Attachment B

CORMIX2 Prediction File
Roseton Generating Station
July Conditions

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        CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
-hsystem CORMIX2:                                          Subsystem version:
   merged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
   ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          ROSETON^GENERATING^STATION
 Design case:              FULL^7-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\R17FPA  .cx2
 Time of Fortran run:      03/04/97--13:00:16

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   1140.00  AS    =  13110.00  QA    =   1324.11  ICHREG= 2
 HA    =     11.50  HD    =      8.70
 UA    =      .101  F     =       .031 USTAR = .6318E-02
 UW    =      .000 UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U         RHOAM =  997.3300

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional parallel
 BANK  =  LEFT      DISTB =    100.00  YB1   =    100.00  YB2   =    100.00
 LD    =     99.10  NOPEN =   14       SPAC  =      7.62
 D0    =      .910  A0    =       .650 H0    =      2.70
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =       .00  SIGMA =    270.00  BETA  =     90.00
       =      4.441 Q0    =     40.440       = .4044E+02
   )0  =  994.1600  DRHO0 = .3170E+01  GP0   = .3117E-01
 C0    = .1000E+02  CUNITS=  degC
 IPOLL =  3         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .4081E+00  m0    = .1812E+01  j0    = .1272E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =      .092  lM    =     33.14  lm    =    177.67
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .4044E+02  M0    = .1796E+03  J0    = .1261E+01
 Associated 3-d length scales (meters)
 LQ    =      3.02  LM    =     43.70  Lm    =    132.69  Lb    =   1223.44
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     82.98  FRD0  =     26.37  R     =     43.97
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     8.70  2
 2222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .1000E+02  CUNITS=  degC
 NTOX  =  0
 NSTD  =  0
```

```
 REGMZ =  0
 XINT  =  12000.00  XMAX  =  12000.00

Y Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       100.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.70     1.0  .100E+02     .07     49.55

 OF MOD201: DIFFUSER DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 The diffuser near-field dilution is REDUCED because of the PROXIMITY
   of the shoreline.
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY
  MIXED over the entire layer depth (HS =    8.70m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.70     1.0  .100E+02     .07     49.55
      .00     -.99     2.73     1.6  .609E+01     .27     48.11
      .00    -1.98     2.77     1.9  .524E+01     .47     46.75
      .00    -2.97     2.80     2.1  .473E+01     .67     45.47
      .00    -3.96     2.83     2.3  .438E+01     .87     44.26
      .00    -4.95     2.87     2.4  .410E+01    1.06     43.12
      .00    -5.95     2.90     2.6  .388E+01    1.26     42.05
      .00    -6.94     2.93     2.7  .370E+01    1.46     41.03
      .00    -7.93     2.96     2.8  .355E+01    1.66     40.08
      .00    -8.92     3.00     2.9  .342E+01    1.86     39.17
      .00    -9.91     3.03     3.0  .330E+01    2.06     38.31
      .00   -10.90     3.06     3.1  .319E+01    2.25     37.49
```

.00	-11.89	3.10	3.2	.310E+01	2.45	36.71
.00	-12.88	3.13	3.3	.301E+01	2.65	35.98
.00	-13.87	3.16	3.4	.294E+01	2.85	35.28
.00	-14.87	3.20	3.5	.287E+01	3.05	34.61
.00	-15.86	3.23	3.6	.280E+01	3.24	33.97
.00	-16.85	3.26	3.7	.274E+01	3.44	33.36
.00	-17.84	3.29	3.7	.268E+01	3.64	32.78
.00	-18.83	3.33	3.8	.263E+01	3.84	32.22
.00	-19.82	3.36	3.9	.258E+01	4.04	31.69
.00	-20.81	3.39	3.9	.253E+01	4.24	31.18
.00	-21.80	3.43	4.0	.249E+01	4.43	30.69
.00	-22.79	3.46	4.1	.245E+01	4.63	30.22
.00	-23.78	3.49	4.1	.241E+01	4.83	29.78
.00	-24.77	3.52	4.2	.237E+01	5.03	29.36
.00	-25.77	3.56	4.3	.234E+01	5.23	28.96
.00	-26.76	3.59	4.3	.230E+01	5.42	28.57
.00	-27.75	3.62	4.4	.227E+01	5.62	28.21
.00	-28.74	3.66	4.5	.224E+01	5.82	27.87
.00	-29.73	3.69	4.5	.221E+01	6.02	27.55
.00	-30.72	3.72	4.6	.218E+01	6.22	27.25
.00	-31.71	3.76	4.6	.216E+01	6.42	26.97
.00	-32.70	3.79	4.7	.213E+01	6.61	26.71
.00	-33.69	3.82	4.7	.211E+01	6.81	26.47
.00	-34.68	3.85	4.8	.208E+01	7.01	26.25
.00	-35.68	3.89	4.9	.206E+01	7.21	26.05
.00	-36.67	3.92	4.9	.204E+01	7.41	25.87
.00	-37.66	3.95	5.0	.202E+01	7.60	25.71
.00	-38.65	3.99	5.0	.199E+01	7.80	25.56
.00	-39.64	4.02	5.1	.197E+01	8.00	25.43
.00	-40.63	4.05	5.1	.195E+01	8.20	25.32
.00	-41.62	4.09	5.2	.194E+01	8.40	25.22
.00	-42.61	4.12	5.2	.192E+01	8.60	25.14
.00	-43.60	4.15	5.3	.190E+01	8.70	25.07
.00	-44.60	4.18	5.3	.188E+01	8.70	25.01
.00	-45.59	4.22	5.4	.187E+01	8.70	24.96
.00	-46.58	4.25	5.4	.185E+01	8.70	24.92
.00	-47.57	4.28	5.5	.183E+01	8.70	24.88
.00	-48.56	4.32	5.5	.182E+01	8.70	24.86
.00	-49.55	4.35	5.5	.180E+01	8.70	24.84

Cumulative travel time = 62. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-49.55	8.70	5.5	.180E+01	8.70	23.46
31.24	-105.13	8.70	6.1	.164E+01	4.96	49.27
65.40	-160.71	8.70	6.6	.151E+01	4.18	67.82
102.25	-216.29	8.70	7.1	.140E+01	3.78	85.15
141.61	-271.88	8.70	7.6	.132E+01	3.53	101.96
183.32	-327.46	8.70	8.0	.125E+01	3.35	118.50
227.26	-383.04	8.70	8.4	.119E+01	3.21	134.90
273.32	-438.62	8.70	8.8	.114E+01	3.10	151.22
321.41	-494.20	8.70	9.2	.109E+01	3.01	167.50
371.45	-549.78	8.70	9.5	.105E+01	2.93	183.77
423.36	-605.36	8.70	9.9	.101E+01	2.87	200.05
477.07	-660.94	8.70	10.2	.981E+00	2.81	216.33
532.54	-716.53	8.70	10.5	.951E+00	2.75	232.65
589.70	-772.11	8.70	10.8	.923E+00	2.71	248.99
648.50	-827.69	8.70	11.1	.898E+00	2.66	265.36
708.91	-883.27	8.70	11.4	.875E+00	2.62	281.77
770.88	-938.85	8.70	11.7	.853E+00	2.59	298.22
834.37	-994.43	8.70	12.0	.833E+00	2.55	314.70
899.35	-1050.01	8.70	12.3	.815E+00	2.52	331.23
965.77	-1105.59	8.70	12.5	.797E+00	2.49	347.79
1033.62	-1161.18	8.70	12.8	.781E+00	2.46	364.39
1102.87	-1216.76	8.70	13.1	.766E+00	2.43	381.03
1173.47	-1272.34	8.70	13.3	.751E+00	2.41	397.72
1245.42	-1327.92	8.70	13.6	.737E+00	2.38	414.44
1318.68	-1383.50	8.70	13.8	.724E+00	2.36	431.20
1393.24	-1439.08	8.70	14.0	.712E+00	2.34	448.00
1469.06	-1494.66	8.70	14.3	.700E+00	2.32	464.83
1546.13	-1550.24	8.70	14.5	.689E+00	2.30	481.71
1624.43	-1605.83	8.70	14.7	.678E+00	2.28	498.62
1703.94	-1661.41	8.70	15.0	.668E+00	2.26	515.57
1784.64	-1716.99	8.70	15.2	.659E+00	2.24	532.56
1866.52	-1772.57	8.70	15.4	.649E+00	2.22	549.58
1949.55	-1828.15	8.70	15.6	.640E+00	2.20	566.64
2033.73	-1883.73	8.70	15.8	.632E+00	2.19	583.74
2119.03	-1939.31	8.70	16.0	.624E+00	2.17	600.87
2205.44	-1994.90	8.70	16.2	.616E+00	2.16	618.03
2292.95	-2050.48	8.70	16.4	.608E+00	2.14	635.23
2381.55	-2106.06	8.70	16.6	.601E+00	2.13	652.46
2471.21	-2161.64	8.70	16.8	.594E+00	2.11	669.72
2561.94	-2217.22	8.70	17.0	.587E+00	2.10	687.02
2653.71	-2272.80	8.70	17.2	.580E+00	2.08	704.35
2746.51	-2328.38	8.70	17.4	.574E+00	2.07	721.71
2840.34	-2383.96	8.70	17.6	.568E+00	2.06	739.10
2935.18	-2439.55	8.70	17.8	.562E+00	2.05	756.52
3031.02	-2495.13	8.70	18.0	.556E+00	2.03	773.98
3127.85	-2550.71	8.70	18.2	.550E+00	2.02	791.46
3225.66	-2606.29	8.70	18.4	.545E+00	2.01	808.97
3324.45	-2661.87	8.70	18.5	.539E+00	2.00	826.52
3424.19	-2717.45	8.70	18.7	.534E+00	1.99	844.09
3524.89	-2773.03	8.70	18.9	.529E+00	1.98	861.69
3626.53	-2828.61	8.70	19.1	.524E+00	1.96	879.32

Cumulative travel time = 43149. sec

OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
  Nearest bank is now on RIGHT.

The initial plume WIDTH values in the next far-field module will be
  CORRECTED by a factor 1.46 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe
  PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
  Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment C

CORMIX2 Prediction File
Roseton Generating Station
August Conditions

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        CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
ᵐᵇsystem CORMIX2:                                                Subsystem version:
   ᵐerged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
   ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          ROSETON^GENERATING^STATION
 Design case:              FULL^8-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\R18FPA  .cx2
 Time of Fortran run:      03/04/97--13:09:14

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   1140.00  AS    =  13110.00  QA    =   1284.78  ICHREG= 2
 HA    =     11.50  HD    =      8.70
 UA    =      .098  F     =       .031 USTAR = .6131E-02
 UW    =      .000  UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U          RHOAM =  997.1900

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional parallel
 BANK  =  LEFT      DISTB =    100.00  YB1   =    100.00  YB2   =    100.00
 LD    =     99.10  NOPEN =   14       SPAC  =      7.62
 D0    =      .910  A0    =       .650 H0    =      2.70
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =       .00  SIGMA =    270.00  BETA  =     90.00
 ᵀ     =      4.441 Q0    =     40.440       = .4044E+02
   ᵀ0  =  993.9901  DRHO0 = .3200E+01  GP0   = .3147E-01
 ᶜ0    = .1000E+02  CUNITS=  degC
 IPOLL =  3         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .4081E+00  m0    = .1812E+01  j0    = .1284E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =       .092 lM    =     32.93  lm    =    188.71
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .4044E+02  M0    = .1796E+03  J0    = .1273E+01
 Associated 3-d length scales (meters)
 LQ    =      3.02  LM    =     43.49  Lm    =    136.75  Lb    =   1352.17
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     82.59  FRD0  =     26.24  R     =     45.31
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     8.70  2
 22222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 ᶜ0    = .1000E+02  CUNITS=  degC
 NTOX  =  0
 NSTD  =  0
```

REGMZ = 0
XINT = 12000.00 XMAX = 12000.00

Y Y-Z COORDINATE SYSTEM:
ORIGIN is located at the bottom and the diffuser mid-point:
100.00 m from the LEFT bank/shore.
X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
S = hydrodynamic dilutions, include buoyancy (heat) loss effects, but provided plume has surface contact
C = corresponding temperature values (always in "degC"!), include heat loss, if any

---

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	2.70	1.0	.100E+02	.07	49.55

OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TEE

The diffuser near-field dilution is REDUCED because of the PROXIMITY of the shoreline.
In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 8.70m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	2.70	1.0	.100E+02	.07	49.55
.00	-.99	2.73	1.6	.609E+01	.27	48.11
.00	-1.98	2.77	1.9	.524E+01	.47	46.75
.00	-2.97	2.80	2.1	.473E+01	.67	45.47
.00	-3.96	2.83	2.3	.438E+01	.87	44.26
.00	-4.95	2.87	2.4	.410E+01	1.06	43.12
.00	-5.95	2.90	2.6	.388E+01	1.26	42.05
.00	-6.94	2.93	2.7	.370E+01	1.46	41.03
.00	-7.93	2.96	2.8	.355E+01	1.66	40.08
.00	-8.92	3.00	2.9	.342E+01	1.86	39.17
.00	-9.91	3.03	3.0	.330E+01	2.06	38.31
.00	-10.90	3.06	3.1	.319E+01	2.25	37.49

.00	-11.89	3.10	3.2	.310E+01	2.45	36.71
.00	-12.88	3.13	3.3	.301E+01	2.65	35.98
.00	-13.87	3.16	3.4	.294E+01	2.85	35.28
.00	-14.87	3.20	3.5	.287E+01	3.05	34.61
.00	-15.86	3.23	3.6	.280E+01	3.24	33.97
.00	-16.85	3.26	3.7	.274E+01	3.44	33.36
.00	-17.84	3.29	3.7	.268E+01	3.64	32.78
.00	-18.83	3.33	3.8	.263E+01	3.84	32.22
.00	-19.82	3.36	3.9	.258E+01	4.04	31.69
.00	-20.81	3.39	3.9	.253E+01	4.24	31.18
.00	-21.80	3.43	4.0	.249E+01	4.43	30.69
.00	-22.79	3.46	4.1	.245E+01	4.63	30.22
.00	-23.78	3.49	4.1	.241E+01	4.83	29.78
.00	-24.77	3.52	4.2	.237E+01	5.03	29.36
.00	-25.77	3.56	4.3	.234E+01	5.23	28.96
.00	-26.76	3.59	4.3	.230E+01	5.42	28.57
.00	-27.75	3.62	4.4	.227E+01	5.62	28.21
.00	-28.74	3.66	4.5	.224E+01	5.82	27.87
.00	-29.73	3.69	4.5	.221E+01	6.02	27.55
.00	-30.72	3.72	4.6	.218E+01	6.22	27.25
.00	-31.71	3.76	4.6	.216E+01	6.42	26.97
.00	-32.70	3.79	4.7	.213E+01	6.61	26.71
.00	-33.69	3.82	4.7	.211E+01	6.81	26.47
.00	-34.68	3.85	4.8	.208E+01	7.01	26.25
.00	-35.68	3.89	4.9	.206E+01	7.21	26.05
.00	-36.67	3.92	4.9	.204E+01	7.41	25.87
.00	-37.66	3.95	5.0	.202E+01	7.60	25.71
.00	-38.65	3.99	5.0	.199E+01	7.80	25.56
.00	-39.64	4.02	5.1	.197E+01	8.00	25.43
.00	-40.63	4.05	5.1	.195E+01	8.20	25.32
.00	-41.62	4.09	5.2	.194E+01	8.40	25.22
.00	-42.61	4.12	5.2	.192E+01	8.60	25.14
.00	-43.60	4.15	5.3	.190E+01	8.70	25.07
.00	-44.60	4.18	5.3	.188E+01	8.70	25.01
.00	-45.59	4.22	5.4	.187E+01	8.70	24.96
.00	-46.58	4.25	5.4	.185E+01	8.70	24.92
.00	-47.57	4.28	5.5	.183E+01	8.70	24.88
.00	-48.56	4.32	5.5	.182E+01	8.70	24.86
.00	-49.55	4.35	5.5	.180E+01	8.70	24.84

Cumulative travel time = 62. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-49.55	8.70	5.5	.180E+01	8.70	23.57
32.48	-108.91	8.70	6.2	.163E+01	4.88	50.82
68.16	-168.26	8.70	6.7	.149E+01	4.12	70.52
106.80	-227.62	8.70	7.2	.139E+01	3.73	89.00
148.17	-286.97	8.70	7.7	.130E+01	3.48	106.95
192.11	-346.33	8.70	8.1	.123E+01	3.30	124.64
238.47	-405.68	8.70	8.6	.117E+01	3.17	142.20
287.14	-465.04	8.70	9.0	.111E+01	3.06	159.69
338.01	-524.39	8.70	9.4	.107E+01	2.97	177.16
390.98	-583.75	8.70	9.7	.103E+01	2.90	194.62
445.98	-643.10	8.70	10.1	.991E+00	2.83	212.10
502.94	-702.46	8.70	10.4	.958E+00	2.78	229.60
561.79	-761.81	8.70	10.8	.928E+00	2.73	247.13
622.47	-821.17	8.70	11.1	.901E+00	2.68	264.70
684.92	-880.52	8.70	11.4	.876E+00	2.64	282.31
749.11	-939.88	8.70	11.7	.853E+00	2.60	299.97
814.98	-999.23	8.70	12.0	.832E+00	2.56	317.67
882.49	-1058.59	8.70	12.3	.812E+00	2.53	335.41
951.60	-1117.94	8.70	12.6	.794E+00	2.49	353.20
1022.28	-1177.30	8.70	12.9	.776E+00	2.46	371.04
1094.48	-1236.66	8.70	13.2	.760E+00	2.44	388.92
1168.19	-1296.01	8.70	13.4	.745E+00	2.41	406.84
1243.37	-1355.37	8.70	13.7	.731E+00	2.38	424.81
1319.99	-1414.72	8.70	13.9	.717E+00	2.36	442.83
1398.03	-1474.08	8.70	14.2	.705E+00	2.34	460.89
1477.46	-1533.43	8.70	14.4	.692E+00	2.31	478.99
1558.25	-1592.79	8.70	14.7	.681E+00	2.29	497.14
1640.39	-1652.14	8.70	14.9	.670E+00	2.27	515.33
1723.85	-1711.50	8.70	15.2	.660E+00	2.25	533.57
1808.61	-1770.85	8.70	15.4	.650E+00	2.23	551.84
1894.65	-1830.21	8.70	15.6	.640E+00	2.22	570.16
1981.95	-1889.56	8.70	15.9	.631E+00	2.20	588.51
2070.50	-1948.92	8.70	16.1	.622E+00	2.18	606.91
2160.27	-2008.27	8.70	16.3	.614E+00	2.16	625.34
2251.26	-2067.63	8.70	16.5	.606E+00	2.15	643.82
2343.44	-2126.98	8.70	16.7	.598E+00	2.13	662.33
2436.80	-2186.34	8.70	16.9	.590E+00	2.12	680.88
2531.33	-2245.69	8.70	17.1	.583E+00	2.10	699.47
2627.01	-2305.05	8.70	17.4	.576E+00	2.09	718.09
2723.82	-2364.40	8.70	17.6	.570E+00	2.08	736.75
2821.76	-2423.76	8.70	17.8	.563E+00	2.06	755.45
2920.81	-2483.11	8.70	18.0	.557E+00	2.05	774.18
3020.96	-2542.47	8.70	18.2	.551E+00	2.04	792.95
3122.19	-2601.83	8.70	18.3	.545E+00	2.02	811.75
3224.50	-2661.18	8.70	18.5	.539E+00	2.01	830.58
3327.88	-2720.54	8.70	18.7	.534E+00	2.00	849.45
3432.31	-2779.89	8.70	18.9	.529E+00	1.99	868.35
3537.78	-2839.25	8.70	19.1	.523E+00	1.98	887.29
3644.28	-2898.60	8.70	19.3	.518E+00	1.97	906.25
3751.81	-2957.96	8.70	19.5	.513E+00	1.95	925.25
3860.35	-3017.31	8.70	19.7	.509E+00	1.94	944.28

Cumulative travel time = 47331. sec

OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
  Nearest bank is now on RIGHT.

The initial plume WIDTH values in the next far-field module will be
  CORRECTED by a factor 1.46 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe
  PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
  Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment D

CORMIX2 Prediction File
Roseton Generating Station
September Conditions

```
        CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
 ` `system CORMIX2:                                                Subsystem version:
    )merged Multiport Diffuser Discharges    CORMIX v.3.20      September 1996
 ` ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          ROSETON^GENERATING^STATION
 Design case:              FULL^9-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\R19FPA  .cx2
 Time of Fortran run:      03/04/97--13:18:41

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   1140.00  AS     =  13110.00  QA     =   1193.01  ICHREG= 2
 HA     =     11.50  HD     =      8.70
 UA     =      .091  F      =      .031  USTAR = .5693E-02
 UW     =      .000  UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U          RHOAM =  999.0500

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK   =  LEFT      DISTB =    100.00  YB1    =    100.00  YB2    =    100.00
 LD     =     99.10  NOPEN =   14       SPAC   =      7.62
 D0     =      .910  A0     =      .650  H0     =      2.70
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =       .00  SIGMA =    270.00  BETA   =     90.00
 `      =      4.441  Q0     =     40.440        = .4044E+02
   )0   =  996.1500  DRHO0 = .2900E+01  GP0    = .2847E-01
 `C0    = .1000E+02  CUNITS=  degC
 IPOLL =  3          KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .4081E+00  m0     = .1812E+01  j0     = .1162E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =      .092  lM     =     35.21  lm     =    218.86
 lmp    =  99999.00  lbp    =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .4044E+02  M0     = .1796E+03  J0     = .1151E+01
 Associated 3-d length scales (meters)
 LQ     =      3.02  LM     =     45.73  Lm     =    147.27  Lb     =   1527.61
                                         Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =     86.84  FRD0   =     27.59  R      =     48.80
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     8.70  2
 2222222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 `C0    = .1000E+02  CUNITS=  degC
 NTOX   =  0
 NSTD   =  0
```

```
REGMZ =  0
XINT  =  12000.00  XMAX  =  12000.00

v ''-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       100.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S        C        BV        BH
      .00       .00      2.70      1.0  .100E+02     .07     49.55

 - ` OF MOD201: DIFFUSER DISCHARGE MODULE
    ----------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 The diffuser near-field dilution is REDUCED because of the PROXIMITY
   of the shoreline.
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULL
  MIXED over the entire layer depth (HS =    8.70m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X         Y         Z         S        C        BV        BH
      .00       .00      2.70      1.0  .100E+02     .07     49.55
      .00      -.99      2.73      1.6  .609E+01     .27     48.11
      .00     -1.98      2.77      1.9  .524E+01     .47     46.75
      .00     -2.97      2.80      2.1  .473E+01     .67     45.47
      .00     -3.96      2.83      2.3  .438E+01     .87     44.26
      .00     -4.95      2.87      2.4  .410E+01    1.06     43.12
      .00     -5.95      2.90      2.6  .388E+01    1.26     42.05
      .00     -6.94      2.93      2.7  .370E+01    1.46     41.03
      .00     -7.93      2.96      2.8  .355E+01    1.66     40.08
      .00     -8.92      3.00      2.9  .342E+01    1.86     39.17
      .00     -9.91      3.03      3.0  .330E+01    2.06     38.31
      .00    -10.90      3.06      3.1  .319E+01    2.25     37.49
```

.00	-11.89	3.10	3.2	.310E+01	2.45	36.71
.00	-12.88	3.13	3.3	.301E+01	2.65	35.98
.00	-13.87	3.16	3.4	.294E+01	2.85	35.28
.00	-14.87	3.20	3.5	.287E+01	3.05	34.61
.00	-15.86	3.23	3.6	.280E+01	3.24	33.97
.00	-16.85	3.26	3.7	.274E+01	3.44	33.36
.00	-17.84	3.29	3.7	.268E+01	3.64	32.78
.00	-18.83	3.33	3.8	.263E+01	3.84	32.22
.00	-19.82	3.36	3.9	.258E+01	4.04	31.69
.00	-20.81	3.39	3.9	.253E+01	4.24	31.18
.00	-21.80	3.43	4.0	.249E+01	4.43	30.69
.00	-22.79	3.46	4.1	.245E+01	4.63	30.22
.00	-23.78	3.49	4.1	.241E+01	4.83	29.78
.00	-24.77	3.52	4.2	.237E+01	5.03	29.36
.00	-25.77	3.56	4.3	.234E+01	5.23	28.96
.00	-26.76	3.59	4.3	.230E+01	5.42	28.57
.00	-27.75	3.62	4.4	.227E+01	5.62	28.21
.00	-28.74	3.66	4.5	.224E+01	5.82	27.87
.00	-29.73	3.69	4.5	.221E+01	6.02	27.55
.00	-30.72	3.72	4.6	.218E+01	6.22	27.25
.00	-31.71	3.76	4.6	.216E+01	6.42	26.97
.00	-32.70	3.79	4.7	.213E+01	6.61	26.71
.00	-33.69	3.82	4.7	.211E+01	6.81	26.47
.00	-34.68	3.85	4.8	.208E+01	7.01	26.25
.00	-35.68	3.89	4.9	.206E+01	7.21	26.05
.00	-36.67	3.92	4.9	.204E+01	7.41	25.87
.00	-37.66	3.95	5.0	.202E+01	7.60	25.71
.00	-38.65	3.99	5.0	.199E+01	7.80	25.56
.00	-39.64	4.02	5.1	.197E+01	8.00	25.43
.00	-40.63	4.05	5.1	.195E+01	8.20	25.32
.00	-41.62	4.09	5.2	.194E+01	8.40	25.22
.00	-42.61	4.12	5.2	.192E+01	8.60	25.14
.00	-43.60	4.15	5.3	.190E+01	8.70	25.07
.00	-44.60	4.18	5.3	.188E+01	8.70	25.01
.00	-45.59	4.22	5.4	.187E+01	8.70	24.96
.00	-46.58	4.25	5.4	.185E+01	8.70	24.92
.00	-47.57	4.28	5.5	.183E+01	8.70	24.88
.00	-48.56	4.32	5.5	.182E+01	8.70	24.86
.00	-49.55	4.35	5.5	.180E+01	8.70	24.84

Cumulative travel time = 62. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-49.55	8.70	5.5	.180E+01	8.70	23.84
35.70	-119.21	8.70	6.3	.160E+01	4.80	53.95
75.45	-188.87	8.70	6.9	.145E+01	4.06	76.12
118.87	-258.52	8.70	7.5	.134E+01	3.69	97.08
165.67	-328.18	8.70	8.0	.125E+01	3.45	117.55
215.63	-397.84	8.70	8.5	.117E+01	3.29	137.81
268.55	-467.50	8.70	9.0	.111E+01	3.16	157.96
324.28	-537.16	8.70	9.4	.106E+01	3.06	178.07
382.68	-606.81	8.70	9.9	.101E+01	2.97	198.19
443.64	-676.47	8.70	10.3	.972E+00	2.90	218.33
507.05	-746.13	8.70	10.7	.936E+00	2.84	238.51
572.83	-815.79	8.70	11.1	.903E+00	2.78	258.74
640.88	-885.44	8.70	11.4	.874E+00	2.73	279.02
711.14	-955.10	8.70	11.8	.847E+00	2.69	299.36
783.54	-1024.76	8.70	12.1	.823E+00	2.64	319.76
858.01	-1094.42	8.70	12.5	.801E+00	2.61	340.21
934.51	-1164.08	8.70	12.8	.780E+00	2.57	360.73
1012.97	-1233.73	8.70	13.1	.761E+00	2.54	381.30
1093.36	-1303.39	8.70	13.5	.743E+00	2.51	401.94
1175.62	-1373.05	8.70	13.8	.727E+00	2.48	422.63
1259.71	-1442.71	8.70	14.1	.711E+00	2.45	443.39
1345.60	-1512.37	8.70	14.4	.697E+00	2.42	464.20
1433.25	-1582.02	8.70	14.6	.683E+00	2.40	485.07
1522.62	-1651.68	8.70	14.9	.670E+00	2.37	505.99
1613.68	-1721.34	8.70	15.2	.658E+00	2.35	526.98
1706.40	-1791.00	8.70	15.5	.646E+00	2.33	548.01
1800.75	-1860.65	8.70	15.7	.635E+00	2.31	569.10
1896.71	-1930.31	8.70	16.0	.625E+00	2.28	590.24
1994.24	-1999.97	8.70	16.3	.615E+00	2.27	611.44
2093.32	-2069.63	8.70	16.5	.605E+00	2.25	632.68
2193.93	-2139.29	8.70	16.8	.596E+00	2.23	653.98
2296.05	-2208.94	8.70	17.0	.588E+00	2.21	675.32
2399.65	-2278.60	8.70	17.3	.579E+00	2.19	696.71
2504.71	-2348.26	8.70	17.5	.571E+00	2.18	718.15
2611.21	-2417.92	8.70	17.7	.564E+00	2.16	739.64
2719.13	-2487.58	8.70	18.0	.556E+00	2.14	761.18
2828.46	-2557.23	8.70	18.2	.549E+00	2.13	782.76
2939.18	-2626.89	8.70	18.4	.543E+00	2.12	804.38
3051.26	-2696.55	8.70	18.7	.536E+00	2.10	826.05
3164.70	-2766.21	8.70	18.9	.530E+00	2.09	847.76
3279.48	-2835.87	8.70	19.1	.524E+00	2.07	869.52
3395.57	-2905.52	8.70	19.3	.518E+00	2.06	891.31
3512.97	-2975.18	8.70	19.5	.512E+00	2.05	913.15
3631.67	-3044.84	8.70	19.7	.507E+00	2.03	935.03
3751.64	-3114.50	8.70	20.0	.501E+00	2.02	956.95
3872.88	-3184.16	8.70	20.2	.496E+00	2.01	978.91
3995.36	-3253.81	8.70	20.4	.491E+00	2.00	1000.91
4119.09	-3323.47	8.70	20.6	.486E+00	1.99	1022.95
4244.04	-3393.13	8.70	20.8	.481E+00	1.98	1045.03
4370.21	-3462.79	8.70	21.0	.477E+00	1.96	1067.14
4497.59	-3532.45	8.70	21.2	.472E+00	1.95	1089.30

Cumulative travel time = 59371. sec

OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

```
Bank nearest to plume centerline has changed.
  Nearest bank is now on RIGHT.

The initial plume WIDTH values in the next far-field module will be
  CORRECTED by a factor  1.46 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe
  PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
  Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.
-------------------------------------------------------------------------------
CORMIX2: Submerged Multiport Diffuser Discharges       End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222
```

Attachment E

CORMIX2 Prediction File
Indian Point Generating Station
June Conditions

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CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                    CORMIX: CORNELL MIXING ZONE EXPERT SYSTEM
                        CORMIX v.3.20     September 1996
SITE NAME/LABEL:                INDIAN POINT GENERATING STATION
  DESIGN CASE:                  FULL 6-81 10PC FLOOD APAC CORRECT DEL-T
  FILE NAME:                    I16FPAC
Using subsystem CORMIX2:        Submerged Multiport Diffuser Discharges
  Start of session:             11/06/98--16:21:03
*************************************************************************
SUMMARY OF INPUT DATA:
-------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = bounded
  Width                         BS      =         1510 m
  Channel regularity            ICHREG = 2
  Ambient flowrate              QA      =      1129.48 m^3/s
  Average depth                 HA      =          8.5 m
  Depth at discharge            HD      =         6.55 m
  Ambient velocity              UA      =         .088 m/s
  Darcy-Weisbach friction factor F      =       0.0346
    Calculated from Manning's n         =          .03
  Wind velocity                 UW      =            0 m/s
Stratification Type             STRCND = A
  Surface density               RHOAS   =        999.2 kg/m^3
  Bottom density                RHOAB   =       1000.8 kg/m^3
-------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = unidirectional parallel
  Diffuser length               LD      = 70.4 m
  Nearest bank                          = right
  Diffuser endpoints            YB1     =       0 m;    YB2 =       0 m
  Number of openings            NOPEN   =           12
  Spacing between risers/openings SPAC  =         6.40 m
  Port/Nozzle diameter          D0      =         2.66 m
    with contraction ratio              = .8
  Equivalent slot width         B0      =       0.7577 m
  Total area of openings        A0      =       4.4457 m^2
  Discharge velocity            U0      =         1.98 m/s
  Total discharge flowrate      Q0      =          106 m^3/s
  Discharge port height         H0      =         2.15 m
  Nozzle arrangement            BETYPE = unidirectional without fanning
  Diffuser alignment angle      GAMMA   =            0 deg
  Vertical discharge angle      THETA   =            0 deg
  Horizontal discharge angle    SIGMA   =           90 deg
  Relative orientation angle    BETA    =           90 deg
  Discharge density             RHO0    =        997.6 kg/m^3
  Density difference            DRHO    =       2.4000 kg/m^3
  Buoyant acceleration          GP0     =        .0235 m/s^2
  Discharge concentration       C0      =             9.06 degC
  Surface heat exchange coeff.  KS      =            0 m/s
  Coefficient of decay          KD      =            0 /s
-------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)       q0      =     1.505682 m^2/s
  Momentum flux                 m0      =     2.991670 m^3/s^2
  Buoyancy flux                 j0      =     0.035438 m^3/s^3
-------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES :
```

```
  lq  =        0.75 m          lm  =     386.32 m          lM  =      27.75 m
  lm' =     99999.0 m          lb' =    99999.0 m          la  =    99999.0 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
  Slot Froude number                FR0     =      14.87
  Port/nozzle Froude number         FRD0    =       7.94
  Velocity ratio                    R       =      22.57
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                           = no
  Water quality standard specified          = no
  Regulatory mixing zone                    = no
  Region of interest                        =     25000.00 m downstream
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-------------------------*
  | FLOW CLASS    =     MU3 |
  *-------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.  The ambient density stratification at the
  discharge site is relatively weak and unimportant so the discharge flow
  penetrates to the surface and/or breaks down the existing stratification
  through vigorous mixing.
  Applicable layer depth = water depth =          6.55 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):
-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
                0 m from the right bank/shore.
  Number of display steps NSTEP = 50 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at edge of NFR =          1.0959 degC
  Dilution at edge of NFR                =          8.2
  NFR Location:                        x =      7589.91 m
    (centerline coordinates)           y =      6081.25 m
                                       z =         6.55 m
  NFR plume dimensions:        half-width =      1975.26 m
                                 thickness =         1.25 m
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
Stratification assessment:
  The specified ambient density stratification is weak relative to the
  discharge conditions and is dynamically unimportant. The discharge will
  behave as if the ambient were unstratified.
-----------------------------------------------------------------------------
Near-field instability behavior:
  The diffuser flow will experience instabilities with full vertical mixing
  in the near-field.
```

There may be benthic impact of high pollutant concentrations.

FAR-FIELD MIXING SUMMARY:
Plume becomes vertically fully mixed WITHIN NEAR-FIELD at .00 m downstream, but RE-STRATIFIES LATER and is not mixed in the far-field.
Plume becomes laterally fully mixed at 7589.91 m downstream.

PLUME BANK CONTACT SUMMARY:
Plume contacts both banks simultaneously.
The x-coordinate for this contact is 7589.91 m.

************************ TOXIC DILUTION ZONE SUMMARY ************************

No TDZ was specified for this simulation.

*********************** REGULATORY MIXING ZONE SUMMARY ***********************

No RMZ and no ambient water quality standard have been specified.

********************* FINAL DESIGN ADVICE AND COMMENTS *********************

CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent the actual three-dimensional diffuser geometry. Thus, it approximates the details of the merging process of the individual jets from each port/nozzle.
In the present design, the spacing between adjacent ports/nozzles (or riser assemblies) is of the order of, or less than, the local water depth so that the slot diffuser approximation holds well.
Nevertheless, if this is a final design, the user is advised to use a final CORMIX1 (single port discharge) analysis, with discharge data for an individual diffuser jet/plume, in order to compare to the present near-field prediction.

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

****

DESIGN CASE:	FULL 6-81 10PC FLOOD APAC CORRECT DEL-T
FILE NAME:	I16FPAC
Subsystem CORMIX2:	Submerged Multiport Diffuser Discharges
END OF SESSION/ITERATION:	11/06/98--16:27:20

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          INDIAN^POINT^GENERATING^STATION
 Design case:              FULL^6-81^10PC^FLOOD^APAC^CORRECT^DEL-T
 FILE NAME:                cormix\sim\I16FPAC .cx2
 Time of Fortran run:      11/06/98--16:24:01

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   1510.00  AS     =  12835.00  QA     =   1129.48  ICHREG= 2
 HA     =      8.50  HD     =      6.55
 UA     =      .088  F      =      .035  USTAR = .5789E-02
 UW     =      .000  UWSTAR= .0000E+00
 Density stratified environment
 STRCND=  A          RHOAM = 1000.0000
 RHOAS =  999.2000   RHOAB = 1000.8000  RHOAH0= 1000.0000  E      = .2394E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK   =  RIGHT     DISTB =       .00  YB1    =       .00  YB2    =       .00
 LD     =     70.40  NOPEN =   12       SPAC   =      6.40
 D0     =     2.660  A0    =     5.557  H0     =      2.15
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00   THETA =       .00  SIGMA =     90.00  BETA   =     90.00
 U0     =     1.987  Q0    =   106.000        = .1060E+03
 RHO0   =  997.6000  DRHO0 = .2400E+01  GP0    = .2354E-01
 C0     = .9060E+01  CUNITS=  degC
 IPOLL =  3          KS    = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .1506E+01  m0    = .2992E+01  j0     = .3544E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =       .758 lM    =     27.76  lm     =    386.32
 lmp    =  99999.00  lbp   =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .1060E+03  M0    = .2106E+03  J0     = .2495E+01
 Associated 3-d length scales (meters)
 LQ     =      7.30  LM    =     35.00  Lm     =    164.92  Lb     =   3660.92
                                        Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =     14.88  FRD0  =      7.94  R      =     22.57
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.55  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .9060E+01  CUNITS=  degC
 NTOX   =  0
```

```
 NSTD  =  0
 REGMZ =  0
 XINT  =  25000.00  XMAX  =  25000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
          .00 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60     35.20

END OF MOD201: DIFFUSER DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TE

 The diffuser near-field dilution is REDUCED because of the PROXIMITY
   of the shoreline.
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FUL
  MIXED over the entire layer depth (HS =    6.55m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60     35.20
      .00      .70     2.17     1.1  .856E+01     .75     34.18
      .00     1.41     2.20     1.1  .837E+01     .89     33.21
      .00     2.11     2.22     1.1  .823E+01    1.03     32.30
      .00     2.82     2.24     1.1  .811E+01    1.17     31.44
      .00     3.52     2.26     1.1  .801E+01    1.31     30.63
      .00     4.22     2.29     1.1  .792E+01    1.45     29.87
      .00     4.93     2.31     1.2  .784E+01    1.59     29.15
      .00     5.63     2.33     1.2  .777E+01    1.73     28.47
      .00     6.34     2.35     1.2  .771E+01    1.87     27.82
      .00     7.04     2.38     1.2  .764E+01    2.01     27.21
```

.00	7.74	2.40	1.2	.759E+01	2.15	26.63
.00	8.45	2.42	1.2	.753E+01	2.29	26.08
.00	9.15	2.44	1.2	.748E+01	2.44	25.56
.00	9.86	2.47	1.2	.743E+01	2.58	25.06
.00	10.56	2.49	1.2	.738E+01	2.72	24.58
.00	11.26	2.51	1.2	.734E+01	2.86	24.13
.00	11.97	2.53	1.2	.730E+01	3.00	23.70
.00	12.67	2.56	1.2	.726E+01	3.14	23.28
.00	13.38	2.58	1.3	.722E+01	3.28	22.89
.00	14.08	2.60	1.3	.718E+01	3.42	22.51
.00	14.78	2.62	1.3	.714E+01	3.56	22.15
.00	15.49	2.65	1.3	.711E+01	3.70	21.80
.00	16.19	2.67	1.3	.707E+01	3.84	21.47
.00	16.90	2.69	1.3	.704E+01	3.98	21.16
.00	17.60	2.71	1.3	.701E+01	4.12	20.86
.00	18.30	2.74	1.3	.698E+01	4.27	20.57
.00	19.01	2.76	1.3	.695E+01	4.41	20.30
.00	19.71	2.78	1.3	.692E+01	4.55	20.04
.00	20.42	2.80	1.3	.689E+01	4.69	19.80
.00	21.12	2.83	1.3	.686E+01	4.83	19.57
.00	21.82	2.85	1.3	.683E+01	4.97	19.36
.00	22.53	2.87	1.3	.681E+01	5.11	19.16
.00	23.23	2.89	1.3	.678E+01	5.25	18.98
.00	23.94	2.92	1.3	.675E+01	5.39	18.80
.00	24.64	2.94	1.3	.673E+01	5.53	18.65
.00	25.34	2.96	1.4	.670E+01	5.67	18.51
.00	26.05	2.98	1.4	.668E+01	5.81	18.38
.00	26.75	3.01	1.4	.666E+01	5.96	18.26
.00	27.46	3.03	1.4	.663E+01	6.10	18.16
.00	28.16	3.05	1.4	.661E+01	6.24	18.07
.00	28.86	3.07	1.4	.659E+01	6.38	17.99
.00	29.57	3.10	1.4	.657E+01	6.52	17.92
.00	30.27	3.12	1.4	.655E+01	6.55	17.86
.00	30.98	3.14	1.4	.652E+01	6.55	17.81
.00	31.68	3.16	1.4	.650E+01	6.55	17.77
.00	32.38	3.19	1.4	.648E+01	6.55	17.73
.00	33.09	3.21	1.4	.646E+01	6.55	17.70
.00	33.79	3.23	1.4	.644E+01	6.55	17.68
.00	34.50	3.25	1.4	.643E+01	6.55	17.66
.00	35.20	3.28	1.4	.641E+01	6.55	17.64

Cumulative travel time = 25. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TI

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
BV = top-hat thickness, measured vertically
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	35.20	6.55	1.4	.641E+01	6.55	17.53
43.74	156.12	6.55	1.8	.497E+01	3.02	61.23
97.36	277.04	6.55	2.2	.420E+01	2.59	96.89
159.28	397.96	6.55	2.4	.370E+01	2.39	132.01
228.51	518.88	6.55	2.7	.335E+01	2.26	167.19
304.36	639.81	6.55	2.9	.308E+01	2.17	202.57
386.28	760.73	6.55	3.2	.287E+01	2.09	238.21
473.85	881.65	6.55	3.4	.270E+01	2.03	274.11
566.74	1002.57	6.55	3.6	.255E+01	1.98	310.27
664.64	1123.49	6.55	3.7	.243E+01	1.93	346.67
767.33	1244.41	6.55	3.9	.232E+01	1.89	383.32
874.58	1365.33	6.55	4.1	.222E+01	1.85	420.20
986.21	1486.25	6.55	4.2	.214E+01	1.82	457.30
1102.05	1607.17	6.55	4.4	.207E+01	1.79	494.61
1221.95	1728.09	6.55	4.5	.200E+01	1.76	532.12
1345.79	1849.02	6.55	4.7	.194E+01	1.73	569.83
1473.43	1969.94	6.55	4.8	.188E+01	1.70	607.72
1604.78	2090.86	6.55	5.0	.183E+01	1.68	645.79
1739.72	2211.78	6.55	5.1	.178E+01	1.66	684.03
1878.17	2332.70	6.55	5.2	.174E+01	1.64	722.44
2020.04	2453.62	6.55	5.3	.170E+01	1.62	761.01
2165.24	2574.54	6.55	5.5	.166E+01	1.60	799.73
2313.71	2695.46	6.55	5.6	.162E+01	1.58	838.61
2465.37	2816.38	6.55	5.7	.159E+01	1.56	877.63
2620.15	2937.31	6.55	5.8	.156E+01	1.54	916.79
2778.00	3058.23	6.55	5.9	.153E+01	1.53	956.09
2938.86	3179.15	6.55	6.0	.150E+01	1.51	995.52
3102.67	3300.07	6.55	6.2	.147E+01	1.50	1035.09
3269.38	3420.99	6.55	6.3	.145E+01	1.48	1074.78
3438.93	3541.91	6.55	6.4	.142E+01	1.47	1114.59
3611.29	3662.83	6.55	6.5	.140E+01	1.46	1154.53
3786.41	3783.75	6.55	6.6	.138E+01	1.44	1194.59
3964.24	3904.67	6.55	6.7	.136E+01	1.43	1234.76
4144.74	4025.60	6.55	6.8	.134E+01	1.42	1275.04
4327.88	4146.52	6.55	6.9	.132E+01	1.41	1315.44
4513.61	4267.44	6.55	7.0	.130E+01	1.40	1355.94
4701.91	4388.36	6.55	7.1	.128E+01	1.39	1396.55
4892.74	4509.28	6.55	7.1	.127E+01	1.37	1437.27
5086.05	4630.20	6.55	7.2	.125E+01	1.36	1478.09
5281.84	4751.12	6.55	7.3	.124E+01	1.35	1519.00
5480.05	4872.04	6.55	7.4	.122E+01	1.34	1560.02
5680.66	4992.96	6.55	7.5	.121E+01	1.33	1601.13
5883.65	5113.88	6.55	7.6	.119E+01	1.33	1642.34
6088.99	5234.80	6.55	7.7	.118E+01	1.32	1683.65
6296.64	5355.73	6.55	7.8	.117E+01	1.31	1725.04
6506.59	5476.65	6.55	7.9	.115E+01	1.30	1766.53
6718.81	5597.57	6.55	7.9	.114E+01	1.29	1808.10
6933.28	5718.49	6.55	8.0	.113E+01	1.28	1849.76
7149.96	5839.41	6.55	8.1	.112E+01	1.27	1891.51
7368.85	5960.33	6.55	8.2	.111E+01	1.27	1933.35
7589.91	6081.25	6.55	8.3	.110E+01	1.26	1975.27

Cumulative travel time = 103524. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on LEFT.

The initial plume WIDTH values in the next far-field module will be CORRECTED by a factor 1.35 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment F

CORMIX2 Prediction File
Indian Point Generating Station
July Conditions

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          INDIAN^POINT^GENERATING^STATION
 Design case:              FULL^7-81^10PC^FLOOD^APAC^CORRECT^DEL-T
 FILE NAME:                cormix\sim\I17FPAC .cx2
 Time of Fortran run:      11/06/98--17:30:26

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   1510.00  AS     =  12835.00  QA     =   1167.99  ICHREG= 2
 HA     =      8.50  HD     =      6.55
 UA     =      .091  F      =      .035  USTAR = .5986E-02
 UW     =      .000  UWSTAR= .0000E+00
 Density stratified environment
 STRCND=  A          RHOAM =  999.6500
 RHOAS =  999.4600   RHOAB =  999.8400  RHOAH0=  999.6500  E      = .5690E-03

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK   =  RIGHT     DISTB =       .00  YB1    =       .00  YB2    =       .00
 LD     =     70.40  NOPEN =   12       SPAC   =      6.40
 D0     =     2.660  A0    =     5.557  H0     =      2.15
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00   THETA =       .00  SIGMA =     90.00  BETA   =     90.00
 U0     =     1.987  Q0    =   106.000        = .1060E+03
 RHO0   =  996.8800  DRHO0 = .2770E+01  GP0    = .2717E-01
 C0     = .9060E+01  CUNITS=  degC
 IPOLL =  3          KS    = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .1506E+01  m0    = .2992E+01  j0     = .4092E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =       .758 lM    =     25.22  lm     =    361.27
 lmp    =  99999.00  lbp   =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .1060E+03  M0    = .2106E+03  J0     = .2880E+01
 Associated 3-d length scales (meters)
 LQ     =      7.30  LM    =     32.58  Lm     =    159.48  Lb     =   3822.39
                                        Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =     13.85  FRD0  =      7.39  R      =     21.83
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.55  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .9060E+01  CUNITS=  degC
 NTOX   =  0
```

```
 NSTD  =  0
 REGMZ =  0
 XINT  =  25000.00  XMAX  =  25000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
          .00 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60    35.20

END OF MOD201: DIFFUSER DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 The diffuser near-field dilution is REDUCED because of the PROXIMITY
   of the shoreline.
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULL
  MIXED over the entire layer depth (HS =    6.55m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60    35.20
      .00      .70     2.17     1.1  .856E+01     .75    34.18
      .00     1.41     2.20     1.1  .837E+01     .89    33.21
      .00     2.11     2.22     1.1  .823E+01    1.03    32.30
      .00     2.82     2.24     1.1  .811E+01    1.17    31.44
      .00     3.52     2.26     1.1  .801E+01    1.31    30.63
      .00     4.22     2.29     1.1  .792E+01    1.45    29.87
      .00     4.93     2.31     1.2  .784E+01    1.59    29.15
      .00     5.63     2.33     1.2  .777E+01    1.73    28.47
      .00     6.34     2.35     1.2  .771E+01    1.87    27.82
      .00     7.04     2.38     1.2  .764E+01    2.01    27.21
```

.00	7.74	2.40	1.2	.759E+01	2.15	26.63
.00	8.45	2.42	1.2	.753E+01	2.29	26.08
.00	9.15	2.44	1.2	.748E+01	2.44	25.56
.00	9.86	2.47	1.2	.743E+01	2.58	25.06
.00	10.56	2.49	1.2	.738E+01	2.72	24.58
.00	11.26	2.51	1.2	.734E+01	2.86	24.13
.00	11.97	2.53	1.2	.730E+01	3.00	23.70
.00	12.67	2.56	1.2	.726E+01	3.14	23.28
.00	13.38	2.58	1.3	.722E+01	3.28	22.89
.00	14.08	2.60	1.3	.718E+01	3.42	22.51
.00	14.78	2.62	1.3	.714E+01	3.56	22.15
.00	15.49	2.65	1.3	.711E+01	3.70	21.80
.00	16.19	2.67	1.3	.707E+01	3.84	21.47
.00	16.90	2.69	1.3	.704E+01	3.98	21.16
.00	17.60	2.71	1.3	.701E+01	4.12	20.86
.00	18.30	2.74	1.3	.698E+01	4.27	20.57
.00	19.01	2.76	1.3	.695E+01	4.41	20.30
.00	19.71	2.78	1.3	.692E+01	4.55	20.04
.00	20.42	2.80	1.3	.689E+01	4.69	19.80
.00	21.12	2.83	1.3	.686E+01	4.83	19.57
.00	21.82	2.85	1.3	.683E+01	4.97	19.36
.00	22.53	2.87	1.3	.681E+01	5.11	19.16
.00	23.23	2.89	1.3	.678E+01	5.25	18.98
.00	23.94	2.92	1.3	.675E+01	5.39	18.80
.00	24.64	2.94	1.3	.673E+01	5.53	18.65
.00	25.34	2.96	1.4	.670E+01	5.67	18.51
.00	26.05	2.98	1.4	.668E+01	5.81	18.38
.00	26.75	3.01	1.4	.666E+01	5.96	18.26
.00	27.46	3.03	1.4	.663E+01	6.10	18.16
.00	28.16	3.05	1.4	.661E+01	6.24	18.07
.00	28.86	3.07	1.4	.659E+01	6.38	17.99
.00	29.57	3.10	1.4	.657E+01	6.52	17.92
.00	30.27	3.12	1.4	.655E+01	6.55	17.86
.00	30.98	3.14	1.4	.652E+01	6.55	17.81
.00	31.68	3.16	1.4	.650E+01	6.55	17.77
.00	32.38	3.19	1.4	.648E+01	6.55	17.73
.00	33.09	3.21	1.4	.646E+01	6.55	17.70
.00	33.79	3.23	1.4	.644E+01	6.55	17.68
.00	34.50	3.25	1.4	.643E+01	6.55	17.66
.00	35.20	3.28	1.4	.641E+01	6.55	17.64

Cumulative travel time = 25. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
BV = top-hat thickness, measured vertically
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	35.20	6.55	1.4	.641E+01	6.55	17.46
41.87	148.04	6.55	1.8	.503E+01	2.98	60.18
92.74	260.89	6.55	2.1	.428E+01	2.55	94.67
151.24	373.73	6.55	2.4	.379E+01	2.34	128.55
216.48	486.57	6.55	2.6	.344E+01	2.21	162.43
287.81	599.42	6.55	2.9	.317E+01	2.12	196.48
364.77	712.26	6.55	3.1	.295E+01	2.04	230.77
446.95	825.10	6.55	3.3	.277E+01	1.98	265.30
534.06	937.95	6.55	3.5	.263E+01	1.93	300.07
625.82	1050.79	6.55	3.6	.250E+01	1.88	335.08
722.02	1163.63	6.55	3.8	.239E+01	1.84	370.33
822.45	1276.48	6.55	4.0	.229E+01	1.80	405.79
926.94	1389.32	6.55	4.1	.221E+01	1.77	441.47
1035.34	1502.16	6.55	4.3	.213E+01	1.74	477.35
1147.52	1615.01	6.55	4.4	.206E+01	1.71	513.43
1263.35	1727.85	6.55	4.5	.200E+01	1.68	549.69
1382.72	1840.69	6.55	4.7	.194E+01	1.66	586.14
1505.53	1953.54	6.55	4.8	.189E+01	1.63	622.76
1631.69	2066.38	6.55	4.9	.184E+01	1.61	659.55
1761.10	2179.22	6.55	5.1	.179E+01	1.59	696.50
1893.69	2292.07	6.55	5.2	.175E+01	1.57	733.61
2029.38	2404.91	6.55	5.3	.171E+01	1.55	770.86
2168.11	2517.75	6.55	5.4	.168E+01	1.54	808.27
2309.81	2630.59	6.55	5.5	.164E+01	1.52	845.82
2454.42	2743.44	6.55	5.6	.161E+01	1.50	883.50
2601.87	2856.28	6.55	5.7	.158E+01	1.49	921.33
2752.12	2969.12	6.55	5.8	.155E+01	1.47	959.28
2905.12	3081.97	6.55	6.0	.152E+01	1.46	997.36
3060.82	3194.81	6.55	6.1	.150E+01	1.44	1035.56
3219.17	3307.65	6.55	6.2	.147E+01	1.43	1073.89
3380.12	3420.50	6.55	6.3	.145E+01	1.42	1112.33
3543.64	3533.34	6.55	6.4	.143E+01	1.40	1150.89
3709.69	3646.18	6.55	6.5	.140E+01	1.39	1189.57
3878.23	3759.03	6.55	6.5	.138E+01	1.38	1228.35
4049.22	3871.87	6.55	6.6	.136E+01	1.37	1267.24
4222.62	3984.71	6.55	6.7	.135E+01	1.36	1306.24
4398.41	4097.56	6.55	6.8	.133E+01	1.35	1345.35
4576.56	4210.40	6.55	6.9	.131E+01	1.34	1384.55
4757.02	4323.24	6.55	7.0	.129E+01	1.33	1423.86
4939.78	4436.09	6.55	7.1	.128E+01	1.32	1463.26
5124.80	4548.93	6.55	7.2	.126E+01	1.31	1502.76
5312.06	4661.77	6.55	7.3	.125E+01	1.30	1542.36
5501.53	4774.62	6.55	7.3	.123E+01	1.29	1582.05
5693.18	4887.46	6.55	7.4	.122E+01	1.28	1621.83
5886.99	5000.30	6.55	7.5	.121E+01	1.27	1661.70
6082.94	5113.15	6.55	7.6	.119E+01	1.26	1701.66
6281.01	5225.99	6.55	7.7	.118E+01	1.25	1741.71
6481.16	5338.83	6.55	7.8	.117E+01	1.24	1781.85
6683.38	5451.68	6.55	7.8	.116E+01	1.24	1822.06
6887.65	5564.52	6.55	7.9	.114E+01	1.23	1862.37
7093.95	5677.36	6.55	8.0	.113E+01	1.22	1902.75

Cumulative travel time = 93572. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on LEFT.

The initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.36 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe
PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment G

CORMIX2 Prediction File
Indian Point Generating Station
August Conditions

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2222222222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          INDIAN^POINT^GENERATING^STATION
 Design case:              FULL^8-81^10PC^FLOOD^APAC^CORRECT^DEL-T
 FILE NAME:                cormix\sim\I18FPAC .cx2
 Time of Fortran run:      11/06/98--17:37:26

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   1510.00  AS     =  12835.00  QA     =   1129.48  ICHREG= 2
 HA     =      8.50  HD     =      6.55
 UA     =       .088 F      =       .035 USTAR = .5789E-02
 UW     =       .000 UWSTAR= .0000E+00
 Density stratified environment
 STRCND=  A          RHOAM =  999.3700
 RHOAS =  999.2200   RHOAB =  999.5200  RHOAH0=  999.3700  E      = .4490E-03

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional_parallel
 BANK   =  RIGHT     DISTB =       .00  YB1    =       .00  YB2    =       .00
 LD     =     70.40  NOPEN =   12       SPAC   =      6.40
 D0     =      2.660 A0    =      5.557 H0     =      2.15
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =       .00   THETA =       .00  SIGMA =     90.00  BETA   =     90.00
 U0     =      1.987 Q0    =    106.000        = .1060E+03
 RHO0   =  996.5800  DRHO0 = .2790E+01  GP0    = .2738E-01
 C0     = .9060E+01  CUNITS=  degC
 IPOLL =  3          KS    = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .1506E+01  m0    = .2992E+01  j0     = .4122E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =       .758 lM    =     25.10  lm     =    386.32
 lmp    =  99999.00  lbp   =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .1060E+03  M0    = .2106E+03  J0     = .2902E+01
 Associated 3-d length scales (meters)
 LQ     =      7.30  LM    =     32.45  Lm     =    164.92  Lb     =   4258.53
                                        Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =     13.79  FRD0  =      7.36  R      =     22.57
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.55  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .9060E+01  CUNITS=  degC
 NTOX   =  0
 NSTD   =  0
 REGMZ  =  0
 XINT   =  25000.00  XMAX   =  25000.00
```

X-Y-Z COORDINATE SYSTEM:
ORIGIN is located at the bottom and the diffuser mid-point:
.00 m from the RIGHT bank/shore.
X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
S = hydrodynamic dilutions, include buoyancy (heat) loss effects, but provided plume has surface contact
C = corresponding temperature values (always in "degC"!), include heat loss, if any

---

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	2.15	1.0	.906E+01	.60	35.20

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TEE

The diffuser near-field dilution is REDUCED because of the PROXIMITY of the shoreline.
In this laterally contracting zone the diffuser plume becomes VERTICALLY FULL MIXED over the entire layer depth (HS = 6.55m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	2.15	1.0	.906E+01	.60	35.20
.00	.70	2.17	1.1	.856E+01	.75	34.18
.00	1.41	2.20	1.1	.837E+01	.89	33.21
.00	2.11	2.22	1.1	.823E+01	1.03	32.30
.00	2.82	2.24	1.1	.811E+01	1.17	31.44
.00	3.52	2.26	1.1	.801E+01	1.31	30.63
.00	4.22	2.29	1.1	.792E+01	1.45	29.87
.00	4.93	2.31	1.2	.784E+01	1.59	29.15
.00	5.63	2.33	1.2	.777E+01	1.73	28.47
.00	6.34	2.35	1.2	.771E+01	1.87	27.82
.00	7.04	2.38	1.2	.764E+01	2.01	27.21
.00	7.74	2.40	1.2	.759E+01	2.15	26.63
.00	8.45	2.42	1.2	.753E+01	2.29	26.08
.00	9.15	2.44	1.2	.748E+01	2.44	25.56
.00	9.86	2.47	1.2	.743E+01	2.58	25.06
.00	10.56	2.49	1.2	.738E+01	2.72	24.58
.00	11.26	2.51	1.2	.734E+01	2.86	24.13

.00	12.67	2.56	1.2	.726E+01	3.14	23.28
.00	13.38	2.58	1.3	.722E+01	3.28	22.89
.00	14.08	2.60	1.3	.718E+01	3.42	22.51
.00	14.78	2.62	1.3	.714E+01	3.56	22.15
.00	15.49	2.65	1.3	.711E+01	3.70	21.80
.00	16.19	2.67	1.3	.707E+01	3.84	21.47
.00	16.90	2.69	1.3	.704E+01	3.98	21.16
.00	17.60	2.71	1.3	.701E+01	4.12	20.86
.00	18.30	2.74	1.3	.698E+01	4.27	20.57
.00	19.01	2.76	1.3	.695E+01	4.41	20.30
.00	19.71	2.78	1.3	.692E+01	4.55	20.04
.00	20.42	2.80	1.3	.689E+01	4.69	19.80
.00	21.12	2.83	1.3	.686E+01	4.83	19.57
.00	21.82	2.85	1.3	.683E+01	4.97	19.36
.00	22.53	2.87	1.3	.681E+01	5.11	19.16
.00	23.23	2.89	1.3	.678E+01	5.25	18.98
.00	23.94	2.92	1.3	.675E+01	5.39	18.80
.00	24.64	2.94	1.3	.673E+01	5.53	18.65
.00	25.34	2.96	1.4	.670E+01	5.67	18.51
.00	26.05	2.98	1.4	.668E+01	5.81	18.38
.00	26.75	3.01	1.4	.666E+01	5.96	18.26
.00	27.46	3.03	1.4	.663E+01	6.10	18.16
.00	28.16	3.05	1.4	.661E+01	6.24	18.07
.00	28.86	3.07	1.4	.659E+01	6.38	17.99
.00	29.57	3.10	1.4	.657E+01	6.52	17.92
.00	30.27	3.12	1.4	.655E+01	6.55	17.86
.00	30.98	3.14	1.4	.652E+01	6.55	17.81
.00	31.68	3.16	1.4	.650E+01	6.55	17.77
.00	32.38	3.19	1.4	.648E+01	6.55	17.73
.00	33.09	3.21	1.4	.646E+01	6.55	17.70
.00	33.79	3.23	1.4	.644E+01	6.55	17.68
.00	34.50	3.25	1.4	.643E+01	6.55	17.66
.00	35.20	3.28	1.4	.641E+01	6.55	17.64

Cumulative travel time = 25. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (T

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
BV = top-hat thickness, measured vertically
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajector
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	35.20	6.55	1.4	.641E+01	6.55	17.53
43.74	156.12	6.55	1.8	.497E+01	2.93	62.94
97.36	277.04	6.55	2.2	.420E+01	2.52	99.91
159.28	397.96	6.55	2.4	.370E+01	2.32	136.34
228.51	518.88	6.55	2.7	.335E+01	2.19	172.85

386.28	760.73	6.55	3.2	.287E+01	2.02	246.59
473.85	881.65	6.55	3.4	.270E+01	1.96	283.89
566.74	1002.57	6.55	3.6	.255E+01	1.91	321.46
664.64	1123.49	6.55	3.7	.243E+01	1.86	359.31
767.33	1244.41	6.55	3.9	.232E+01	1.82	397.42
874.58	1365.33	6.55	4.1	.222E+01	1.79	435.78
986.21	1486.25	6.55	4.2	.214E+01	1.75	474.38
1102.05	1607.17	6.55	4.4	.207E+01	1.72	513.21
1221.95	1728.09	6.55	4.5	.200E+01	1.69	552.25
1345.79	1849.02	6.55	4.7	.194E+01	1.67	591.51
1473.43	1969.94	6.55	4.8	.188E+01	1.64	630.96
1604.78	2090.86	6.55	5.0	.183E+01	1.62	670.61
1739.72	2211.78	6.55	5.1	.178E+01	1.60	710.44
1878.17	2332.70	6.55	5.2	.174E+01	1.58	750.45
2020.04	2453.62	6.55	5.3	.170E+01	1.56	790.64
2165.24	2574.54	6.55	5.5	.166E+01	1.54	830.99
2313.71	2695.46	6.55	5.6	.162E+01	1.52	871.51
2465.37	2816.38	6.55	5.7	.159E+01	1.50	912.18
2620.15	2937.31	6.55	5.8	.156E+01	1.49	953.01
2778.00	3058.23	6.55	5.9	.153E+01	1.47	993.98
2938.86	3179.15	6.55	6.0	.150E+01	1.46	1035.10
3102.67	3300.07	6.55	6.2	.147E+01	1.44	1076.36
3269.38	3420.99	6.55	6.3	.145E+01	1.43	1117.75
3438.93	3541.91	6.55	6.4	.142E+01	1.41	1159.28
3611.29	3662.83	6.55	6.5	.140E+01	1.40	1200.94
3786.41	3783.75	6.55	6.6	.138E+01	1.39	1242.73
3964.24	3904.67	6.55	6.7	.136E+01	1.38	1284.64
4144.74	4025.60	6.55	6.8	.134E+01	1.36	1326.67
4327.88	4146.52	6.55	6.9	.132E+01	1.35	1368.82
4513.61	4267.44	6.55	7.0	.130E+01	1.34	1411.09
4701.91	4388.36	6.55	7.1	.128E+01	1.33	1453.48
4892.74	4509.28	6.55	7.1	.127E+01	1.32	1495.97
5086.05	4630.20	6.55	7.2	.125E+01	1.31	1538.58
5281.84	4751.12	6.55	7.3	.124E+01	1.30	1581.29
5480.05	4872.04	6.55	7.4	.122E+01	1.29	1624.11
5680.66	4992.96	6.55	7.5	.121E+01	1.28	1667.04
5883.65	5113.88	6.55	7.6	.119E+01	1.27	1710.06
6088.99	5234.80	6.55	7.7	.118E+01	1.26	1753.19
6296.64	5355.73	6.55	7.8	.117E+01	1.26	1796.42
6506.59	5476.65	6.55	7.9	.115E+01	1.25	1839.74
6718.81	5597.57	6.55	7.9	.114E+01	1.24	1883.16
6933.28	5718.49	6.55	8.0	.113E+01	1.23	1926.68
7149.96	5839.41	6.55	8.1	.112E+01	1.22	1970.28
7368.85	5960.33	6.55	8.2	.111E+01	1.22	2013.98
7589.91	6081.25	6.55	8.3	.110E+01	1.21	2057.77

Cumulative travel time = 103524. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on LEFT.

The initial plume WIDTH values in the next far-field module will be CORRECTED by a factor 1.35 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation: SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment H

CORMIX2 Prediction File
Indian Point Generating Station
September Conditions

Lawler, Matusky & Skelly Engineers LLP

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          INDIAN^POINT^GENERATING^STATION
 Design case:              FULL^9-81^10PC^FLOOD^APAC^CORRECT^DEL-T
 FILE NAME:                cormix\sim\I19FPAC .cx2
 Time of Fortran run:      11/06/98--17:53:39

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   1510.00  AS    =  12835.00  QA    =   1090.97  ICHREG= 2
 HA    =      8.50  HD    =      6.55
 UA    =       .085 F     =       .035 USTAR = .5592E-02
 UW    =       .000 UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1002.9600

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional parallel
 BANK  =  RIGHT     DISTB =       .00  YB1   =       .00  YB2   =       .00
 LD    =     70.40  NOPEN =   12       SPAC  =      6.40
 D0    =     2.660  A0    =     5.557  H0    =      2.15
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =       .00  SIGMA =     90.00  BETA  =     90.00
 U0    =     1.987  Q0    =   106.000        = .1060E+03
 RHO0  = 1000.4600  DRHO0 = .2500E+01  GP0   = .2444E-01
 C0    = .9060E+01  CUNITS=  degC
 IPOLL =  3         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .1506E+01  m0    = .2992E+01  j0    = .3681E-01  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =       .758 lM    =     26.95  lm    =    414.07
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .1060E+03  M0    = .2106E+03  J0    = .2591E+01
 Associated 3-d length scales (meters)
 LQ    =      7.30  LM    =     34.35  Lm    =    170.74  Lb    =   4219.12
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     14.59  FRD0  =      7.79  R     =     23.37
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU3    2
 2  Applicable layer depth HS =     6.55  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .9060E+01  CUNITS=  degC
 NTOX  =  0
 NSTD  =  0
```

```
 REGMZ =  0
 XINT  =  25000.00  XMAX  =  25000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
          .00 m  from the RIGHT bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60    35.20

END OF MOD201: DIFFUSER DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 The diffuser near-field dilution is REDUCED because of the PROXIMITY
   of the shoreline.
 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULL
  MIXED over the entire layer depth (HS =    6.55m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     2.15     1.0  .906E+01     .60    35.20
      .00      .70     2.17     1.1  .856E+01     .75    34.18
      .00     1.41     2.20     1.1  .837E+01     .89    33.21
      .00     2.11     2.22     1.1  .823E+01    1.03    32.30
      .00     2.82     2.24     1.1  .811E+01    1.17    31.44
      .00     3.52     2.26     1.1  .801E+01    1.31    30.63
      .00     4.22     2.29     1.1  .792E+01    1.45    29.87
      .00     4.93     2.31     1.2  .784E+01    1.59    29.15
      .00     5.63     2.33     1.2  .777E+01    1.73    28.47
      .00     6.34     2.35     1.2  .771E+01    1.87    27.82
      .00     7.04     2.38     1.2  .764E+01    2.01    27.21
      .00     7.74     2.40     1.2  .759E+01    2.15    26.63
```

.00	8.45	2.42	1.2	.753E+01	2.29	26.08
.00	9.15	2.44	1.2	.748E+01	2.44	25.56
.00	9.86	2.47	1.2	.743E+01	2.58	25.06
.00	10.56	2.49	1.2	.738E+01	2.72	24.58
.00	11.26	2.51	1.2	.734E+01	2.86	24.13
.00	11.97	2.53	1.2	.730E+01	3.00	23.70
.00	12.67	2.56	1.2	.726E+01	3.14	23.28
.00	13.38	2.58	1.3	.722E+01	3.28	22.89
.00	14.08	2.60	1.3	.718E+01	3.42	22.51
.00	14.78	2.62	1.3	.714E+01	3.56	22.15
.00	15.49	2.65	1.3	.711E+01	3.70	21.80
.00	16.19	2.67	1.3	.707E+01	3.84	21.47
.00	16.90	2.69	1.3	.704E+01	3.98	21.16
.00	17.60	2.71	1.3	.701E+01	4.12	20.86
.00	18.30	2.74	1.3	.698E+01	4.27	20.57
.00	19.01	2.76	1.3	.695E+01	4.41	20.30
.00	19.71	2.78	1.3	.692E+01	4.55	20.04
.00	20.42	2.80	1.3	.689E+01	4.69	19.80
.00	21.12	2.83	1.3	.686E+01	4.83	19.57
.00	21.82	2.85	1.3	.683E+01	4.97	19.36
.00	22.53	2.87	1.3	.681E+01	5.11	19.16
.00	23.23	2.89	1.3	.678E+01	5.25	18.98
.00	23.94	2.92	1.3	.675E+01	5.39	18.80
.00	24.64	2.94	1.3	.673E+01	5.53	18.65
.00	25.34	2.96	1.4	.670E+01	5.67	18.51
.00	26.05	2.98	1.4	.668E+01	5.81	18.38
.00	26.75	3.01	1.4	.666E+01	5.96	18.26
.00	27.46	3.03	1.4	.663E+01	6.10	18.16
.00	28.16	3.05	1.4	.661E+01	6.24	18.07
.00	28.86	3.07	1.4	.659E+01	6.38	17.99
.00	29.57	3.10	1.4	.657E+01	6.52	17.92
.00	30.27	3.12	1.4	.655E+01	6.55	17.86
.00	30.98	3.14	1.4	.652E+01	6.55	17.81
.00	31.68	3.16	1.4	.650E+01	6.55	17.77
.00	32.38	3.19	1.4	.648E+01	6.55	17.73
.00	33.09	3.21	1.4	.646E+01	6.55	17.70
.00	33.79	3.23	1.4	.644E+01	6.55	17.68
.00	34.50	3.25	1.4	.643E+01	6.55	17.66
.00	35.20	3.28	1.4	.641E+01	6.55	17.64

Cumulative travel time = 25. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TI

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.
This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajector
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	35.20	6.55	1.4	.641E+01	6.55	17.60
45.78	165.07	6.55	1.9	.490E+01	2.95	64.52
102.41	294.94	6.55	2.2	.411E+01	2.55	103.12
168.11	424.81	6.55	2.5	.362E+01	2.35	141.28
241.77	554.68	6.55	2.8	.326E+01	2.22	179.56
322.60	684.55	6.55	3.0	.300E+01	2.13	218.12
410.01	814.41	6.55	3.2	.279E+01	2.06	256.98
503.55	944.28	6.55	3.5	.262E+01	2.00	296.15
602.83	1074.15	6.55	3.7	.247E+01	1.94	335.63
707.54	1204.02	6.55	3.9	.235E+01	1.90	375.40
817.42	1333.89	6.55	4.0	.225E+01	1.86	415.44
932.22	1463.76	6.55	4.2	.215E+01	1.82	455.75
1051.75	1593.63	6.55	4.4	.207E+01	1.79	496.31
1175.82	1723.50	6.55	4.5	.200E+01	1.75	537.11
1304.28	1853.37	6.55	4.7	.193E+01	1.73	578.14
1436.98	1983.24	6.55	4.8	.187E+01	1.70	619.38
1573.79	2113.11	6.55	5.0	.182E+01	1.67	660.84
1714.59	2242.98	6.55	5.1	.177E+01	1.65	702.50
1859.27	2372.84	6.55	5.3	.172E+01	1.63	744.35
2007.73	2502.71	6.55	5.4	.168E+01	1.61	786.39
2159.87	2632.58	6.55	5.5	.164E+01	1.59	828.62
2315.61	2762.45	6.55	5.7	.160E+01	1.57	871.01
2474.86	2892.32	6.55	5.8	.157E+01	1.55	913.58
2637.55	3022.19	6.55	5.9	.154E+01	1.53	956.30
2803.62	3152.06	6.55	6.0	.151E+01	1.52	999.19
2972.98	3281.93	6.55	6.1	.148E+01	1.50	1042.23
3145.58	3411.80	6.55	6.2	.145E+01	1.49	1085.43
3321.36	3541.67	6.55	6.4	.142E+01	1.47	1128.76
3500.26	3671.54	6.55	6.5	.140E+01	1.46	1172.25
3682.23	3801.41	6.55	6.6	.138E+01	1.44	1215.87
3867.22	3931.27	6.55	6.7	.135E+01	1.43	1259.62
4055.18	4061.14	6.55	6.8	.133E+01	1.42	1303.51
4246.06	4191.01	6.55	6.9	.131E+01	1.40	1347.53
4439.82	4320.88	6.55	7.0	.129E+01	1.39	1391.67
4636.42	4450.75	6.55	7.1	.128E+01	1.38	1435.94
4835.81	4580.62	6.55	7.2	.126E+01	1.37	1480.33
5037.96	4710.49	6.55	7.3	.124E+01	1.36	1524.84
5242.84	4840.36	6.55	7.4	.122E+01	1.35	1569.46
5450.39	4970.23	6.55	7.5	.121E+01	1.34	1614.20
5660.60	5100.10	6.55	7.6	.119E+01	1.33	1659.06
5873.43	5229.97	6.55	7.7	.118E+01	1.32	1704.02
6088.84	5359.83	6.55	7.8	.117E+01	1.31	1749.09
6306.81	5489.70	6.55	7.9	.115E+01	1.30	1794.27
6527.30	5619.57	6.55	8.0	.114E+01	1.29	1839.55
6750.29	5749.44	6.55	8.0	.113E+01	1.28	1884.93
6975.75	5879.31	6.55	8.1	.111E+01	1.27	1930.42
7203.65	6009.18	6.55	8.2	.110E+01	1.27	1976.00
7433.97	6139.05	6.55	8.3	.109E+01	1.26	2021.69
7666.68	6268.92	6.55	8.4	.108E+01	1.25	2067.47
7901.75	6398.79	6.55	8.5	.107E+01	1.24	2113.34
8139.17	6528.66	6.55	8.6	.106E+01	1.23	2159.31

Cumulative travel time = 114931. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on LEFT.

The initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.35 to conserve the mass flux in the far-field!

Because of the strong horizontal momentum flux of this diffuser, severe
PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment I

CORMIX2 Prediction File
Bowline Point Generating Station
June Conditions

```
        CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
 ·`system CORMIX2:                                          Subsystem version:
   merged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
 ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          BOWLINE^GENERATING^STATION
 Design case:              FULL^6-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\B16FPA  .cx2
 Time of Fortran run:      03/04/97--13:32:39

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   4355.00  AS     =  23952.50  QA     =   1748.53  ICHREG= 2
 HA     =      5.50  HD     =      6.90
 UA     =      .073  F      =      .040  USTAR = .5163E-02
 UW     =      .000  UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U          RHOAM = 1000.8200

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK   =  LEFT      DISTB =    366.00  YB1    =    366.00  YB2    =    366.00
 LD     =    106.60  NOPEN =   16       SPAC   =      7.11
 D0     =      .910  A0     =      .650  H0     =      1.83
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =      5.00  SIGMA =    270.00  BETA   =     90.00
       =      4.656  Q0     =    48.450        = .4845E+02
   )0  =  998.8800  DRHO0 = .1940E+01  GP0    = .1901E-01
 C0    = .7220E+01  CUNITS=  degC
 IPOLL =  3         KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .4545E+00  m0     = .2116E+01  j0     = .8640E-02  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =      .098  lM     =     50.06  lm     =    397.09
 lmp    =  99999.00  lbp    =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .4845E+02  M0     = .2256E+03  J0     = .9210E+00
 Associated 3-d length scales (meters)
 LQ     =      3.23  LM     =     60.65  Lm     =    205.74  Lb     =   2367.47
                                         Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =    108.08  FRD0   =     35.39  R      =     63.77
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.90   2
 22222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .7220E+01  CUNITS=  degC
 NTOX   =  0
 NSTD   =  0
```

```
 REGMZ =   0
 XINT  =   44000.00  XMAX  =  44000.00

Y -Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       366.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S         C        BV        BH
      .00       .00      1.83       1.0   .722E+01     .08     53.30

-   OF MOD201: DIFFUSER DISCHARGE MODULE
    -----------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY
  MIXED over the entire layer depth (HS =    6.90m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X         Y         Z         S         C        BV        BH
      .00       .00      1.83       1.0   .722E+01     .08     53.30
      .00     -1.07      1.86       1.7   .425E+01     .29     51.75
      .00     -2.13      1.89       2.0   .363E+01     .50     50.29
      .00     -3.20      1.93       2.2   .327E+01     .72     48.91
      .00     -4.26      1.96       2.4   .301E+01     .93     47.61
      .00     -5.33      1.99       2.6   .282E+01    1.14     46.39
      .00     -6.40      2.02       2.7   .266E+01    1.36     45.23
      .00     -7.46      2.06       2.9   .253E+01    1.57     44.14
      .00     -8.53      2.09       3.0   .242E+01    1.78     43.11
      .00     -9.59      2.12       3.1   .233E+01    2.00     42.13
      .00    -10.66      2.15       3.2   .225E+01    2.21     41.21
      .00    -11.73      2.19       3.3   .218E+01    2.42     40.33
      .00    -12.79      2.22       3.4   .211E+01    2.64     39.49
      .00    -13.86      2.25       3.5   .205E+01    2.85     38.70
```

.00	-14.92	2.28	3.6	.200E+01	3.06	37.94
.00	-15.99	2.32	3.7	.195E+01	3.28	37.22
.00	-17.06	2.35	3.8	.190E+01	3.49	36.54
.00	-18.12	2.38	3.9	.186E+01	3.70	35.88
.00	-19.19	2.41	4.0	.182E+01	3.92	35.26
.00	-20.25	2.45	4.0	.178E+01	4.13	34.66
.00	-21.32	2.48	4.1	.175E+01	4.34	34.08
.00	-22.39	2.51	4.2	.172E+01	4.56	33.54
.00	-23.45	2.54	4.3	.169E+01	4.77	33.01
.00	-24.52	2.58	4.4	.166E+01	4.98	32.51
.00	-25.58	2.61	4.4	.163E+01	5.19	32.03
.00	-26.65	2.64	4.5	.161E+01	5.41	31.58
.00	-27.72	2.67	4.6	.158E+01	5.62	31.15
.00	-28.78	2.70	4.6	.156E+01	5.83	30.74
.00	-29.85	2.74	4.7	.154E+01	6.05	30.35
.00	-30.91	2.77	4.8	.151E+01	6.26	29.98
.00	-31.98	2.80	4.8	.149E+01	6.47	29.64
.00	-33.05	2.83	4.9	.148E+01	6.69	29.31
.00	-34.11	2.87	5.0	.146E+01	6.90	29.01
.00	-35.18	2.90	5.0	.144E+01	6.90	28.73
.00	-36.24	2.93	5.1	.142E+01	6.90	28.47
.00	-37.31	2.96	5.1	.141E+01	6.90	28.24
.00	-38.38	3.00	5.2	.139E+01	6.90	28.02
.00	-39.44	3.03	5.3	.137E+01	6.90	27.83
.00	-40.51	3.06	5.3	.136E+01	6.90	27.65
.00	-41.57	3.09	5.4	.135E+01	6.90	27.50
.00	-42.64	3.13	5.4	.133E+01	6.90	27.36
.00	-43.71	3.16	5.5	.132E+01	6.90	27.24
.00	-44.77	3.19	5.5	.131E+01	6.90	27.13
.00	-45.84	3.22	5.6	.129E+01	6.90	27.04
.00	-46.90	3.26	5.6	.128E+01	6.90	26.96
.00	-47.97	3.29	5.7	.127E+01	6.90	26.90
.00	-49.04	3.32	5.7	.126E+01	6.90	26.85
.00	-50.10	3.35	5.8	.125E+01	6.90	26.80
.00	-51.17	3.39	5.8	.124E+01	6.90	26.77
.00	-52.23	3.42	5.9	.122E+01	6.90	26.74
.00	-53.30	3.45	5.9	.121E+01	6.90	26.72

Cumulative travel time = 68. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.

Profile definitions:

BV = layer depth (vertically mixed)
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-53.30	6.90	5.9	.121E+01	6.90	27.57
1.47	-57.90	6.90	6.0	.120E+01	6.90	28.01
2.95	-62.51	6.90	6.0	.119E+01	6.90	28.45

4.45	-67.11	6.90	6.1	.119E+01	6.90	28.89
5.96	-71.72	6.90	6.1	.118E+01	6.90	29.33
7.47	-76.32	6.90	6.2	.117E+01	6.90	29.77
9.00	-80.92	6.90	6.2	.116E+01	6.90	30.20
10.55	-85.53	6.90	6.3	.115E+01	6.90	30.64
12.10	-90.13	6.90	6.3	.114E+01	6.90	31.08
13.67	-94.73	6.90	6.4	.113E+01	6.90	31.51
15.24	-99.34	6.90	6.4	.112E+01	6.90	31.95
16.83	-103.94	6.90	6.5	.112E+01	6.90	32.39
18.43	-108.55	6.90	6.5	.111E+01	6.90	32.82
20.04	-113.15	6.90	6.6	.110E+01	6.90	33.26
21.66	-117.75	6.90	6.6	.109E+01	6.90	33.69
23.29	-122.36	6.90	6.6	.109E+01	6.90	34.12
24.94	-126.96	6.90	6.7	.108E+01	6.90	34.56
26.59	-131.57	6.90	6.7	.107E+01	6.90	34.99
28.26	-136.17	6.90	6.8	.107E+01	6.90	35.42
29.93	-140.77	6.90	6.8	.106E+01	6.90	35.86
31.62	-145.38	6.90	6.9	.105E+01	6.90	36.29
33.31	-149.98	6.90	6.9	.105E+01	6.90	36.72
35.02	-154.59	6.90	7.0	.104E+01	6.90	37.15
36.74	-159.19	6.90	7.0	.103E+01	6.90	37.58
38.47	-163.79	6.90	7.0	.103E+01	6.90	38.01
40.21	-168.40	6.90	7.1	.102E+01	6.90	38.44
41.95	-173.00	6.90	7.1	.101E+01	6.90	38.87
43.71	-177.60	6.90	7.2	.101E+01	6.90	39.30
45.48	-182.21	6.90	7.2	.100E+01	6.90	39.73
47.26	-186.81	6.90	7.2	.997E+00	6.90	40.16
49.05	-191.42	6.90	7.3	.991E+00	6.90	40.59
50.85	-196.02	6.90	7.3	.986E+00	6.90	41.01
52.66	-200.62	6.90	7.4	.981E+00	6.90	41.44
54.48	-205.23	6.90	7.4	.975E+00	6.90	41.87
56.31	-209.83	6.90	7.4	.970E+00	6.90	42.30
58.15	-214.44	6.90	7.5	.965E+00	6.90	42.72
59.99	-219.04	6.90	7.5	.960E+00	6.90	43.15
61.85	-223.64	6.90	7.6	.955E+00	6.90	43.57
63.72	-228.25	6.90	7.6	.950E+00	6.90	44.00
65.60	-232.85	6.90	7.6	.945E+00	6.90	44.42
67.48	-237.46	6.90	7.7	.941E+00	6.90	44.85
69.38	-242.06	6.90	7.7	.936E+00	6.90	45.27
71.28	-246.66	6.90	7.8	.931E+00	6.90	45.70
73.20	-251.27	6.90	7.8	.927E+00	6.90	46.12
75.12	-255.87	6.90	7.8	.922E+00	6.90	46.54
77.06	-260.47	6.90	7.9	.918E+00	6.90	46.97
79.00	-265.08	6.90	7.9	.914E+00	6.90	47.39
80.95	-269.68	6.90	7.9	.909E+00	6.90	47.81
82.91	-274.29	6.90	8.0	.905E+00	6.90	48.24
84.88	-278.89	6.90	8.0	.901E+00	6.90	48.66
86.86	-283.49	6.90	8.1	.897E+00	6.90	49.08

Cumulative travel time = 1496. sec

End of Phase 1:

The mixed diffuser flow has RESTRATIFIED and is now detached from the bottom or surface/interface.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

ofile definitions:

BV = top-hat thickness, measured vertically

BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory

ZU = upper plume boundary (Z-coordinate)

ZL = lower plume boundary (Z-coordinate)

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
86.86	-283.49	6.90	8.1	.897E+00	6.90	49.08
167.91	-457.41	6.90	9.3	.774E+00	4.00	111.65
260.11	-631.33	6.90	10.5	.690E+00	3.46	159.71
362.24	-805.25	6.90	11.5	.629E+00	3.19	205.77
473.43	-979.17	6.90	12.4	.582E+00	3.02	251.13
592.98	-1153.09	6.90	13.3	.544E+00	2.90	296.24
720.35	-1327.01	6.90	14.1	.513E+00	2.80	341.28
855.08	-1500.93	6.90	14.9	.486E+00	2.73	386.35
996.79	-1674.85	6.90	15.6	.463E+00	2.66	431.51
1145.16	-1848.77	6.90	16.3	.443E+00	2.61	476.78
1299.89	-2022.69	6.90	17.0	.426E+00	2.56	522.19
1460.73	-2196.61	6.90	17.6	.410E+00	2.52	567.74
1627.47	-2370.53	6.90	18.2	.396E+00	2.48	613.43
1799.90	-2544.45	6.90	18.8	.384E+00	2.44	659.27
1977.83	-2718.37	6.90	19.4	.372E+00	2.41	705.25
2161.11	-2892.29	6.90	20.0	.362E+00	2.38	751.38
2349.57	-3066.21	6.90	20.5	.352E+00	2.35	797.65
2543.09	-3240.13	6.90	21.1	.343E+00	2.32	844.06
2741.53	-3414.05	6.90	21.6	.335E+00	2.30	890.61
2944.78	-3587.97	6.90	22.1	.327E+00	2.27	937.30
3152.71	-3761.89	6.90	22.6	.320E+00	2.25	984.11
3365.24	-3935.81	6.90	23.1	.313E+00	2.23	1031.06
3582.26	-4109.73	6.90	23.6	.307E+00	2.21	1078.13
3803.68	-4283.65	6.90	24.0	.301E+00	2.19	1125.32
4029.41	-4457.57	6.90	24.5	.295E+00	2.17	1172.63
4259.38	-4631.49	6.90	24.9	.290E+00	2.15	1220.06
4493.50	-4805.41	6.90	25.4	.285E+00	2.14	1267.61
4731.71	-4979.33	6.90	25.8	.280E+00	2.12	1315.27
4973.94	-5153.25	6.90	26.2	.275E+00	2.10	1363.04
5220.12	-5327.17	6.90	26.7	.271E+00	2.09	1410.92
5470.18	-5501.09	6.90	27.1	.267E+00	2.07	1458.90
5724.08	-5675.01	6.90	27.5	.263E+00	2.06	1506.99
5981.74	-5848.93	6.90	27.9	.259E+00	2.05	1555.18
6243.13	-6022.85	6.90	28.3	.255E+00	2.03	1603.47
6508.18	-6196.77	6.90	28.7	.252E+00	2.02	1651.85
6776.84	-6370.69	6.90	29.1	.248E+00	2.01	1700.34
7049.07	-6544.61	6.90	29.4	.245E+00	1.99	1748.92
7324.82	-6718.53	6.90	29.8	.242E+00	1.98	1797.59
7604.05	-6892.45	6.90	30.2	.239E+00	1.97	1846.35
7886.71	-7066.37	6.90	30.6	.236E+00	1.96	1895.20
8172.77	-7240.29	6.90	30.9	.234E+00	1.95	1944.14
8462.18	-7414.21	6.90	31.3	.231E+00	1.94	1993.17
8754.90	-7588.13	6.90	31.6	.228E+00	1.93	2042.28
9050.90	-7762.05	6.90	32.0	.226E+00	1.91	2091.48
9350.14	-7935.97	6.90	32.3	.223E+00	1.90	2140.76
9652.59	-8109.89	6.90	32.7	.221E+00	1.89	2190.12
9958.21	-8283.81	6.90	33.0	.219E+00	1.88	2239.56
10266.97	-8457.73	6.90	33.3	.217E+00	1.88	2289.08
10578.84	-8631.65	6.90	33.7	.214E+00	1.87	2338.68
10893.79	-8805.57	6.90	34.0	.212E+00	1.86	2388.36
11211.79	-8979.49	6.90	34.3	.210E+00	1.85	2438.11

mulative travel time = 184371. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

```
Bank nearest to plume centerline has changed.
  Nearest bank is now on RIGHT.

  : initial plume WIDTH values in the next far-field module will be
 ORRECTED by a factor  1.57 to conserve the mass flux in the far-field!
The correction factor is quite large because of the small ambient velocity
  relative to the strong mixing characteristics of the discharge!
  This indicates localized RECIRCULATION REGIONS and internal hydraulic JUMPS.

Because of the strong horizontal momentum flux of this diffuser, severe
  PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
  Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.
-------------------------------------------------------------------------------
CORMIX2: Submerged Multiport Diffuser Discharges       End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222
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Attachment J

CORMIX2 Prediction File
Bowline Point Generating Station
July Conditions

```
        CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
   Submerged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
   ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          BOWLINE^GENERATING^STATION
 Design case:              FULL^7-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\B17FPA  .cx2
 Time of Fortran run:      03/04/97--13:47:54

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   4355.00  AS    =  23952.50  QA    =   1676.68  ICHREG= 2
 HA    =      5.50  HD    =      6.90
 UA    =      .070  F     =      .040  USTAR = .4951E-02
 UW    =      .000  UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U          RHOAM = 1000.7200

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK  =  LEFT       DISTB =    366.00  YB1   =    366.00  YB2   =    366.00
 LD    =    106.60  NOPEN =   16       SPAC  =      7.11
 D0    =      .910  A0    =      .650  H0    =      1.83
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =      5.00  SIGMA =    270.00  BETA  =     90.00
 [illegible] =     4.656  Q0    =     48.450        = .4845E+02
 [illegible]0  =  998.5000  DRHO0 = .2220E+01  GP0   = .2175E-01
 [illegible]   = .7220E+01  CUNITS=  degC
 IPOLL =  3          KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .4545E+00  m0    = .2116E+01  j0    = .9888E-02  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =      .098  lM    =     45.76  lm    =    431.86
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .4845E+02  M0    = .2256E+03  J0    = .1054E+01
 Associated 3-d length scales (meters)
 LQ    =      3.23  LM    =     56.69  Lm    =    214.56  Lb    =   3072.97
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    101.03  FRD0  =     33.09  R     =     66.51
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 22222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.90  2
 22222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 [illegible]0    = .7220E+01  CUNITS=  degC
 NTOX  =  0
 NSTD  =  0
```

```
 REGMZ =  0
 XINT  =  44000.00  XMAX  =  44000.00

y ᵛ-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       366.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S        C        BV        BH
       .00       .00      1.83      1.0  .722E+01     .08     53.30

ˉ ˋ OF MOD201: DIFFUSER DISCHARGE MODULE
    -------------------------------------------------------------------------
- -------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULL
  MIXED over the entire layer depth (HS =    6.90m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X         Y         Z         S        C        BV        BH
       .00       .00      1.83      1.0  .722E+01     .08     53.30
       .00     -1.07      1.86      1.7  .425E+01     .29     51.75
       .00     -2.13      1.89      2.0  .363E+01     .50     50.29
       .00     -3.20      1.93      2.2  .327E+01     .72     48.91
       .00     -4.26      1.96      2.4  .301E+01     .93     47.61
       .00     -5.33      1.99      2.6  .282E+01    1.14     46.39
       .00     -6.40      2.02      2.7  .266E+01    1.36     45.23
       .00     -7.46      2.06      2.9  .253E+01    1.57     44.14
       .00     -8.53      2.09      3.0  .242E+01    1.78     43.11
       .00     -9.59      2.12      3.1  .233E+01    2.00     42.13
       .00    -10.66      2.15      3.2  .225E+01    2.21     41.21
       .00    -11.73      2.19      3.3  .218E+01    2.42     40.33
       .00    -12.79      2.22      3.4  .211E+01    2.64     39.49
       .00    -13.86      2.25      3.5  .205E+01    2.85     38.70
```

.00	-14.92	2.28	3.6	.200E+01	3.06	37.94
.00	-15.99	2.32	3.7	.195E+01	3.28	37.22
.00	-17.06	2.35	3.8	.190E+01	3.49	36.54
.00	-18.12	2.38	3.9	.186E+01	3.70	35.88
.00	-19.19	2.41	4.0	.182E+01	3.92	35.26
.00	-20.25	2.45	4.0	.178E+01	4.13	34.66
.00	-21.32	2.48	4.1	.175E+01	4.34	34.08
.00	-22.39	2.51	4.2	.172E+01	4.56	33.54
.00	-23.45	2.54	4.3	.169E+01	4.77	33.01
.00	-24.52	2.58	4.4	.166E+01	4.98	32.51
.00	-25.58	2.61	4.4	.163E+01	5.19	32.03
.00	-26.65	2.64	4.5	.161E+01	5.41	31.58
.00	-27.72	2.67	4.6	.158E+01	5.62	31.15
.00	-28.78	2.70	4.6	.156E+01	5.83	30.74
.00	-29.85	2.74	4.7	.154E+01	6.05	30.35
.00	-30.91	2.77	4.8	.151E+01	6.26	29.98
.00	-31.98	2.80	4.8	.149E+01	6.47	29.64
.00	-33.05	2.83	4.9	.148E+01	6.69	29.31
.00	-34.11	2.87	5.0	.146E+01	6.90	29.01
.00	-35.18	2.90	5.0	.144E+01	6.90	28.73
.00	-36.24	2.93	5.1	.142E+01	6.90	28.47
.00	-37.31	2.96	5.1	.141E+01	6.90	28.24
.00	-38.38	3.00	5.2	.139E+01	6.90	28.02
.00	-39.44	3.03	5.3	.137E+01	6.90	27.83
.00	-40.51	3.06	5.3	.136E+01	6.90	27.65
.00	-41.57	3.09	5.4	.135E+01	6.90	27.50
.00	-42.64	3.13	5.4	.133E+01	6.90	27.36
.00	-43.71	3.16	5.5	.132E+01	6.90	27.24
.00	-44.77	3.19	5.5	.131E+01	6.90	27.13
.00	-45.84	3.22	5.6	.129E+01	6.90	27.04
.00	-46.90	3.26	5.6	.128E+01	6.90	26.96
.00	-47.97	3.29	5.7	.127E+01	6.90	26.90
.00	-49.04	3.32	5.7	.126E+01	6.90	26.85
.00	-50.10	3.35	5.8	.125E+01	6.90	26.80
.00	-51.17	3.39	5.8	.124E+01	6.90	26.77
.00	-52.23	3.42	5.9	.122E+01	6.90	26.74
.00	-53.30	3.45	5.9	.121E+01	6.90	26.72

Cumulative travel time = 68. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.

Profile definitions:

BV = layer depth (vertically mixed)
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-53.30	6.90	5.9	.121E+01	6.90	27.67
.68	-55.51	6.90	6.0	.121E+01	6.90	27.88
1.35	-57.72	6.90	6.0	.120E+01	6.90	28.09

2.03	-59.93	6.90	6.0	.120E+01	6.90	28.30
2.72	-62.14	6.90	6.0	.120E+01	6.90	28.52
3.40	-64.35	6.90	6.1	.119E+01	6.90	28.73
4.09	-66.56	6.90	6.1	.119E+01	6.90	28.94
4.78	-68.77	6.90	6.1	.118E+01	6.90	29.15
5.48	-70.98	6.90	6.1	.118E+01	6.90	29.36
6.17	-73.19	6.90	6.2	.117E+01	6.90	29.57
6.87	-75.39	6.90	6.2	.117E+01	6.90	29.79
7.58	-77.60	6.90	6.2	.116E+01	6.90	30.00
8.28	-79.81	6.90	6.2	.116E+01	6.90	30.21
8.99	-82.02	6.90	6.2	.116E+01	6.90	30.42
9.70	-84.23	6.90	6.3	.115E+01	6.90	30.63
10.41	-86.44	6.90	6.3	.115E+01	6.90	30.84
11.12	-88.65	6.90	6.3	.114E+01	6.90	31.05
11.84	-90.86	6.90	6.3	.114E+01	6.90	31.26
12.56	-93.07	6.90	6.4	.114E+01	6.90	31.47
13.28	-95.28	6.90	6.4	.113E+01	6.90	31.68
14.01	-97.49	6.90	6.4	.113E+01	6.90	31.89
14.73	-99.70	6.90	6.4	.112E+01	6.90	32.10
15.46	-101.91	6.90	6.4	.112E+01	6.90	32.32
16.20	-104.12	6.90	6.5	.112E+01	6.90	32.53
16.93	-106.33	6.90	6.5	.111E+01	6.90	32.74
17.67	-108.54	6.90	6.5	.111E+01	6.90	32.95
18.41	-110.75	6.90	6.5	.110E+01	6.90	33.16
19.15	-112.96	6.90	6.6	.110E+01	6.90	33.37
19.90	-115.17	6.90	6.6	.110E+01	6.90	33.57
20.64	-117.37	6.90	6.6	.109E+01	6.90	33.78
21.39	-119.58	6.90	6.6	.109E+01	6.90	33.99
22.14	-121.79	6.90	6.6	.109E+01	6.90	34.20
22.90	-124.00	6.90	6.7	.108E+01	6.90	34.41
23.65	-126.21	6.90	6.7	.108E+01	6.90	34.62
24.41	-128.42	6.90	6.7	.108E+01	6.90	34.83
25.17	-130.63	6.90	6.7	.107E+01	6.90	35.04
25.94	-132.84	6.90	6.7	.107E+01	6.90	35.25
26.71	-135.05	6.90	6.8	.107E+01	6.90	35.46
27.47	-137.26	6.90	6.8	.106E+01	6.90	35.67
28.24	-139.47	6.90	6.8	.106E+01	6.90	35.88
29.02	-141.68	6.90	6.8	.106E+01	6.90	36.08
29.79	-143.89	6.90	6.9	.105E+01	6.90	36.29
30.57	-146.10	6.90	6.9	.105E+01	6.90	36.50
31.35	-148.31	6.90	6.9	.105E+01	6.90	36.71
32.13	-150.52	6.90	6.9	.104E+01	6.90	36.92
32.92	-152.73	6.90	6.9	.104E+01	6.90	37.13
33.71	-154.94	6.90	7.0	.104E+01	6.90	37.33
34.50	-157.15	6.90	7.0	.104E+01	6.90	37.54
35.29	-159.35	6.90	7.0	.103E+01	6.90	37.75
36.08	-161.56	6.90	7.0	.103E+01	6.90	37.96
36.88	-163.77	6.90	7.0	.103E+01	6.90	38.17

Cumulative travel time = 700. sec

End of Phase 1:
The mixed diffuser flow has RESTRATIFIED and is now detached from the bottom or surface/interface.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

ofile definitions:
BV = top-hat thickness, measured vertically
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
36.88	-163.77	6.90	7.0	.103E+01	6.90	38.17
114.39	-356.20	6.90	8.6	.839E+00	3.74	103.26
206.12	-548.63	6.90	9.9	.726E+00	3.25	155.36
310.15	-741.06	6.90	11.1	.650E+00	3.02	206.15
425.16	-933.48	6.90	12.2	.593E+00	2.87	256.67
550.19	-1125.91	6.90	13.1	.549E+00	2.76	307.25
684.48	-1318.34	6.90	14.0	.514E+00	2.68	358.00
827.45	-1510.76	6.90	14.9	.485E+00	2.61	408.98
978.58	-1703.19	6.90	15.7	.460E+00	2.55	460.21
1137.47	-1895.62	6.90	16.5	.438E+00	2.50	511.69
1303.75	-2088.05	6.90	17.2	.420E+00	2.45	563.42
1477.11	-2280.47	6.90	17.9	.403E+00	2.41	615.40
1657.26	-2472.90	6.90	18.6	.389E+00	2.38	667.61
1843.96	-2665.33	6.90	19.2	.375E+00	2.34	720.06
2037.00	-2857.76	6.90	19.9	.364E+00	2.31	772.72
2236.16	-3050.18	6.90	20.5	.353E+00	2.28	825.60
2441.26	-3242.61	6.90	21.1	.343E+00	2.26	878.69
2652.14	-3435.04	6.90	21.6	.334E+00	2.23	931.98
2868.65	-3627.46	6.90	22.2	.325E+00	2.21	985.46
3090.63	-3819.89	6.90	22.8	.317E+00	2.18	1039.13
3317.96	-4012.32	6.90	23.3	.310E+00	2.16	1092.98
3550.52	-4204.75	6.90	23.8	.303E+00	2.14	1147.01
3788.19	-4397.17	6.90	24.3	.297E+00	2.12	1201.20
4030.86	-4589.60	6.90	24.8	.291E+00	2.10	1255.57
4278.43	-4782.03	6.90	25.3	.285E+00	2.08	1310.09
4530.81	-4974.45	6.90	25.8	.280E+00	2.07	1364.77
4787.90	-5166.88	6.90	26.3	.275E+00	2.05	1419.60
5049.63	-5359.31	6.90	26.7	.270E+00	2.03	1474.58
5315.91	-5551.74	6.90	27.2	.266E+00	2.02	1529.71
5586.66	-5744.16	6.90	27.6	.261E+00	2.00	1584.97
5861.81	-5936.59	6.90	28.1	.257E+00	1.99	1640.38
6141.30	-6129.02	6.90	28.5	.253E+00	1.97	1695.92
6425.05	-6321.45	6.90	28.9	.249E+00	1.96	1751.59
6713.01	-6513.87	6.90	29.4	.246E+00	1.95	1807.39
7005.10	-6706.30	6.90	29.8	.242E+00	1.93	1863.31
7301.29	-6898.73	6.90	30.2	.239E+00	1.92	1919.36
7601.50	-7091.15	6.90	30.6	.236E+00	1.91	1975.53
7905.69	-7283.58	6.90	31.0	.233E+00	1.90	2031.82
8213.80	-7476.01	6.90	31.4	.230E+00	1.89	2088.23
8525.78	-7668.44	6.90	31.8	.227E+00	1.87	2144.75
8841.60	-7860.86	6.90	32.2	.224E+00	1.86	2201.38
9161.19	-8053.29	6.90	32.6	.222E+00	1.85	2258.13
9484.53	-8245.72	6.90	32.9	.219E+00	1.84	2314.98
9811.56	-8438.15	6.90	33.3	.217E+00	1.83	2371.94
10142.24	-8630.57	6.90	33.7	.214E+00	1.82	2429.00
10476.54	-8823.00	6.90	34.0	.212E+00	1.81	2486.17
10814.41	-9015.43	6.90	34.4	.210E+00	1.80	2543.44
11155.82	-9207.86	6.90	34.8	.208E+00	1.79	2600.80
11500.73	-9400.28	6.90	35.1	.206E+00	1.78	2658.27
11849.10	-9592.71	6.90	35.5	.204E+00	1.78	2715.84
12200.91	-9785.14	6.90	35.8	.202E+00	1.77	2773.49

'mulative travel time = 209226. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on RIGHT.

: initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.57 to conserve the mass flux in the far-field!
The correction factor is quite large because of the small ambient velocity
relative to the strong mixing characteristics of the discharge!
This indicates localized RECIRCULATION REGIONS and internal hydraulic JUMPS

Because of the strong horizontal momentum flux of this diffuser, severe
PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222222

Attachment K

CORMIX2 Prediction File
Bowline Point Generating Station
August Conditions

Lawler, Matusky & Skelly Engineers LLP

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
   ;ystem CORMIX2:                                                Subsystem version:
  .omerged Multiport Diffuser Discharges    CORMIX v.3.20      September 1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          BOWLINE^GENERATING^STATION
 Design case:              FULL^8-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\B18FPA  .cx2
 Time of Fortran run:      03/04/97--13:56:22

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =   4355.00  AS    =  23952.50  QA    =   1676.68  ICHREG= 2
 HA    =      5.50  HD    =      6.90
 UA    =       .070 F     =       .040 USTAR = .4951È-02
 UW    =       .000 UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1001.1900

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= unidirectional parallel
 BANK  =  LEFT      DISTB =    366.00  YB1   =    366.00  YB2   =    366.00
 LD    =    106.60  NOPEN =   16       SPAC  =      7.11
 D0    =       .910 A0    =       .650 H0    =      1.83
 Nozzle/port arrangement:   unidirectional without fanning
 ^^MMA =       .00  THETA =      5.00  SIGMA =    270.00  BETA  =     90.00
       =      4.656 Q0    =     48.450        = .4845E+02
 ..O0  =  998.9901  DRHO0 = .2200E+01  GP0   = .2155E-01
 C0    = .7220E+01  CUNITS=  degC
 IPOLL =  3         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .4545E+00  m0    = .2116E+01  j0    = .9794E-02  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =       .098 lM    =     46.05  lm    =    431.86
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .4845E+02  M0    = .2256E+03  J0    = .1044E+01
 Associated 3-d length scales (meters)
 LQ    =      3.23  LM    =     56.97  Lm    =    214.56  Lb    =   3043.88
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    101.51  FRD0  =     33.24  R     =     66.51
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.90  2
  ^2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .7220E+01  CUNITS=  degC
 NTOX  =  0
```

```
 NSTD  =  0
 REGMZ =  0
 XINT  =  44000.00  XMAX  =  44000.00

    ·Z COORDINATE SYSTEM:
     ORIGIN is located at the bottom and the diffuser mid-point:
        366.00 m  from the LEFT  bank/shore.
     X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     1.83      1.0  .722E+01     .08    53.30

    OF MOD201: DIFFUSER DISCHARGE MODULE
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY
  MIXED over the entire layer depth (HS =    6.90m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     1.83      1.0  .722E+01     .08    53.30
      .00    -1.07     1.86      1.7  .425E+01     .29    51.75
      .00    -2.13     1.89      2.0  .363E+01     .50    50.29
      .00    -3.20     1.93      2.2  .327E+01     .72    48.91
      .00    -4.26     1.96      2.4  .301E+01     .93    47.61
      .00    -5.33     1.99      2.6  .282E+01    1.14    46.39
      .00    -6.40     2.02      2.7  .266E+01    1.36    45.23
      .00    -7.46     2.06      2.9  .253E+01    1.57    44.14
      .00    -8.53     2.09      3.0  .242E+01    1.78    43.11
      .00    -9.59     2.12      3.1  .233E+01    2.00    42.13
      .00   -10.66     2.15      3.2  .225E+01    2.21    41.21
      .00   -11.73     2.19      3.3  .218E+01    2.42    40.33
      .00   -12.79     2.22      3.4  .211E+01    2.64    39.49
```

.00	-13.86	2.25	3.5	.205E+01	2.85	38.70
.00	-14.92	2.28	3.6	.200E+01	3.06	37.94
.00	-15.99	2.32	3.7	.195E+01	3.28	37.22
.00	-17.06	2.35	3.8	.190E+01	3.49	36.54
.00	-18.12	2.38	3.9	.186E+01	3.70	35.88
.00	-19.19	2.41	4.0	.182E+01	3.92	35.26
.00	-20.25	2.45	4.0	.178E+01	4.13	34.66
.00	-21.32	2.48	4.1	.175E+01	4.34	34.08
.00	-22.39	2.51	4.2	.172E+01	4.56	33.54
.00	-23.45	2.54	4.3	.169E+01	4.77	33.01
.00	-24.52	2.58	4.4	.166E+01	4.98	32.51
.00	-25.58	2.61	4.4	.163E+01	5.19	32.03
.00	-26.65	2.64	4.5	.161E+01	5.41	31.58
.00	-27.72	2.67	4.6	.158E+01	5.62	31.15
.00	-28.78	2.70	4.6	.156E+01	5.83	30.74
.00	-29.85	2.74	4.7	.154E+01	6.05	30.35
.00	-30.91	2.77	4.8	.151E+01	6.26	29.98
.00	-31.98	2.80	4.8	.149E+01	6.47	29.64
.00	-33.05	2.83	4.9	.148E+01	6.69	29.31
.00	-34.11	2.87	5.0	.146E+01	6.90	29.01
.00	-35.18	2.90	5.0	.144E+01	6.90	28.73
.00	-36.24	2.93	5.1	.142E+01	6.90	28.47
.00	-37.31	2.96	5.1	.141E+01	6.90	28.24
.00	-38.38	3.00	5.2	.139E+01	6.90	28.02
.00	-39.44	3.03	5.3	.137E+01	6.90	27.83
.00	-40.51	3.06	5.3	.136E+01	6.90	27.65
.00	-41.57	3.09	5.4	.135E+01	6.90	27.50
.00	-42.64	3.13	5.4	.133E+01	6.90	27.36
.00	-43.71	3.16	5.5	.132E+01	6.90	27.24
.00	-44.77	3.19	5.5	.131E+01	6.90	27.13
.00	-45.84	3.22	5.6	.129E+01	6.90	27.04
.00	-46.90	3.26	5.6	.128E+01	6.90	26.96
.00	-47.97	3.29	5.7	.127E+01	6.90	26.90
.00	-49.04	3.32	5.7	.126E+01	6.90	26.85
.00	-50.10	3.35	5.8	.125E+01	6.90	26.80
.00	-51.17	3.39	5.8	.124E+01	6.90	26.77
.00	-52.23	3.42	5.9	.122E+01	6.90	26.74
.00	-53.30	3.45	5.9	.121E+01	6.90	26.72

Cumulative travel time = 68. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.

Profile definitions:

BV = layer depth (vertically mixed)
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-53.30	6.90	5.9	.121E+01	6.90	27.67
.72	-55.66	6.90	6.0	.121E+01	6.90	27.89

1.44	-58.02	6.90	6.0	.120E+01	6.90	28.12
2.17	-60.37	6.90	6.0	.120E+01	6.90	28.35
2.90	-62.73	6.90	6.0	.119E+01	6.90	28.57
3.64	-65.09	6.90	6.1	.119E+01	6.90	28.80
4.37	-67.45	6.90	6.1	.118E+01	6.90	29.02
5.11	-69.81	6.90	6.1	.118E+01	6.90	29.25
5.85	-72.16	6.90	6.1	.118E+01	6.90	29.48
6.60	-74.52	6.90	6.2	.117E+01	6.90	29.70
7.35	-76.88	6.90	6.2	.117E+01	6.90	29.93
8.10	-79.24	6.90	6.2	.116E+01	6.90	30.15
8.85	-81.60	6.90	6.2	.116E+01	6.90	30.38
9.61	-83.95	6.90	6.3	.115E+01	6.90	30.60
10.37	-86.31	6.90	6.3	.115E+01	6.90	30.83
11.13	-88.67	6.90	6.3	.114E+01	6.90	31.05
11.89	-91.03	6.90	6.3	.114E+01	6.90	31.28
12.66	-93.39	6.90	6.4	.113E+01	6.90	31.50
13.43	-95.74	6.90	6.4	.113E+01	6.90	31.73
14.21	-98.10	6.90	6.4	.113E+01	6.90	31.95
14.99	-100.46	6.90	6.4	.112E+01	6.90	32.18
15.77	-102.82	6.90	6.5	.112E+01	6.90	32.40
16.55	-105.18	6.90	6.5	.111E+01	6.90	32.63
17.33	-107.53	6.90	6.5	.111E+01	6.90	32.85
18.12	-109.89	6.90	6.5	.111E+01	6.90	33.07
18.91	-112.25	6.90	6.5	.110E+01	6.90	33.30
19.71	-114.61	6.90	6.6	.110E+01	6.90	33.52
20.50	-116.97	6.90	6.6	.109E+01	6.90	33.75
21.30	-119.32	6.90	6.6	.109E+01	6.90	33.97
22.11	-121.68	6.90	6.6	.109E+01	6.90	34.19
22.91	-124.04	6.90	6.7	.108E+01	6.90	34.42
23.72	-126.40	6.90	6.7	.108E+01	6.90	34.64
24.53	-128.76	6.90	6.7	.108E+01	6.90	34.86
25.34	-131.11	6.90	6.7	.107E+01	6.90	35.09
26.16	-133.47	6.90	6.8	.107E+01	6.90	35.31
26.98	-135.83	6.90	6.8	.107E+01	6.90	35.53
27.80	-138.19	6.90	6.8	.106E+01	6.90	35.75
28.62	-140.54	6.90	6.8	.106E+01	6.90	35.98
29.45	-142.90	6.90	6.8	.106E+01	6.90	36.20
30.28	-145.26	6.90	6.9	.105E+01	6.90	36.42
31.11	-147.62	6.90	6.9	.105E+01	6.90	36.64
31.94	-149.98	6.90	6.9	.105E+01	6.90	36.87
32.78	-152.33	6.90	6.9	.104E+01	6.90	37.09
33.62	-154.69	6.90	7.0	.104E+01	6.90	37.31
34.46	-157.05	6.90	7.0	.104E+01	6.90	37.53
35.31	-159.41	6.90	7.0	.103E+01	6.90	37.76
36.16	-161.77	6.90	7.0	.103E+01	6.90	37.98
37.01	-164.12	6.90	7.0	.103E+01	6.90	38.20
37.86	-166.48	6.90	7.1	.102E+01	6.90	38.42
38.71	-168.84	6.90	7.1	.102E+01	6.90	38.64
39.57	-171.20	6.90	7.1	.102E+01	6.90	38.86

Cumulative travel time = 746. sec

End of Phase 1:

The mixed diffuser flow has RESTRATIFIED and is now detached from the bottom or surface/interface.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

ɔfile definitions:

BV = top-hat thickness, measured vertically

BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory

ZU = upper plume boundary (Z-coordinate)

ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
39.57	-171.20	6.90	7.1	.102E+01	6.90	38.86
117.61	-363.48	6.90	8.7	.833E+00	3.75	104.10
209.77	-555.76	6.90	10.0	.723E+00	3.26	156.21
314.14	-748.03	6.90	11.1	.648E+00	3.03	206.95
429.43	-940.31	6.90	12.2	.592E+00	2.88	257.41
554.70	-1132.59	6.90	13.2	.548E+00	2.77	307.90
689.20	-1324.87	6.90	14.1	.513E+00	2.68	358.55
832.33	-1517.15	6.90	14.9	.484E+00	2.61	409.43
983.61	-1709.43	6.90	15.7	.459E+00	2.56	460.54
1142.62	-1901.71	6.90	16.5	.438E+00	2.51	511.90
1309.00	-2093.99	6.90	17.2	.419E+00	2.46	563.50
1482.43	-2286.26	6.90	17.9	.403E+00	2.42	615.34
1662.64	-2478.54	6.90	18.6	.388E+00	2.38	667.42
1849.39	-2670.82	6.90	19.2	.375E+00	2.35	719.72
2042.45	-2863.10	6.90	19.9	.363E+00	2.32	772.24
2241.62	-3055.38	6.90	20.5	.352E+00	2.29	824.98
2446.72	-3247.66	6.90	21.1	.342E+00	2.26	877.92
2657.59	-3439.94	6.90	21.7	.333E+00	2.24	931.06
2874.06	-3632.22	6.90	22.2	.325E+00	2.21	984.38
3096.01	-3824.50	6.90	22.8	.317E+00	2.19	1037.90
3323.29	-4016.77	6.90	23.3	.310E+00	2.17	1091.59
3555.78	-4209.05	6.90	23.8	.303E+00	2.15	1145.46
3793.38	-4401.33	6.90	24.3	.297E+00	2.13	1199.49
4035.97	-4593.61	6.90	24.8	.291E+00	2.11	1253.69
4283.45	-4785.89	6.90	25.3	.285E+00	2.09	1308.05
535.73	-4978.17	6.90	25.8	.280E+00	2.07	1362.57
4792.71	-5170.45	6.90	26.3	.275E+00	2.05	1417.23
5054.32	-5362.73	6.90	26.7	.270E+00	2.04	1472.04
5320.47	-5555.00	6.90	27.2	.265E+00	2.02	1527.00
5591.08	-5747.28	6.90	27.6	.261E+00	2.01	1582.09
5866.10	-5939.56	6.90	28.1	.257E+00	1.99	1637.33
6145.43	-6131.84	6.90	28.5	.253E+00	1.98	1692.69
6429.02	-6324.12	6.90	29.0	.249E+00	1.96	1748.19
6716.81	-6516.40	6.90	29.4	.246E+00	1.95	1803.81
7008.74	-6708.68	6.90	29.8	.242E+00	1.94	1859.56
7304.74	-6900.96	6.90	30.2	.239E+00	1.93	1915.43
7604.77	-7093.23	6.90	30.6	.236E+00	1.91	1971.43
7908.76	-7285.51	6.90	31.0	.233E+00	1.90	2027.54
8216.67	-7477.79	6.90	31.4	.230E+00	1.89	2083.76
8528.45	-7670.07	6.90	31.8	.227E+00	1.88	2140.10
8844.05	-7862.35	6.90	32.2	.224E+00	1.87	2196.55
9163.43	-8054.63	6.90	32.6	.222E+00	1.86	2253.12
9486.54	-8246.91	6.90	32.9	.219E+00	1.85	2309.78
9813.34	-8439.19	6.90	33.3	.217E+00	1.84	2366.56
10143.78	-8631.46	6.90	33.7	.214E+00	1.83	2423.44
10477.83	-8823.74	6.90	34.0	.212E+00	1.82	2480.42
10815.45	-9016.02	6.90	34.4	.210E+00	1.81	2537.50
11156.61	-9208.30	6.90	34.8	.208E+00	1.80	2594.68
11501.25	-9400.58	6.90	35.1	.206E+00	1.79	2651.96
11849.36	-9592.86	6.90	35.5	.204E+00	1.78	2709.33
2200.90	-9785.13	6.90	35.8	.202E+00	1.77	2766.80

mulative travel time = 209226. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

```
** End of NEAR-FIELD REGION (NFR) **

 Bank nearest to plume centerline has changed.
   Nearest bank is now on RIGHT.

  ..e initial plume WIDTH values in the next far-field module will be
  CORRECTED by a factor  1.57 to conserve the mass flux in the far-field!
 The correction factor is quite large because of the small ambient velocity
   relative to the strong mixing characteristics of the discharge!
   This indicates localized RECIRCULATION REGIONS and internal hydraulic JUMPS.

 Because of the strong horizontal momentum flux of this diffuser, severe
   PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

 Consider a different diffuser design with a reduced offshore momentum flux.
 No predictive techniques available for this situation; SIMULATION ENDS.

 Surface plume centerline coincides with the mid-width of bounded channel.
   Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.
-------------------------------------------------------------------------------
CORMIX2: Submerged Multiport Diffuser Discharges       End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222222
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Attachment L

CORMIX2 Prediction File
Bowline Point Generating Station
September Conditions

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        CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
   Merged Multiport Diffuser Discharges    CORMIX v.3.20     September 1996
 ---------------------------------------------------------------------------
---------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          BOWLINE^GENERATING^STATION
 Design case:              FULL^9-81^10PC^FLOOD^APAC
 FILE NAME:                cormix\sim\B19FPA  .cx2
 Time of Fortran run:      03/04/97--14:08:40

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =   4355.00  AS     =  23952.50  QA     =   1604.82  ICHREG= 2
 HA     =      5.50  HD     =      6.90
 UA     =      .067  F      =      .040  USTAR = .4739E-02
 UW     =      .000  UWSTAR= .0000E+00
 Uniform density environment
 STRCND=  U           RHOAM = 1004.0100

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional parallel
 BANK   =  LEFT      DISTB =    366.00  YB1    =    366.00  YB2    =    366.00
 LD     =    106.60  NOPEN =   16       SPAC   =      7.11
 D0     =      .910  A0     =      .650  H0     =      1.83
 Nozzle/port arrangement:   unidirectional without fanning
 GAMMA =       .00  THETA =      5.00  SIGMA =    270.00  BETA   =     90.00
       =      4.656  Q0     =    48.450        = .4845E+02
   ρ0  = 1002.0300  DRHO0 = .1980E+01  GP0    = .1934E-01
 C0    = .7220E+01  CUNITS=  degC
 IPOLL =  3         KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .4545E+00  m0     = .2116E+01  j0     = .8790E-02  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =      .098  lM     =     49.49  lm     =    471.40
 lmp    =  99999.00  lbp    =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .4845E+02  M0     = .2256E+03  J0     = .9370E+00
 Associated 3-d length scales (meters)
 LQ     =      3.23  LM     =     60.13  Lm     =    224.17  Lb     =   3115.49
                                         Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =    107.15  FRD0   =     35.09  R      =     69.49
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU3    2
 2  Applicable layer depth HS =     6.90  2
 2222222222222222222222222222222222222222

   ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .7220E+01  CUNITS=  degC
 NTOX   =  0
 NSTD   =  0
```

```
 REGMZ =  0
 XINT  =  44000.00  XMAX  =  44000.00

   -Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       366.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

NOTE on dilution/concentration values for this HEATED DISCHARGE (IPOLL=3):
   S  = hydrodynamic dilutions, include buoyancy (heat) loss effects, but
        provided plume has surface contact
   C  = corresponding temperature values (always in "degC"!),
        include heat loss, if any
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     1.83      1.0  .722E+01     .08    53.30

    OF MOD201: DIFFUSER DISCHARGE MODULE
   -------------------------------------------------------------------------
-------------------------------------------------------------------------------
BEGIN MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING  DIFFUSER (TEE

 In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY
  MIXED over the entire layer depth (HS =    6.90m).
   Full mixing is achieved after a plume distance of about five
   layer depths from the diffuser.

 Profile definitions:
   BV = layer depth (vertically mixed)
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X        Y        Z        S        C        BV       BH
      .00      .00     1.83      1.0  .722E+01     .08    53.30
      .00    -1.07     1.86      1.7  .425E+01     .29    51.75
      .00    -2.13     1.89      2.0  .363E+01     .50    50.29
      .00    -3.20     1.93      2.2  .327E+01     .72    48.91
      .00    -4.26     1.96      2.4  .301E+01     .93    47.61
      .00    -5.33     1.99      2.6  .282E+01    1.14    46.39
      .00    -6.40     2.02      2.7  .266E+01    1.36    45.23
      .00    -7.46     2.06      2.9  .253E+01    1.57    44.14
      .00    -8.53     2.09      3.0  .242E+01    1.78    43.11
      .00    -9.59     2.12      3.1  .233E+01    2.00    42.13
      .00   -10.66     2.15      3.2  .225E+01    2.21    41.21
      .00   -11.73     2.19      3.3  .218E+01    2.42    40.33
      .00   -12.79     2.22      3.4  .211E+01    2.64    39.49
      .00   -13.86     2.25      3.5  .205E+01    2.85    38.70
```

.00	-14.92	2.28	3.6	.200E+01	3.06	37.94
.00	-15.99	2.32	3.7	.195E+01	3.28	37.22
.00	-17.06	2.35	3.8	.190E+01	3.49	36.54
.00	-18.12	2.38	3.9	.186E+01	3.70	35.88
.00	-19.19	2.41	4.0	.182E+01	3.92	35.26
.00	-20.25	2.45	4.0	.178E+01	4.13	34.66
.00	-21.32	2.48	4.1	.175E+01	4.34	34.08
.00	-22.39	2.51	4.2	.172E+01	4.56	33.54
.00	-23.45	2.54	4.3	.169E+01	4.77	33.01
.00	-24.52	2.58	4.4	.166E+01	4.98	32.51
.00	-25.58	2.61	4.4	.163E+01	5.19	32.03
.00	-26.65	2.64	4.5	.161E+01	5.41	31.58
.00	-27.72	2.67	4.6	.158E+01	5.62	31.15
.00	-28.78	2.70	4.6	.156E+01	5.83	30.74
.00	-29.85	2.74	4.7	.154E+01	6.05	30.35
.00	-30.91	2.77	4.8	.151E+01	6.26	29.98
.00	-31.98	2.80	4.8	.149E+01	6.47	29.64
.00	-33.05	2.83	4.9	.148E+01	6.69	29.31
.00	-34.11	2.87	5.0	.146E+01	6.90	29.01
.00	-35.18	2.90	5.0	.144E+01	6.90	28.73
.00	-36.24	2.93	5.1	.142E+01	6.90	28.47
.00	-37.31	2.96	5.1	.141E+01	6.90	28.24
.00	-38.38	3.00	5.2	.139E+01	6.90	28.02
.00	-39.44	3.03	5.3	.137E+01	6.90	27.83
.00	-40.51	3.06	5.3	.136E+01	6.90	27.65
.00	-41.57	3.09	5.4	.135E+01	6.90	27.50
.00	-42.64	3.13	5.4	.133E+01	6.90	27.36
.00	-43.71	3.16	5.5	.132E+01	6.90	27.24
.00	-44.77	3.19	5.5	.131E+01	6.90	27.13
.00	-45.84	3.22	5.6	.129E+01	6.90	27.04
.00	-46.90	3.26	5.6	.128E+01	6.90	26.96
.00	-47.97	3.29	5.7	.127E+01	6.90	26.90
.00	-49.04	3.32	5.7	.126E+01	6.90	26.85
.00	-50.10	3.35	5.8	.125E+01	6.90	26.80
.00	-51.17	3.39	5.8	.124E+01	6.90	26.77
.00	-52.23	3.42	5.9	.122E+01	6.90	26.74
.00	-53.30	3.45	5.9	.121E+01	6.90	26.72

Cumulative travel time = 68. sec

END OF MOD272: ACCELERATION ZONE OF UNIDIRECTIONAL CROSS-FLOWING DIFFUSER (TE

BEGIN MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 1: The diffuser plume is VERTICALLY FULLY MIXED over the entire layer depth.

Profile definitions:

BV = layer depth (vertically mixed)
BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	-53.30	6.90	5.9	.121E+01	6.90	27.76
1.25	-57.56	6.90	6.0	.121E+01	6.90	28.18
2.51	-61.82	6.90	6.0	.120E+01	6.90	28.59

3.77	-66.08	6.90	6.1	.119E+01	6.90	29.00
5.05	-70.34	6.90	6.1	.118E+01	6.90	29.41
6.34	-74.60	6.90	6.2	.117E+01	6.90	29.82
7.63	-78.86	6.90	6.2	.116E+01	6.90	30.23
8.94	-83.12	6.90	6.3	.115E+01	6.90	30.64
10.25	-87.38	6.90	6.3	.115E+01	6.90	31.05
11.58	-91.64	6.90	6.3	.114E+01	6.90	31.46
12.91	-95.90	6.90	6.4	.113E+01	6.90	31.86
14.25	-100.16	6.90	6.4	.112E+01	6.90	32.27
15.60	-104.42	6.90	6.5	.112E+01	6.90	32.68
16.96	-108.68	6.90	6.5	.111E+01	6.90	33.09
18.33	-112.94	6.90	6.6	.110E+01	6.90	33.49
19.70	-117.20	6.90	6.6	.109E+01	6.90	33.90
21.09	-121.47	6.90	6.6	.109E+01	6.90	34.31
22.48	-125.73	6.90	6.7	.108E+01	6.90	34.71
23.88	-129.99	6.90	6.7	.107E+01	6.90	35.12
25.29	-134.25	6.90	6.8	.107E+01	6.90	35.52
26.71	-138.51	6.90	6.8	.106E+01	6.90	35.93
28.14	-142.77	6.90	6.8	.106E+01	6.90	36.33
29.58	-147.03	6.90	6.9	.105E+01	6.90	36.74
31.02	-151.29	6.90	6.9	.104E+01	6.90	37.14
32.47	-155.55	6.90	7.0	.104E+01	6.90	37.54
33.93	-159.81	6.90	7.0	.103E+01	6.90	37.95
35.40	-164.07	6.90	7.0	.103E+01	6.90	38.35
36.88	-168.33	6.90	7.1	.102E+01	6.90	38.75
38.36	-172.59	6.90	7.1	.101E+01	6.90	39.16
39.85	-176.85	6.90	7.2	.101E+01	6.90	39.56
41.36	-181.11	6.90	7.2	.100E+01	6.90	39.96
42.86	-185.37	6.90	7.2	.999E+00	6.90	40.36
44.38	-189.63	6.90	7.3	.994E+00	6.90	40.76
45.91	-193.89	6.90	7.3	.989E+00	6.90	41.16
47.44	-198.15	6.90	7.3	.984E+00	6.90	41.57
48.98	-202.41	6.90	7.4	.979E+00	6.90	41.97
50.53	-206.67	6.90	7.4	.974E+00	6.90	42.37
52.08	-210.93	6.90	7.5	.969E+00	6.90	42.77
53.64	-215.19	6.90	7.5	.964E+00	6.90	43.17
55.22	-219.45	6.90	7.5	.960E+00	6.90	43.57
56.79	-223.71	6.90	7.6	.955E+00	6.90	43.96
58.38	-227.97	6.90	7.6	.950E+00	6.90	44.36
59.97	-232.23	6.90	7.6	.946E+00	6.90	44.76
61.57	-236.49	6.90	7.7	.942E+00	6.90	45.16
63.18	-240.75	6.90	7.7	.937E+00	6.90	45.56
64.80	-245.01	6.90	7.7	.933E+00	6.90	45.96
66.42	-249.27	6.90	7.8	.929E+00	6.90	46.35
68.05	-253.53	6.90	7.8	.925E+00	6.90	46.75
69.69	-257.80	6.90	7.8	.920E+00	6.90	47.15
71.33	-262.06	6.90	7.9	.916E+00	6.90	47.54
72.99	-266.32	6.90	7.9	.912E+00	6.90	47.94

Cumulative travel time = 1375. sec

End of Phase 1:

The mixed diffuser flow has RESTRATIFIED and is now detached from the bottom or surface/interface.

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

ofile definitions:

BV = top-hat thickness, measured vertically

BH = Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory

ZU = upper plume boundary (Z-coordinate)

ZL = lower plume boundary (Z-coordinate)

S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
72.99	-266.32	6.90	7.9	.912E+00	6.90	47.94
162.23	-475.02	6.90	9.5	.764E+00	3.85	120.29
266.05	-683.72	6.90	10.8	.670E+00	3.34	177.20
382.62	-892.42	6.90	11.9	.604E+00	3.09	232.29
510.68	-1101.13	6.90	13.0	.555E+00	2.93	286.87
649.28	-1309.83	6.90	14.0	.515E+00	2.81	341.36
797.67	-1518.53	6.90	14.9	.484E+00	2.73	395.94
955.24	-1727.23	6.90	15.8	.457E+00	2.66	450.68
1121.49	-1935.93	6.90	16.6	.434E+00	2.60	505.62
1295.98	-2144.64	6.90	17.4	.415E+00	2.54	560.78
1478.34	-2353.34	6.90	18.2	.398E+00	2.50	616.17
1668.25	-2562.04	6.90	18.9	.382E+00	2.46	671.79
1865.41	-2770.74	6.90	19.6	.369E+00	2.42	727.63
2069.58	-2979.44	6.90	20.2	.357E+00	2.38	783.69
2280.51	-3188.15	6.90	20.9	.345E+00	2.35	839.96
2497.99	-3396.85	6.90	21.5	.335E+00	2.32	896.45
2721.84	-3605.55	6.90	22.1	.326E+00	2.29	953.14
2951.88	-3814.25	6.90	22.7	.318E+00	2.27	1010.02
3187.94	-4022.96	6.90	23.3	.310E+00	2.24	1067.10
3429.88	-4231.66	6.90	23.9	.302E+00	2.22	1124.37
3677.55	-4440.36	6.90	24.4	.295E+00	2.20	1181.81
3930.83	-4649.06	6.90	25.0	.289E+00	2.18	1239.43
4189.60	-4857.76	6.90	25.5	.283E+00	2.16	1297.23
4453.74	-5066.47	6.90	26.0	.277E+00	2.14	1355.19
4723.14	-5275.17	6.90	26.5	.272E+00	2.12	1413.31
4997.70	-5483.87	6.90	27.0	.267E+00	2.10	1471.59
5277.33	-5692.57	6.90	27.5	.262E+00	2.09	1530.02
5561.94	-5901.27	6.90	28.0	.258E+00	2.07	1588.61
5851.45	-6109.98	6.90	28.5	.254E+00	2.05	1647.34
6145.76	-6318.68	6.90	28.9	.249E+00	2.04	1706.22
6444.80	-6527.38	6.90	29.4	.246E+00	2.02	1765.23
6748.51	-6736.08	6.90	29.9	.242E+00	2.01	1824.39
7056.80	-6944.79	6.90	30.3	.238E+00	2.00	1883.68
7369.62	-7153.49	6.90	30.7	.235E+00	1.98	1943.10
7686.89	-7362.19	6.90	31.2	.232E+00	1.97	2002.64
8008.56	-7570.89	6.90	31.6	.229E+00	1.96	2062.32
8334.57	-7779.59	6.90	32.0	.226E+00	1.94	2122.12
8664.85	-7988.30	6.90	32.4	.223E+00	1.93	2182.04
8999.36	-8197.00	6.90	32.8	.220E+00	1.92	2242.08
9338.04	-8405.70	6.90	33.2	.217E+00	1.91	2302.24
9680.84	-8614.40	6.90	33.6	.215E+00	1.90	2362.51
10027.72	-8823.10	6.90	34.0	.212E+00	1.89	2422.90
10378.62	-9031.81	6.90	34.4	.210E+00	1.88	2483.40
10733.49	-9240.51	6.90	34.8	.207E+00	1.87	2544.01
11092.31	-9449.21	6.90	35.2	.205E+00	1.86	2604.72
11455.01	-9657.91	6.90	35.6	.203E+00	1.85	2665.54
11821.57	-9866.62	6.90	35.9	.201E+00	1.84	2726.47
12191.94	********	6.90	36.3	.199E+00	1.83	2787.50
12566.08	********	6.90	36.7	.197E+00	1.82	2848.63
12943.95	********	6.90	37.0	.195E+00	1.81	2909.86
13325.53	********	6.90	37.4	.193E+00	1.80	2971.19

mulative travel time = 238734. sec

END OF MOD252: DIFFUSER INDUCED PLUME IN WEAK CROSS-FLOW

** End of NEAR-FIELD REGION (NFR) **

Bank nearest to plume centerline has changed.
Nearest bank is now on RIGHT.

: initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.57 to conserve the mass flux in the far-field!
The correction factor is quite large because of the small ambient velocity
relative to the strong mixing characteristics of the discharge!
This indicates localized RECIRCULATION REGIONS and internal hydraulic JUMPS.

Because of the strong horizontal momentum flux of this diffuser, severe
PLUME INTERACTION WITH THE OPPOSITE BANK occurs.

Consider a different diffuser design with a reduced offshore momentum flux.
No predictive techniques available for this situation; SIMULATION ENDS.

Surface plume centerline coincides with the mid-width of bounded channel.
Thus, the plume interacts SIMULTANEOUSLY WITH BOTH BANKS.

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
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