Numerical Modelling of Suspended Transport and Deposition of Highway Deposited Sediments

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Numerical modelling of suspended transport and deposition of highway deposited sediments

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Good data for calibration and validation of numerical models are of high importance. In the natural environment data can be hard to archive and the stochastic nature have governing influence on the data archived. Hence for modelling of suspended transport and deposition of particles, originating from the highway surfaces, in highway detention ponds, four transport experiments are carried out. To simplify the complexity of a real pond and for easy control and measurement the sediment transport experiments where carried out in two rectangular channels: one 7.5m x 0.3m, x 0.3 m and one 30m x 0.8 m x 0.7 m (length x width x depth) respectively with sediment traps at the bottom. The model calculations showed good correlation with the measured longitudinal sediment net accumulation as shown subsequently. The sediment used in the experiments origins from the *Vodskov* detentions pond and settling velocity distributions was initially measured in a vertical tube for characterizing the sediment. The hydrodynamics within the channels are described with the CFD program MIKE3 (DHI, 2008) in three dimensions by solving the Navier Stokes equation with assumption of hydrostatic pressure distribution cf. the mass conservation eqn. 1 and the momentum eqn. 2 (for the x-direction).

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=S \tag{1}$$

$$\frac{\partial u}{\partial t}+\frac{\partial uu}{\partial x}+\frac{\partial uv}{\partial y}+\frac{\partial uw}{\partial z}=-\frac{1}{\rho}\frac{\partial P}{\partial x}+\frac{\partial}{\partial x}\left(2\nu_T\frac{\partial u}{\partial x}\right)+\frac{\partial}{\partial y}\left(\nu_T\left(\frac{\partial u}{\partial y}+\frac{\partial v}{\partial x}\right)\right)+\frac{\partial}{\partial z}\left(\nu_T\frac{\partial u}{\partial z}\right)+u_sS \tag{2}$$

where u,v,w = velocities in the x,y,z directions, S = source/sink term, ρ = density, ν_T = eddy viscosity and the pressure term is solved by eqn. (3)

$$\frac{1}{\rho}\frac{\partial P}{\partial x}=\frac{g\rho(\zeta)}{\rho}\frac{\partial \zeta}{\partial x}+\frac{g}{\rho}\int_z^{\xi}\frac{\partial \rho}{\partial x}dz \tag{3}$$

where g = acceleration due to gravity and ξ = surface elevation. The eddy viscosity is calculated by means of the Smagorinsky formulation (eqn 4).

$$\nu_T = (C \cdot \Delta s)\sqrt{S_{ij} \cdot S_{ji}} \tag{4}$$

where C = Smagorinsky coefficients (one for the horizontal plane and one for the vertical) Δs = grid spacing and S = velocity gradients. The sediment transport within the channels is described with the CFD program MIKE3 - Mud Transport (MT) (DHI, 2008). The sediment pumped to the channel is in the model divided into 7 fractions with different settling velocities, corresponding to measured settling velocity distributions of Vodskov pond sediment. The suspended transport of sediment within the channels is described with the advection-dispersion eqn. (5) (for the z-direction).

$$\frac{\partial c}{\partial t} + \frac{\partial}{\partial z}\left(c\left(w - w_{s,i}\right)\right) = \frac{\partial}{\partial z}\left(D_c \frac{\partial c}{\partial z}\right) + S_c \tag{5}$$

where c = concentration of the ith fraction of sediment with the corresponding settling velocity w_s and D = dispersion coefficient calculated proportional to eddy viscosity with the Prantl number. The deposition of suspended material is governed by whether the bed shear stress is below the critical shear stress for deposition τ_{cd}. The critical shear stress for deposition is set to vary between 0.04 N/m^2 for the fastest falling particles and 0.03 N/m^2 for the slowest. The deposition D of the ith fraction is described as given in eqn. 6 (DHI, 2008).

$$D_i = w_s^i c_b^i p_d^i \tag{6}$$

where c_b is the near bed concentration and p_d is the probability of deposition $1 - \frac{\tau_b}{\tau_{cd}}, \tau_b \le \tau_{cd}$

Experiment 1

Experiment 1 was carried out in a channel 7.5 m long and 0.3 m wide with a constant water level of 0.3 m The channel is discretized in grids of 0.075m x 0.04 m x 0.028m (x,y,z) and applied an equivalent sand roughness of 0.001 m. Only water and dissolved Rodamin was used and the Rodamin concentration was measured in the outlet of the channel. Laser Doppler Anamometry was used for velocity measurements. The aim of the experiment was to calibrate the hydrodynamic description (the Smagorinsky coefficients, eqn. 4)) for low flow velocities, which are common in detention ponds, and dispersion coefficients for the dispersion term in eqn. 5. Figure 1 to Figure 6 shows the experiment and results of the calibrated model, with Smagorinsky coefficients of 0.11 for the horizontal plane and 0.14 for the vertical plane and dispersion factors of 0.3 and 1 proportional to the eddy viscosity. By adjusting the Smagorinsky coefficients the turbulence formulation is not longer an actual Smagorinsky turbulence formulation but a mixing length formulation.

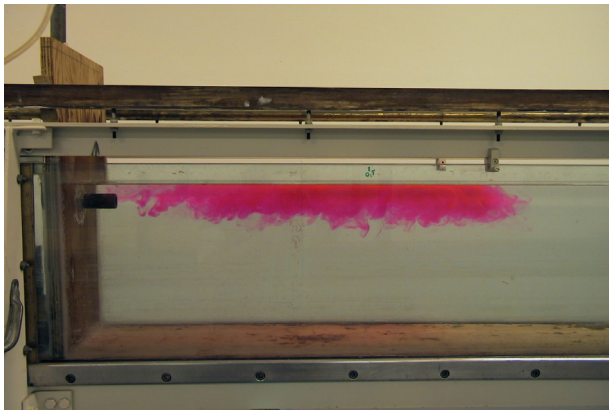

Figure 1. Initial phase of the tracer experiment.

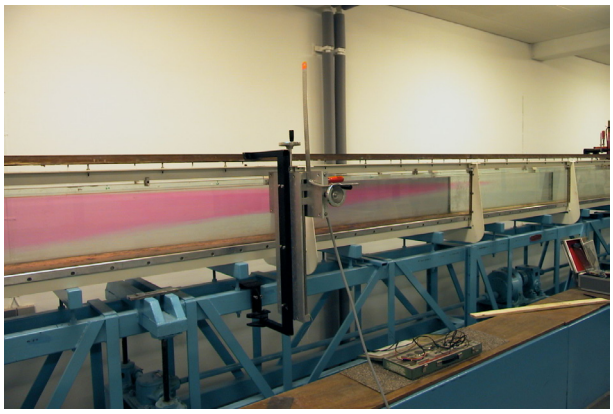

Figure 2. The spread of tracer after 25 minutes.

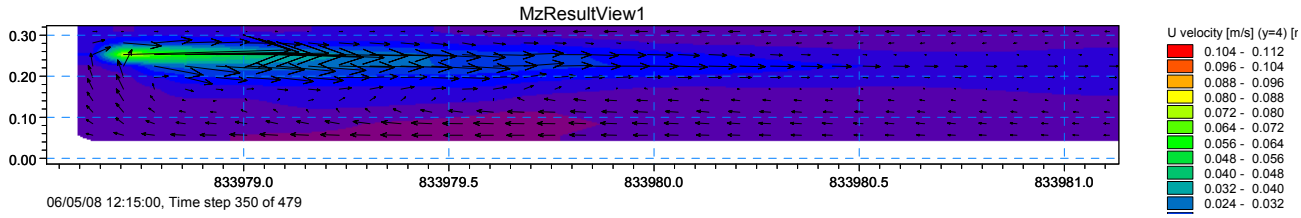

Figure 3. Model results for the centre of the channel. The colour are visualizing the U velocity component and vectors the resultant of U and W.

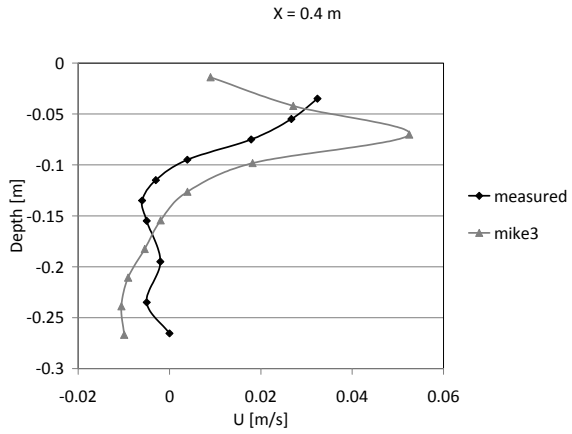

Figure 4 Model and measured U velocities in the centre of the channel 0.4 m from the inlet.

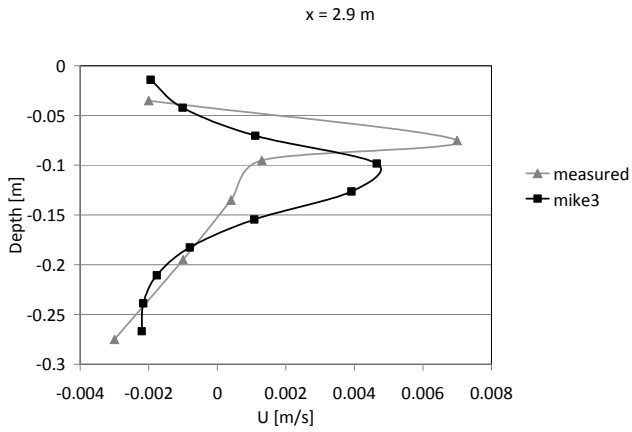

Figure 5 Model and measured U velocities in the centre of the channel 2.9 m from the inlet.

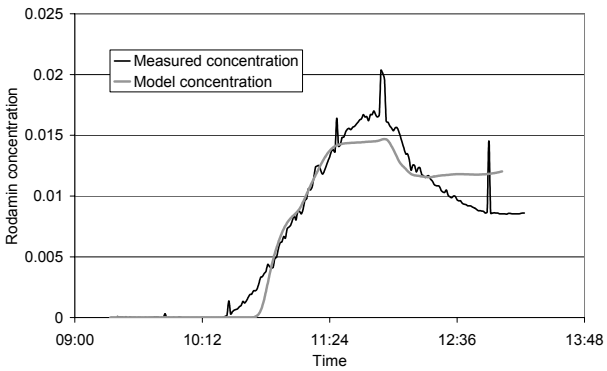

Figure 6. Model and measured Rodamin concentration in the outlet from the channel.

Experiment 2

The experiment 2 was conducted in a 30 m long and 0.8 m wide concrete channel placed beside the Aarslev detention pond (Figure 9). An overview of the experiment is given in Figure 7. The inlet structure in this experiment (2) is different than the one showed on Figure 7 which is a pipe inlet used in experiment 3. In experiment 2, the water and sediment are pumped to the channel in a device spreading the water and sediment uniform over the width and placed at the very beginning of the channel.

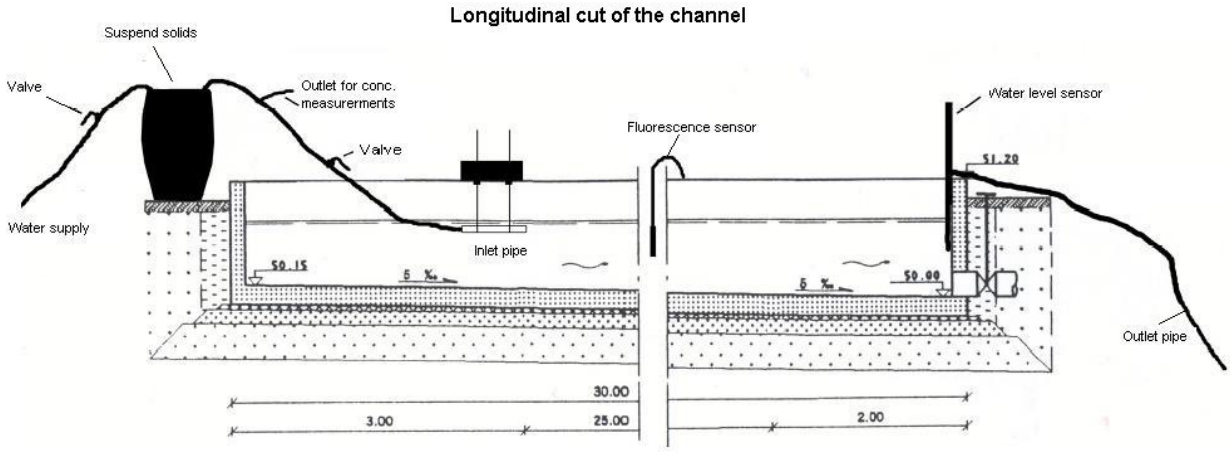

Figure 7 Longitudinal cut of the channel used in experiment 2/3.

As initial condition, the channel was filled with water from the detention pond to a water level corresponding to Figure 8. Subsequently water was pumped to the barrel as shown on Figure 7 where water and sediment from the Vodskov detention pond was mixed and pumped to the channel. The outlet was a siphon pipe with a discharge corresponding to Figure 8. At the bottom of the channel sediment traps were placed (Figure 10 and Figure 11).

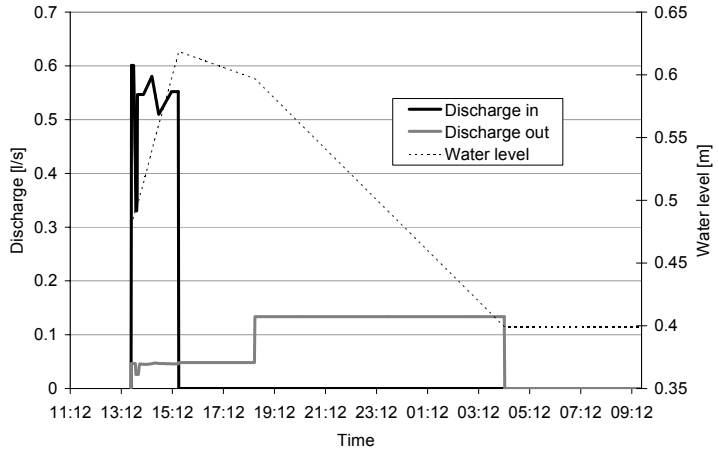

Figure 8. Discharges and water level in experiment 2.

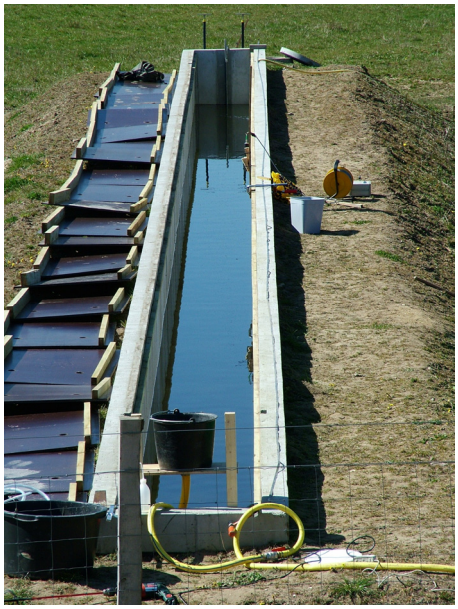

Figure 9. Channel used for the large scale experiments.

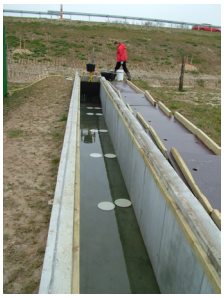

Figure 10. Sediment plates at the bottom of the channel.

Figure 11. Sediment plates at the inlet and outlet zone respectively.

Initially the settling velocity distribution measured in a vertical tube in still water was used as input parameter for the MIKE 3 – Mud Transport model. Several attempt on calibrating the model were done, but without luck. The sediment did only settle in the first 2/3rd of the channel in the model and almost 80 percent within the first few metres. In conjunction with the measured longitudinal net accumulation, sediment grain size distributions for the accumulated sediment within each sediment trap was measured by laser diffraction analysis. The longitudinal grain size distribution showed a very good correlation with the mass accumulation distribution as shown in Figure 12 and Figure 13.

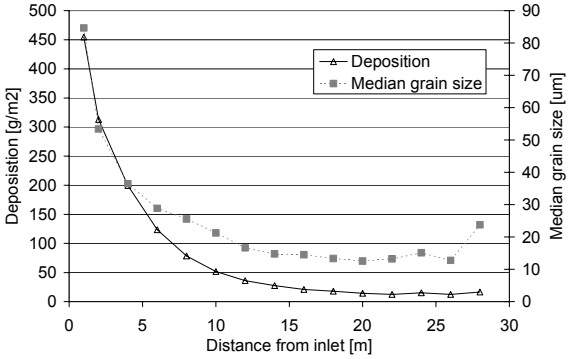

Figure 12. Longitudinal net deposition and median grain size distribution.

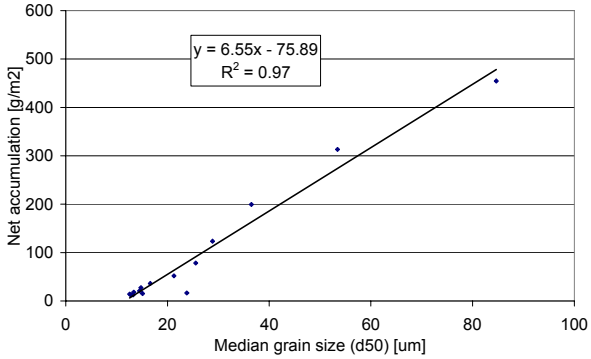

Figure 13. Longitudinal net deposition as function of median grain size.

Thus with knowledge about the longitudinal mass distribution of the sediment, the mass that have left the channel through the outlet and with appliance of Stokes law for settling with a fractionated density as described in e.g. Kayhanian and Rasa (2007). A new settling velocity distribution was calculated and used as input parameter for the sediment description with a satisfactory result as shown in Figure 14. A possible reason for a changed settling velocity distribution could be explained by the presence of the pump. The initial settling velocity distribution was measured by adding a bulk of sediment to a vertical tube with still water. Thus flocculation of particles might have increased the settling velocity whereas in the channel experiment the bulk of sediment added

has passed several facilities with very high turbulence and mechanic stresses in contact with the pump blades. As shown in Figure 15 the grain size distribution is not significant disturbed through the inlet facilities, which can be explained by the way the laser diffraction analysis where done. Here sediment/water is re-circulated by a pump through small pipes with high velocity. The undisturbed sample and the samples taken in the inlet facility have thus passed the same stress conditions.

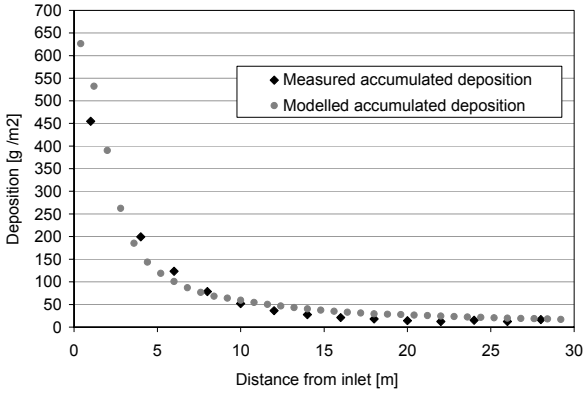

Figure 14. Measured and modelled longitudinal net deposition and median grain size distribution.

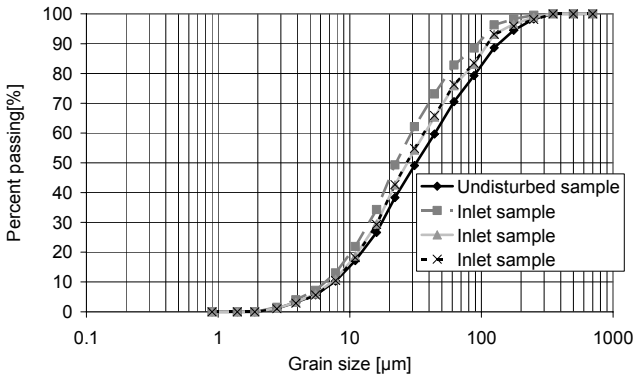

Figure 15. Grain size distributions for initial added sediment and sediment passing the inlet facilities.

Experiment 3 and 4

For validation of the sediment transport model, two experiments were subsequently done, one in the small channel and one in the large channel. The small channel experiment is similar to experiment one described previously but with sediment continuously added over 40 minutes. The inlet concentrations were measured at 1 Hz sampling frequency with a density meter as described in Bentzen *et al.* (2008a). Flow data and concentration data can be seen in Figure 16 and photo from the experiment in Figure 17. The model showed good correlation with the measured deposition as shown in Figure 18 except for the area just below the inlet pipe. The mass balance for the experiment holds: 148 grams of sediment was added, 148 grams was recovered at the bottom (in the model 149 grams was recovered on the bottom). Additional information about the composition of the deposited sediment was achieved cf. Figure 19 where, as expected, with increasing organic content in the longitudinal direction.

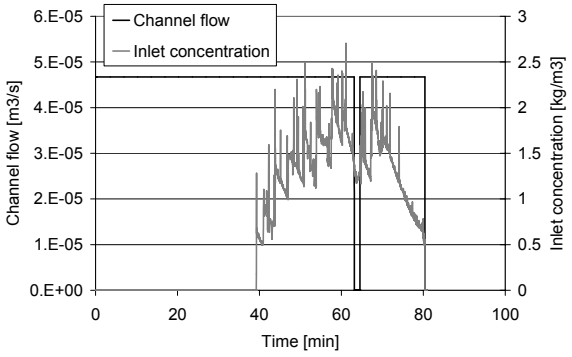

Figure 16. Flow through the channel and inlet concentration.

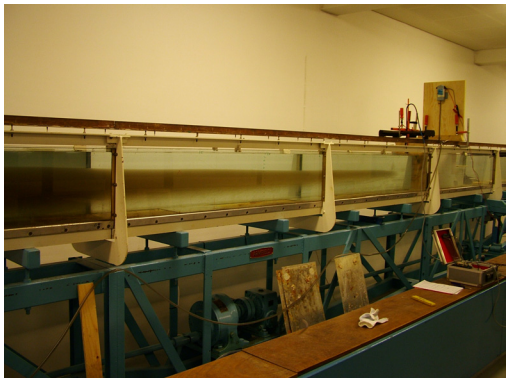

Figure 17. Sediment transport trough the channel. Outlet to the right.

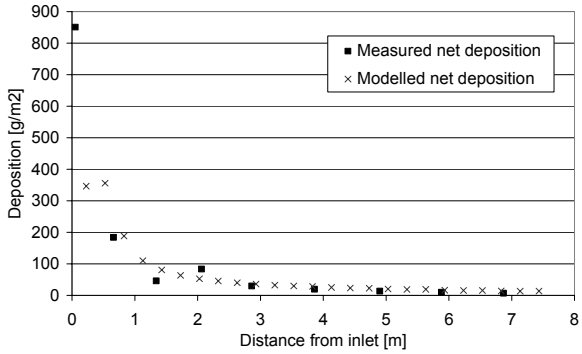

Figure 18. Measured and modelled longitudinal net deposition and median grain size distribution.

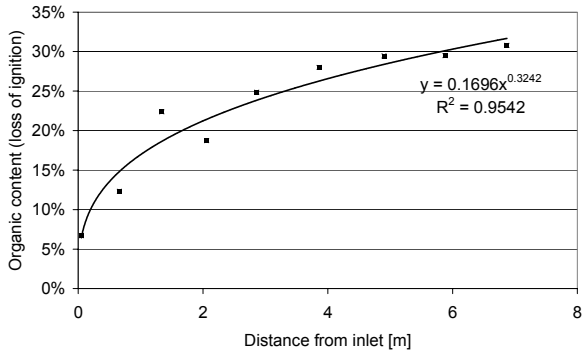

Figure 19. Longitudinal variation of the organic content within the sediment.

The validation experiment in the large channel is sketched in Figure 7, with a pipe inlet as shown on Figure 20 and Figure 21. Results can be seen in Figure 22 and Figure 23. The model showed fairly good correlation with the measured deposition as shown in Figure 18. The deposition is underestimated in the model within the area of three to six metres from the inlet pipe and slight overestimated in end of the channel. Whether this is due to a change in settling velocity distribution compared to experiment 2 or uncertainties in the model can not be concluded from the present data. The measured and modelled outlet concentration are timely good correlated, but the modelled outlet mass is underestimated as shown in Figure 23. This corresponds with the higher deposition in end of the channel in the model. So whether it is to less turbulence in the end of the channel or still the settling velocity distribution that might not be completely correct is not to be said. But never the less the model has be shown capable with an acceptable accuracy to model the transport of highway sediments within the channels.

Figure 20. Adjusting the pipe inlet prior experiment 4.

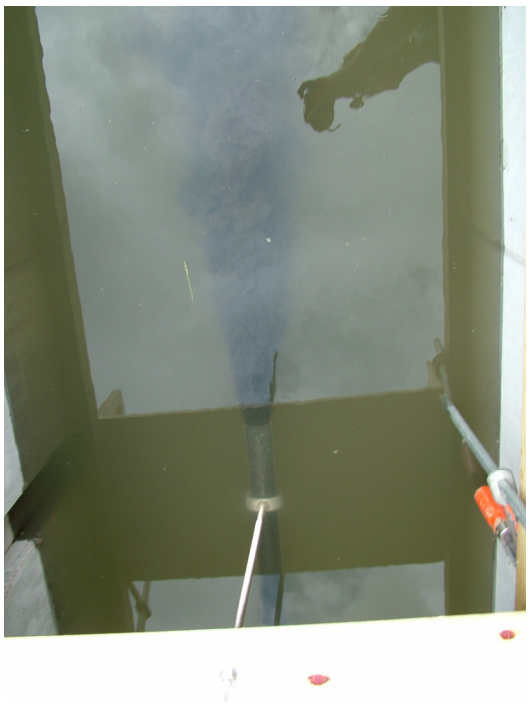

Figure 21. Initial phase of experiment 4 with sediment inflow.

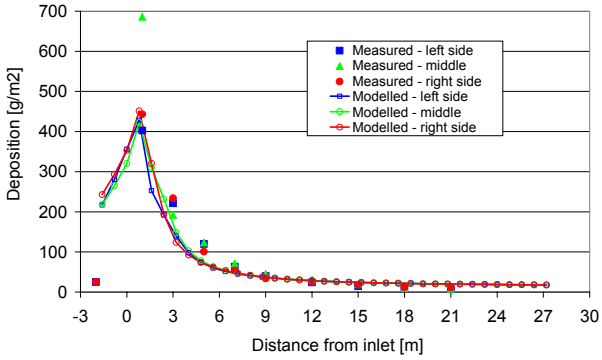

Figure 22. Measured and modelled longitudinal net deposition and median grain size distribution.

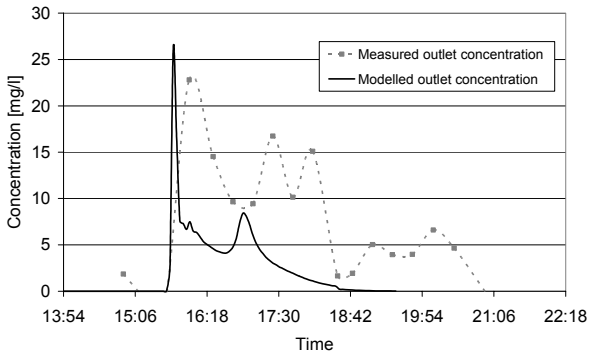

Figure 23. Measured and modelled outlet concentration from the channel.

Conclusion

Since the model has been shown capable with an acceptable accuracy to model the transport of highway sediments within the channels it might be assumed that this is also the case in e.g. detention ponds where water depths and flow conditions are comparable with the especially the large channel. Previously the model has been shown capable to model the hydrodynamics and transport of dissolved tracer pollutants with highly acceptable accuracy e.g. in Bentzen et al. (2005), Bentzen et al. (2008b) and in Bentzen, T. R., 2008c.

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Bentzen, T. R., (2008c) Accumulation of pollutants in highway detention ponds - PhD thesis, Series number 13. Submitted 22. September 2008, at Aalborg University, Department of Civil Engineering, Water and Soil.

DHI (2008) Danish Hydraulic Institute, Software package 2008. Software description available on the website: http://www.dhigroup.com/Software.aspx

Kayhanian, M. and Rasa, E. (2007) Particle size distribution and fractionated particle density as a monitoring tool for assessing the performance of stormwater best management practices. 11th diffuse pollution conference and 1st meeting of diffuse pollution and urban drainage specialist groups. 26 – 31 August 2007, Belo Horizonte, Brazil.

Appendix – MIKE 3 Mud Transport setup for experiment 4

```
// Created     : 2008-08-28 15:27:48
// DLL id      : c:\programmer\fælles
filer\dhi\mikezero\pfs2004.dll
// PFS version : Nov 27 2007 20:39:43

[MIKE3_FLOW_MODEL]
  [BASIC_PARAMETERS]
    [OPTION_PARAMETERS]
    EndSect  // OPTION_PARAMETERS

    [MODULE_SELECTION]
      Touched = 1
      IncludeSalinity = true
      IncludeTemperature = false
      IncludeAD = false
      IncludeMT = true
      IncludeECOLab = false
      ADScheme = 1
      ADUpdateFrequency = 1
      HydroStaticEngine = true
      InternalComponentLoop = false
    EndSect  // MODULE_SELECTION

    [BATHYMETRY_SELECTION]
      Touched = 1
      MzSEPfsListItemCount = 1
      NoOfAreas = 1
      HotStart = false
      Projection = 'PROJCS["UTM-
30",GEOGCS["Unused",DATUM["UTM
Projections",SPHEROID["WGS
1984",6378137,298.257223563]],PRIMEM["Gr
eenwich",0],UNIT["Degree",0.0174532925199
433]],PROJECTION["Transverse_Mercator"],P
ARAMETER["False_Easting",500000],PARA
METER["False_Northing",0],PARAMETER["
Central_Meridian",-
3],PARAMETER["Scale_Factor",0.9996],PAR
AMETER["Latitude_Of_Origin",0],UNIT["Met
er",1]]'
      Layers = 14
      GridSpacing = 0.04
      Use3DBathymetry = false
      CoriolisForce = false
      strUTMModified = 1
      LayerNumModified = 1
      [AREA_1]
        Touched = 1
        ValidBathymetry = 1
        NoOfCalculationPoints = 9842
        [DATA_FILE]
          Touched = 1
          FILE_NAME = |.\Grid1.dfs2|
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // BATHYMETRY_SELECTION

    [SIMULATION_PERIOD]
      Touched = 1
      StartTime = 2007, 6, 18, 13, 55, 0
      NumberOfTimesteps = 400000
      TimeStepInterval = 0.05
      WarmUpPeriod = 0
    EndSect  // SIMULATION_PERIOD

    [BOUNDARY]
      Touched = 1
      MzSEPfsListItemCount = 0
      ZeroGradient = false
      NumberOfBoundaries = 0
      ProgramDetected = true
    EndSect  // BOUNDARY

    [SOURCE_AND_SINK]
      Touched = 1
      MzSEPfsListItemCount = 2
      NumberOfSources = 2
      [SOURCE_SINK_1]
        Touched = 1
        Type = 0
        SourceSinkPoint = 4, 10, 13
        Area = 1
        SourcePoint = 0, 0, 13
        SourceArea = 1
        SinkPoint = 0, 0, 13
        SinkArea = 1
      EndSect  // SOURCE_SINK_1

      [SOURCE_SINK_2]
        Touched = 1
        Type = 0
        SourceSinkPoint = 37, 10, 12
        Area = 1
        SourcePoint = 0, 0, 13
        SourceArea = 1
        SinkPoint = 0, 0, 13
        SinkArea = 1
      EndSect  // SOURCE_SINK_2

    EndSect  // SOURCE_AND_SINK

    [FLOOD_AND_DRY]
      Touched = 1
      EnableFloodAndDryChecking = false
      DryingDepth = 0.001
      FloodingDepth = 0.003
    EndSect  // FLOOD_AND_DRY

    [TURBULENCE_MODEL]
      Touched = 1
      TurbulenceModel = 3
    EndSect  // TURBULENCE_MODEL

    [MASS_BUDGET]
      Touched = 1
      MzSEPfsListItemCount = 0
      NoOfPolygons = 0
    EndSect  // MASS_BUDGET

  EndSect  // BASIC_PARAMETERS

  [HYDRODYNAMIC_PARAMETERS]
    [OPTION_PARAMETERS]
    EndSect  // OPTION_PARAMETERS

    [INITIAL_SURFACE_ELEVATION]
      Touched = 1
      MzSEPfsListItemCount = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue = 0
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  //
INITIAL_SURFACE_ELEVATION

    [BOUNDARY_CONDITIONS]
      Touched = 1
      MzSEPfsListItemCount = 0
    EndSect  // BOUNDARY_CONDITIONS

    [RESISTANCE]
      Touched = 1
      MzSEPfsListItemCount = 1
      IncludePiers = false
      NoOfPiers = 1
      IncludeBedFriction = true
      [SLIP_FACTORS]
        Top = 1
        Bottom = 1
        Walls = 1
      EndSect  // SLIP_FACTORS

      [DATA_FILE]
        Touched = 1
        FILE_NAME = ||
        ITEM_COUNT = 1
        ITEM_NUMBERS = 1
      EndSect  // DATA_FILE

      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue = 0.001
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // RESISTANCE

    [TURBULENCE_PARAMETERS]
      Touched = 1
      MzSEPfsListItemCount = 1
      [AREA_1]
        Touched = 1
        Format = 0
        VCoefficient = 0.14
        HCoefficient = 0.11
        EddyXLimits = 1.799999933485565e-
027, 128
        EddyYLimits = 1.799999933485565e-
027, 0.3528000116348267
        EddyZLimits = 1.799999933485565e-
027, 0.3199999928474426
```

```
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  //
TURBULENCE_PARAMETERS

    [DENSITY]
      Touched = 1
      IncludeDamping = true
      HorizontalCoefficient = 0
      VerticalCoefficient = 10
      PrescribedOutFlowBC = false
      RangeChecking = false
      SalinityRange = 0, 32
      TemperatureRange = -
1.200000047683716, 30
      M21ADSalt = false
      M21ADTemp = false
    EndSect  // DENSITY

    [SALINITY]
      Touched = 1
      Formulation = 0
      BackgroundValue = 0
      ImplVertDisp = true
      [INITIAL_VALUE]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // INITIAL_VALUE

      [DISPERSION_FACTORS]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.1000000014901161, 0.1000000014901161
        EndSect  // AREA_1

      EndSect  // DISPERSION_FACTORS

      [DISPERSION_LIMITS]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          XLimits = 0, 0.005000000353902578
          YLimits = 0, 0.005000000353902578
          ZLimits = 1.799999933485565e-027,
0.007199999876320362
        EndSect  // AREA_1

      EndSect  // DISPERSION_LIMITS

    EndSect  // SALINITY

    [TEMPERATURE]
      Touched = 1
      Formulation = 0
      BackgroundValue = 17
      ImplVertDisp = true
      [INITIAL_VALUE]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 17
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // INITIAL_VALUE

      [DISPERSION_FACTORS]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.1000000014901161, 0.1000000014901161
        EndSect  // AREA_1

      EndSect  // DISPERSION_FACTORS

      [DISPERSION_LIMITS]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          XLimits = 0, 0.03999999910593033
          YLimits = 0, 0.008999999612569809
          ZLimits = 1.800000006824121e-007,
0.02999999932944775
        EndSect  // AREA_1

      EndSect  // DISPERSION_LIMITS

    EndSect  // TEMPERATURE

    [PRECIPITATION]
      IncludePrecipitation = false
      ConstantValue = 0
      Format = -1
      NetPrecipitation = true
      [PrecipTemp]
        Touched = 1
        Format = -1
        ConstantValue = 0
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // PrecipTemp

      [EvapTemp]
        Touched = 1
        Format = -3
        ConstantValue = 0
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // EvapTemp

      [DATA_FILE]
        Touched = 1
        FILE_NAME = ||
        ITEM_COUNT = 1
        ITEM_NUMBERS = 1
      EndSect  // DATA_FILE

    EndSect  // PRECIPITATION

    [PARTICLE_TRACKING]
      Touched = 0
      MzSEPfsListItemCount = 0
      NumberOfParticleSources = 0
      Releases = 0, 0, 1
      TimeSteps = 0, 100, 30
      FILE_NAME = ||
      Title = ''
    EndSect  // PARTICLE_TRACKING

    [WIND_CONDITIONS]
      Touched = 1
      Format = 0
      ConstantWindDirection = 270
      ConstantWindSpeed = 10
      NeutralPressure = 1013
      TypeOfWindFriction = 0
      ConstantFriction = 0.0026
      LinearFriction = 0.0015999999595806,
0.002600000007078052
      LinearSpeed = 0, 24
      IncludeAirPressureVariation = false
      IncludeAirPressureCorrections = false
      [DATA_FILE]
        Touched = 1
        FILE_NAME = ||
        ITEM_COUNT = 1
        ITEM_NUMBERS = 1
      EndSect  // DATA_FILE

    EndSect  // WIND_CONDITIONS

    [DISCHARGE_CALCULATIONS]
      Touched = 1
      MzSEPfsListItemCount = 0
      NumberOfLines = 0
    EndSect  //
DISCHARGE_CALCULATIONS

    [HD_SOURCE_SINK]
      Touched = 1
      MzSEPfsListItemCount = 2
      [SOURCE_1]
        Touched = 1
        Format = 1
        IncludedInFile = false
        Salinity = 0
        Temperature = 10
        [DATA_FILE]
          Touched = 1
          FILE_NAME = |.\Indloeb.dfs0|
          ITEM_COUNT = 3
          ITEM_NUMBERS = 1, 2, 3
        EndSect  // DATA_FILE
```

```
  EndSect  // SOURCE_1

  [SOURCE_2]
    Touched = 1
    Format = 1
    IncludedInFile = false
    Salinity = 0
    Temperature = 10
    [DATA_FILE]
      Touched = 1
      FILE_NAME = |.\Udloeb.dfs0|
      ITEM_COUNT = 3
      ITEM_NUMBERS = 1, 2, 3
    EndSect  // DATA_FILE

  EndSect  // SOURCE_2

EndSect  // HD_SOURCE_SINK

[MASS_BUDGET]
  Touched = 1
  MzSEPfsListItemCount = 0
  NoOfMassFiles = 0
EndSect  // MASS_BUDGET

[OUTPUT_SPECIFICATIONS]
  Touched = 1
  MzSEPfsListItemCount = 2
  NumberOfOutputAreas = 2
  [AREA_1]
    Touched = 1
    AssociatedArea = 1
    XRange = 0, 38, 1
    YRange = 0, 20, 1
    ZRange = 0, 14, 1
    TRange = 0, 400000, 4000
    UVelocity = true
    VVelocity = true
    WVelocity = true
    Pressure = false
    SurfaceElevation = false
    Density = true
    Temperature = false
    XEddy = true
    YEddy = false
    ZEddy = false
    TKE = false
    TKD = false
    Salinity = false
    TimeAveraged = true
    FILE_NAME = 'aarslev3.dfs3'
    Title = ''
  EndSect  // AREA_1

  [AREA_2]
    Touched = 1
    AssociatedArea = 1
    XRange = 0, 38, 1
    YRange = 0, 20, 1
    ZRange = 14, 14, 1
    TRange = 0, 400000, 4000
    UVelocity = false
    VVelocity = false
    WVelocity = false
    Pressure = false
    SurfaceElevation = true
    Density = false
    Temperature = false
    XEddy = false
    YEddy = false
    ZEddy = false
    TKE = false
    TKD = false
    Salinity = false
    TimeAveraged = true
    FILE_NAME = 'aarslev3.dfs2'
    Title = ''
  EndSect  // AREA_2

  EndSect  // OUTPUT_SPECIFICATIONS

  [HOT_FILES]
    Touched = 1
    MzSEPfsListItemCount = 1
    GenerateHotData = true
    TRange = 325000, 325000, 1
    [AREA_1]
      Touched = 1
      FILE_NAME = 'Aarslev_hotstart.dfs3'
      Title = ''
    EndSect  // AREA_1

  EndSect  // HOT_FILES

EndSect  //
HYDRODYNAMIC_PARAMETERS


[ADVECTION_DISPERSION_PARAMETER
S]
  [OPTION_PARAMETERS]
  EndSect  // OPTION_PARAMETERS

EndSect  //
ADVECTION_DISPERSION_PARAMETERS

[MUD_TRANSPORT_PARAMETERS]
  [OPTION_PARAMETERS]
  EndSect  // OPTION_PARAMETERS

  [TASK_SELECTION]
    Touched = 1
    Number_of_layers = 1
    Number_of_fractions = 7
    IncludeHeavyMetals = false
    MTincludesalinity = false
  EndSect  // TASK_SELECTION

  [INITIAL_CONDITIONS]
    Touched = 1
    [INITIAL_CONCENTRATIONS]
      Touched = 1
      MzSEPfsListItemCount = 7
      [FRACTION_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_1

      [FRACTION_2]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_2

      [FRACTION_3]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_3

      [FRACTION_4]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_4

      [FRACTION_5]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_5

      [FRACTION_6]
```

```
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_6

      [FRACTION_7]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // FRACTION_7

    EndSect  // INITIAL_CONCENTRATIONS

    [INITIAL_BED_THICKNESS]
      Touched = 1
      MzSEPfsListItemCount = 1
      [LAYER_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // LAYER_1

    EndSect  // INITIAL_BED_THICKNESS


[INITIAL_BED_SEDIMENT_DISTRIBUTIO
N]
      Touched = 1
      MzSEPfsListItemCount = 1
      [BED_LAYER_1]
        Fraction_Distribution = 14, 14, 14, 14,
14, 14, 16
      EndSect  // BED_LAYER_1
    EndSect  //
INITIAL_BED_SEDIMENT_DISTRIBUTION

  EndSect  // INITIAL_CONDITIONS

  [DISPERSION_SPECIFICATIONS]
    Touched = 1
    [DISPERSION_FACTORS]
      Touched = 1
      MzSEPfsListItemCount = 7
      [COMPONENT_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_1

      [COMPONENT_2]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_2

      [COMPONENT_3]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_3

      [COMPONENT_4]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_4

      [COMPONENT_5]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_5

      [COMPONENT_6]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_6

      [COMPONENT_7]
        Touched = 1
        MzSEPfsListItemCount = 1
        Formulation = 0
        [AREA_1]
          Touched = 1
          DispersionFactors =
0.300000011920929, 1, 0
        EndSect  // AREA_1

      EndSect  // COMPONENT_7

    EndSect  // DISPERSION_FACTORS

    [DISPERSION_LIMITS]
      Touched = 1
      MzSEPfsListItemCount = 7
      [COMPONENT_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          XLimits = 0, 0.2000000029802322
          YLimits = 0,
0.003528000088408589
          ZLimits = 0, 1.999999994950485e-
006
        EndSect  // AREA_1

      EndSect  // COMPONENT_1

      [COMPONENT_2]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          XLimits = 0, 0.2000000029802322
          YLimits = 0,
0.003527999855577946
          ZLimits = 0, 1.999999994950485e-
006
        EndSect  // AREA_1

      EndSect  // COMPONENT_2

      [COMPONENT_3]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          XLimits = 0, 0.2000000029802322
          YLimits = 0,
0.003527999855577946
          ZLimits = 0, 1.999999994950485e-
006
        EndSect  // AREA_1

      EndSect  // COMPONENT_3

      [COMPONENT_4]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
```

```
            XLimits = 0, 0.2000000029802322
            YLimits = 0,
0.003527999855577946
            ZLimits = 0, 1.999999994950485e-
006
          EndSect  // AREA_1

        EndSect  // COMPONENT_4

        [COMPONENT_5]
          Touched = 1
          MzSEPfsListItemCount = 1
          [AREA_1]
            Touched = 1
            XLimits = 0, 0.2000000029802322
            YLimits = 0,
0.003527999855577946
            ZLimits = 0, 1.999999994950485e-
006
          EndSect  // AREA_1

        EndSect  // COMPONENT_5

        [COMPONENT_6]
          Touched = 1
          MzSEPfsListItemCount = 1
          [AREA_1]
            Touched = 1
            XLimits = 0, 0.2000000029802322
            YLimits = 0,
0.003527999855577946
            ZLimits = 0, 1.999999994950485e-
006
          EndSect  // AREA_1

        EndSect  // COMPONENT_6

        [COMPONENT_7]
          Touched = 1
          MzSEPfsListItemCount = 1
          [AREA_1]
            Touched = 1
            XLimits = 0, 0.2000000029802322
            YLimits = 0,
0.003527999855577946
            ZLimits = 0, 1.999999994950485e-
006
          EndSect  // AREA_1

        EndSect  // COMPONENT_7

      EndSect  // DISPERSION_LIMITS

    EndSect  //
DISPERSION_SPECIFICATIONS

    [MT_BOUNDARIES]
      Touched = 1
      MzSEPfsListItemCount = 7
      [COMPONENT_1]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_1

      [COMPONENT_2]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_2

      [COMPONENT_3]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_3

      [COMPONENT_4]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_4

      [COMPONENT_5]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_5

      [COMPONENT_6]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_6

      [COMPONENT_7]
        Touched = 1
        MzSEPfsListItemCount = 0
      EndSect  // COMPONENT_7

    EndSect  // MT_BOUNDARIES

    [MT_SOURCES]
      Touched = 1
      MzSEPfsListItemCount = 2
      [SOURCE_1]
        Touched = 1
        Format = 0
        ConstantValues = 0.01, 0.01, 0.01, 0.01,
0.01, 0.01, 0.01
        [DATA_FILE]
          Touched = 1
          FILE_NAME =
|.\7_fraktioner_new_dist.dfs0|
          ITEM_COUNT = 7
          ITEM_NUMBERS = 1, 2, 3, 4, 5, 6, 7
        EndSect  // DATA_FILE

      EndSect  // SOURCE_1

      [SOURCE_2]
        Touched = 1
        Format = -1
        ConstantValues = 0, 0, 0, 0, 0, 0, 0
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 7
          ITEM_NUMBERS = 1, 2, 3, 4, 5, 6, 7
        EndSect  // DATA_FILE

      EndSect  // SOURCE_2

    EndSect  // MT_SOURCES

    [FORCINGS]
      Touched = 1
      [WAVES]
        Touched = 0
        WaveFormat = 0
        UseInterpolationInTime = false
        MinWaterDepthForIncludingWaves = 0
        Include_Liquefaction = false
        Liquefaction_factor = 1
        [CONSTANT_WAVES]
          Touched = 0
          SignificantWaveHeight = 0.3
          ZeroCrossingWavePeriod = 3
          MeanWaveDirection = 0
        EndSect  // CONSTANT_WAVES

        [TIME_AND_SPACE_VARYING_WAVES]
          Touched = 0
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  //
TIME_AND_SPACE_VARYING_WAVES

        [DATABASE]
          Touched = 0
          MzSEPfsListItemCount = 1
          Data_Base_File_Name_1_1_1 = ''
          [WIND_SPEED]
            Touched = 1
            StartingValueOfWindSpeed = 5
            IncrementValueOfWindSpeed = 5
            NumberOfWindSpeeds = 1
          EndSect  // WIND_SPEED

          [WIND_DIRECTION]
            Touched = 1
            StartingValueOfWindDirection = 90
            IncrementValueOfWindDirection =
90
            NumberOfWindDirections = 1
          EndSect  // WIND_DIRECTION

          [WATER_LEVEL]
            Touched = 1
            StartingValueOfWaterLevel = 0
            IncrementValueOfWaterLevel = 1
            NumberOfWaterLevels = 1
          EndSect  // WATER_LEVEL

        EndSect  // DATABASE

      EndSect  // WAVES

    EndSect  // FORCINGS

    [WATER_COLUMN]
      SandFractionDescription = 0
      IncludeDensityFeedbackOnHD = true
      [SAND_FRACTIONS]
        Mean_Fall_Velocity_Fraction_1 =
0.001
        Sand_fraction_1 = false
        Mean_Fall_Velocity_Fraction_2 =
0.001
        Sand_fraction_2 = false
        Mean_Fall_Velocity_Fraction_3 =
0.001
        Sand_fraction_3 = false
        Mean_Fall_Velocity_Fraction_4 =
0.001
        Sand_fraction_4 = false
        Mean_Fall_Velocity_Fraction_5 =
0.001
        Sand_fraction_5 = false
        Mean_Fall_Velocity_Fraction_6 =
0.001
        Sand_fraction_6 = false
        Mean_Fall_Velocity_Fraction_7 =
0.001
        Sand_fraction_7 = false
      EndSect  // SAND_FRACTIONS

      [VISCOSITY_PARAMETERS]
```

```
    Touched = 1
    DensityOfSediment = 1600
    BaseInViscosityFormula = 100
    ConcInViscosityFormula = 600
  EndSect  // VISCOSITY_PARAMETERS

  [SETTLING]
    Touched = 1
    Flocculation_Description = 0
    Hindered_Settling_Description = 0
    RhoSed = 2650
    GelPoint = 50
    CHinder = 10
    Cfloc = 0.01
    Wsn = 1
    [SEDIMENT_FRACTION_1]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.003100000089034438
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_1

    [SEDIMENT_FRACTION_2]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.001099999994039536
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_2

    [SEDIMENT_FRACTION_3]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.0004499999922700226
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_3

    [SEDIMENT_FRACTION_4]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.00023999999393709
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_4

    [SEDIMENT_FRACTION_5]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.00015999999595806
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_5

    [SEDIMENT_FRACTION_6]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
6.70000008540228e-005
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_6

    [SEDIMENT_FRACTION_7]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
4.800000169780105e-005
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_7

  EndSect  // SETTLING


[CRITICAL_SHEAR_STRESS_DEPOSITION
]
    Touched = 1
    [SEDIMENT_FRACTION_1]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.029999999329447775
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_1

    [SEDIMENT_FRACTION_2]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.029999999329447775
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // SEDIMENT_FRACTION_2

    [SEDIMENT_FRACTION_3]
      Touched = 1
      MzSEPfsListItemCount = 1
      Gamma = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue =
0.029999999329447775
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1
```

```
      EndSect  // SEDIMENT_FRACTION_3

      [SEDIMENT_FRACTION_4]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue =
0.02999999932944775
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // SEDIMENT_FRACTION_4

      [SEDIMENT_FRACTION_5]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue =
0.01999999955296516
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // SEDIMENT_FRACTION_5

      [SEDIMENT_FRACTION_6]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue =
0.009999999776482582
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // SEDIMENT_FRACTION_6

      [SEDIMENT_FRACTION_7]
        Touched = 1
        MzSEPfsListItemCount = 1
        Gamma = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue =
0.009999999776482582
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // SEDIMENT_FRACTION_7

    EndSect  //
CRITICAL_SHEAR_STRESS_DEPOSITION

  EndSect  // WATER_COLUMN

  [BED_PARAMETERS]
    [EROSION_COEFFICIENTS]
      CMax = 50
      [BED_LAYER_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        Em = 1
        Erosion_Description = 0
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 5e-005
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // BED_LAYER_1


[CRITICAL_SHEAR_STRESS_EROSION]
        [BED_LAYER_1]
          Touched = 1
          MzSEPfsListItemCount = 1
          [AREA_1]
            Touched = 1
            Format = 0
            ConstantValue = 0.1
            [DATA_FILE]
              Touched = 1
              FILE_NAME = ||
              ITEM_COUNT = 1
              ITEM_NUMBERS = 1
            EndSect  // DATA_FILE

          EndSect  // AREA_1

        EndSect  // BED_LAYER_1

      EndSect  //
CRITICAL_SHEAR_STRESS_EROSION

    EndSect  // EROSION_COEFFICIENTS

    [DRY_DENSITY]
      [BED_LAYER_1]
        Touched = 1
        MzSEPfsListItemCount = 1
        [AREA_1]
          Touched = 1
          Format = 0
          ConstantValue = 300
          [DATA_FILE]
            Touched = 1
            FILE_NAME = ||
            ITEM_COUNT = 1
            ITEM_NUMBERS = 1
          EndSect  // DATA_FILE

        EndSect  // AREA_1

      EndSect  // BED_LAYER_1

    EndSect  // DRY_DENSITY

    [BED_ROUGHNESS]
      Touched = 1
      MzSEPfsListItemCount = 1
      [AREA_1]
        Touched = 1
        Format = 0
        ConstantValue = 0.01
        [DATA_FILE]
          Touched = 1
          FILE_NAME = ||
          ITEM_COUNT = 1
          ITEM_NUMBERS = 1
        EndSect  // DATA_FILE

      EndSect  // AREA_1

    EndSect  // BED_ROUGHNESS

    [TRANSITION]
      Touched = 1
      MzSEPfsListItemCount = 0
      IncludeTransitionBetweenLayers = 0
    EndSect  // TRANSITION

  EndSect  // BED_PARAMETERS

  [MASS_BUDGET]
    Touched = 0
    MzSEPfsListItemCount = 0
    NoOfMassFiles = 0
  EndSect  // MASS_BUDGET

  [MT_OUTPUT]
    Touched = 1
    MzSEPfsListItemCount = 3
    NumberOfOutputAreas = 3
    [AREA_1]
      Touched = 1
      AssociatedArea = 1
      XRange = 0, 38, 1
      YRange = 0, 20, 1
      ZRange = 0, 14, 1
      TRange = 0, 400000, 4000
      Title = ''
      FILE_NAME = 'aarslev3_MT.dfs3'
      [MAIN_OUTPUT_ITEMS]
        SSC_Fraction_1 = true
        SSC_Fraction_2 = true
        SSC_Fraction_3 = true
        SSC_Fraction_4 = true
        SSC_Fraction_5 = true
        SSC_Fraction_6 = true
        SSC_Fraction_7 = true
        Bed_Mass_Layer_1_Fraction_1 =
false
        Bed_Mass_Layer_1_Fraction_2 =
false
        Bed_Mass_Layer_1_Fraction_3 =
false
        Bed_Mass_Layer_1_Fraction_4 =
false
        Bed_Mass_Layer_1_Fraction_5 =
false
```

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        Bed_Mass_Layer_1_Fraction_6 =
false
        Bed_Mass_Layer_1_Fraction_7 =
false
      EndSect  // MAIN_OUTPUT_ITEMS

      [DERIVED_OUTPUT_ITEMS]
        Bed_Thickness_Layer_1 = false
        Net_Deposition_Fraction_1 = false
        Net_Deposition_Fraction_2 = false
        Net_Deposition_Fraction_3 = false
        Net_Deposition_Fraction_4 = false
        Net_Deposition_Fraction_5 = false
        Net_Deposition_Fraction_6 = false
        Net_Deposition_Fraction_7 = false

Net_Deposition_Accumulated_Fraction_1 =
false

Net_Deposition_Accumulated_Fraction_2 =
false

Net_Deposition_Accumulated_Fraction_3 =
false

Net_Deposition_Accumulated_Fraction_4 =
false

Net_Deposition_Accumulated_Fraction_5 =
false

Net_Deposition_Accumulated_Fraction_6 =
false

Net_Deposition_Accumulated_Fraction_7 =
false
        Net_Deposition_Accumulated_Total =
false
        Total_Bed_Thickness_Change = false
        Total_Bed_Mass_Change = false
        Total_Ssc = false
      EndSect  //
DERIVED_OUTPUT_ITEMS

      [PROCESS_OUTPUT_ITEMS]
        Bed_Shear_Stress = false
        Settling_Velocity_Fraction_1 = false
        Settling_Velocity_Fraction_2 = false
        Settling_Velocity_Fraction_3 = false
        Settling_Velocity_Fraction_4 = false
        Settling_Velocity_Fraction_5 = false
        Settling_Velocity_Fraction_6 = false
        Settling_Velocity_Fraction_7 = false
        Deposition_Fraction_1 = false
        Deposition_Fraction_2 = false
        Deposition_Fraction_3 = false
        Deposition_Fraction_4 = false
        Deposition_Fraction_5 = false
        Deposition_Fraction_6 = false
        Deposition_Fraction_7 = false
        Erosion_Fraction_1 = false
        Erosion_Fraction_2 = false
        Erosion_Fraction_3 = false
        Erosion_Fraction_4 = false
        Erosion_Fraction_5 = false
        Erosion_Fraction_6 = false
        Erosion_Fraction_7 = false
        U_Velocity = true
        V_Velocity = true
        W_Velocity = true
        Wave_Height = false
        Wave_Period = false
        Wave_Direction = false
      EndSect  //
PROCESS_OUTPUT_ITEMS

      NoOfComponents = 61
    EndSect  // AREA_1

    [AREA_2]
      Touched = 1
      AssociatedArea = 1
      XRange = 0, 38, 1
      YRange = 0, 20, 1
      ZRange = 14, 14, 1
      TRange = 0, 400000, 4000
      Title = ''
      FILE_NAME = 'aarslev_MT.dfs2'
      [MAIN_OUTPUT_ITEMS]
        SSC_Fraction_1 = false
        SSC_Fraction_2 = false
        SSC_Fraction_3 = false
        SSC_Fraction_4 = false
        SSC_Fraction_5 = false
        SSC_Fraction_6 = false
        SSC_Fraction_7 = false
        Bed_Mass_Layer_1_Fraction_1 = true
        Bed_Mass_Layer_1_Fraction_2 = true
        Bed_Mass_Layer_1_Fraction_3 = true
        Bed_Mass_Layer_1_Fraction_4 = true
        Bed_Mass_Layer_1_Fraction_5 = true
        Bed_Mass_Layer_1_Fraction_6 = true
        Bed_Mass_Layer_1_Fraction_7 = true
      EndSect  // MAIN_OUTPUT_ITEMS

      [DERIVED_OUTPUT_ITEMS]
        Bed_Thickness_Layer_1 = false
        Net_Deposition_Fraction_1 = false
        Net_Deposition_Fraction_2 = false
        Net_Deposition_Fraction_3 = false
        Net_Deposition_Fraction_4 = false
        Net_Deposition_Fraction_5 = false
        Net_Deposition_Fraction_6 = false
        Net_Deposition_Fraction_7 = false

Net_Deposition_Accumulated_Fraction_1 =
true

Net_Deposition_Accumulated_Fraction_2 =
true

Net_Deposition_Accumulated_Fraction_3 =
true

Net_Deposition_Accumulated_Fraction_4 =
true

Net_Deposition_Accumulated_Fraction_5 =
true

Net_Deposition_Accumulated_Fraction_6 =
true

Net_Deposition_Accumulated_Fraction_7 =
true
        Net_Deposition_Accumulated_Total =
true
        Total_Bed_Thickness_Change = true
        Total_Bed_Mass_Change = true
        Total_Ssc = false
      EndSect  //
DERIVED_OUTPUT_ITEMS

      [PROCESS_OUTPUT_ITEMS]
        Bed_Shear_Stress = true
        Settling_Velocity_Fraction_1 = false
        Settling_Velocity_Fraction_2 = false
        Settling_Velocity_Fraction_3 = false
        Settling_Velocity_Fraction_4 = false
        Settling_Velocity_Fraction_5 = false
        Settling_Velocity_Fraction_6 = false
        Settling_Velocity_Fraction_7 = false
        Deposition_Fraction_1 = false
        Deposition_Fraction_2 = false
        Deposition_Fraction_3 = false
        Deposition_Fraction_4 = false
        Deposition_Fraction_5 = false
        Deposition_Fraction_6 = false
        Deposition_Fraction_7 = false
        Erosion_Fraction_1 = false
        Erosion_Fraction_2 = false
        Erosion_Fraction_3 = false
        Erosion_Fraction_4 = false
        Erosion_Fraction_5 = false
        Erosion_Fraction_6 = false
        Erosion_Fraction_7 = false
        U_Velocity = false
        V_Velocity = false
        W_Velocity = false
        Wave_Height = false
        Wave_Period = false
        Wave_Direction = false
      EndSect  //
PROCESS_OUTPUT_ITEMS

      NoOfComponents = 61
    EndSect  // AREA_2

    [AREA_3]
      Touched = 1
      AssociatedArea = 1
      XRange = 37, 37, 1
      YRange = 10, 10, 1
      ZRange = 12, 12, 1
      TRange = 0, 400000, 4000
      Title = ''
      FILE_NAME = 'aarslev3_MT.dfs0'
      [MAIN_OUTPUT_ITEMS]
        SSC_Fraction_1 = true
        SSC_Fraction_2 = true
        SSC_Fraction_3 = true
        SSC_Fraction_4 = true
        SSC_Fraction_5 = true
        SSC_Fraction_6 = true
        SSC_Fraction_7 = true
        Bed_Mass_Layer_1_Fraction_1 =
false
        Bed_Mass_Layer_1_Fraction_2 =
false
        Bed_Mass_Layer_1_Fraction_3 =
false
        Bed_Mass_Layer_1_Fraction_4 =
false
        Bed_Mass_Layer_1_Fraction_5 =
false
        Bed_Mass_Layer_1_Fraction_6 =
false
        Bed_Mass_Layer_1_Fraction_7 =
false
      EndSect  // MAIN_OUTPUT_ITEMS

      [DERIVED_OUTPUT_ITEMS]
        Bed_Thickness_Layer_1 = false
        Net_Deposition_Fraction_1 = false
        Net_Deposition_Fraction_2 = false
        Net_Deposition_Fraction_3 = false
        Net_Deposition_Fraction_4 = false
        Net_Deposition_Fraction_5 = false
        Net_Deposition_Fraction_6 = false
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          Net_Deposition_Fraction_7 = false

Net_Deposition_Accumulated_Fraction_1 =
false

Net_Deposition_Accumulated_Fraction_2 =
false

Net_Deposition_Accumulated_Fraction_3 =
false

Net_Deposition_Accumulated_Fraction_4 =
false

Net_Deposition_Accumulated_Fraction_5 =
false

Net_Deposition_Accumulated_Fraction_6 =
false

Net_Deposition_Accumulated_Fraction_7 =
false
          Net_Deposition_Accumulated_Total =
false
          Total_Bed_Thickness_Change = false
          Total_Bed_Mass_Change = false
          Total_Ssc = true
        EndSect  //
DERIVED_OUTPUT_ITEMS

        [PROCESS_OUTPUT_ITEMS]
          Bed_Shear_Stress = false
          Settling_Velocity_Fraction_1 = false
          Settling_Velocity_Fraction_2 = false
          Settling_Velocity_Fraction_3 = false
          Settling_Velocity_Fraction_4 = false
          Settling_Velocity_Fraction_5 = false
          Settling_Velocity_Fraction_6 = false
          Settling_Velocity_Fraction_7 = false
          Deposition_Fraction_1 = false
          Deposition_Fraction_2 = false
          Deposition_Fraction_3 = false
          Deposition_Fraction_4 = false
          Deposition_Fraction_5 = false
          Deposition_Fraction_6 = false
          Deposition_Fraction_7 = false
          Erosion_Fraction_1 = false
          Erosion_Fraction_2 = false
          Erosion_Fraction_3 = false
          Erosion_Fraction_4 = false
          Erosion_Fraction_5 = false
          Erosion_Fraction_6 = false
          Erosion_Fraction_7 = false
          U_Velocity = false
          V_Velocity = false
          W_Velocity = false
          Wave_Height = false
          Wave_Period = false
          Wave_Direction = false
        EndSect  //
PROCESS_OUTPUT_ITEMS

        NoOfComponents = 61
      EndSect  // AREA_3

    EndSect  // MT_OUTPUT

  EndSect  //
MUD_TRANSPORT_PARAMETERS

  [ECO_LAB_PARAMETERS]
    [OPTION_PARAMETERS]
    EndSect  // OPTION_PARAMETERS

    [MODEL_DEFINITION]
      Touched = 0
      ModelDefinitionFile = ||
      IntegrationMethod = 1
      UpdateFrequency = 1
      DisableProcesses = false
    EndSect  // MODEL_DEFINITION

    [STATE_VARIABLES]
      Touched = 0
      MzSEPfsListItemCount = 0
      NoOfComponents = 0
    EndSect  // STATE_VARIABLES

    [INITIAL_CONDITIONS]
      Touched = 0
      MzSEPfsListItemCount = 0
    EndSect  // INITIAL_CONDITIONS

    [AD_TRANSPORT_PARAMETERS]
      [AD_BOUNDARY]
        Touched = 0
        MzSEPfsListItemCount = 0
      EndSect  // AD_BOUNDARY

      [AD_DISPERSION]
        ImplicitVerticalDispersionScheme =
false
        [AD_DISPERSION_FACTOR]
          Touched = 0
          MzSEPfsListItemCount = 0
        EndSect  //
AD_DISPERSION_FACTOR

        [AD_DISPERSION_LIMIT]
          Touched = 0
          MzSEPfsListItemCount = 0
        EndSect  // AD_DISPERSION_LIMIT

      EndSect  // AD_DISPERSION

      [AD_SOURCE_AND_SINK]
        Touched = 0
        MzSEPfsListItemCount = 2
        [SOURCE_SINK_1]
          Touched = 0
          Format = 0
          ConstantValues = 0
          [DATA_FILE]
            Touched = 0
            FILE_NAME = ||
            ITEM_COUNT = 0
            ITEM_NUMBERS =
          EndSect  // DATA_FILE

        EndSect  // SOURCE_SINK_1

        [SOURCE_SINK_2]
          Touched = 0
          Format = 0
          ConstantValues = 0
          [DATA_FILE]
            Touched = 0
            FILE_NAME = ||
            ITEM_COUNT = 0
            ITEM_NUMBERS =
          EndSect  // DATA_FILE

        EndSect  // SOURCE_SINK_2

      EndSect  // AD_SOURCE_AND_SINK

      [AD_PRECIPITATION]
        Touched = 0
        MzSEPfsListItemCount = 0
      EndSect  // AD_PRECIPITATION

      [AD_DEPOSITION]
        IncludeSurfaceDeposition = false
        IncludeSoilDeposition = false
        [AD_DEPOSITION_SOIL]
          Touched = 0
          MzSEPfsListItemCount = 0
        EndSect  // AD_DEPOSITION_SOIL

        [AD_DEPOSITION_SURFACE]
          Touched = 0
          MzSEPfsListItemCount = 0
        EndSect  //
AD_DEPOSITION_SURFACE

      EndSect  // AD_DEPOSITION

    EndSect  //
AD_TRANSPORT_PARAMETERS

    [CONSTANTS]
      Touched = 0
      MzSEPfsListItemCount = 0
      NoOfConstants = 0
    EndSect  // CONSTANTS

    [FORCINGS]
      Touched = 0
      MzSEPfsListItemCount = 0
      NoOfForcings = 0
    EndSect  // FORCINGS

    [MASS_BUDGET]
      Touched = 0
      MzSEPfsListItemCount = 0
      NoOfMassFiles = 0
    EndSect  // MASS_BUDGET

    [RESULTS]
      Touched = 0
      MzSEPfsListItemCount = 0
      [ADDITIONAL_OPTIONAL_OUTPUT]
        NoItems = 0
      EndSect  //
ADDITIONAL_OPTIONAL_OUTPUT

      NumberOfOutputAreas = 0
    EndSect  // RESULTS

  EndSect  // ECO_LAB_PARAMETERS

EndSect  // MIKE3_FLOW_MODEL
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