

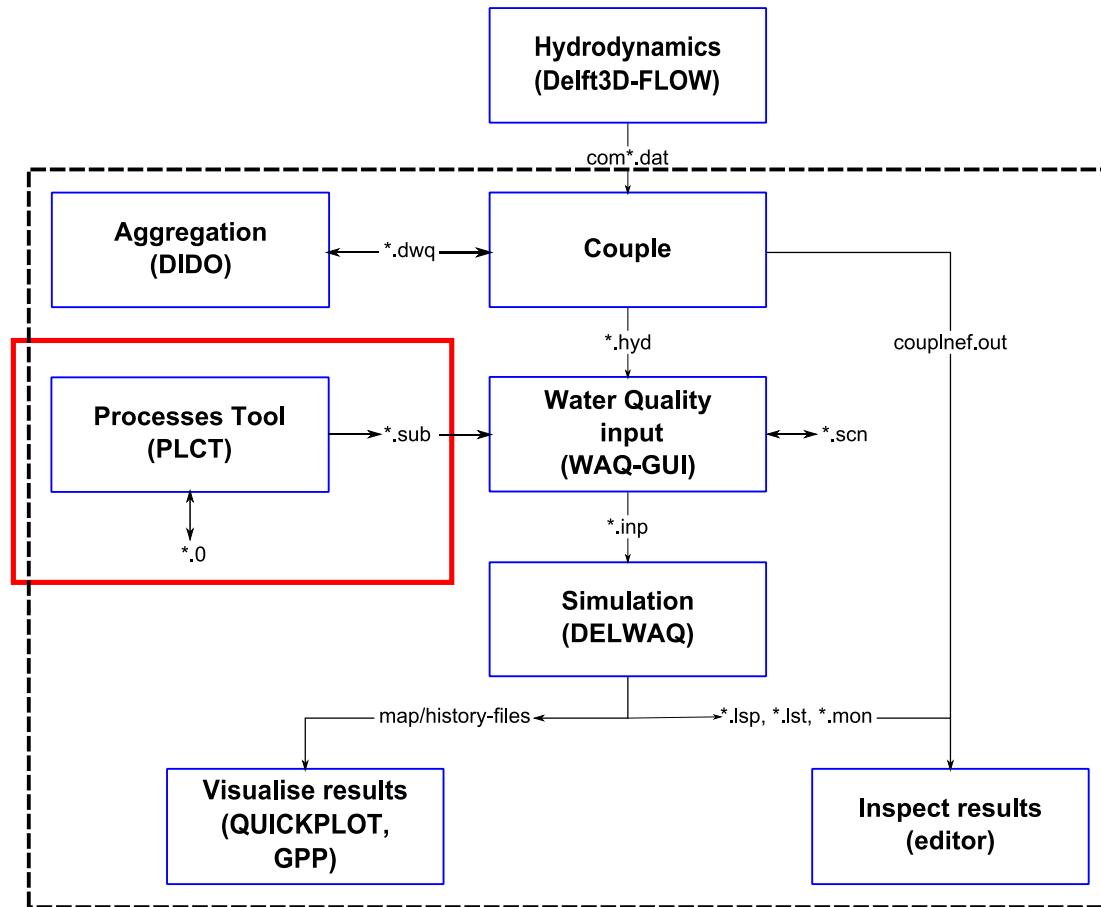
Introductory Course Delft3D-WAQ

Selecting Water Quality Processes
with the

Processes Library Configuration Tool (PLCT)

WAQ_PLCT_03

Delft3D-WAQ Framework



Water quality processes



$$M_i^{t+\Delta t} = M_i^t + \Delta t \left(\frac{\Delta M}{\Delta t} \right)_{Tr} + \Delta t \left(\frac{\Delta M}{\Delta t} \right)_P + \Delta t \left(\frac{\Delta M}{\Delta t} \right)_S$$

physical and (bio)chemical processes:

sedimentation/resuspension

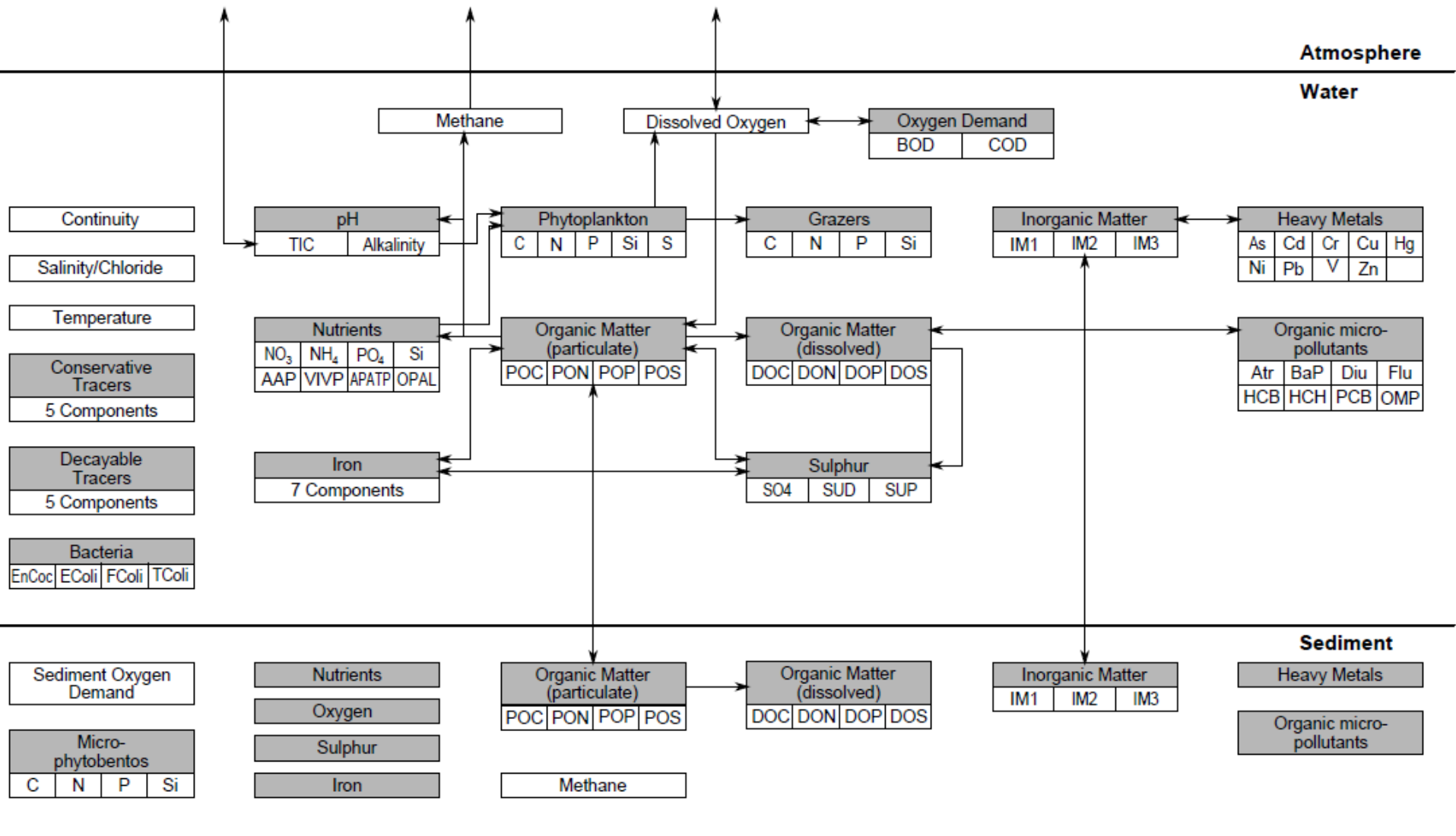
mineralisation

nitrification/denitrification

reaeration (air-water exchange)

etc.

Deltares



Processes Library Configuration Tool

Graphical interface allows you to select substances and associated processes

Multi-level interactive editor

- substance groups
 - > substances
 - associated processes
 - process parameters
 - extra processes

by selecting substances they are included in the model

Steps in PLCT



4 steps to operate the Processes Library

Configuration Tool (PLCT):

Step 1 → Selection of substances

Step 2 → Selection of processes

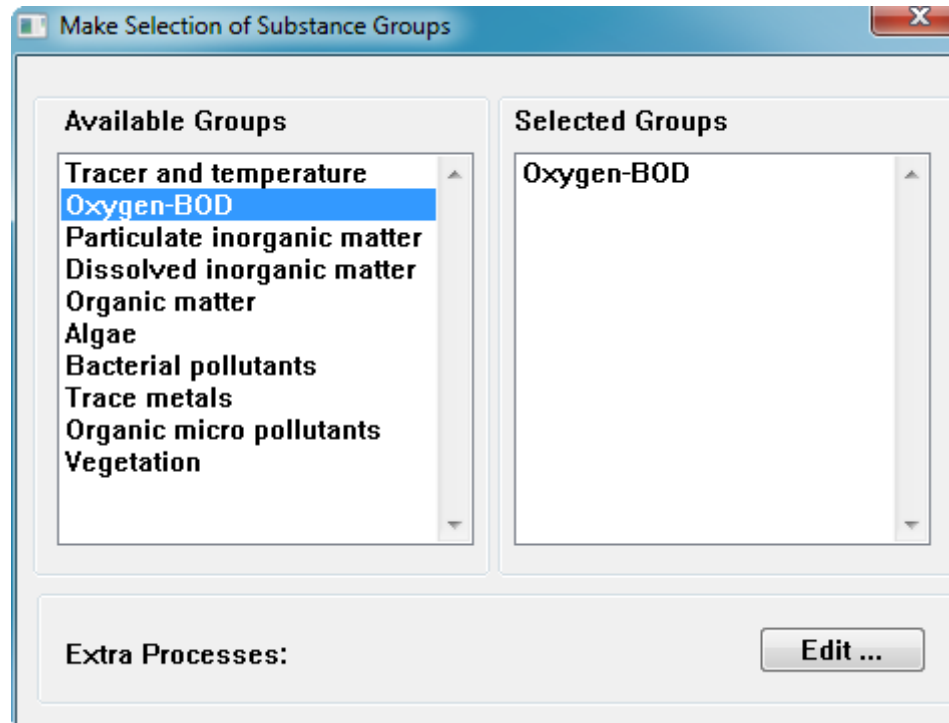
Step 3 → Selection of process parameters

Step 4 → Specification of extra processes

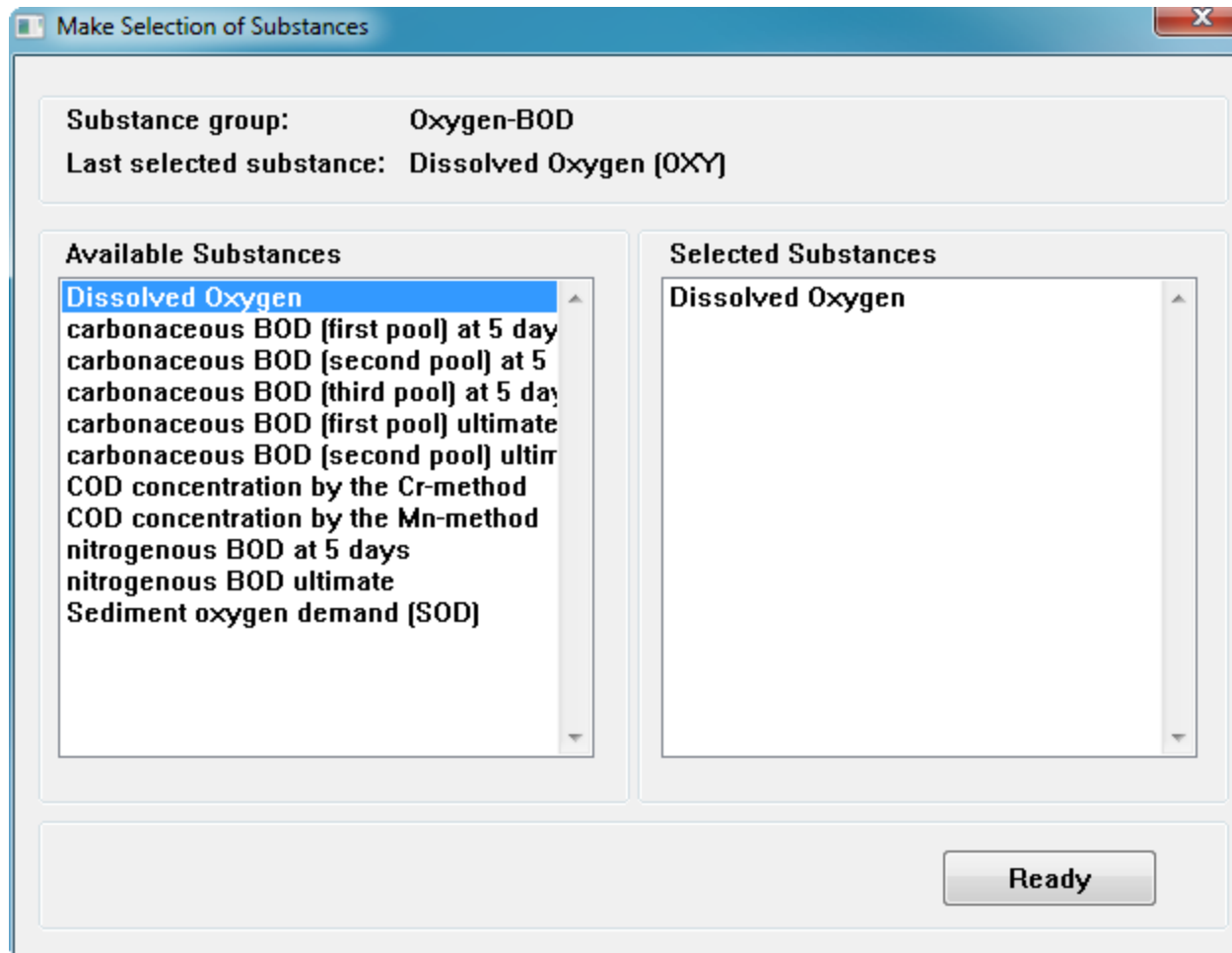
Every process is described in the Delft3D-WAQ manual.

*A good knowledge of the processes is essential
for setting up a good model.*

Substance groups



Select substances



Select processes

Select Processes

Substance: Dissolved Oxygen

Available Processes	Active
Horizontal dispersion in a 1D model (HorzDisper)	<input type="checkbox"/>
Horizontal dispersion velocity depend (HDisperVel)	<input type="checkbox"/>
Uptake of nutrients by growth of alga (NutUpt_Alg)	<input type="checkbox"/>
Denitrification in water column (DenWat_NO3)	<input type="checkbox"/>
Nitrification of ammonium (Nitrif_NH4)	<input type="checkbox"/>
Reaeration of oxygen (RearOXY)	<input checked="" type="checkbox"/>
Variation of primary production within da (VAROXY)	<input type="checkbox"/>
Mineralisation detritus carbon in sedi (BMS1_DetC)	<input type="checkbox"/>
Mineralisation detritus carbon in sedi (BMS2_DetC)	<input type="checkbox"/>
Mineralisation other organic C in sedim (BMS1_OOC)	<input type="checkbox"/>
Mineralisation other organic C in sedim (BMS2_OOC)	<input type="checkbox"/>
Mineralisation BOD and COD (BODCOD)	<input type="checkbox"/>

Buttons: Edit... (next to RearOXY), Scroll Up, Scroll Down, Ok, Cancel

Specify process

Specify Process

Process: Reaeration of oxygen (RearOXY)

Input / Output parameters		Unit	Editable	Output
Dissolved Oxygen (OXY)	Modelled	[g/m ³]		
Salinity (Salinity)	Constant 35	[g/kg]	<input type="checkbox"/>	<input type="checkbox"/>
depth of segment (Depth)	DynDepth (DynDepth)	[m]		<input type="checkbox"/>
ambient water temperature (Temp)	Constant 15	[oC]	<input type="checkbox"/>	<input type="checkbox"/>
horizontal flow velocity (Velocity)	Constant 0.5	[m/s]	<input type="checkbox"/>	<input type="checkbox"/>
wind speed (VWind)	Constant 3	[m/s]	<input checked="" type="checkbox"/>	<input type="checkbox"/>
switch for oxygen reaeration formulation (SWRear)	Constant 1	{}	<input checked="" type="checkbox"/>	<input type="checkbox"/>
reaeration transfer coefficient (KLRear)	Constant 1	[m/d]	<input type="checkbox"/>	<input type="checkbox"/>
temperature coefficient for reaeration (TCRear)	Constant 1.016	{}	<input type="checkbox"/>	<input type="checkbox"/>
timestep for processes (DELTA)	Modelled	[d]		

Scroll Up Scroll Down

Ok Cancel

Notes on PLCT (1)



Substances are subject to fluxes of material between substances
Fluxes are computed by process modules which need specific input
Coefficients may have defaults
PLCT can determine if a process can be switched on
The user may specify constants, functions, parameters or segment functions. The default values are assigned automatically.



Besides concentrations, also all fluxes and many derived variables are available for post-processing

Per substance, all fluxes form a closed mass balance, available for analysis

In the WAQ-manual the formulations for every process are described. Also the meaning of all the input parameters is explained here.

Available Processes



Transport of conservative and decaying substances

Bacteriological pollution: *E.Coli*

Sedimentation and erosion

Oxygen depletion and biological decay

Eutrofication & algae growth

Temperature

Heavy metals and organic micropollutants

In the water column and two sediment layers.

Finally ...



Substance files are available for standard applications (sedimentation, oxygen)

When setting up a model, work incrementally

- start with salinity or a tracer
- add substances along the way
- a proven sequence is: salinity → temperature → suspended sediment → total nutrients → oxygen → algae

It should not be your goal to make the model as complicated as possible. *Simple is beautiful !*

Inspect the diagnostics output (the *.lsp file)

Always understand the result of your simulation