

**Supplementary Information - Enhancing Hydro-epidemiological Modelling of
Nearshore Coastal Waters with Source-Receptor Connectivity Study**

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Supplementary Figures

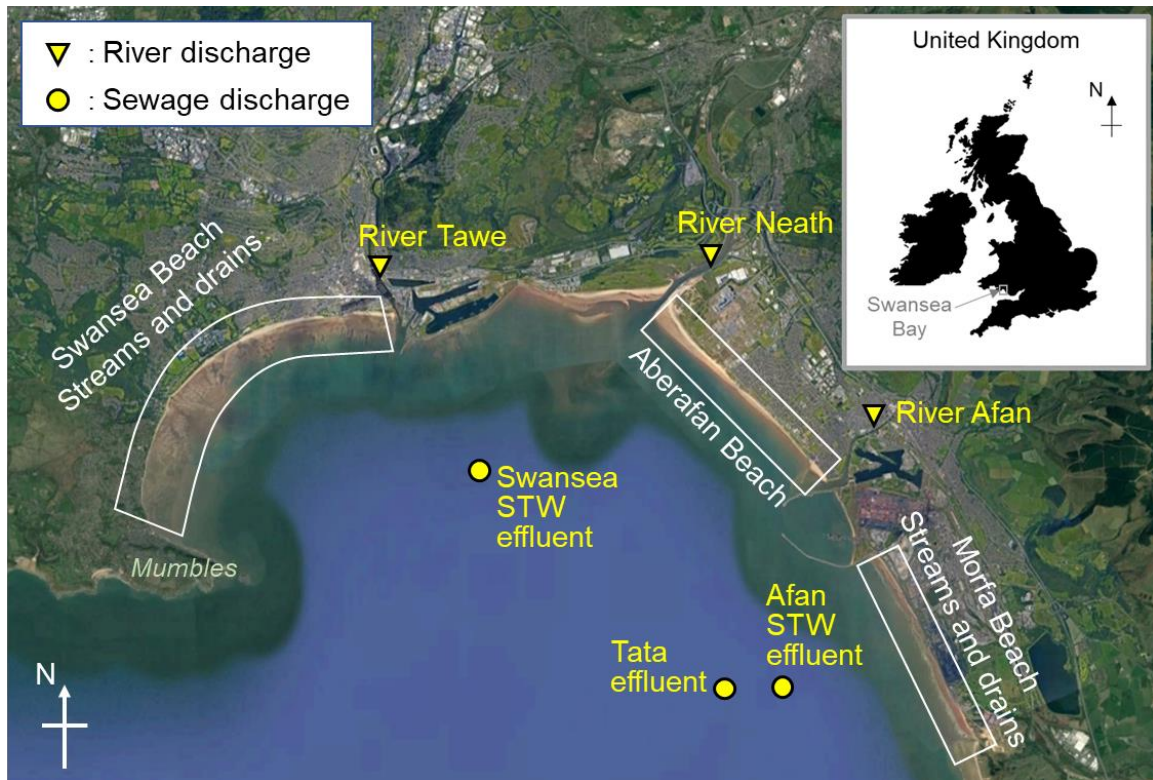


Figure SI-1. Overview of the test site - Swansea Bay, UK.



Figure SI-2. Computation mesh for Severn Estuary and Bristol Channel.

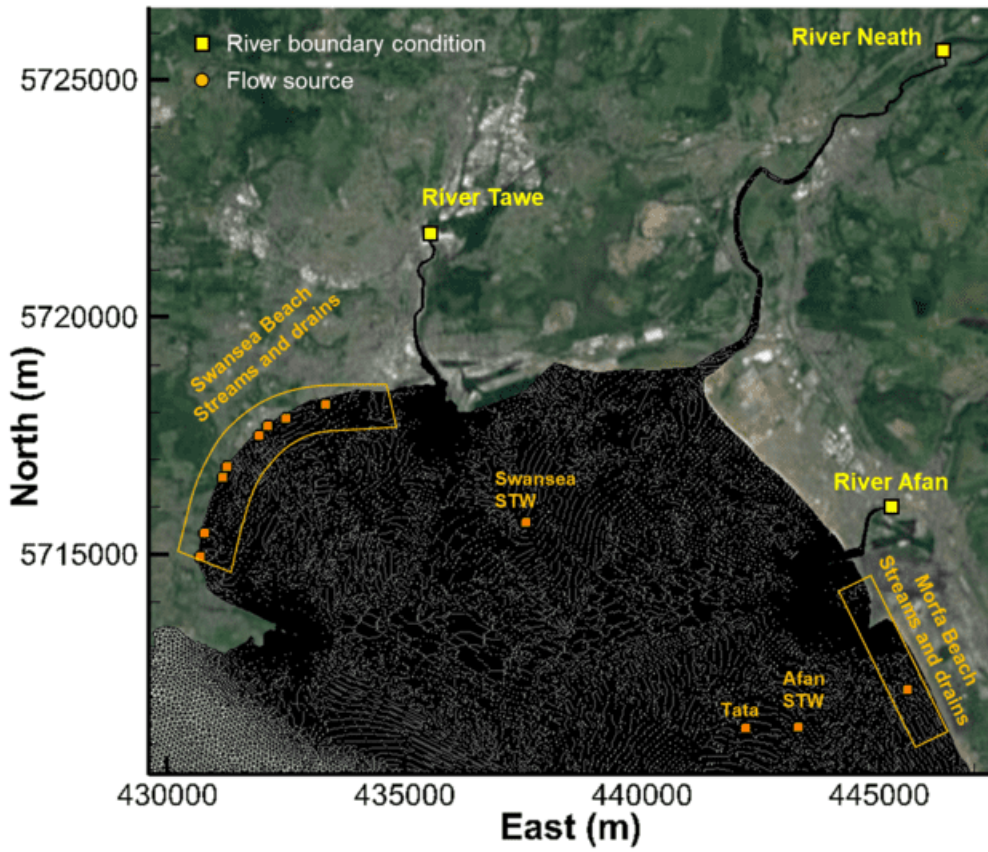
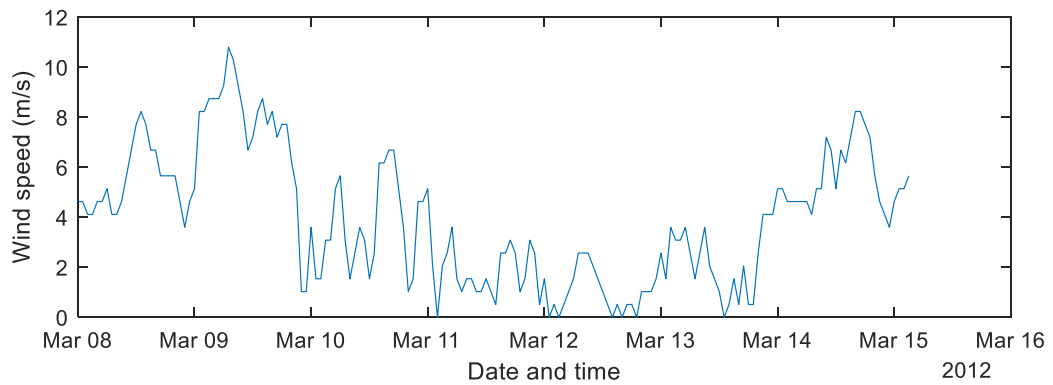
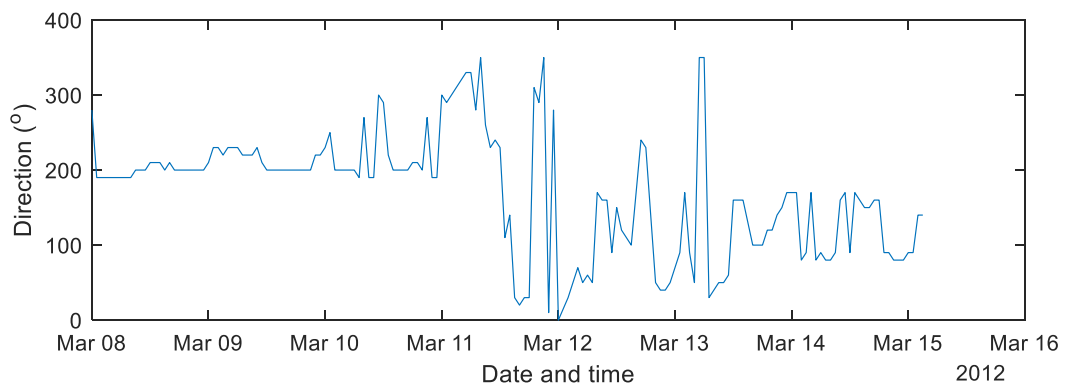


Figure SI-3. Boundary conditions and sources representing inflows to Swansea Bay.



(a)



(b)

Figure SI-4. (a) Wind speed and (b) direction at Mumbles head obtained from the Met Office MIDAS database.

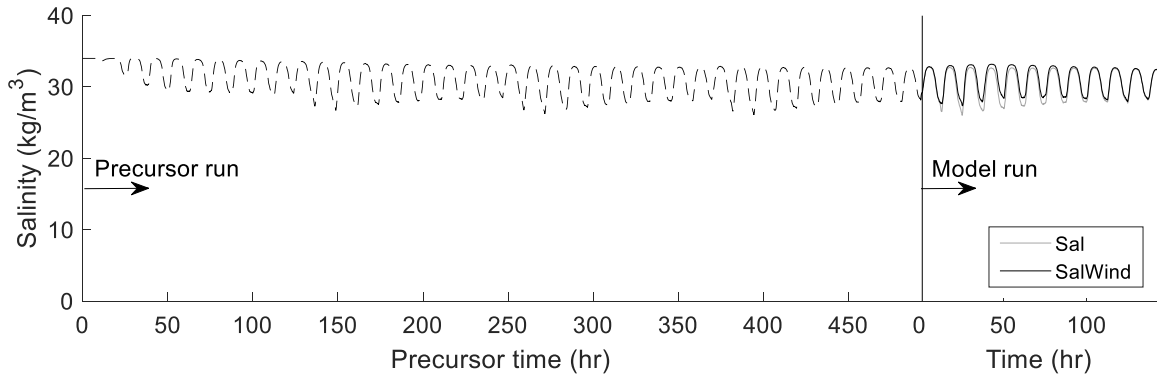


Figure SI-5. Computed depth-averaged salinity with TELEMAC-3D model at monitoring point S2 (see Figure SI-7). Dotted line represents the precursor run; solid lines represent model runs.

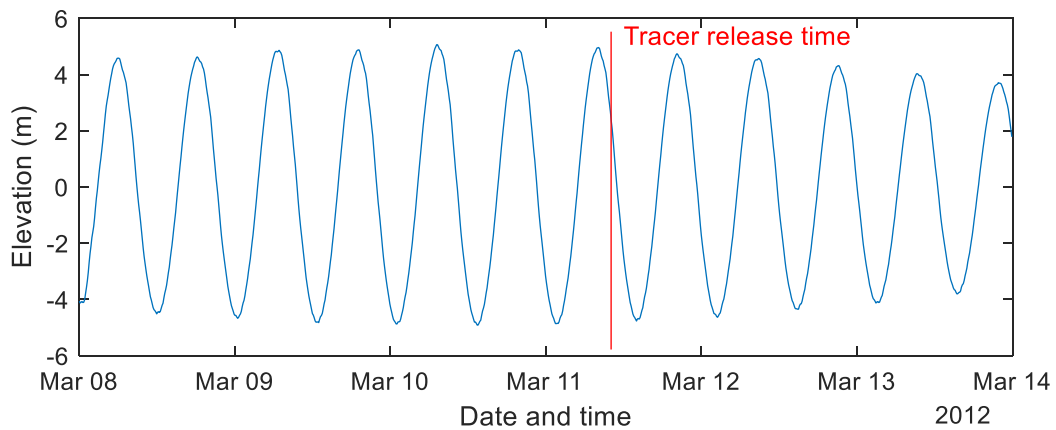
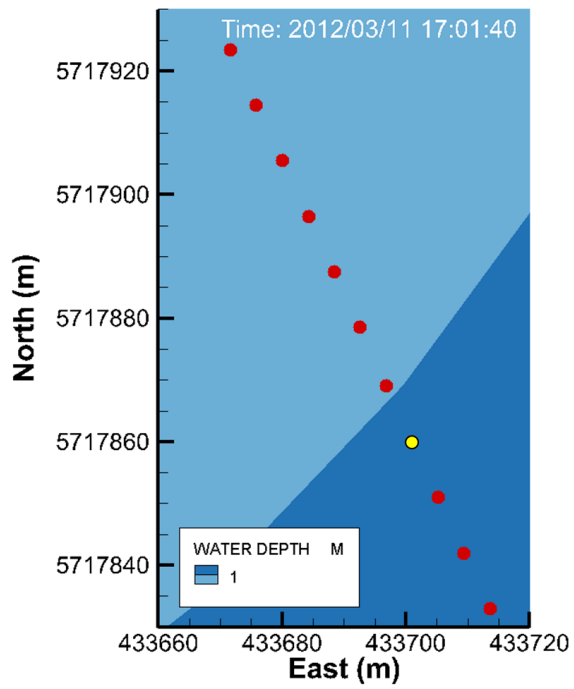
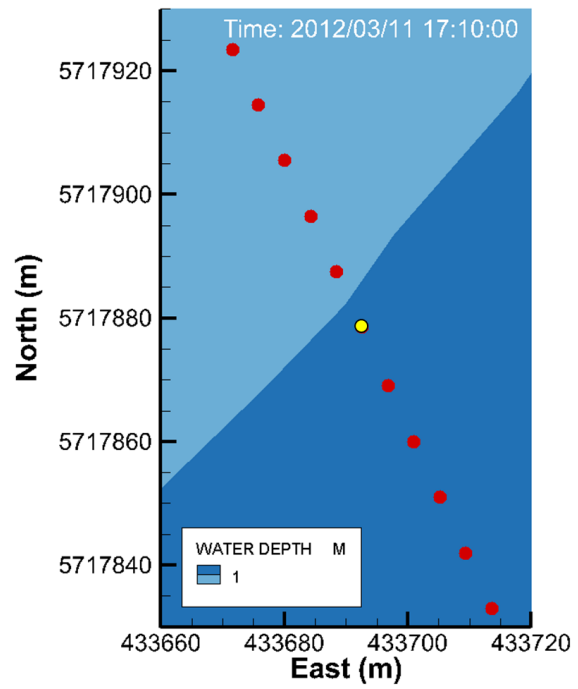


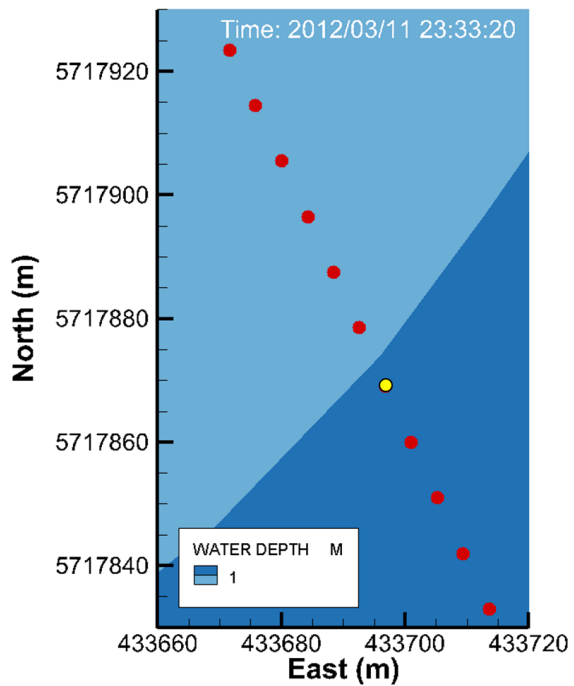
Figure SI-6. Modelled elevation at the Mumbles during 8-13 Mar 2012 and the tracer release time.



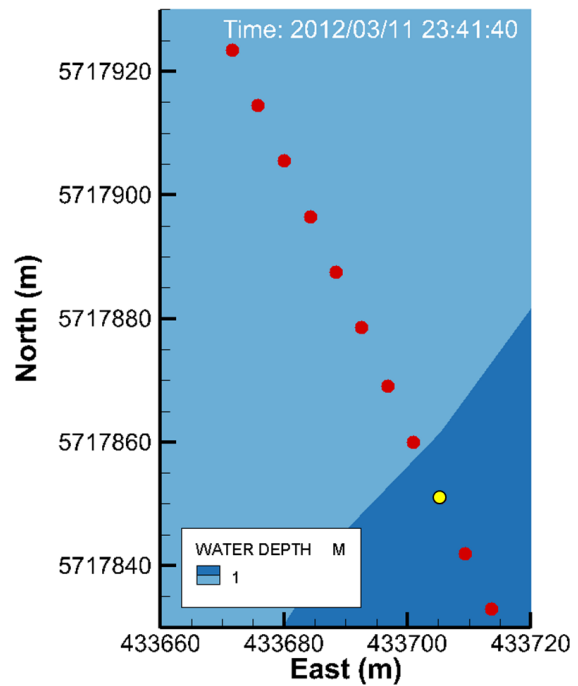
(a)



(b)



(c)



(d)

Figure SI-7. Sampling points along the Swansea sampling transect (a, b) during a flood tide and (c, d) during an ebb tide. The red circles represent potential sampling points along the transect; the yellow circles represent the active sampling points. The active sampling point for the transect moved on-shore according to the change in water depth during the flood tide in (a, b) and moves off-shore during the

ebb tide in (c, d). The active sampling point was always the nearest point to the water depth = 1 m contour line among the points having a water depth > 1 m.

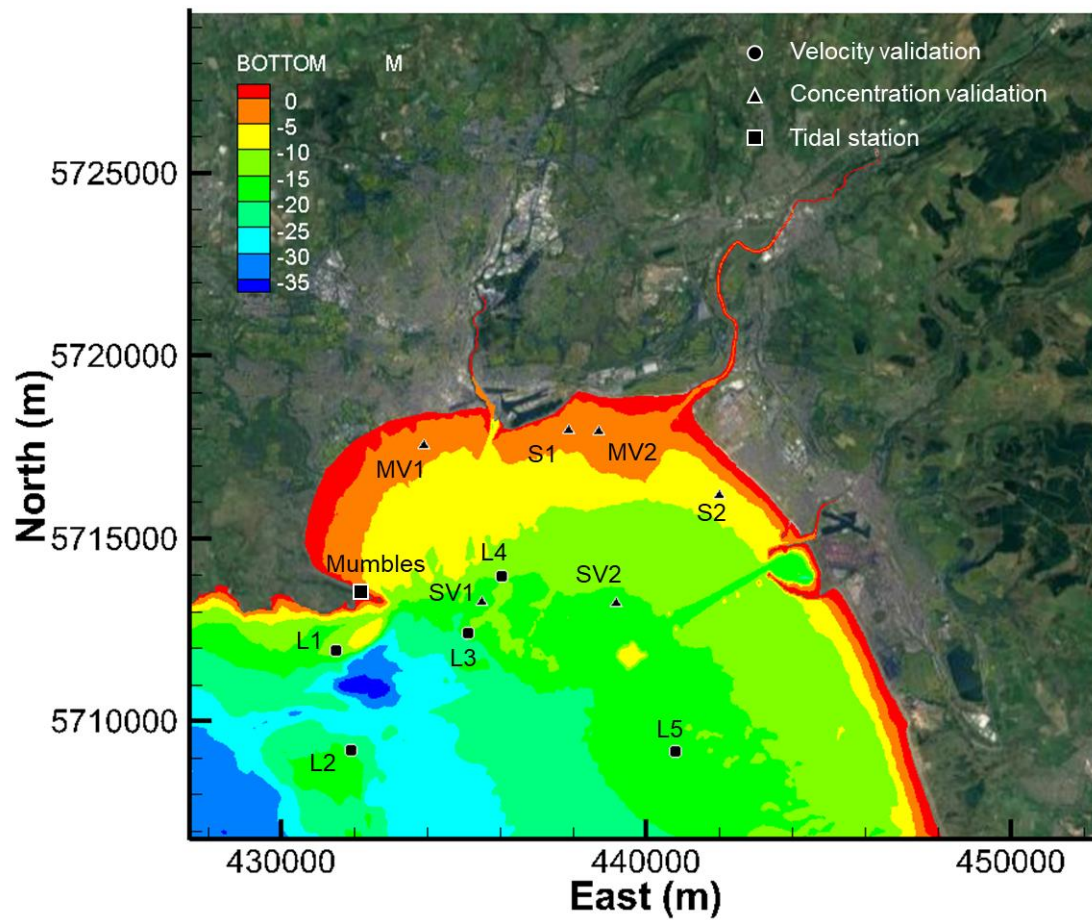


Figure SI-8. Locations of velocity and salinity validation points and tidal stations. The model velocity was validated against points L1-L5; Salinity concentration was validated against points SV1 and SV2. The stationarity of salinity concentration was tested at points S1 and S2 before model runs started. The vertical distribution of microbes was sampled at MV1 and MV2. The water surface elevation at the Mumbles was sampled as the reference level for defining tidal phases for comparing data obtained at different periods of time.

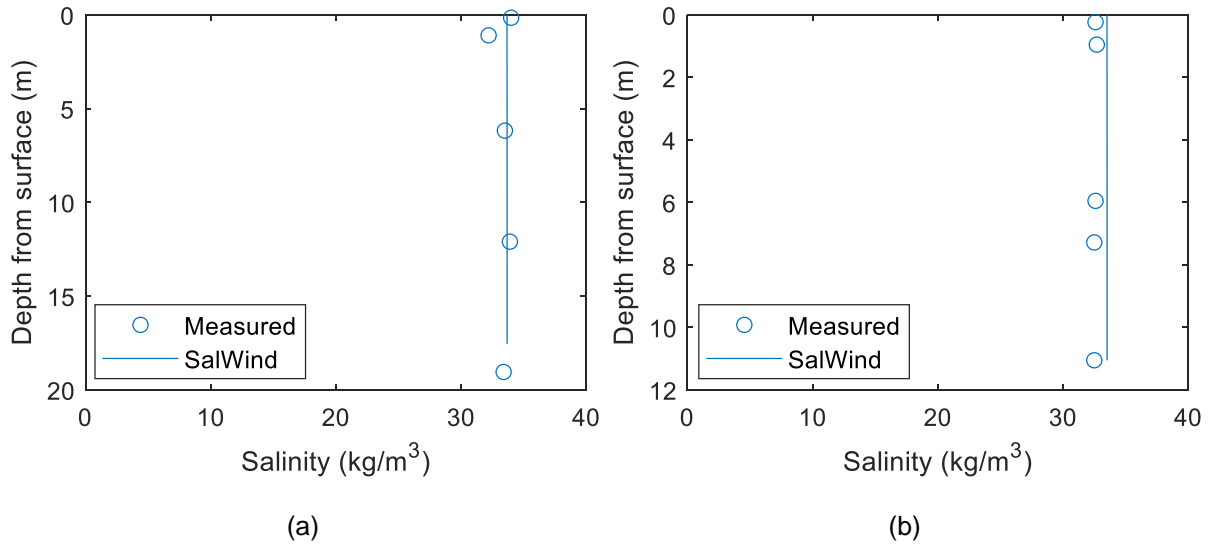


Figure SI-9. Measured and modelled salinity across the depth at (a) SV1, tidal phase 82.8° and (b) SV2, tidal phase 176.4°. Tidal phase was evaluated with respect to the water elevation at the Mumbles, with 0° selected to correspond to high tides.

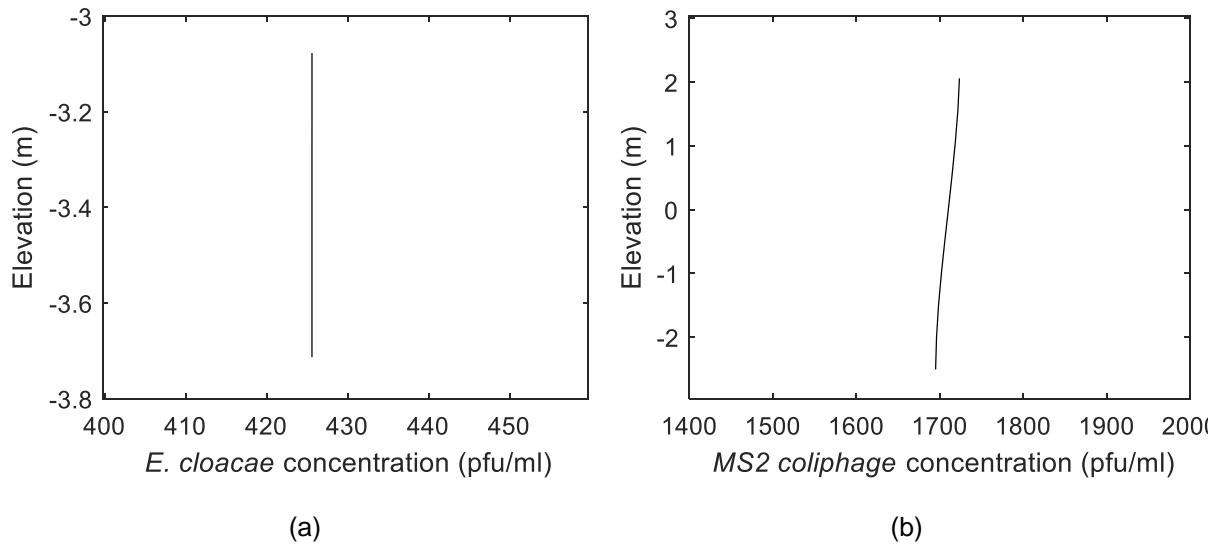
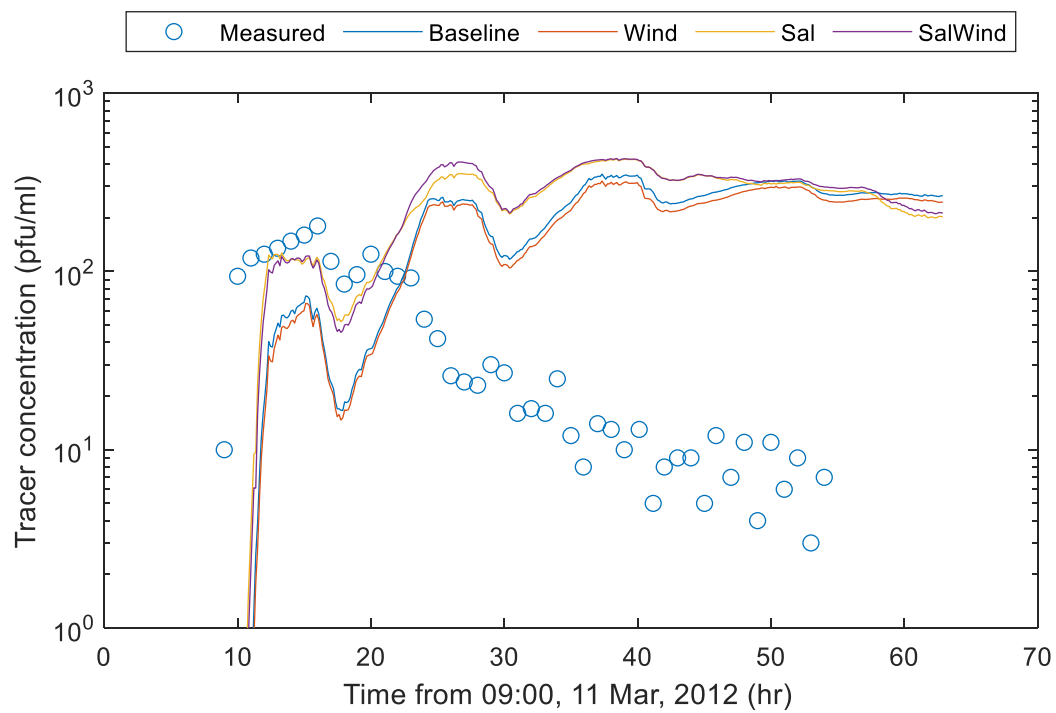
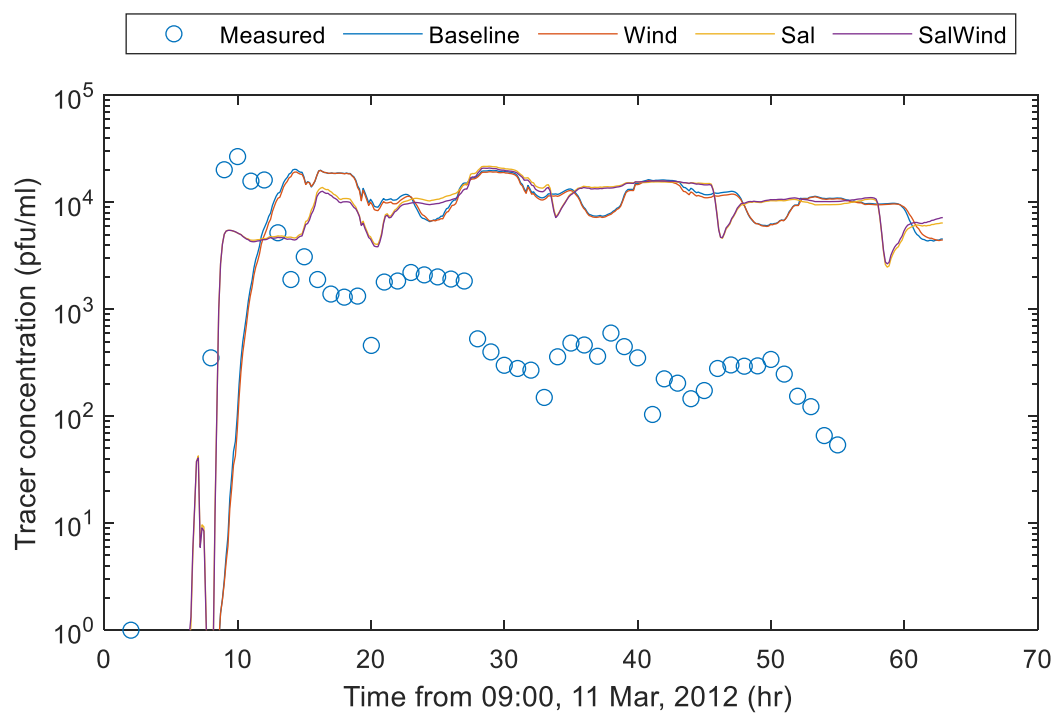


Figure SI-10. Tracer microbes at points M1 and M2 in model SalWind. (a) *E. cloacae* (released at Tawe Barrage) concentration at M1 at 01:40:00, 13 Mar 2012; (b) *MS2 coliphage* (released at Monkstone stream) concentration at M2 at 22:35:00, 11 Mar 2012.

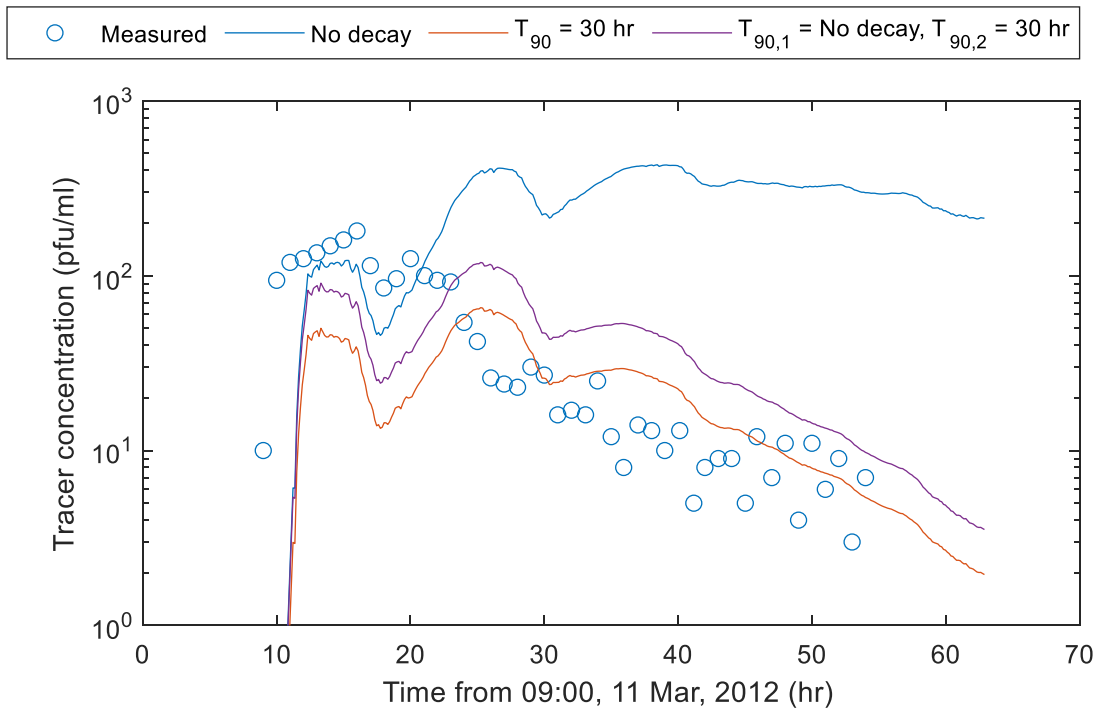


(a)

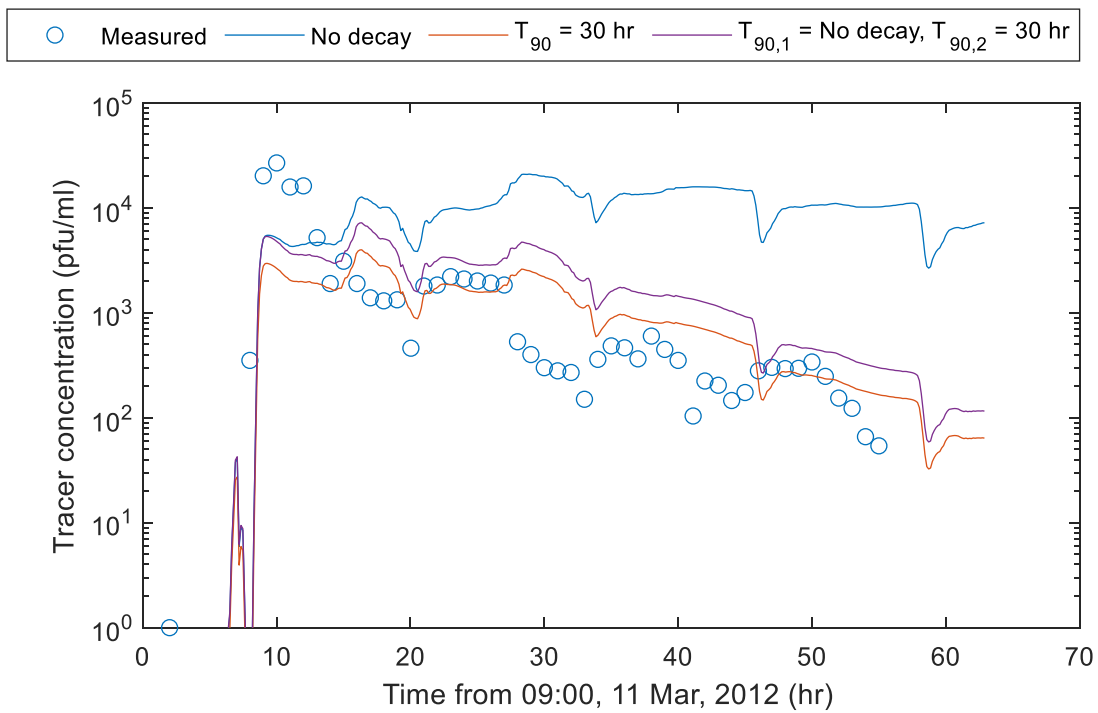


(b)

Figure SI-11. Measured and modelled (a) *E. cloacae* concentrations (released at River Tawe) sampled at the Swansea transect; and (b) *MS2 coliphage* concentrations (released at Monkstone Stream) sampled at the Crymlyn Burrows transect.



(a)



(b)

Figure SI-12. Measured and modelled microbe concentrations with different decay rates in SalWind. The microbe species and sampling locations were (a) *E. cloacae* (released at River Tawe) sampled at

the Swansea transect; (b) *MS2 coliphage* (released at Monkstone Stream) sampled at the Crymlyn Burrows transect.

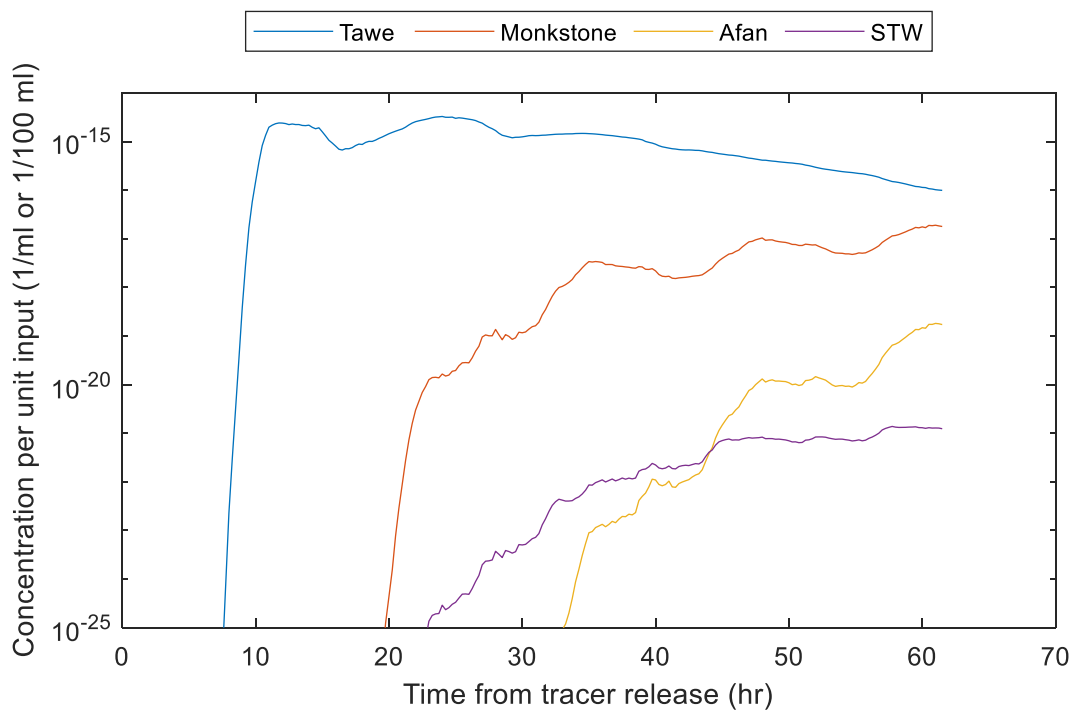
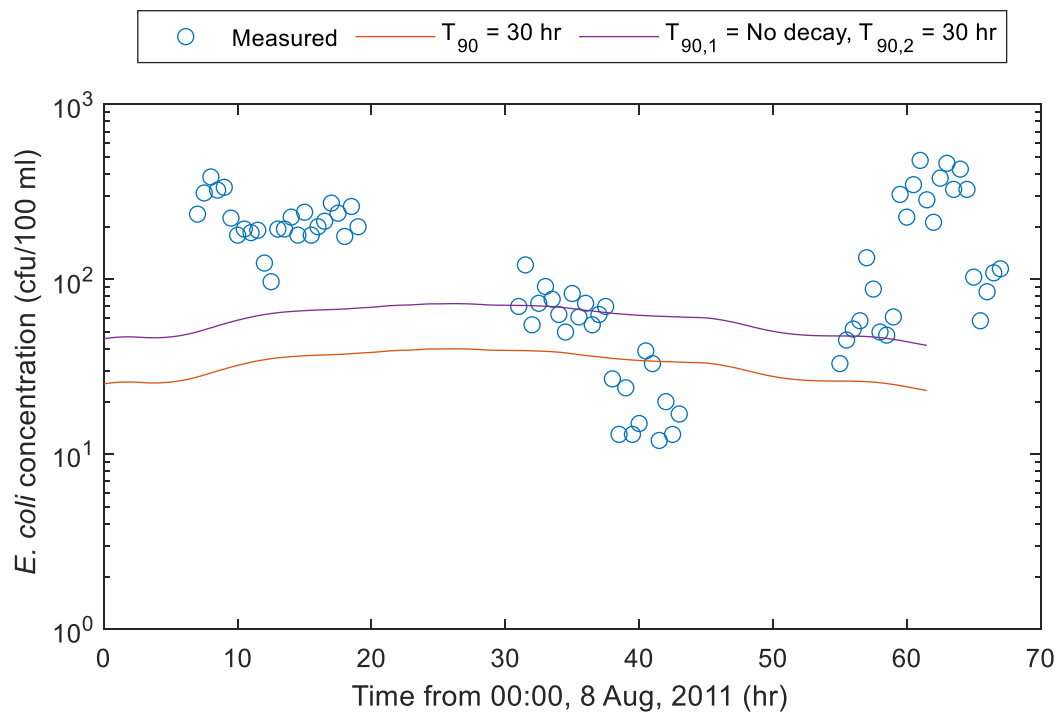
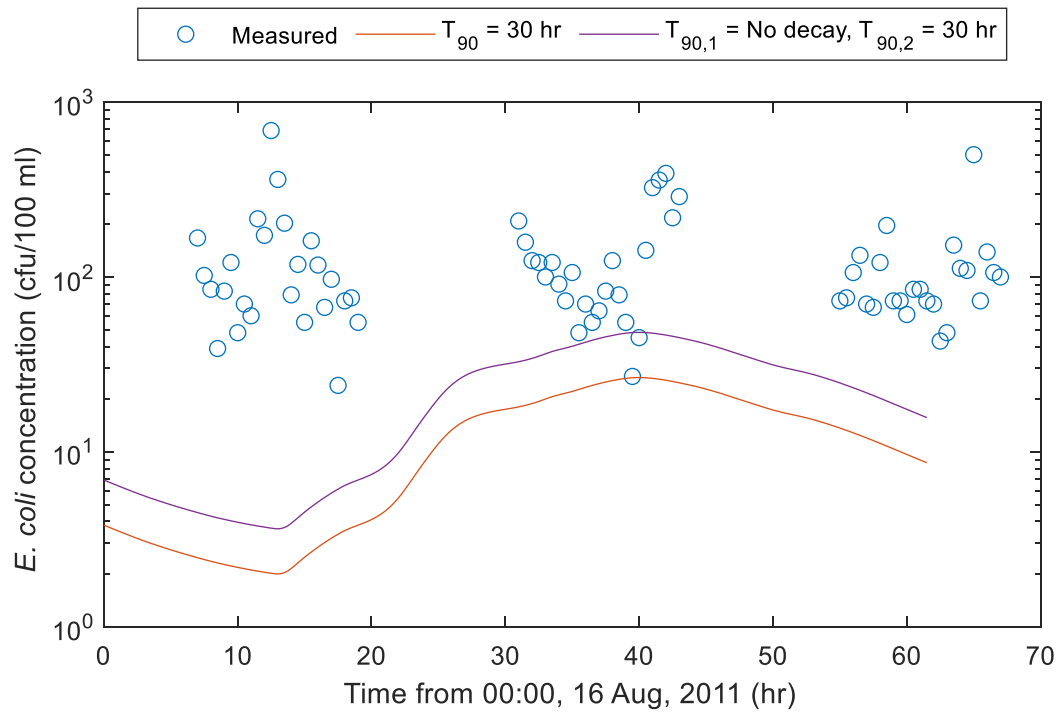


Figure SI-13. Impulse Response Functions between the four input locations and the Swansea transect in model SalWind with a constant decay rate $T_{90} = 30 \text{ hr}$. The unit for the IRF for STW is 1/100 ml and the unit for other IRFs is 1/ml.



(a)



(b)

Figure SI-14. Measured and hindcasted *E. coli* concentrations at the Swansea transect during (a) 8-10 Aug 2011; and (b) 16-18 Aug 2011.