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CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                  CORMIX: CORNELL MIXING ZONE EXPERT SYSTEM
                      CORMIX-GI Version 4.1GTR
SITE NAME/LABEL:                A-Plant Deep Reservoir
  DESIGN CASE:                  Summer Stratified
  FILE NAME:                    C:\Program Files\CORMIX-GIv41GTR\Sample
Files\Sample1.prd
Using subsystem CORMIX1:        Submerged Single Port Discharges
  Start of session:             09/22/2000--06:37:56
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SUMMARY OF INPUT DATA:
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AMBIENT PARAMETERS:
  Cross-section                         = unbounded
  Average depth                 HA      = 35 m
  Depth at discharge            HD      = 30.5 m
  Ambient velocity              UA      = 0.015 m/s
  Darcy-Weisbach friction factor  F     = 0.0096
    Calculated from Manning's n         = 0.02
  Wind velocity                 UW      = 2 m/s
Stratification Type             STRCND = C
  Surface temperature                   = 28.10
 degC
  Bottom temperature                    = 11
 degC
  Temperature below thermocline         = 19.10 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density               RHOAS   = 996.2053 kg/m^3
  Bottom density                RHOAB   = 999.6072 kg/m^3
  Stratification height         HINT    = 15.5 m (pycnocline level)
  Density below pycnocline      RHOAP   = 998.3866 kg/m^3
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DISCHARGE PARAMETERS:           Submerged Single Port Discharge
  Nearest bank                          = right
  Distance to bank              DISTB   = 46 m
  Port diameter                 D0      = 0.254 m
  Port cross-sectional area     A0      = 0.0507 m^2
  Discharge velocity            U0      = 3.02 m/s
  Discharge flowrate            Q0      = 0.153 m^3/s
  Discharge port height         H0      = 0.6 m
  Vertical discharge angle      THETA   = 10 deg
  Horizontal discharge angle    SIGMA   = 90 deg
  Discharge temperature (freshwater)    = 20 degC
    Corresponding density       RHO0    = 998.2051 kg/m^3
  Density difference            DRHO    = 1.3548 kg/m^3
  Buoyant acceleration          GP0     = 0.0133 m/s^2
  Discharge concentration       C0      = 3500 ppb
  Surface heat exchange coeff.  KS      = 0 m/s
  Coefficient of decay          KD      = 0 /s
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DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.23 m         Lm  = 45.31 m         Lb  = 602.58 m
  LM  = 12.43 m         Lm' = 4.95 m         Lb' = 3.12 m
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NON-DIMENSIONAL PARAMETERS:
  Port densimetric Froude number  FR0   = 51.97
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  Velocity ratio                  R      = 201.30
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MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = yes
  CMC concentration               CMC    = 1200 ppb
  CCC concentration               CCC    = 600 ppb
  Water quality standard specified       = given by CCC value
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = width
  Regulatory mixing zone value           = 120 m (m^2 if area)
  Region of interest                     = 3500 m
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HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = S3 |
  *------------------------*
  The specified ambient density stratification is important, the discharge
  near field flow is confined to the lower layer by the ambient density
  stratification.
  Applicable layer depth = lower layer depth = 15.5 m
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MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

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X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
    46 m from the right bank/shore.
  Number of display steps NSTEP = 10 per module.
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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 = 90.2667 ppb
  Dilution at edge of NFR                = 38.8
  NFR Location:                        x = 105.55 m
    (centerline coordinates)           y = 26.27 m
                                       z = 3.05 m
  NFR plume dimensions:       half-width = 206.30 m
                               thickness = 0.96 m
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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.
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Stratification assessment:
  The specified ambient density stratification is dynamically important.
  The discharge near field flow is trapped within the linearly stratified
  ambient density layer.
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UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  96.54 m
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  Intrusion stagnation point              =  -94.14 m
  Intrusion thickness                     =  1.30 m
  Intrusion half width at impingement     =  206.30 m
  Intrusion half thickness at impingement =  0.96 m
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PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section contacts nearest bank at 105.55 m downstream.
************************ TOXIC DILUTION ZONE SUMMARY ************************
Recall: The TDZ corresponds to the three (3) criteria issued in the USEPA
  Technical Support Document (TSD) for Water Quality-based Toxics Control,
  1991 (EPA/505/2-90-001).
  Criterion maximum concentration (CMC)  = 1200  ppb
Corresponding dilution                   = 2.916667
The CMC was encountered at the following plume position:
  Plume location:                      x = 0.03 m
    (centerline coordinates)           y = 3.93 m
                                       z = 1.31 m
  Plume dimension:             half-width = 0.05 m
                                thickness = 0.05 m
 CRITERION 1: This location is within 50 times the discharge length scale of
              Lq = 0.23 m.
 +++++ The discharge length scale TEST for the TDZ has been SATISFIED. ++++++

 CRITERION 2: This location is within 5 times the ambient water depth of
              HD = 30.5 m.
 ++++++++++ The ambient depth TEST for the TDZ has been SATISFIED.++++++++++

 CRITERION 3: This location is within one tenth the distance of the extent
              of the Regulatory Mixing Zone of 105.55 m downstream.
 +++++ The Regulatory Mixing Zone TEST for the TDZ has been SATISFIED. ++++++
 The diffuser discharge velocity is equal to 3.02 m/s.
   This exceeds the value of 3.0 m/s recommended in the TSD.

 *** All three CMC criteria for the TDZ are SATISFIED for this discharge. ***
********************** REGULATORY MIXING ZONE SUMMARY ***********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                = 90.266693  ppb
Corresponding dilution                   = 38.8
  Plume location:                      x = 105.55 m
    (centerline coordinates)           y = 26.27 m
                                       z = 3.05 m
  Plume dimensions:            half-width = 206.30 m
                                thickness = 0.96 m
At this position, the plume is CONTACTING the RIGHT bank.
Furthermore, the CCC for the toxic pollutant has indeed been met
  within the RMZ. In particular:
The CCC was encountered at the following plume position:
The CCC for the toxic pollutant was encountered at the following
  plume position:
  CCC                                    = 600  ppb
Corresponding dilution                   = 5.8
  Plume location:                      x = 0.16 m
    (centerline coordinates)           y = 7.82 m
                                       z = 2.12 m
  Plume dimensions:            half-width = 0.04 m
                                thickness = 0.04 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
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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.