Webinar Tips & Tricks

Model review resources

Recommended viewing: Spotting modelling errors in TUFLOW	Free AWS TUFLOW webinar: How wrong is your flood model
TUFLOW troubleshooting tips	TUFLOW wiki troubleshooting tutorial
TUFLOW model stability troubleshooting	TUFLOW wiki stability troubleshooting
TUFLOW example model log / QA review checklist	TUFLOW Modelling Log - Tuflow
HEC-RAS troubleshooting	HEC-RAS model troubleshooting webpage
Culvert manufacturer guidelines	Culvert manufacturer guidelines
New Zealand National Stormwater Modelling Guide (appendix b)	National Stormwater Modelling Guide : Water New Zealand

Model review checklist

#	Category	Item	Tips	Additional resources	Comments
1	Model/Approach	Software	Check appropriate software package has been used		Can it do what you need it to do? Check before starting - too late to change later on!
2	Model/Approach	Model type	Check appropriate modelling program and approach (1D vs 2D vs 3D vs coupled)	1D vs 2D vs 3D and steady vs unsteady document	Is there multidirectional flow (use 2D or 3D), or are variations in the vertical water column significant (use 3D)?
3	Model/Approach	Flow type	Check appropriate application of steady vs unsteady flow	1D vs 2D vs 3D and steady vs unsteady document	Don't use steady flow if storage is important.
4	Terrain	Resolution	Check appropriate resolution		Are channels and bunds reflected in the terrain? Don't use SRTM/satellite-based terrain for hydraulics.
5	Terrain	Filtering	Check appropriate filtering for vegetation		May require manual filtering - best to specify "bare earth" during survey scoping
6	Terrain	Depressions	Check for potential depression storage from artificial blockages/basins		May require GIS void-filling routines, initial flows or restart file to fill depressions with water
7	Terrain	Accuracy	Check acquisition date and compare against ground survey		Blake's Example #3
8	Terrain	Datum	Confirm horizontal projection and vertical datum for ground elevations		Confirm appropriate projection and datum before modelling - can be painfull to re-project everything later.
9	Control/Plan	Simulation window	Check that simulation window is sufficient to capture peak flow		Make sure flow is receding everywhere in the model, not just in the main channel (Blake's example #1)
10	Control/Plan	Time step	Check Courant Number (best kept below 2.0)	Free AWS webinar on Courant Number	Courant Number should preferably be less than 2.0, ideally as close to 1.0 as possible.
11	Geometry	Grid size	Check appropriate grid size to capture key hydraulic features		Add break lines, szh lines, or subgrid sampling if high ground is missed by uniform grid cells.
12	Geometry	Culverts	Check culvert capacity/rating curves	Free AWS webinar on culverts	HY-8, nomographs, or alternative model results for culvert flows
13	Geometry	Roughness	Check spatially varying or depth varying roughness coefficients	Free AWS webinar on Froude Number	Check if shallow flow areas need different roughness than channel flow. Blake's Example #2.
14	Geometry	Roughness	Check Froude Number	Free AWS webinar on Froude Number	Sustained supercritical flows in natural systems not realistic - roughness or turbulence coefficients may be too low if Froude Numbers are greater than 1.
15	Results	Error log	Check mass balance error		Inflow Volume - Outflow Volume = Storage. Preferably keep errors below 2%. Generally relates to selected time step. Blake's Example #3.
16	Results	Velocities	Check plan and profile views for velocity spikes	Free AWS webinar on culverts	Compute V^2/2g for peak culvert outlet velocities and other spikes to determine if total H is above inlet levels (unrealistic without added pumps/energy)
17	Results	Depths	Check plan view animation for oscillations		Oscillations generally indicate selected time step is too coarse.
18	Results	WSEL Profiles	Check profile view animation for oscillations		Oscillations generally indicate selected time step is too coarse.
19	Results	Flows	Check cumulative flow volume		Extract cross sections and check Q=VA, calculate proportional loss if rain on grid.
20	General	Calibration	Check against observations		Listed to anecdotal information from locals who have observed flooding (Blake Example #5)

Q&A/Chat suggestions

21			Don't assume that just because it looks right, that it is. I once had a survey on a remote island that looked fantastic. But when we formed up the slab the tide came in and it was underwater. Moral is CHECK check check. In this case, the slab was too low. The survey was to an assumed datum.
22			Yeah different survey datums have caught us out too, especially when they're not different enough obviously be wrong
23			The grid size used in models can miss flood impacts around the "edge" of the flooded area - we had a Tuflow example where a 30m grid was used and there was significant change in the elevation across the grid (a hill adjoining a flat area with the hill starting about half way across the grid) so the "average" elevation used in the model indicated the grid was above all flood levels (i.e. including the PMF) whereas half of the cell was inundated in a 20% AEP event.
24			A good tool for checking culvert hydraulics is HY-8 from the US FHWA
25			There are significant difference in intensities between say Tasmania and Northern NSW/Queensland. When undertaking a stormwater study in Tasmania I thought I had made a mistake because the flows were apparently too small - it was only after numerous checks that I realised this was because the intensity in Tasmania was much lower than Northern NSW/Queensland!
26			another valuable part of a checklist is to double check, even triple check with the plumber and drainers who do the work you are proposing daily
27			Another check I ask the modeller is if the model can answer the questions required by the brief/Client. Is the detail/inspection points available in the correct place?
28			Get as much info from residents such as videos and photos of flooding to give you a better picture of flow direction, flow volumes etc
29			Visit sites prone to flooding/drainage issues during storm events if practical

From the webinar / demo

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30	Model Mangement	Version control	Ensure model results match the model (has the model been updated and not the results?)		
31	Model Mangement	Model log	Has the model got a log and has it been reviewed	See example model log by TUFLOW	

32	Results	Simulation playback	Review the flood depths and velocity vectors throughout the simulation and ask yourself if it looks right	Example shown in webinar recording	You can determine a lot just from looking at the flood depths and velocity arrows, check the flowpaths go where you expect, all external hydrographs/inflows are connected to the right location, the catchment extent is right, are there initial water levels, is glass walling occuring and are there flow occilations?
33	Geometry	2D represntation	Check the GRID/Mesh represents the ground conditions in sufficient detail for the model		Is the GRID size and rotation appropriate? Has the DTM details been picked up by the GRID (ie. Are breaklines required?), are roughness values appropriate?
34	Results	1D culverts	Check flows and velocities are appropriate for the modelled event and pipe/culvert size.	Example shown in webinar recording	Graphing timevarying results for significant structures is important, as maximum values can be decieving
35	Results	Total volumes	Is the inflow volume suitable for the location and area being modelled?		A quick check is rainfall depth multipplied by contirbuting catchment area, should be close to the total inflow volume (minus IWLs)
36	Results	Peak flows	Can a rational method or use of RFFE be used to check order of magnitude of peak flows?		
37	Results	Simulation health	Varies on model methodology but for finite volume with variable timestep, check for small or repeating timesteps (less than 1/50th of the GRID cell size)		
38	Results	Simulation health	Read the simualtion warnings and checks! They might be telling you something important		