP1))
162400 110   CONTINUE
162500 120   CONTINUE
162600 130   CONTINUE
162700 140   CONTINUE
162800      XMULT=((BI1-AI1)*(BI2-AI2))/(4.*QA**2)
162900      DO 150 J=1,NR
163000      DO 150 I=1,NR
163100      XLFX(I,J)=XLF(I,J)*XMULT
163200      X2SGRD(I,J)=X2TOS(X2(J),R(I))
163300 150   CONTINUE
163400      CALL CONVRT(X2SGRD,XLFX,XLF,S,NR,NR,NS)
163500      DO 160 I=1,5
163600      ZO(I)=XMO(I)
163700 160   CONTINUE
163800      RETURN
163900      END
164000      SUBROUTINE OUT(NW)
164100      COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
164200      *      FMX1(201),FMX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
164300      *      X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
164400      WRITE(NW,2100)
164500 2100   FORMAT(/,3X,'BOD',7X,'PDF',10X,'DO',7X,'PDF',10X,'S',8X,'PDF')
164600      N=NR
164700      IF(NR.GT.NS)N=NS
164800      DO 10 I=1,N
164900      WRITE(NW,2200)R(I),FMX1(I),X2(I),FMX2(I),S(I),FMS(I)
165000 2200   FORMAT(1X,3(F7.3,2X,F9.6,4X))

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165100 10 CONTINUE
165200 IF(N.NE.NR)GO TO 40
165300 WRITE(NW,2300)TOTX1,TOTX2
165400 2300 FORMAT(5X,2('TOT',2X,F6.3,11X))
165500 IF(N.NE.NS)GO TO 20
165600 WRITE(NW,2400)TOTS
165700 2400 FORMAT('+',48X,'TOT',2X,F6.3)
165800 RETURN
165900 20 CONTINUE
166000 ISTRT=N+1
166100 IEND=NS
166200 DO 30 I=ISTRT,IEND
166300 WRITE(NW,2500)S(I),FMS(I)
166400 2500 FORMAT('+',44X,F7.3,2X,F9.6)
166500 WRITE(NW,2600)
166600 2600 FORMAT(' ')
166700 30 CONTINUE
166800 WRITE(NW,2400)TOTS
166900 RETURN
167000 40 CONTINUE
167100 WRITE(NW,2600)
167200 WRITE(NW,2400)TOTS
167300 ISTRT=N+1
167400 IEND=NR
167500 DO 50 I=ISTRT,IEND
167600 WRITE(NW,2700)R(I),FMX1(I),X2(I),FMX2(I)
167700 2700 FORMAT('+',2(F7.3,2X,F9.6,4X))
167800 WRITE(NW,2600)
167900 50 CONTINUE
168000 WRITE(NW,2300)TOTX1,TOTX2
168100 RETURN
168200 END
168300 SUBROUTINE WRTPDF(II,XLFX)
168400 COMMON /PDF/ NR,NRM1,DR,R(201),NS,NSM1,DS,S(201),DX2,X2(201),
168500 * FMX1(201),FMX2(201),FMS(201),P,X1MEAN,X1STD,X2MEAN,X2STD,
168600 * X1VAR,TOTX1,X2VAR,TOTX2,COVX,TOTS,IRPLT,ISPLT,IWTPDF
168700 COMMON /MOMENT/ DT,AA(2,2),U(2),VB11,VB12,VL1,VXS1,VXG1,VB21,
168800 * VB24,VL2,VXS2,VXG2,VB23,QS,Q6,XS1,XG1,XS2,XG2,
168900 * RB,B22,XM0(5),XM(5),DXM(5),TERN(9),TITPDF(3,100)
169000 DIMENSION XLFX(201,201),T(1)
169100 T(1)=TITPDF(1,II)
169200 CHANGE(31,TITLE=T)
169300 T(1)=TITPDF(2,II)
169400 CHANGE(32,TITLE=T)
169500 T(1)=TITPDF(3,II)
169600 CHANGE(33,TITLE=T)
169700 WRITE(31,2100)XM0(1),XM0(3)
169800 WRITE(31,2100)X1MEAN,X1VAR
169900 WRITE(32,2100)XM0(2),XM0(5)
170000 WRITE(32,2100)X2MEAN,X2VAR

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170100 2100  FORMAT(F8.5,2X,F8.5)
170200          DO 10 I=1, NR
170300          WRITE(31,2200)R(I),FMX1(I)
170400          WRITE(32,2200)X2(I),FMX2(I)
170500 2200  FORMAT(F7.3,3X,F8.6)
170600 10     CONTINUE
170700          CLOSE(31,DISP=CRUNCH)
170800          CLOSE(32,DISP=CRUNCH)
170900          DO 20 I=1, NR
171000          WRITE(33,2300)(XLFXX(I,J),J=1, NR)
171100 2300  FORMAT(6E10.4)
171200 20     CONTINUE
171300          CLOSE(33,DISP=CRUNCH)
171400          RETURN
171500          END
H
```

APPENDIX C: Output from Sensitivity Problem Run 1

SENSITIVITY PROBLEM

INPUT NOISE STD = 20% COEFFICIENT NOISE STD = 40%

IOPRUN = 3 ICVI = 0 ICVD = 0 IOPECH = 0 IOPSUM = 0 IOPURT = 1 IOPGW = 0

CARD CODE	DISTANCE	MNEMONIC	DESCRIPTION	PRINT CODE	DELTA	FLOW	LATERAL SURFACE FLOW	LATERAL GROUND FLOW	SLOPE	MANNING N	VEL COEF	VEL EXP	HYDR COEF	HYDR EXP	HYDR OPT
H	20.00	H	HEAD OF REACH		0.00	5.00	0.02	0.02	0.0000	0.0000	0.0900	0.6000	0.5332	0.6000	E
C	15.00	C-1	CHECK POINT 1		0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
C	10.00	C-2	CHECK POINT 2		0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
C	5.00	C-3	CHECK POINT 3		0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
T	0.00	T	TERMINATION		0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

SENSITIVITY PROBLEM
 INPUT NOISE STD = 20% COEFFICIENT NOISE STD = 40%

SUMMARY OF SYSTEM FLOW LAYOUT

PT. F.	ID CODE	IDENTIFICATION	DISTANCE (KM)	INPUT FLOW (CMS)	LATERAL SURFACE FLOW (CMS)	LATERAL GROUND FLOW (CMS)	MAIN-STREAM FLOW (CMS)	MAIN-STREAM VEL. (MPS)	MAIN-STREAM AREA (SQM)	MAIN-STREAM H. RAD. (M)	MAIN-STREAM SLOPE	AVE. REACH VEL. (MPS)	AVE. REACH H. RAD. (M)
REACH	1	HEADWATER 1										0.248	3.389
1	1	H HEAD OF REACH	20.00	5.0000	0.4000	0.4000	5.0000	0.239	21.32	3.34	0.00000		
2	6	C-1 CHECK POINT 1	15.00				5.2000	0.245	21.65	3.37	0.00000		
3	6	C-2 CHECK POINT 2	10.00				5.4000	0.250	21.97	3.40	0.00000		
4	6	C-3 CHECK POINT 3	5.00				5.6000	0.256	22.29	3.43	0.00000		
5	9	T TERMINATION	0.00				5.8000						
NPOINT = 5 NREACH = 1 NHWD = 1 NLOAD = 0 NDIRV = 0													

SENSITIVITY PROBLEM
 INPUT NOISE STD = 20% COEFFICIENT NOISE STD = 40%

PROBABILISTIC STREAM SIMULATION AND ASSESSMENT MODEL, PSSAM

NR=101 RMIN= 3.000 RMAX= 22.000 NS=101 SHIN=-20.000 SHAX= 10.000
 X2MIN= -3.000 X2MAX= 12.000 DTMAX= 4000.00(SEC) INTPDF= 0

DATA FOR HEADWATER

	BOD		DO		BOD-DO
	MEAN	VAR	MEAN	VAR	COV
H	15.0000	3.0000	5.0000	1.0000	1.0000

DATA FOR REACH

WATER TEMPERATURE
 16.00

BOD DIFFUSE INPUT

	SURFACE			GROUND			LEACH		
	DET	VAR	UNP	DET	VAR	UNP	DET	VAR	UNP
R1	10.0000	4.0000		5.0000	1.0000		1.0000	0.0400	

BOD EQUATION COEFFICIENTS

	BETA 1,1			BETA 1,2		
	DET	STD	UNP	DET	STD	UNP
	PERCENT			PERCENT		
R1	0.300	40.00		0.000	0.00	

DO DIFFUSE INPUT

	SURFACE		GROUND		LEACH	
	DET	VAR WNP	DET	VAR WNP	DET	VAR WNP
R1	3.0000	0.3600	0.0000	0.0000	0.0000	0.0000

DO EQUATION COEFFICIENTS

	BETA 2,1		BETA 2,2	BETA 2,3		BETA 2,4	
	DET	STD WNP		DET	STD WNP	DET	STD WNP
	PERCENT			PERCENT		PERCENT	
R1	0.000	40.00	-1.000	1.000	40.00	0.200	40.00

TEMPERATURE CORRECTED WATER QUALITY COEFFICIENTS

BOD

REACH	BETA 1,1		BETA 1,2	
	DET	STD WNP	DET	STD WNP
1	0.250	0.100	0.000	0.000

DO

REACH	BETA 2,1		BETA 2,2	BETA 2,3		BETA 2,4	
	DET	STD WNP		DET	STD WNP	DET	STD WNP
1	0.613	0.245		8.692	1.000	0.400	0.200

MARGINAL DENSITY AT POINT 1

BOD	PDF	DO	PDF	S	PDF
3.000	0.000000	-3.000	0.000000	-20.000	0.000000
3.190	0.000000	-2.850	0.000000	-19.700	0.000000
3.380	0.000000	-2.700	0.000000	-19.400	0.000000
3.570	0.000000	-2.550	0.000000	-19.100	0.000000
3.760	0.000000	-2.400	0.000000	-18.800	0.000000
3.950	0.000000	-2.250	0.000000	-18.500	0.000000
4.140	0.000000	-2.100	0.000000	-18.200	0.000000
4.330	0.000000	-1.950	0.000000	-17.900	0.000000
4.520	0.000000	-1.800	0.000000	-17.600	0.000000
4.710	0.000000	-1.650	0.000000	-17.300	0.000000
4.900	0.000000	-1.500	0.000000	-17.000	0.000000
5.090	0.000000	-1.350	0.000000	-16.700	0.000000
5.280	0.000000	-1.200	0.000000	-16.400	0.000000
5.470	0.000000	-1.050	0.000000	-16.100	0.000001
5.660	0.000000	-0.900	0.000000	-15.800	0.000002
5.850	0.000000	-0.750	0.000000	-15.500	0.000006
6.040	0.000000	-0.600	0.000000	-15.200	0.000019
6.230	0.000001	-0.450	0.000000	-14.900	0.000050
6.420	0.000001	-0.300	0.000000	-14.600	0.000126
6.610	0.000002	-0.150	0.000001	-14.300	0.000294
6.800	0.000003	-0.000	0.000001	-14.000	0.000644
6.990	0.000005	0.150	0.000003	-13.700	0.001336
7.180	0.000009	0.300	0.000006	-13.400	0.002631
7.370	0.000014	0.450	0.000013	-13.100	0.004938
7.560	0.000023	0.600	0.000025	-12.800	0.008842
7.750	0.000036	0.750	0.000048	-12.500	0.015125
7.940	0.000057	0.900	0.000089	-12.200	0.024725
8.130	0.000088	1.050	0.000163	-11.900	0.038631
8.320	0.000136	1.200	0.000292	-11.600	0.057695
8.510	0.000206	1.350	0.000510	-11.300	0.082368
8.700	0.000309	1.500	0.000873	-11.000	0.112406
8.890	0.000457	1.650	0.001459	-10.700	0.146635
9.080	0.000669	1.800	0.002384	-10.400	0.182851
9.270	0.000968	1.950	0.003810	-10.100	0.217954
9.460	0.001383	2.100	0.005953	-9.800	0.248335
9.650	0.001952	2.250	0.009094	-9.500	0.270468
9.840	0.002723	2.400	0.013583	-9.200	0.281575
10.030	0.003754	2.550	0.019837	-8.900	0.280200
10.220	0.005111	2.700	0.028327	-8.600	0.266523
10.410	0.006877	2.850	0.039550	-8.300	0.242321
10.600	0.009142	3.000	0.053991	-8.000	0.210587
10.790	0.012007	3.150	0.072065	-7.700	0.174925

10.980	0.015582	3.300	0.094049	-7.400	0.138882
11.170	0.019979	3.450	0.120009	-7.100	0.105392
11.360	0.025311	3.600	0.149727	-6.800	0.076442
11.550	0.031682	3.750	0.182649	-6.500	0.052992
11.740	0.039183	3.900	0.217852	-6.200	0.035111
11.930	0.047880	4.050	0.254059	-5.900	0.022234
12.120	0.057807	4.200	0.289692	-5.600	0.013456
12.310	0.068958	4.350	0.322972	-5.300	0.007783
12.500	0.081275	4.500	0.352065	-5.000	0.004302
12.690	0.094648	4.650	0.375240	-4.700	0.002272
12.880	0.108902	4.800	0.391043	-4.400	0.001147
13.070	0.123803	4.950	0.398444	-4.100	0.000553
13.260	0.139061	5.100	0.396952	-3.800	0.000255
13.450	0.154330	5.250	0.386668	-3.500	0.000112
13.640	0.169227	5.400	0.368270	-3.200	0.000047
13.830	0.183343	5.550	0.342943	-2.900	0.000019
14.020	0.196261	5.700	0.312253	-2.600	0.000007
14.210	0.207575	5.850	0.277983	-2.300	0.000003
14.400	0.216916	6.000	0.241968	-2.000	0.000001
14.590	0.223966	6.150	0.205933	-1.700	0.000000
14.780	0.228479	6.300	0.171364	-1.400	0.000000
14.970	0.230295	6.450	0.139424	-1.100	0.000000
15.160	0.229349	6.600	0.110913	-0.800	0.000000
15.350	0.225675	6.750	0.086268	-0.500	0.000000
15.540	0.219403	6.900	0.065605	-0.200	0.000000
15.730	0.210754	7.050	0.048780	0.100	0.000000
15.920	0.200025	7.200	0.035462	0.400	0.000000
16.110	0.187572	7.350	0.025205	0.700	0.000000
16.300	0.173789	7.500	0.017515	1.000	0.000000
16.490	0.159094	7.650	0.011900	1.300	0.000000
16.680	0.143899	7.800	0.007903	1.600	0.000000
16.870	0.128598	7.950	0.005132	1.900	0.000000
17.060	0.113550	8.100	0.003257	2.200	0.000000
17.250	0.099063	8.250	0.002021	2.500	0.000000
17.440	0.085391	8.400	0.001225	2.800	0.000000
17.630	0.072726	8.550	0.000726	3.100	0.000000
17.820	0.061198	8.700	0.000421	3.400	0.000000
18.010	0.050881	8.850	0.000238	3.700	0.000000
18.200	0.041798	9.000	0.000132	4.000	0.000000
18.390	0.033925	9.150	0.000071	4.300	0.000000
18.580	0.027206	9.300	0.000037	4.600	0.000000
18.770	0.021557	9.450	0.000019	4.900	0.000000
18.960	0.016876	9.600	0.000010	5.200	0.000000
19.150	0.013054	9.750	0.000005	5.500	0.000000
19.340	0.009977	9.900	0.000002	5.800	0.000000
19.530	0.007534	10.050	0.000001	6.100	0.000000
19.720	0.005621	10.200	0.000000	6.400	0.000000
19.910	0.004143	10.350	0.000000	6.700	0.000000
20.100	0.003018	10.500	0.000000	7.000	0.000000
20.290	0.002172	10.650	0.000000	7.300	0.000000
20.480	0.001544	10.800	0.000000	7.600	0.000000

20.670	0.001085	10.950	0.000000	7.900	0.000000
20.860	0.000753	11.100	0.000000	8.200	0.000000
21.050	0.000516	11.250	0.000000	8.500	0.000000
21.240	0.000350	11.400	0.000000	8.800	0.000000
21.430	0.000234	11.550	0.000000	9.100	0.000000
21.620	0.000155	11.700	0.000000	9.400	0.000000
21.810	0.000101	11.850	0.000000	9.700	0.000000
22.000	0.000065	12.000	0.000000	10.000	0.000000
TOT	1.000	TOT	1.000	TOT	1.000

	MOMENT	
	EQUATIONS	PDF
X1 MEAN	15.0000	14.9998
X1 VARIANCE	3.0000	2.9986
X2 MEAN	5.0000	4.9999
X2 VARIANCE	1.0000	0.9999
COV(X1,X2)	1.0000	0.9995

MARGINAL DENSITY AT POINT 2

DOB	PDF	DO	PDF	S	PDF
3.000	0.000000	-3.000	0.000000	-20.000	0.000000
3.190	0.000000	-2.850	0.000000	-19.700	0.000000
3.380	0.000000	-2.700	0.000000	-19.400	0.000000
3.570	0.000000	-2.550	0.000000	-19.100	0.000000
3.760	0.000000	-2.400	0.000000	-18.800	0.000000
3.950	0.000000	-2.250	0.000000	-18.500	0.000000
4.140	0.000000	-2.100	0.000000	-18.200	0.000000
4.330	0.000000	-1.950	0.000001	-17.900	0.000000
4.520	0.000000	-1.800	0.000001	-17.600	0.000000
4.710	0.000000	-1.650	0.000002	-17.300	0.000000
4.900	0.000000	-1.500	0.000003	-17.000	0.000000
5.090	0.000000	-1.350	0.000004	-16.700	0.000000
5.280	0.000000	-1.200	0.000006	-16.400	0.000000
5.470	0.000000	-1.050	0.000010	-16.100	0.000000
5.660	0.000000	-0.900	0.000014	-15.800	0.000000
5.850	0.000001	-0.750	0.000022	-15.500	0.000000
6.040	0.000001	-0.600	0.000033	-15.200	0.000001
6.230	0.000003	-0.450	0.000050	-14.900	0.000003
6.420	0.000005	-0.300	0.000074	-14.600	0.000009
6.610	0.000008	-0.150	0.000110	-14.300	0.000025
6.800	0.000015	-0.000	0.000163	-14.000	0.000069
6.990	0.000025	0.150	0.000241	-13.700	0.000173
7.180	0.000042	0.300	0.000354	-13.400	0.000406
7.370	0.000070	0.450	0.000517	-13.100	0.000888
7.560	0.000114	0.600	0.000750	-12.800	0.001827
7.750	0.000183	0.750	0.001083	-12.500	0.003552
7.940	0.000290	0.900	0.001553	-12.200	0.006551
8.130	0.000450	1.050	0.002213	-11.900	0.011502
8.320	0.000687	1.200	0.003132	-11.600	0.019253
8.510	0.001034	1.350	0.004400	-11.300	0.030763
8.700	0.001530	1.500	0.006133	-11.000	0.046943
8.890	0.002228	1.650	0.008477	-10.700	0.068441
9.080	0.003196	1.800	0.011613	-10.400	0.095364
9.270	0.004512	1.950	0.015761	-10.100	0.127017
9.460	0.006274	2.100	0.021176	-9.800	0.161754
9.650	0.008591	2.250	0.028152	-9.500	0.196990
9.840	0.011586	2.400	0.037006	-9.200	0.229464
10.030	0.015392	2.550	0.048068	-8.900	0.255711
10.220	0.020147	2.700	0.061655	-8.600	0.272663
10.410	0.025984	2.850	0.078037	-8.300	0.278242
10.600	0.033025	3.000	0.097400	-8.000	0.271778
10.790	0.041371	3.150	0.119797	-7.700	0.254140

10.980	0.051087	3.300	0.145102	-7.400	0.227548
11.170	0.062192	3.450	0.172963	-7.100	0.195112
11.360	0.074651	3.600	0.202776	-6.800	0.160242
11.550	0.088361	3.750	0.233670	-6.500	0.126074
11.740	0.103148	3.900	0.264528	-6.200	0.095037
11.930	0.118766	4.050	0.294034	-5.900	0.068652
12.120	0.134896	4.200	0.320754	-5.600	0.047531
12.310	0.151159	4.350	0.343250	-5.300	0.031545
12.500	0.167128	4.500	0.360201	-5.000	0.020072
12.690	0.182343	4.650	0.370535	-4.700	0.012247
12.880	0.196339	4.800	0.373542	-4.400	0.007166
13.070	0.208663	4.950	0.368955	-4.100	0.004022
13.260	0.218905	5.100	0.356983	-3.800	0.002166
13.450	0.226718	5.250	0.338302	-3.500	0.001119
13.640	0.231835	5.400	0.313983	-3.200	0.000555
13.830	0.234092	5.550	0.285390	-2.900	0.000264
14.020	0.233429	5.700	0.254045	-2.600	0.000121
14.210	0.229896	5.850	0.221489	-2.300	0.000053
14.400	0.223648	6.000	0.189156	-2.000	0.000022
14.590	0.214934	6.150	0.158267	-1.700	0.000009
14.780	0.204080	6.300	0.129766	-1.400	0.000004
14.970	0.191470	6.450	0.104294	-1.100	0.000001
15.160	0.177526	6.600	0.082192	-0.800	0.000000
15.350	0.162679	6.750	0.063538	-0.500	0.000000
15.540	0.147355	6.900	0.048200	-0.200	0.000000
15.730	0.131952	7.050	0.035899	0.100	0.000000
15.920	0.116827	7.200	0.026263	0.400	0.000000
16.110	0.102283	7.350	0.018883	0.700	0.000000
16.300	0.088563	7.500	0.013350	1.000	0.000000
16.490	0.075850	7.650	0.009286	1.300	0.000000
16.680	0.064264	7.800	0.006358	1.600	0.000000
16.870	0.053871	7.950	0.004288	1.900	0.000000
17.060	0.044688	8.100	0.002849	2.200	0.000000
17.250	0.036688	8.250	0.001866	2.500	0.000000
17.440	0.029815	8.400	0.001206	2.800	0.000000
17.630	0.023987	8.550	0.000769	3.100	0.000000
17.820	0.019108	8.700	0.000483	3.400	0.000000
18.010	0.015075	8.850	0.000300	3.700	0.000000
18.200	0.011779	9.000	0.000184	4.000	0.000000
18.390	0.009117	9.150	0.000111	4.300	0.000000
18.580	0.006991	9.300	0.000066	4.600	0.000000
18.770	0.005312	9.450	0.000039	4.900	0.000000
18.960	0.003999	9.600	0.000023	5.200	0.000000
19.150	0.002983	9.750	0.000013	5.500	0.000000
19.340	0.002204	9.900	0.000007	5.800	0.000000
19.530	0.001613	10.050	0.000004	6.100	0.000000
19.720	0.001168	10.200	0.000002	6.400	0.000000
19.910	0.000835	10.350	0.000001	6.700	0.000000
20.100	0.000589	10.500	0.000001	7.000	0.000000
20.290	0.000409	10.650	0.000000	7.300	0.000000
20.480	0.000277	10.800	0.000000	7.600	0.000000

20.670	0.000183	10.950	0.000000	7.900	0.000000
20.860	0.000118	11.100	0.000000	8.200	0.000000
21.050	0.000074	11.250	0.000000	8.500	0.000000
21.240	0.000046	11.400	0.000000	8.800	0.000000
21.430	0.000028	11.550	0.000000	9.100	0.000000
21.620	0.000013	11.700	0.000000	9.400	0.000000
21.810	0.000001	11.850	0.000000	9.700	0.000000
22.000	0.000000	12.000	0.000000	10.000	0.000000
TOT	1.000	TOT	1.000	TOT	1.000

	MOMENT EQUATIONS	PDF
X1 MEAN	13.9267	13.9526
X1 VARIANCE	2.9215	2.9156
X2 MEAN	4.7351	4.7403
X2 VARIANCE	1.2098	1.1841
COV(X1,X2)	1.0251	1.0193

MARGINAL DENSITY AT POINT 3

BOD	PDF	BO	PDF	S	PDF
3.000	0.000000	-3.000	0.000001	-20.000	0.000000
3.190	0.000000	-2.850	0.000001	-19.700	0.000000
3.380	0.000000	-2.700	0.000001	-19.400	0.000000
3.570	0.000000	-2.550	0.000002	-19.100	0.000000
3.760	0.000000	-2.400	0.000002	-18.800	0.000000
3.950	0.000000	-2.250	0.000003	-18.500	0.000000
4.140	0.000000	-2.100	0.000005	-18.200	0.000000
4.330	0.000000	-1.950	0.000007	-17.900	0.000000
4.520	0.000000	-1.800	0.000009	-17.600	0.000000
4.710	0.000000	-1.650	0.000013	-17.300	0.000000
4.900	0.000000	-1.500	0.000019	-17.000	0.000000
5.090	0.000000	-1.350	0.000027	-16.700	0.000000
5.280	0.000000	-1.200	0.000038	-16.400	0.000000
5.470	0.000001	-1.050	0.000053	-16.100	0.000000
5.660	0.000002	-0.900	0.000074	-15.800	0.000000
5.850	0.000003	-0.750	0.000104	-15.500	0.000000
6.040	0.000006	-0.600	0.000146	-15.200	0.000000
6.230	0.000012	-0.450	0.000204	-14.900	0.000000
6.420	0.000022	-0.300	0.000285	-14.600	0.000001
6.610	0.000040	-0.150	0.000396	-14.300	0.000002
6.800	0.000070	-0.000	0.000548	-14.000	0.000007
6.990	0.000121	0.150	0.000758	-13.700	0.000018
7.180	0.000204	0.300	0.001044	-13.400	0.000047
7.370	0.000337	0.450	0.001433	-13.100	0.000119
7.560	0.000545	0.600	0.001959	-12.800	0.000284
7.750	0.000863	0.750	0.002668	-12.500	0.000634
7.940	0.001338	0.900	0.003616	-12.200	0.001333
8.130	0.002033	1.050	0.004877	-11.900	0.002643
8.320	0.003029	1.200	0.006543	-11.600	0.004967
8.510	0.004424	1.350	0.008728	-11.300	0.008875
8.700	0.006338	1.500	0.011571	-11.000	0.015122
8.890	0.008909	1.650	0.015237	-10.700	0.024598
9.080	0.012292	1.800	0.019923	-10.400	0.038231
9.270	0.016652	1.950	0.025848	-10.100	0.056799
9.460	0.022155	2.100	0.033259	-9.800	0.080687
9.650	0.028959	2.250	0.042418	-9.500	0.109626
9.840	0.037201	2.400	0.053587	-9.200	0.142486
10.030	0.046979	2.550	0.067015	-8.900	0.177210
10.220	0.058338	2.700	0.082909	-8.600	0.210940
10.410	0.071256	2.850	0.101402	-8.300	0.240369
10.600	0.085634	3.000	0.122520	-8.000	0.262266
10.790	0.101281	3.150	0.146146	-7.700	0.274055

10.980	0.117919	3.300	0.171981	-7.400	0.274315
11.170	0.135184	3.450	0.199518	-7.100	0.263062
11.360	0.152637	3.600	0.228033	-6.800	0.241736
11.550	0.169782	3.750	0.256586	-6.500	0.212896
11.740	0.186091	3.900	0.284059	-6.200	0.179723
11.930	0.201030	4.050	0.309211	-5.900	0.145449
12.120	0.214092	4.200	0.330761	-5.600	0.112861
12.310	0.224822	4.350	0.347495	-5.300	0.083976
12.500	0.232848	4.500	0.358373	-5.000	0.059922
12.690	0.237903	4.650	0.362637	-4.700	0.041010
12.880	0.239835	4.800	0.359896	-4.400	0.026920
13.070	0.238620	4.950	0.350182	-4.100	0.016951
13.260	0.234356	5.100	0.333954	-3.800	0.010238
13.450	0.227254	5.250	0.312065	-3.500	0.005932
13.640	0.217624	5.400	0.285686	-3.200	0.003298
13.830	0.205852	5.550	0.256190	-2.900	0.001758
14.020	0.192376	5.700	0.225030	-2.600	0.000899
14.210	0.177658	5.850	0.193610	-2.300	0.000441
14.400	0.162164	6.000	0.163179	-2.000	0.000208
14.590	0.146335	6.150	0.134746	-1.700	0.000094
14.780	0.130577	6.300	0.109042	-1.400	0.000041
14.970	0.115239	6.450	0.086503	-1.100	0.000017
15.160	0.100611	6.600	0.067299	-0.800	0.000007
15.350	0.086915	6.750	0.051372	-0.500	0.000003
15.540	0.074311	6.900	0.038498	-0.200	0.000001
15.730	0.062893	7.050	0.028340	0.100	0.000000
15.920	0.052705	7.200	0.020508	0.400	0.000000
16.110	0.043742	7.350	0.014599	0.700	0.000000
16.300	0.035960	7.500	0.010232	1.000	0.000000
16.490	0.029290	7.650	0.007066	1.300	0.000000
16.680	0.023643	7.800	0.004812	1.600	0.000000
16.870	0.018916	7.950	0.003234	1.900	0.000000
17.060	0.015005	8.100	0.002147	2.200	0.000000
17.250	0.011801	8.250	0.001409	2.500	0.000000
17.440	0.009206	8.400	0.000915	2.800	0.000000
17.630	0.007122	8.550	0.000588	3.100	0.000000
17.820	0.005467	8.700	0.000374	3.400	0.000000
18.010	0.004163	8.850	0.000236	3.700	0.000000
18.200	0.003145	9.000	0.000148	4.000	0.000000
18.390	0.002357	9.150	0.000092	4.300	0.000000
18.580	0.001752	9.300	0.000056	4.600	0.000000
18.770	0.001291	9.450	0.000034	4.900	0.000000
18.960	0.000944	9.600	0.000021	5.200	0.000000
19.150	0.000684	9.750	0.000012	5.500	0.000000
19.340	0.000491	9.900	0.000007	5.800	0.000000
19.530	0.000349	10.050	0.000004	6.100	0.000000
19.720	0.000245	10.200	0.000003	6.400	0.000000
19.910	0.000171	10.350	0.000001	6.700	0.000000
20.100	0.000117	10.500	0.000001	7.000	0.000000
20.290	0.000079	10.650	0.000000	7.300	0.000000
20.480	0.000052	10.800	0.000000	7.600	0.000000

20.670	0.000034	10.950	0.000000	7.900	0.000000
20.860	0.000022	11.100	0.000000	8.200	0.000000
21.050	0.000014	11.250	0.000000	8.500	0.000000
21.240	0.000008	11.400	0.000000	8.800	0.000000
21.430	0.000004	11.550	0.000000	9.100	0.000000
21.620	0.000002	11.700	0.000000	9.400	0.000000
21.810	0.000001	11.850	0.000000	9.700	0.000000
22.000	0.000000	12.000	0.000000	10.000	0.000000
TOT	1.000	TOT	1.000	TOT	1.000

	MOMENT	
	EQUATIONS	PDF
X1 MEAN	12.9789	13.0252
X1 VARIANCE	2.8011	2.7960
X2 MEAN	4.5793	4.5837
X2 VARIANCE	1.3152	1.2751
COV(X1,X2)	0.9922	0.9861

MARGINAL DENSITY AT POINT 4

BOD	PDF	DO	PDF	S	PDF
3.000	0.000000	-3.000	0.000002	-20.000	0.000000
3.190	0.000000	-2.850	0.000003	-19.700	0.000000
3.380	0.000000	-2.700	0.000004	-19.400	0.000000
3.570	0.000000	-2.550	0.000005	-19.100	0.000000
3.760	0.000000	-2.400	0.000007	-18.800	0.000000
3.950	0.000000	-2.250	0.000009	-18.500	0.000000
4.140	0.000000	-2.100	0.000013	-18.200	0.000000
4.330	0.000000	-1.950	0.000017	-17.900	0.000000
4.520	0.000000	-1.800	0.000024	-17.600	0.000000
4.710	0.000000	-1.650	0.000032	-17.300	0.000000
4.900	0.000000	-1.500	0.000044	-17.000	0.000000
5.090	0.000001	-1.350	0.000060	-16.700	0.000000
5.280	0.000002	-1.200	0.000082	-16.400	0.000000
5.470	0.000003	-1.050	0.000111	-16.100	0.000000
5.660	0.000007	-0.900	0.000151	-15.800	0.000000
5.850	0.000015	-0.750	0.000205	-15.500	0.000000
6.040	0.000029	-0.600	0.000278	-15.200	0.000000
6.230	0.000055	-0.450	0.000376	-14.900	0.000000
6.420	0.000101	-0.300	0.000508	-14.600	0.000000
6.610	0.000182	-0.150	0.000686	-14.300	0.000001
6.800	0.000317	-0.000	0.000922	-14.000	0.000001
6.990	0.000540	0.150	0.001238	-13.700	0.000003
7.180	0.000893	0.300	0.001658	-13.400	0.000007
7.370	0.001440	0.450	0.002214	-13.100	0.000016
7.560	0.002265	0.600	0.002947	-12.800	0.000040
7.750	0.003473	0.750	0.003909	-12.500	0.000095
7.940	0.005200	0.900	0.005165	-12.200	0.000222
8.130	0.007604	1.050	0.006797	-11.900	0.000494
8.320	0.010869	1.200	0.008905	-11.600	0.001042
8.510	0.015194	1.350	0.011609	-11.300	0.002079
8.700	0.020783	1.500	0.015052	-11.000	0.003939
8.890	0.027834	1.650	0.019404	-10.700	0.007109
9.080	0.036517	1.800	0.024855	-10.400	0.012249
9.270	0.046954	1.950	0.031621	-10.100	0.020178
9.460	0.059203	2.100	0.039931	-9.800	0.031799
9.650	0.073233	2.250	0.050024	-9.500	0.047953
9.840	0.088913	2.400	0.062132	-9.200	0.069213
10.030	0.105999	2.550	0.076461	-8.900	0.095632
10.220	0.124140	2.700	0.093170	-8.600	0.126511
10.410	0.142879	2.850	0.112337	-8.300	0.160264
10.600	0.161678	3.000	0.133932	-8.000	0.194444

10.790	0.179939	3.150	0.157777	-7.700	0.225984
10.980	0.197040	3.300	0.183524	-7.400	0.251621
11.170	0.212372	3.450	0.210628	-7.100	0.268450
11.360	0.225379	3.600	0.238341	-6.800	0.274460
11.550	0.235586	3.750	0.265721	-6.500	0.268930
11.740	0.242636	3.900	0.291668	-6.200	0.252568
11.930	0.246308	4.050	0.314981	-5.900	0.227365
12.120	0.246524	4.200	0.334442	-5.600	0.196198
12.310	0.243355	4.350	0.348912	-5.300	0.162292
12.500	0.237006	4.500	0.357438	-5.000	0.128684
12.690	0.227799	4.650	0.359355	-4.700	0.097807
12.880	0.216149	4.800	0.354366	-4.400	0.071252
13.070	0.202534	4.950	0.342588	-4.100	0.049748
13.260	0.187463	5.100	0.324560	-3.800	0.033285
13.450	0.171450	5.250	0.301201	-3.500	0.021338
13.640	0.154987	5.400	0.273728	-3.200	0.013105
13.830	0.138520	5.550	0.243545	-2.900	0.007708
14.020	0.122439	5.700	0.212111	-2.600	0.004342
14.210	0.107064	5.850	0.180815	-2.300	0.002341
14.400	0.092642	6.000	0.150868	-2.000	0.001208
14.590	0.079347	6.150	0.123225	-1.700	0.000596
14.780	0.067288	6.300	0.098542	-1.400	0.000281
14.970	0.056513	6.450	0.077181	-1.100	0.000127
15.160	0.047020	6.600	0.059230	-0.800	0.000055
15.350	0.038766	6.750	0.044560	-0.500	0.000023
15.540	0.031679	6.900	0.032886	-0.200	0.000009
15.730	0.025665	7.050	0.023826	0.100	0.000003
15.920	0.020620	7.200	0.016961	0.400	0.000001
16.110	0.016432	7.350	0.011874	0.700	0.000000
16.300	0.012992	7.500	0.008183	1.000	0.000000
16.490	0.010193	7.650	0.005557	1.300	0.000000
16.680	0.007937	7.800	0.003723	1.600	0.000000
16.870	0.006135	7.950	0.002464	1.900	0.000000
17.060	0.004708	8.100	0.001612	2.200	0.000000
17.250	0.003588	8.250	0.001043	2.500	0.000000
17.440	0.002715	8.400	0.000669	2.800	0.000000
17.630	0.002040	8.550	0.000426	3.100	0.000000
17.820	0.001523	8.700	0.000269	3.400	0.000000
18.010	0.001129	8.850	0.000168	3.700	0.000000
18.200	0.000831	9.000	0.000105	4.000	0.000000
18.390	0.000607	9.150	0.000065	4.300	0.000000
18.580	0.000441	9.300	0.000040	4.600	0.000000
18.770	0.000318	9.450	0.000025	4.900	0.000000
18.960	0.000227	9.600	0.000015	5.200	0.000000
19.150	0.000161	9.750	0.000009	5.500	0.000000
19.340	0.000113	9.900	0.000005	5.800	0.000000
19.530	0.000079	10.050	0.000003	6.100	0.000000
19.720	0.000055	10.200	0.000002	6.400	0.000000
19.910	0.000037	10.350	0.000001	6.700	0.000000
20.100	0.000025	10.500	0.000001	7.000	0.000000
20.290	0.000017	10.650	0.000000	7.300	0.000000

20.480	0.000011	10.800	0.000000	7.600	0.000000
20.670	0.000007	10.950	0.000000	7.900	0.000000
20.860	0.000005	11.100	0.000000	8.200	0.000000
21.050	0.000003	11.250	0.000000	8.500	0.000000
21.240	0.000001	11.400	0.000000	8.800	0.000000
21.430	0.000001	11.550	0.000000	9.100	0.000000
21.620	0.000001	11.700	0.000000	9.400	0.000000
21.810	0.000000	11.850	0.000000	9.700	0.000000
22.000	0.000000	12.000	0.000000	10.000	0.000000
TOT	1.000	TOT	1.000	TOT	1.000

	MOMENT	
	EQUATIONS	PDF
X1 MEAN	12.1386	12.2005
X1 VARIANCE	2.6577	2.6550
X2 MEAN	4.5026	4.5025
X2 VARIANCE	1.3583	1.3097
COV(X1,X2)	0.9293	0.9246

MARGINAL DENSITY AT POINT 5

BDD	PDF	DD	PDF	S	PDF
3.000	0.000000	-3.000	0.000004	-20.000	0.000000
3.190	0.000000	-2.850	0.000005	-19.700	0.000000
3.380	0.000000	-2.700	0.000006	-19.400	0.000000
3.570	0.000000	-2.550	0.000009	-19.100	0.000000
3.760	0.000000	-2.400	0.000011	-18.800	0.000000
3.950	0.000000	-2.250	0.000015	-18.500	0.000000
4.140	0.000000	-2.100	0.000020	-18.200	0.000000
4.330	0.000000	-1.950	0.000027	-17.900	0.000000
4.520	0.000000	-1.800	0.000037	-17.600	0.000000
4.710	0.000000	-1.650	0.000049	-17.300	0.000000
4.900	0.000001	-1.500	0.000065	-17.000	0.000000
5.090	0.000003	-1.350	0.000087	-16.700	0.000000
5.280	0.000007	-1.200	0.000116	-16.400	0.000000
5.470	0.000015	-1.050	0.000155	-16.100	0.000000
5.660	0.000032	-0.900	0.000207	-15.800	0.000000
5.850	0.000064	-0.750	0.000276	-15.500	0.000000
6.040	0.000125	-0.600	0.000367	-15.200	0.000000
6.230	0.000235	-0.450	0.000488	-14.900	0.000000
6.420	0.000427	-0.300	0.000648	-14.600	0.000000
6.610	0.000749	-0.150	0.000860	-14.300	0.000000
6.800	0.001272	-0.000	0.001139	-14.000	0.000000
6.990	0.002094	0.150	0.001506	-13.700	0.000001
7.180	0.003344	0.300	0.001987	-13.400	0.000002
7.370	0.005184	0.450	0.002615	-13.100	0.000004
7.560	0.007814	0.600	0.003433	-12.800	0.000008
7.750	0.011461	0.750	0.004494	-12.500	0.000017
7.940	0.016370	0.900	0.005864	-12.200	0.000038
8.130	0.022794	1.050	0.007625	-11.900	0.000086
8.320	0.030966	1.200	0.009875	-11.600	0.000193
8.510	0.041076	1.350	0.012734	-11.300	0.000421
8.700	0.053241	1.500	0.016343	-11.000	0.000877
8.890	0.067483	1.650	0.020865	-10.700	0.001743
9.080	0.083702	1.800	0.026487	-10.400	0.003304
9.270	0.101660	1.950	0.033417	-10.100	0.005982
9.460	0.120982	2.100	0.041876	-9.800	0.010367
9.650	0.141160	2.250	0.052094	-9.500	0.017208
9.840	0.161577	2.400	0.064292	-9.200	0.027367
10.030	0.181537	2.550	0.078671	-8.900	0.041710
10.220	0.200312	2.700	0.095382	-8.600	0.060920
10.410	0.217187	2.850	0.114502	-8.300	0.085272
10.600	0.231506	3.000	0.136003	-8.000	0.114388
10.790	0.242722	3.150	0.159717	-7.700	0.147064

10.980	0.250425	3.300	0.185309	-7.400	0.181218
11.170	0.254373	3.450	0.212253	-7.100	0.214033
11.360	0.254498	3.600	0.239819	-6.800	0.242300
11.550	0.250904	3.750	0.267086	-6.500	0.262921
11.740	0.243852	3.900	0.292965	-6.200	0.273455
11.930	0.233734	4.050	0.316259	-5.900	0.272597
12.120	0.221041	4.200	0.335738	-5.600	0.260434
12.310	0.206325	4.350	0.350238	-5.300	0.238436
12.500	0.190164	4.500	0.358772	-5.000	0.209163
12.690	0.173129	4.650	0.360632	-4.700	0.175778
12.880	0.155754	4.800	0.355477	-4.400	0.141488
13.070	0.138515	4.950	0.343393	-4.100	0.109054
13.260	0.121815	5.100	0.324906	-3.800	0.080465
13.450	0.105975	5.250	0.300943	-3.500	0.056817
13.640	0.091234	5.400	0.272757	-3.200	0.038378
13.830	0.077750	5.550	0.241807	-2.900	0.024789
14.020	0.065613	5.700	0.209620	-2.600	0.015303
14.210	0.054847	5.850	0.177656	-2.300	0.009025
14.400	0.045430	6.000	0.147185	-2.000	0.005081
14.590	0.037297	6.150	0.119203	-1.700	0.002730
14.780	0.030358	6.300	0.094387	-1.400	0.001398
14.970	0.024507	6.450	0.073088	-1.100	0.000682
15.160	0.019625	6.600	0.055369	-0.800	0.000317
15.350	0.015595	6.750	0.041059	-0.500	0.000140
15.540	0.012299	6.900	0.029825	-0.200	0.000059
15.730	0.009630	7.050	0.021240	0.100	0.000023
15.920	0.007487	7.200	0.014843	0.400	0.000009
16.110	0.005781	7.350	0.010190	0.700	0.000003
16.300	0.004434	7.500	0.006881	1.000	0.000001
16.490	0.003379	7.650	0.004577	1.300	0.000000
16.680	0.002559	7.800	0.003002	1.600	0.000000
16.870	0.001926	7.950	0.001944	1.900	0.000000
17.060	0.001441	8.100	0.001245	2.200	0.000000
17.250	0.001071	8.250	0.000790	2.500	0.000000
17.440	0.000792	8.400	0.000496	2.800	0.000000
17.630	0.000582	8.550	0.000310	3.100	0.000000
17.820	0.000425	8.700	0.000192	3.400	0.000000
18.010	0.000309	8.850	0.000118	3.700	0.000000
18.200	0.000223	9.000	0.000073	4.000	0.000000
18.390	0.000160	9.150	0.000044	4.300	0.000000
18.580	0.000114	9.300	0.000027	4.600	0.000000
18.770	0.000081	9.450	0.000016	4.900	0.000000
18.960	0.000057	9.600	0.000010	5.200	0.000000
19.150	0.000040	9.750	0.000006	5.500	0.000000
19.340	0.000028	9.900	0.000004	5.800	0.000000
19.530	0.000019	10.050	0.000002	6.100	0.000000
19.720	0.000013	10.200	0.000001	6.400	0.000000
19.910	0.000009	10.350	0.000001	6.700	0.000000
20.100	0.000006	10.500	0.000000	7.000	0.000000
20.290	0.000004	10.650	0.000000	7.300	0.000000
20.480	0.000003	10.800	0.000000	7.600	0.000000

20.670	0.000002	10.950	0.000000	7.900	0.000000
20.860	0.000001	11.100	0.000000	8.200	0.000000
21.050	0.000001	11.250	0.000000	8.500	0.000000
21.240	0.000000	11.400	0.000000	8.800	0.000000
21.430	0.000000	11.550	0.000000	9.100	0.000000
21.620	0.000000	11.700	0.000000	9.400	0.000000
21.810	0.000000	11.850	0.000000	9.700	0.000000
22.000	0.000000	12.000	0.000000	10.000	0.000000
TOT	1.000	TOT	1.000	TOT	1.000

	MOMENT EQUATIONS	PDF
X1 MEAN	11.3907	11.4644
X1 VARIANCE	2.5035	2.5039
X2 MEAN	4.4831	4.4763
X2 VARIANCE	1.3632	1.3099
COV(X1,X2)	0.8530	0.8503

SENSITIVITY PROBLEM
 INPUT NOISE STD = 20% COEFFICIENT NOISE STD = 40%

PNT	DISTANCE	ID	BOD		DO		BOD-DO COV
			MEAN	VAR	MEAN	VAR	
REACH# 1		HEADWATER 1					
1	20.00	H	15.000	3.000	5.000	1.000	1.000
2	15.00	C-1	13.927	2.921	4.735	1.210	1.025
3	10.00	C-2	12.979	2.801	4.579	1.315	0.992
4	5.00	C-3	12.139	2.658	4.503	1.358	0.929
5	0.00	T	11.391	2.504	4.483	1.363	0.853