Supplementary Materials

Table S1. Monthly data on precipitation and values obtained in recharge and PET.

Months	Monthly Values		
	Recharge [mm]	PET [mm]	Precipitation [mm]
01-May-18	0.00	156.47	0.00
01-Jun-18	0.00	125.68	0.00
01-Jul-18	0.00	98.55	0.45
01-Aug-18	7.32	83.03	69.40
01-Sep-18	0.00	85.38	0.20
01-Oct-18	0.00	93.68	0.00
01-Nov-18	0.00	110.74	1.70
01-Dec-18	0.00	122.50	1.50
01-Jan-19	0.00	162.46	1.50
01-Feb-19	9.86	167.48	51.60
01-Mar-19	3.15	197.55	18.40
01-Apr-19	0.00	174.65	0.20
01-May-19	0.00	168.20	0.00
01-Jun-19	0.00	134.96	0.00
01-Jul-19	0.00	101.52	0.00
01-Aug-19	7.29	84.13	138.30
01-Sep-19	0.00	79.98	0.20
01-Oct-19	0.00	93.34	0.00
01-Nov-19	0.00	110.46	1.70
01-Dec-19	0.00	122.23	1.50
01-Jan-20	0.00	162.40	2.90
01-Feb-20	3.75	174.96	22.10
01-Mar-20	0.00	193.70	6.90
01-Apr-20	0.00	169.36	4.50
01-May-20	0.00	152.45	0.00
01-Jun-20	0.00	129.30	0.00
01-Jul-20	0.00	112.63	0.90
01-Aug-20	0.00	100.95	0.50
01-Sep-20	0.00	107.51	0.20

Table S2. Annual data of precipitation and values obtained in recharge and ETP.

Year	Yearly Values		
	Recharge [mm]	PET [mm]	Precipitation [mm]
2018	12.9	1584.89	127.3
2019	20.3	1596.95	213.4
2020	3.8	1303.27	38

* The data to generate these results range from May 2018 to September 2020

Darcy's law

Darcy's law governs the movement of underground flow in porous media [51], expressed for conditions of variable density as:

$$v = -\frac{k}{\mu} \cdot (\nabla p - \rho g) \tag{1}$$

Where: v is the Darcy velocity, with components Vx, Vy y Vz (LT-1); k is the tensor of the intrinsic permeability of the porous medium (L2); μ is the dynamic viscosity of the fluid (ML-1T-1); ∇p is the pressure gradient with components $\partial p/\partial x$, $\partial p/\partial y$, and $\partial p/\partial z$ (ML-2T-2); ρ is the density of the fluid (ML-3), and g is the acceleration of gravity (LT-2).

The numerical models solve discretely in space and time the differential equations of flow (2) and transport (3), replacing them with algebraic equations. Some numerical codes explicitly consider the variation in density, which varies linearly as a function of isothermal concentrations.

$$\nabla \left(k \frac{\rho g}{\mu} \nabla h \right) + \rho^* Q = S_s \frac{\partial h}{\partial t} \tag{2}$$

Where: Q is the recharge flow (L3T-1); ρ^* is the density of the injected fluid; h is the piezometric potential, and S_s is the Specific storage.

$$-\theta \rho v \cdot \nabla C + \nabla[\theta \rho (D_m I + D) \cdot \nabla C] + Q_p(C^* - C) = \theta_\rho \frac{\partial C}{\partial t} \tag{3}$$

Where: C is the solute concentration as a mass fraction (mass of solute/mass of fluid) (Ms/M); θ is porosity; v is Darcy's speed; Dm is the molecular diffusion coefficient of the solute in the flow, it includes the tortuosity effect through the porous medium (L2T-1); I is the identity matrix (-); D is the hydrodynamic dispersion tensor (L2T-1); Qp is the aquifer recharge flow given in mass terms (ML-3T-1); C* is the solute concentration, given as a mass fraction of the fluid, of the recharge flow (Ms/M).

In variable density problems, Darcy's velocity is express in equivalent freshwater levels (4):

$$h_e = \frac{p}{\rho_o g} + z = p = \rho_o g(h_e - z) \tag{4}$$

Where: he is the equivalent hydraulic head; p is the potential of the flow system at a given point, and ρ_o is the density of the reference fluid, usually freshwater.

Hydrographs

Below are flow and transport hydrographs with a constant and variable density of the 11 wells.

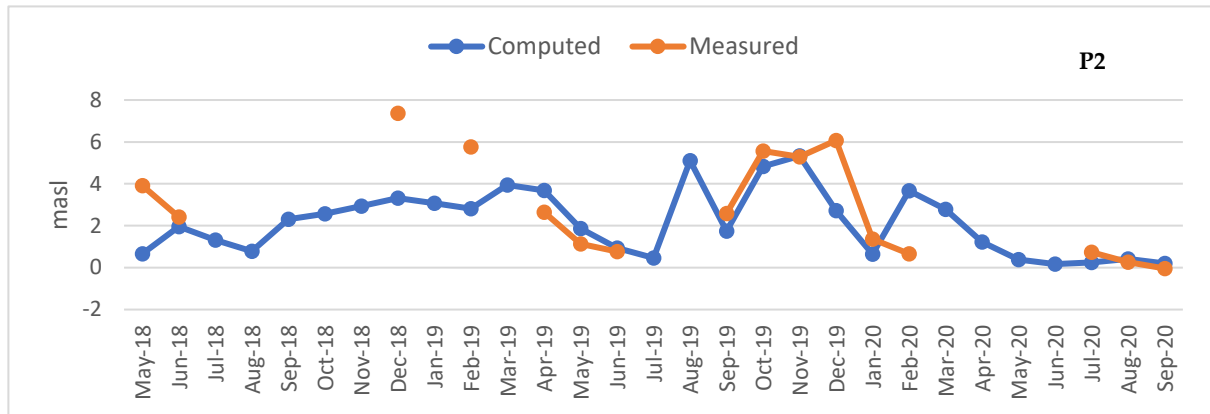## Constant density

Flow model

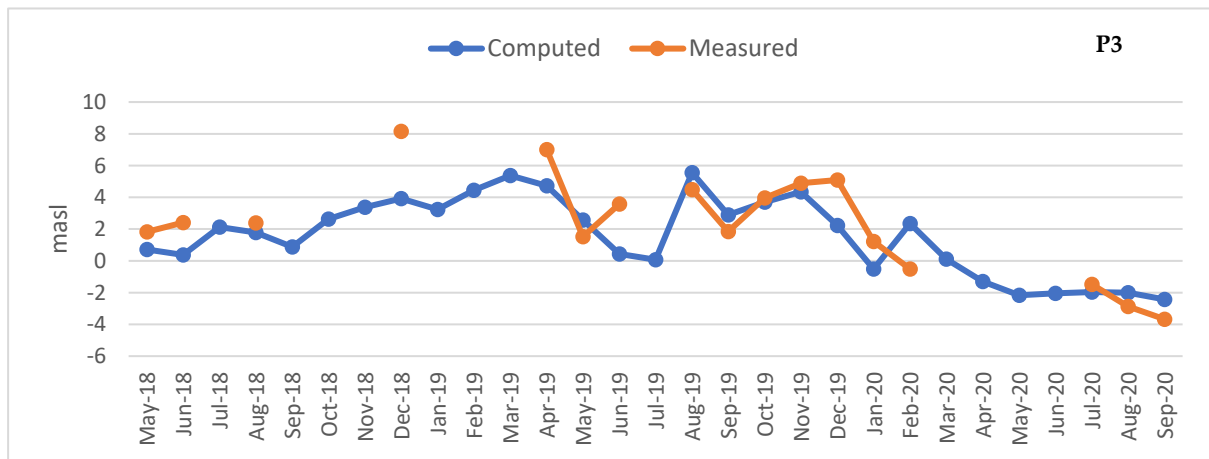*Figure S1.* Well 2 hydrograph (flow model - constant density)

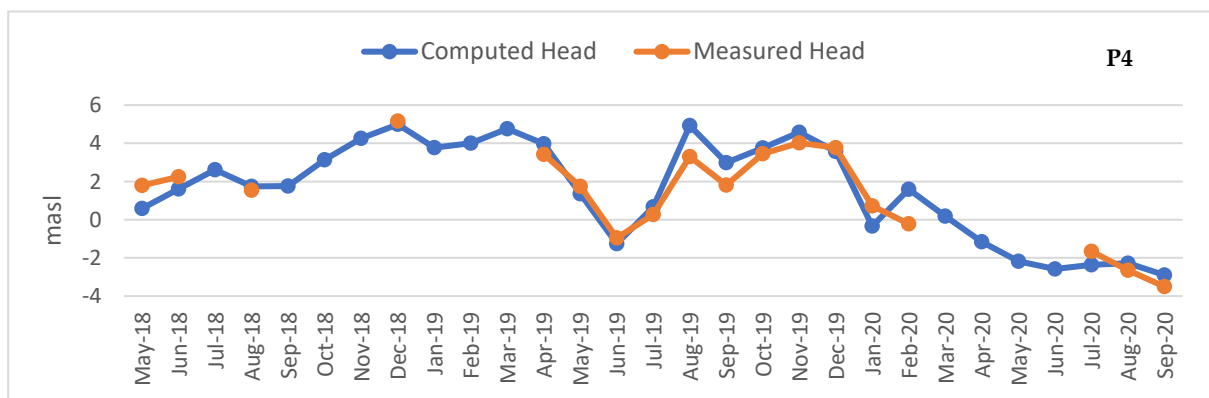*Figure S2.* Well 3 hydrograph (flow model - constant density)

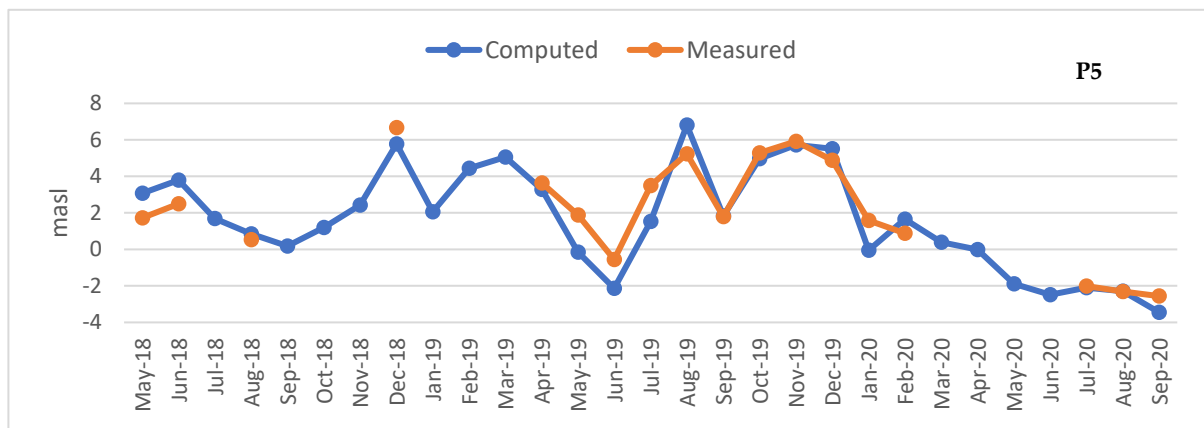*Figure S3. Well 4 hydrograph (flow model - constant density)*

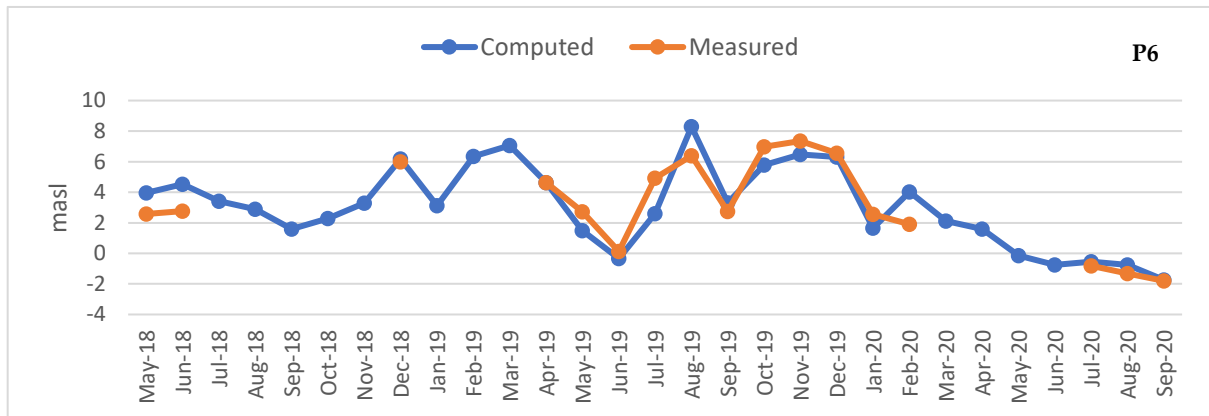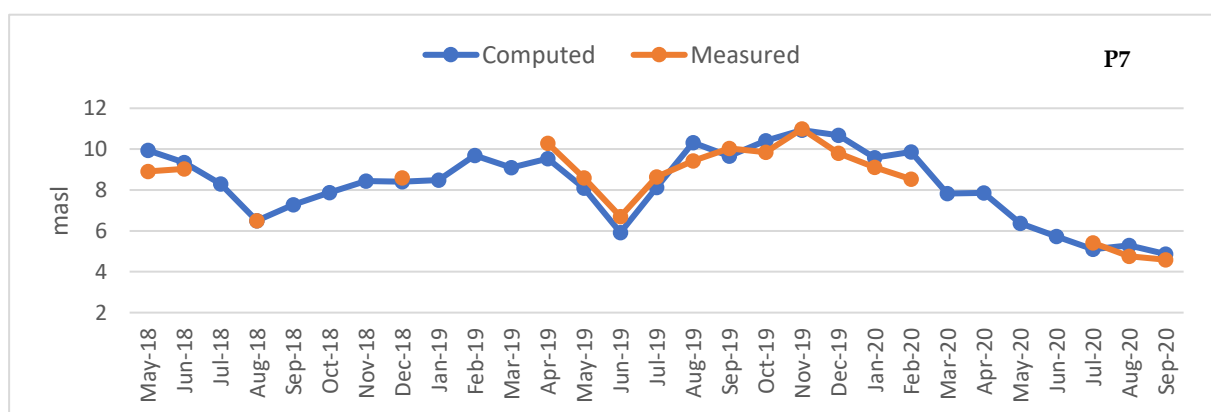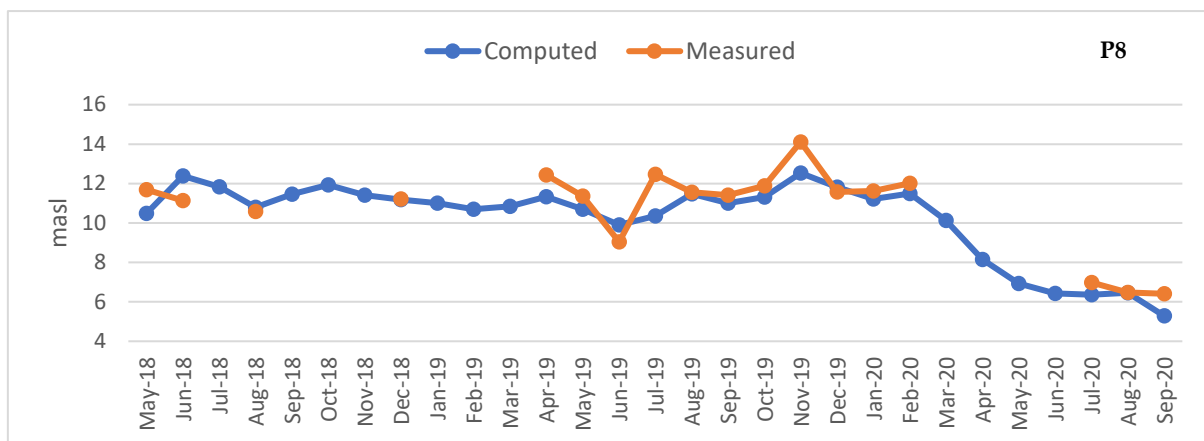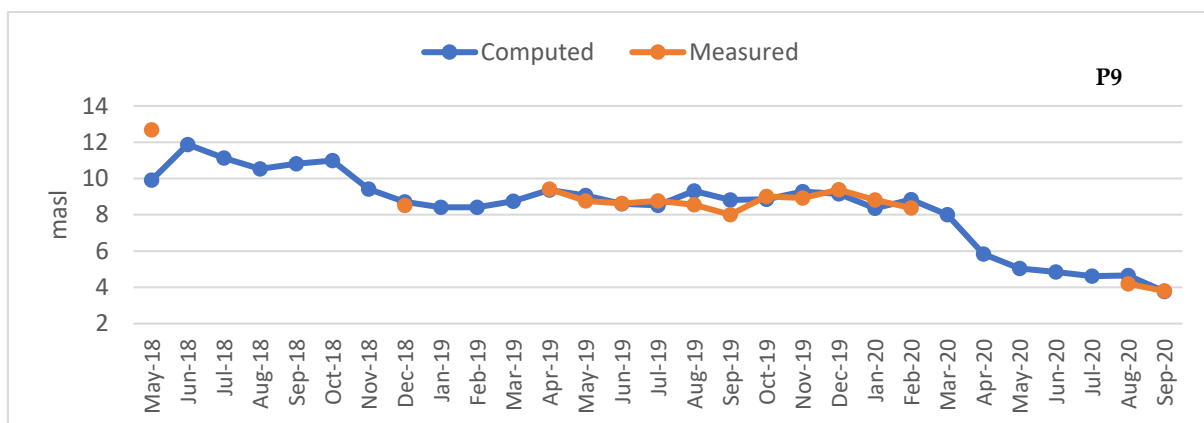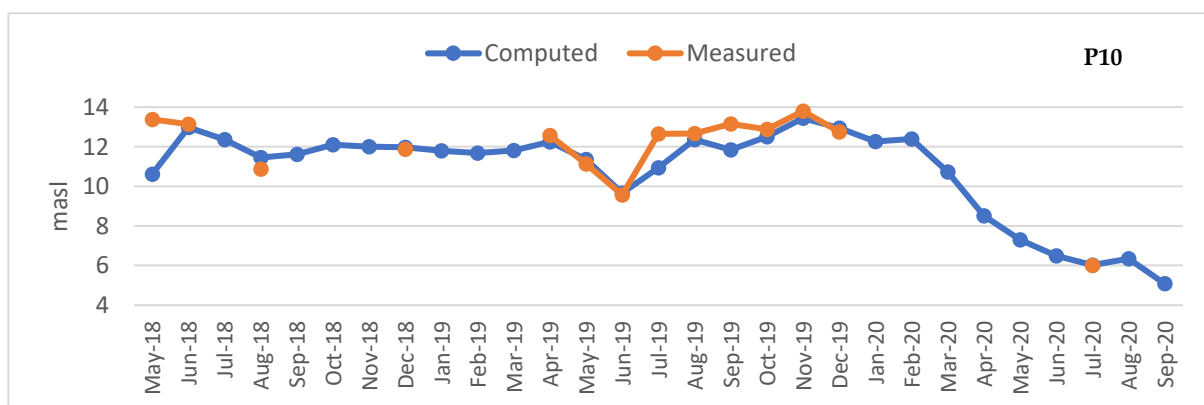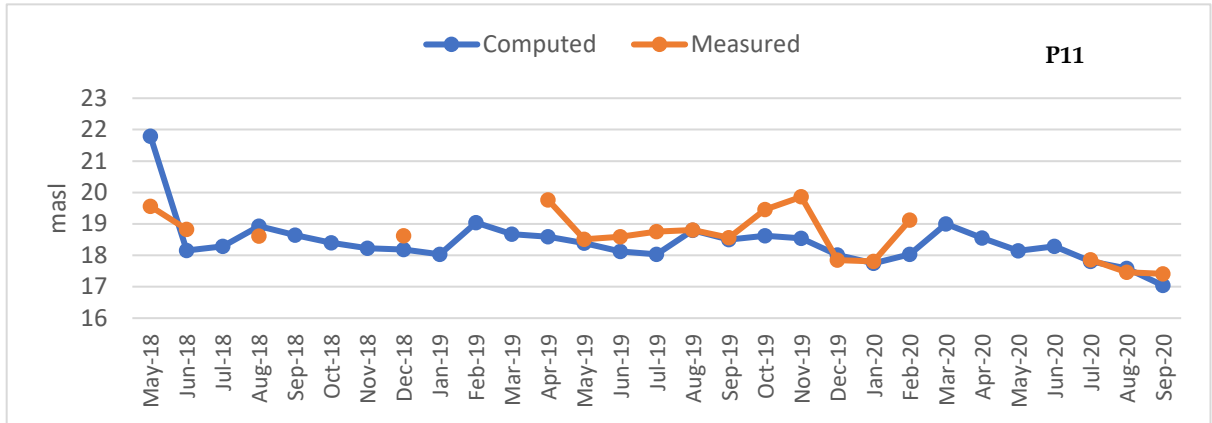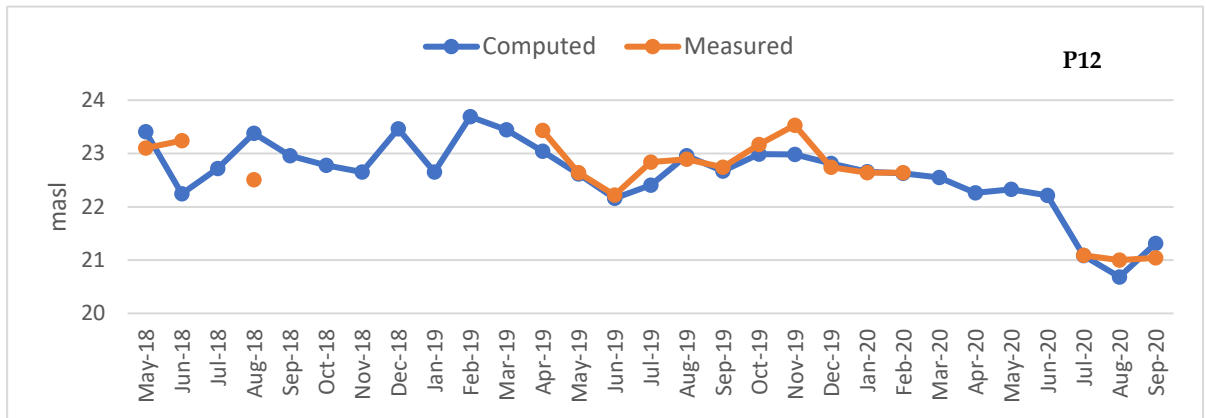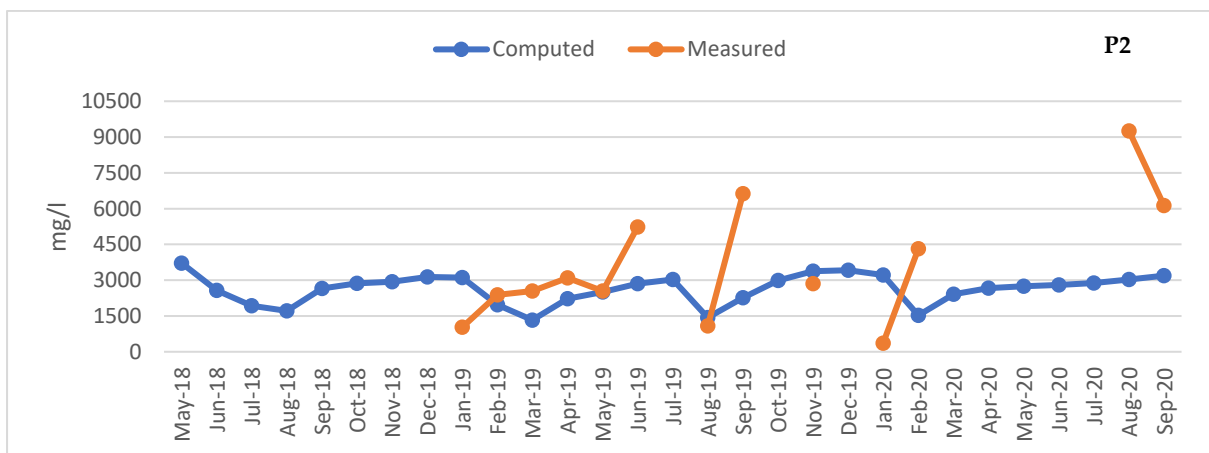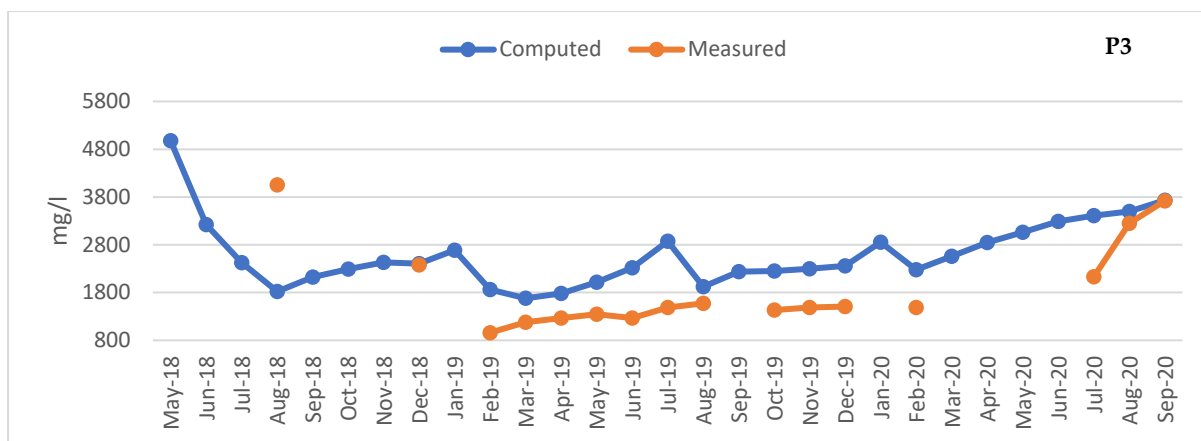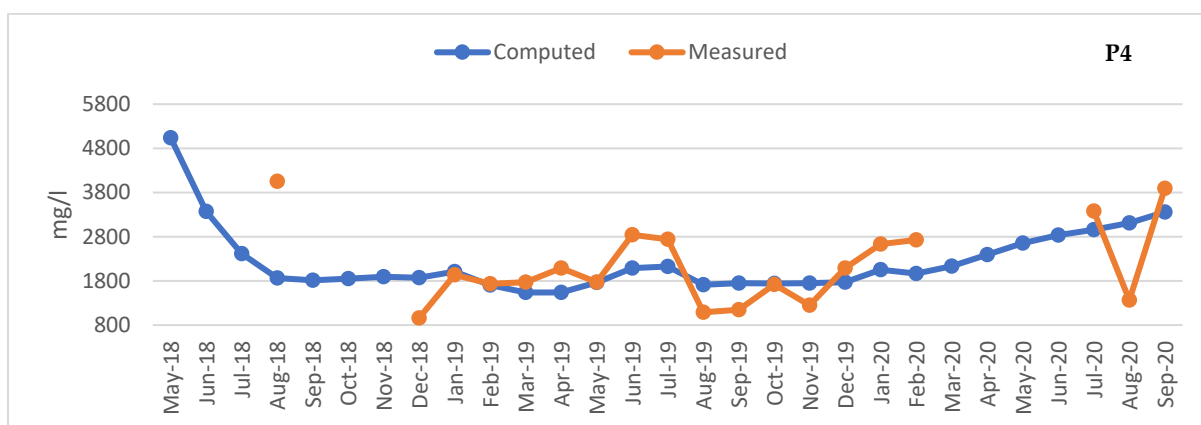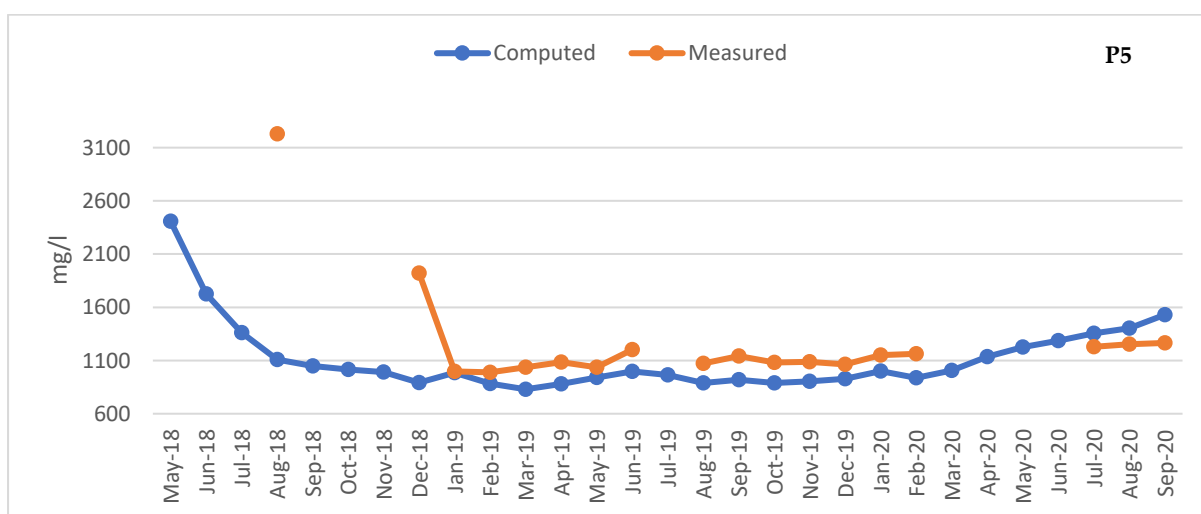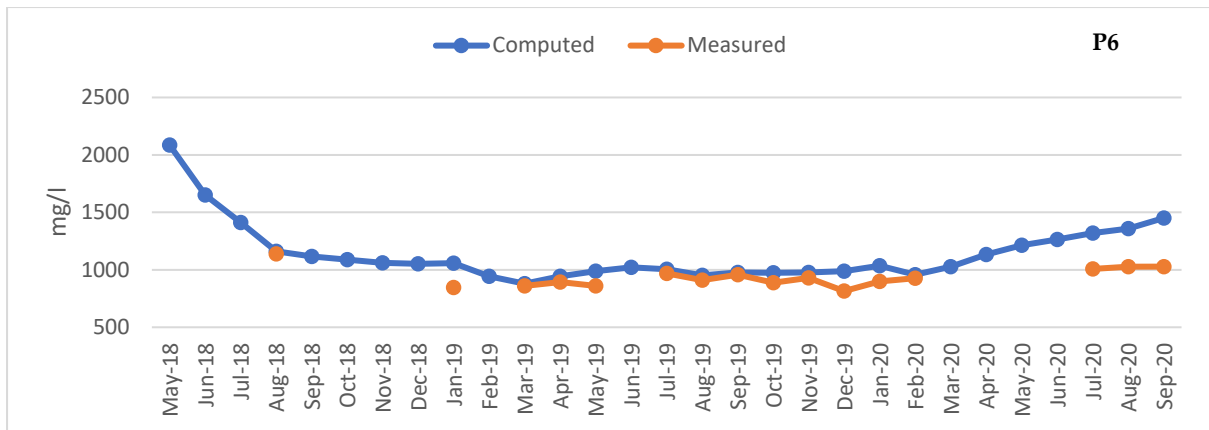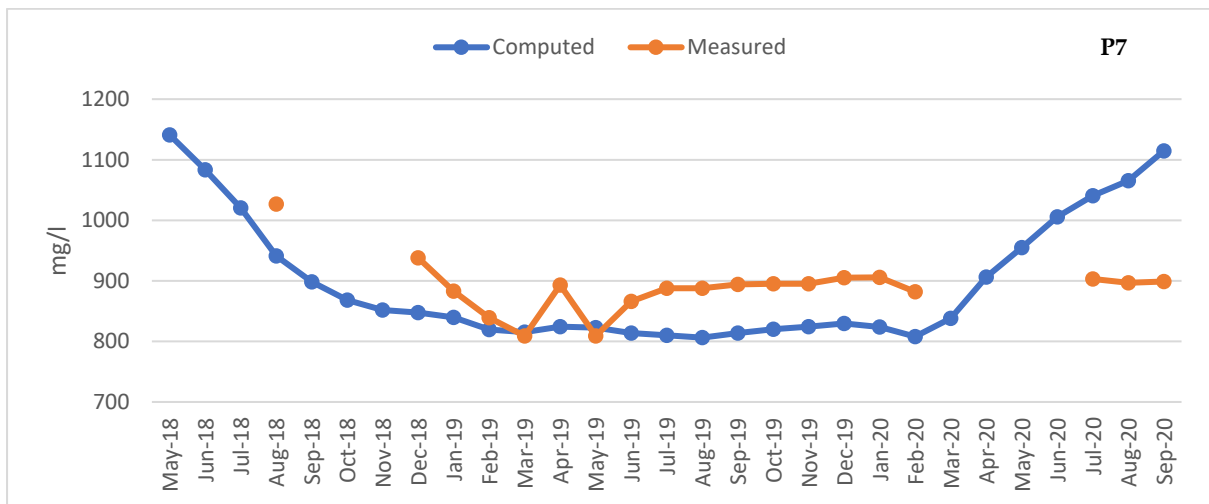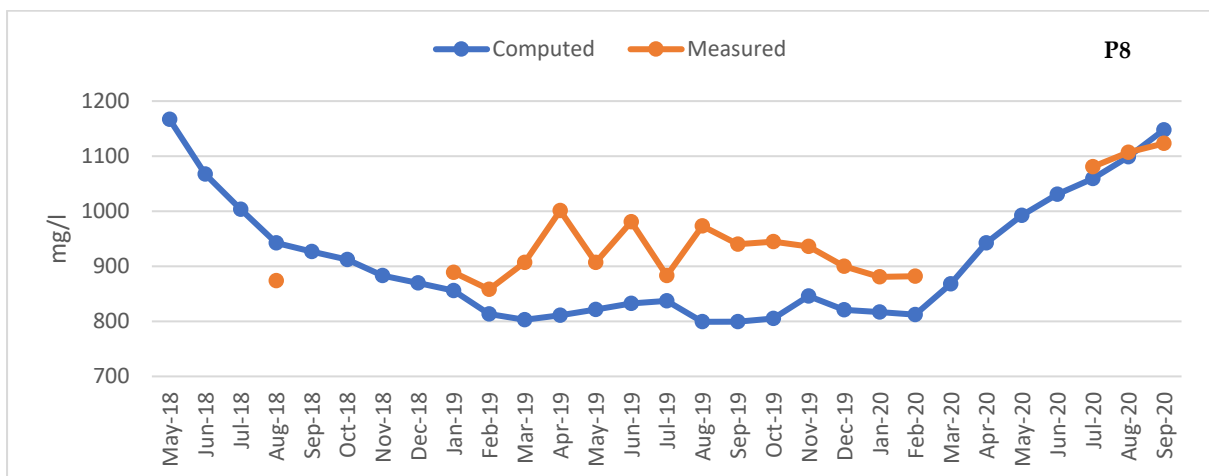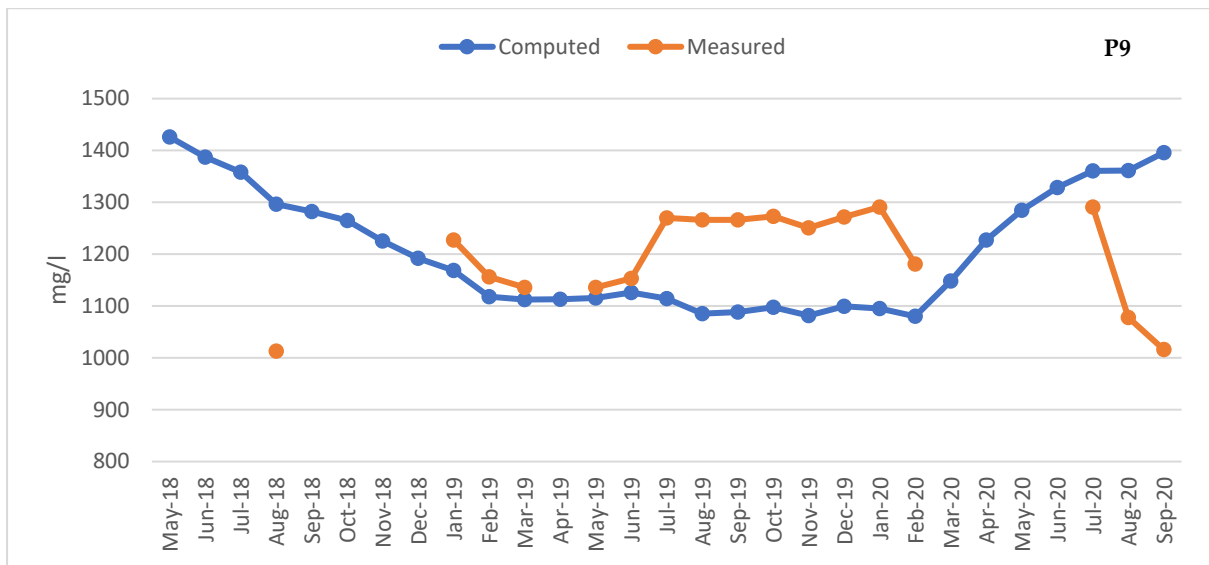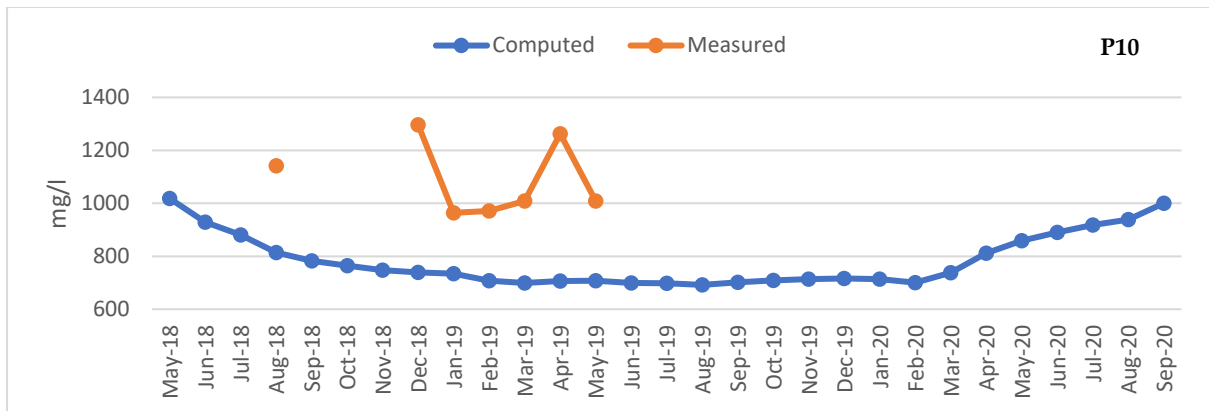*Figure S4.* Well 5 hydrograph (flow model - constant density)

Figure S5. Well 6 hydrograph (flow model - constant density)

Figure S6. Well 7 hydrograph (flow model - constant density)

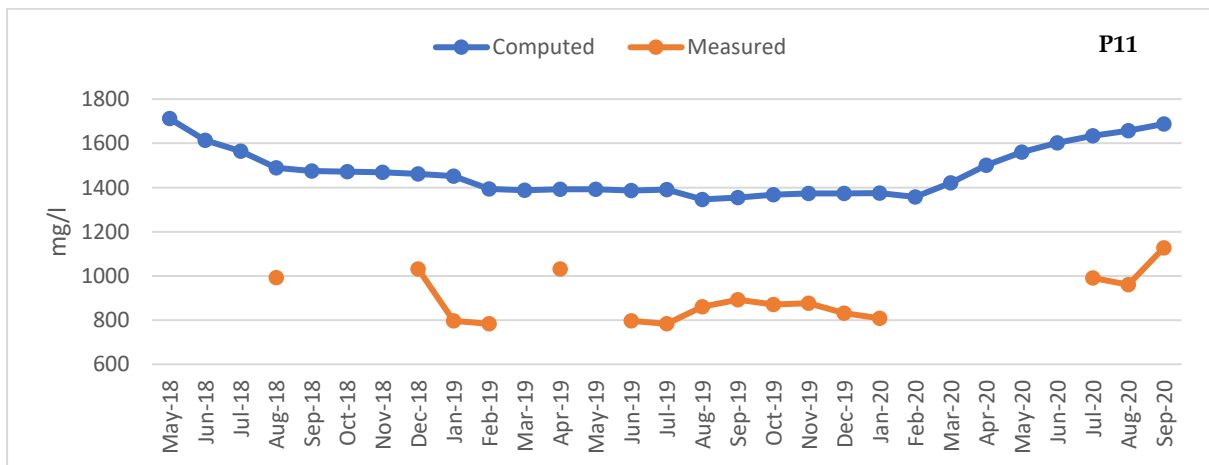*Figure S7. Well 8 hydrograph (flow model - constant density)*

Figure S8. Well 9 hydrograph (flow model - constant density)

Figure S9. Well 10 hydrograph (flow model - constant density)

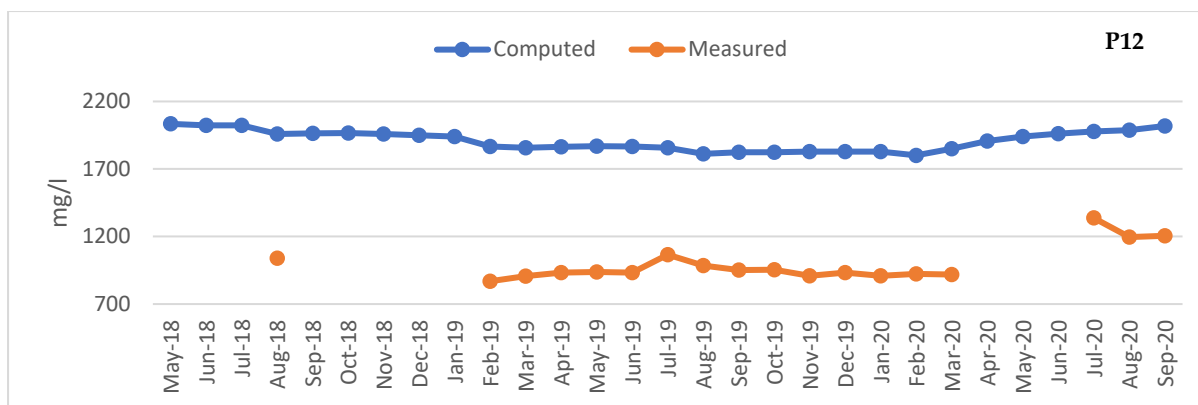**Figure S10.** *Well 11 hydrograph (flow model - constant density)*

Figure S11. *Well 12 hydrograph (flow model - constant density)*

Transport model

Figure S12. *Well 2 hydrograph (transport model - constant density)*

Figure S13. Well 3 hydrograph (transport model - constant density)

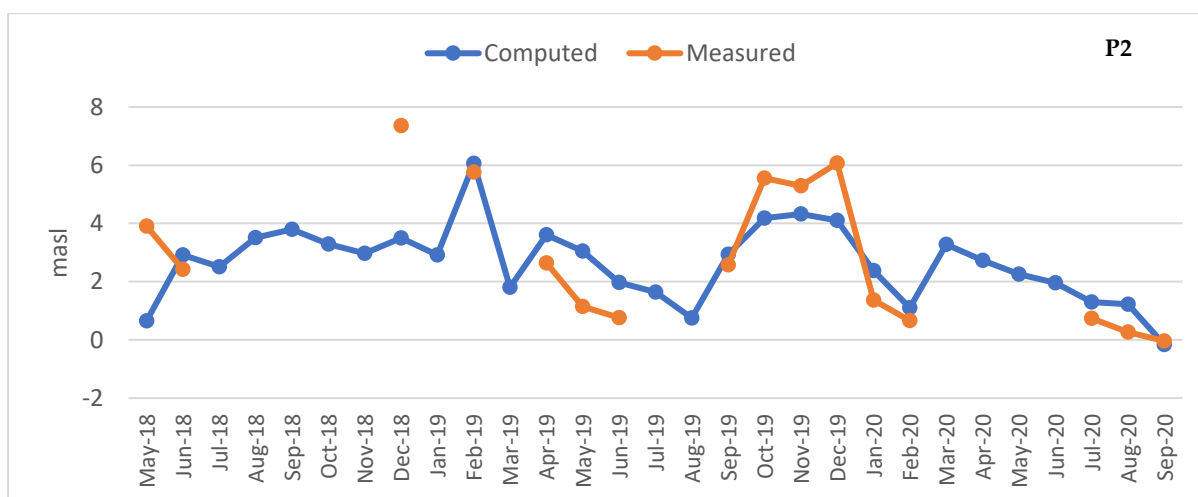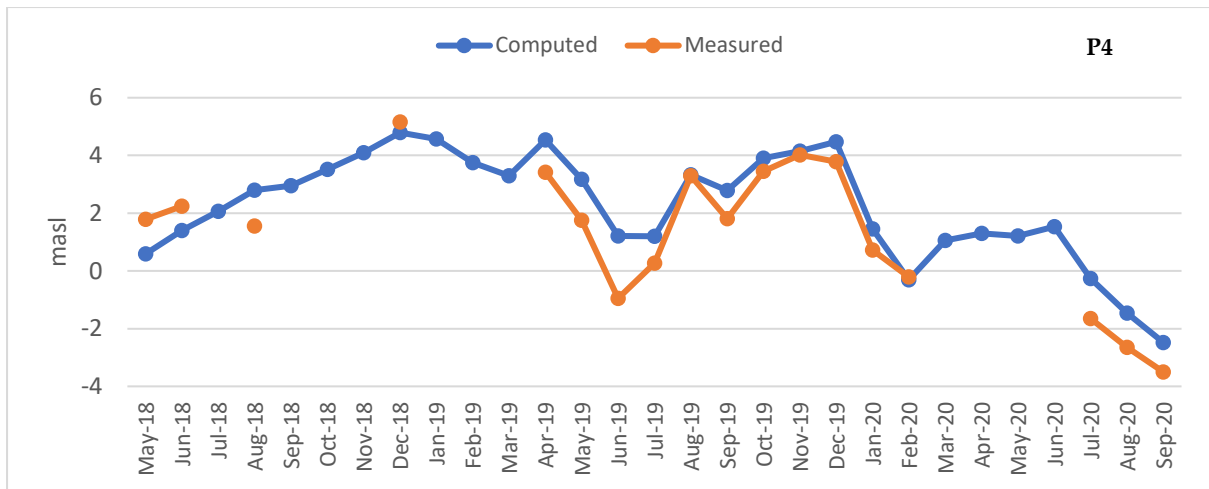*Figure S14.* Well 4 hydrograph (transport model - constant density)

Figure S15. Well 5 hydrograph (transport model - constant density)

Figure S16. Well 6 hydrograph (transport model - constant density)

Figure S17. Well 7 hydrograph (transport model - constant density)

Figure S18. Well 8 hydrograph (transport model - constant density)

Figure S19. Well 9 hydrograph (transport model - constant density)

Figure S20. Well 10 hydrograph (transport model - constant density)

Figure S21. Well 11 hydrograph (transport model - constant density)

Figure S22. Well 12 hydrograph (transport model - constant density)

Variable density

Flow model

Figure S23. Well 2 hydrograph (flow model - variable density)

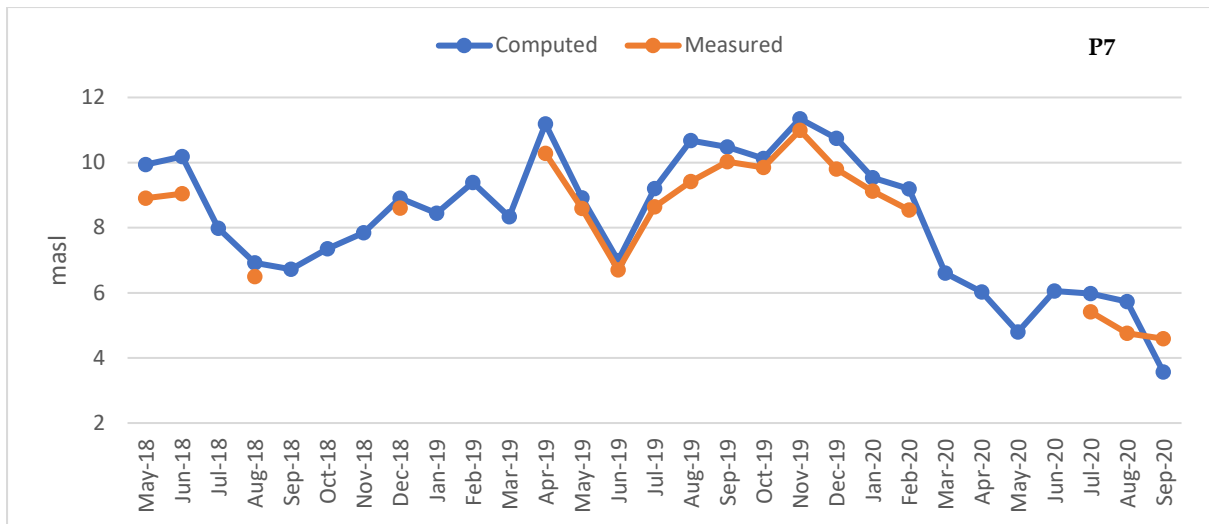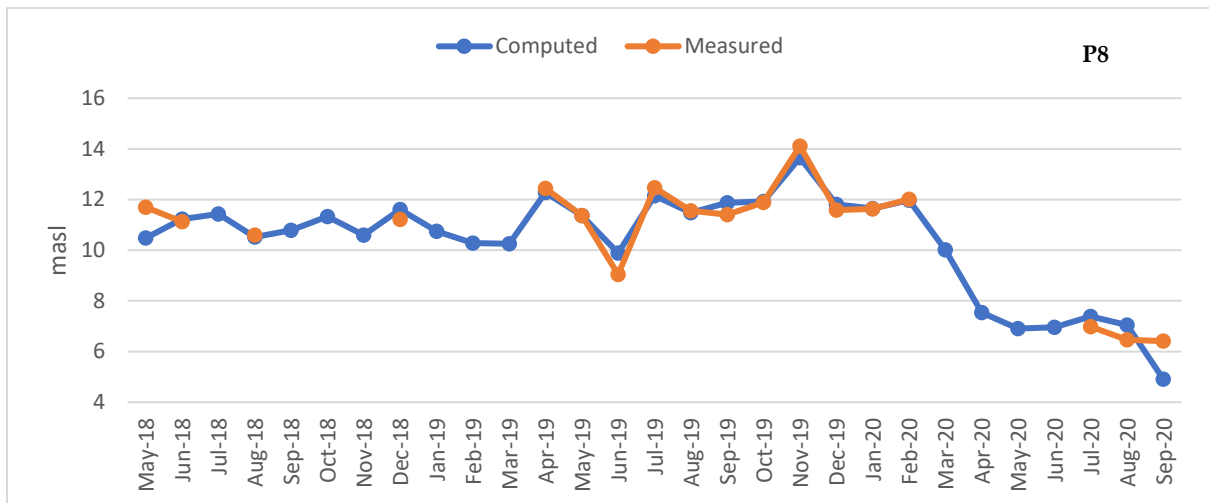*Figure S24.* Well 3 hydrograph (flow model - variable density)

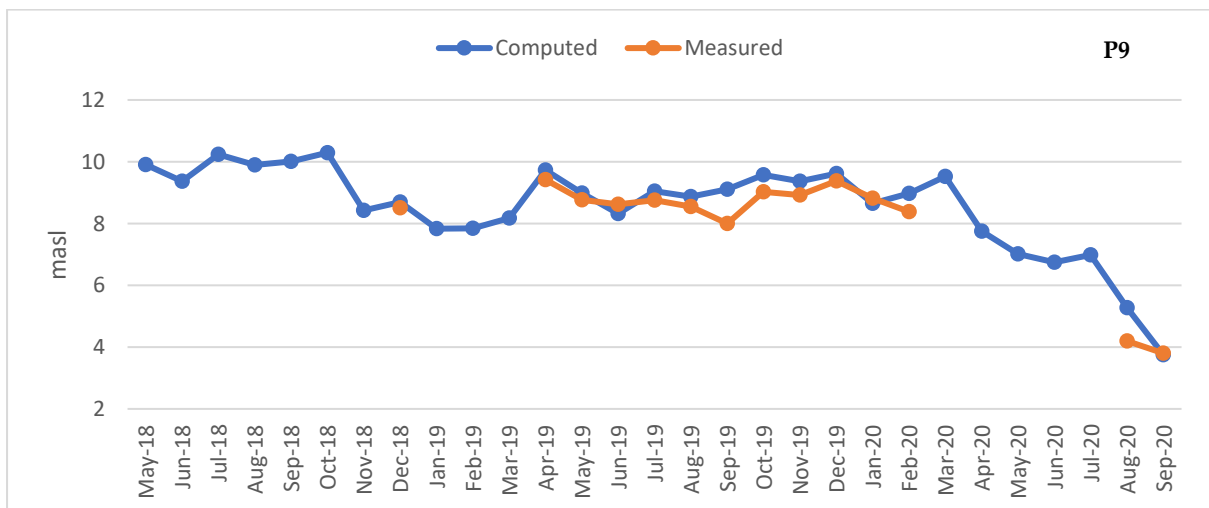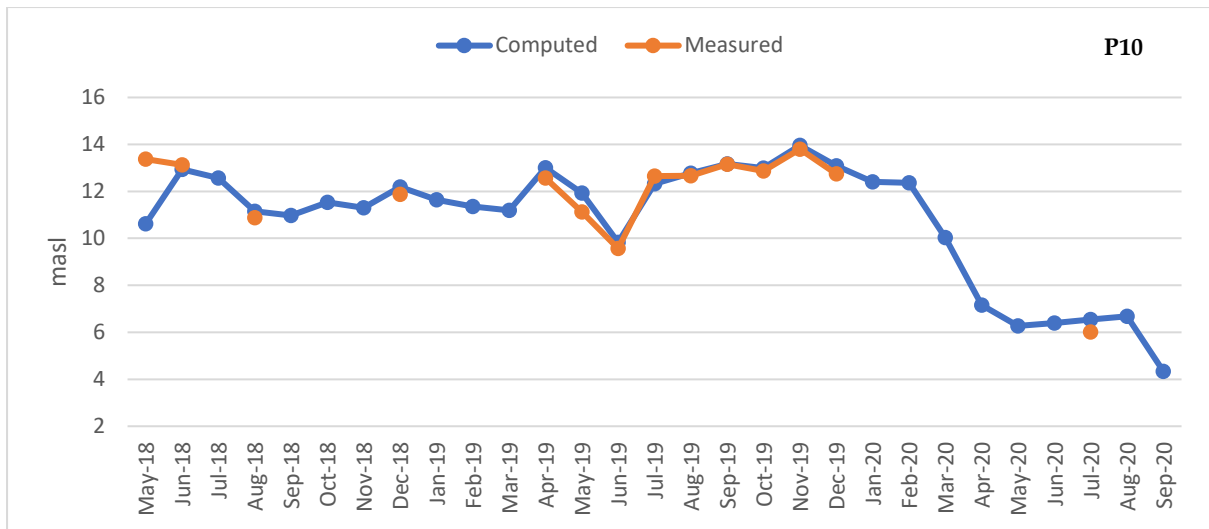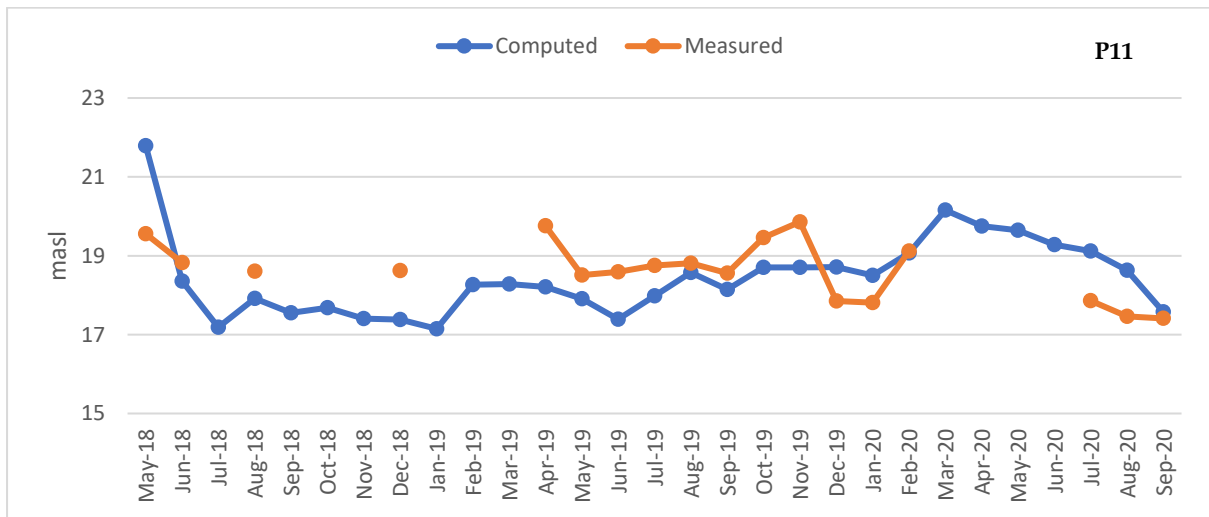*Figure S25.* Well 4 hydrograph (flow model - variable density)

Figure S26. Well 5 hydrograph (flow model - variable density)

Figure S27. Well 6 hydrograph (flow model - variable density)

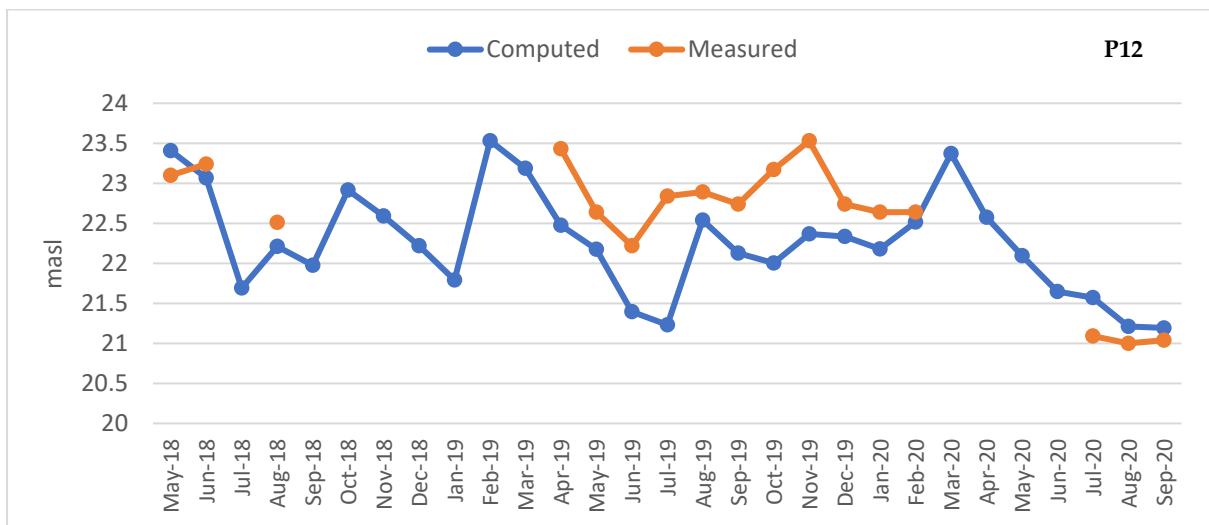*Figure S28.* Well 7 hydrograph (flow model - variable density)

Figure S29. Well 8 hydrograph (flow model - variable density)

Figure S30. Well 9 hydrograph (flow model - variable density)

Figure S31. Well 10 hydrograph (flow model - variable density)

Figure S32. Well 11 hydrograph (flow model - variable density)

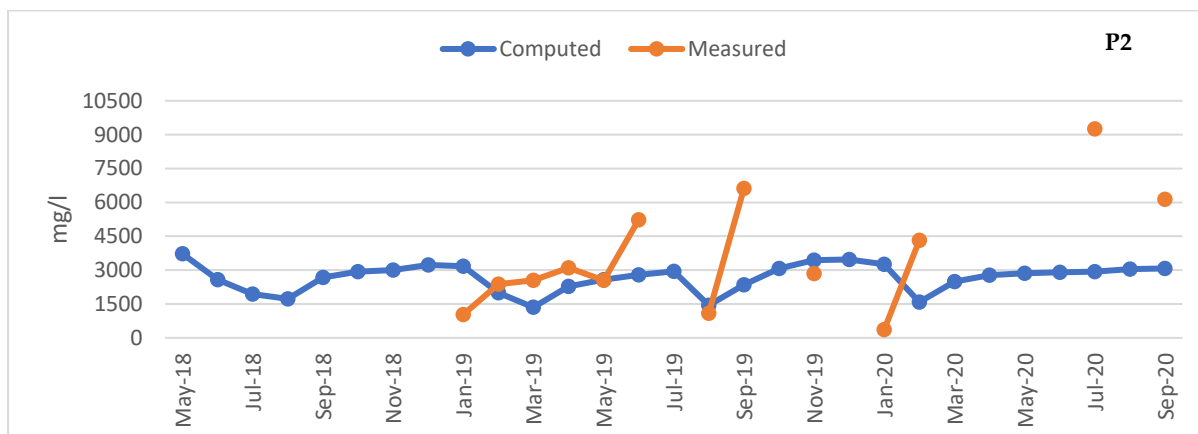*Figure S33.* Well 12 hydrograph (flow model - variable density)

Transport model

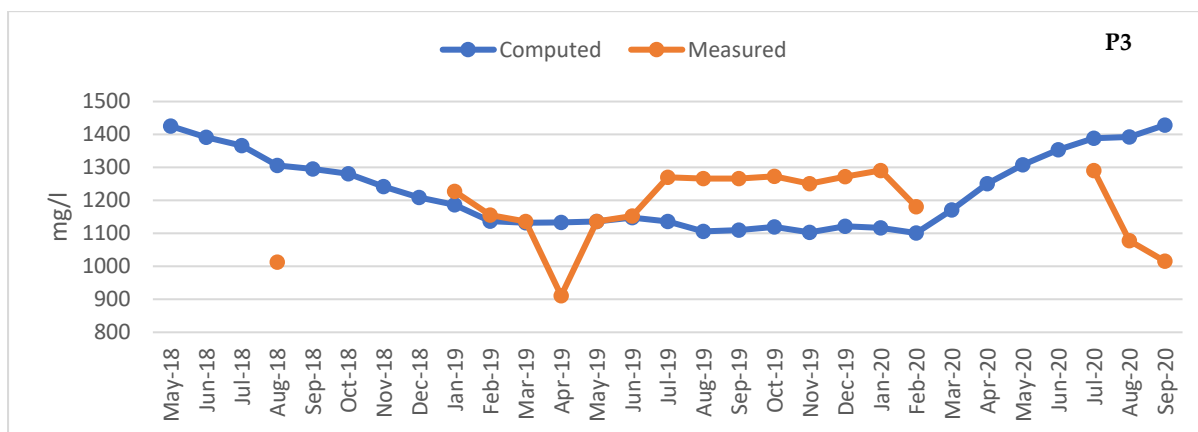*Figure S34.* Well 2 hydrograph (transport model - variable density)

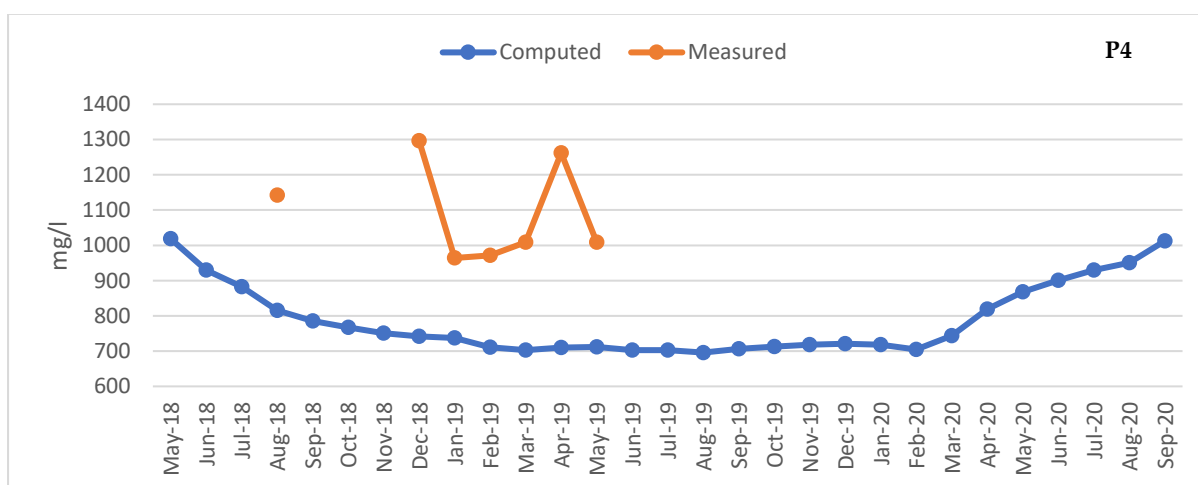*Figure S35.* Well 3 hydrograph (transport model - variable density)

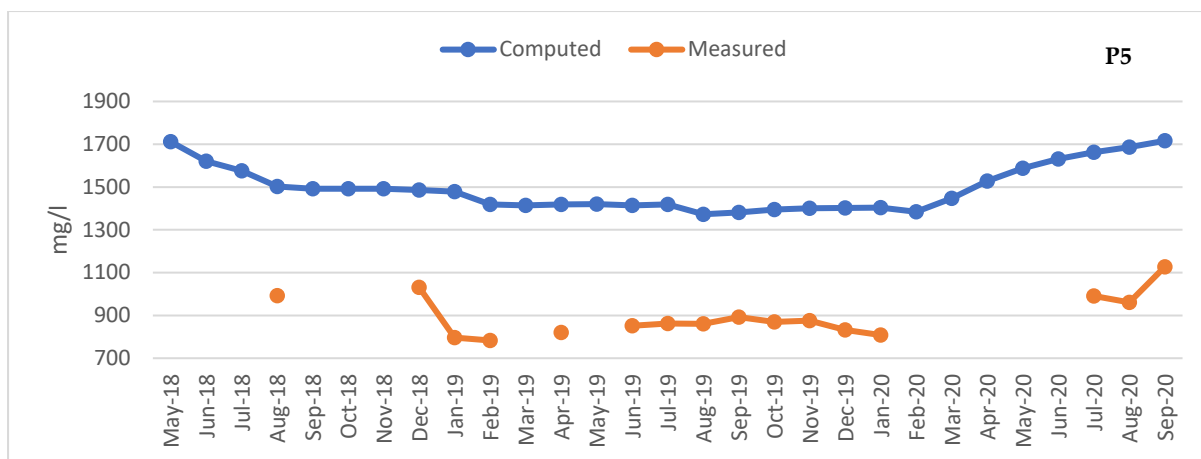*Figure S36.* Well 4 hydrograph (transport model - variable density)

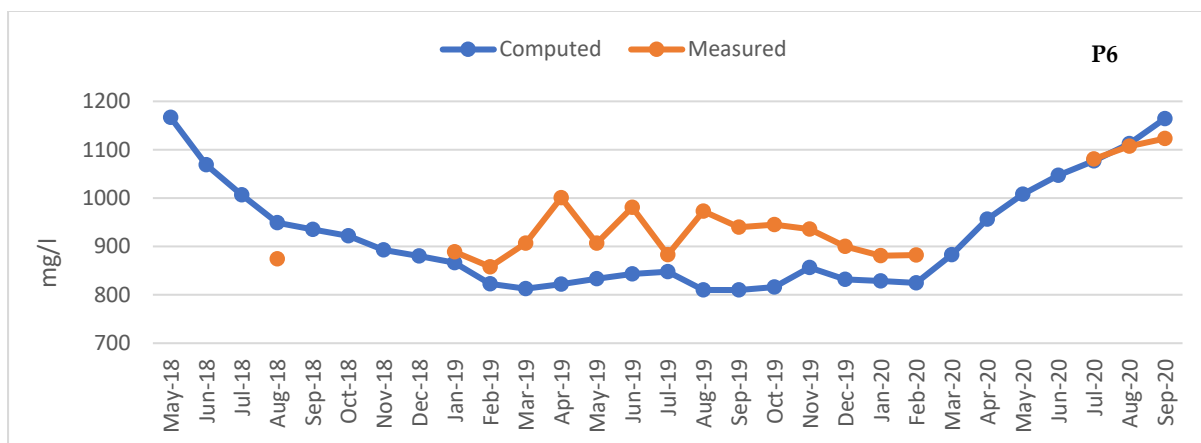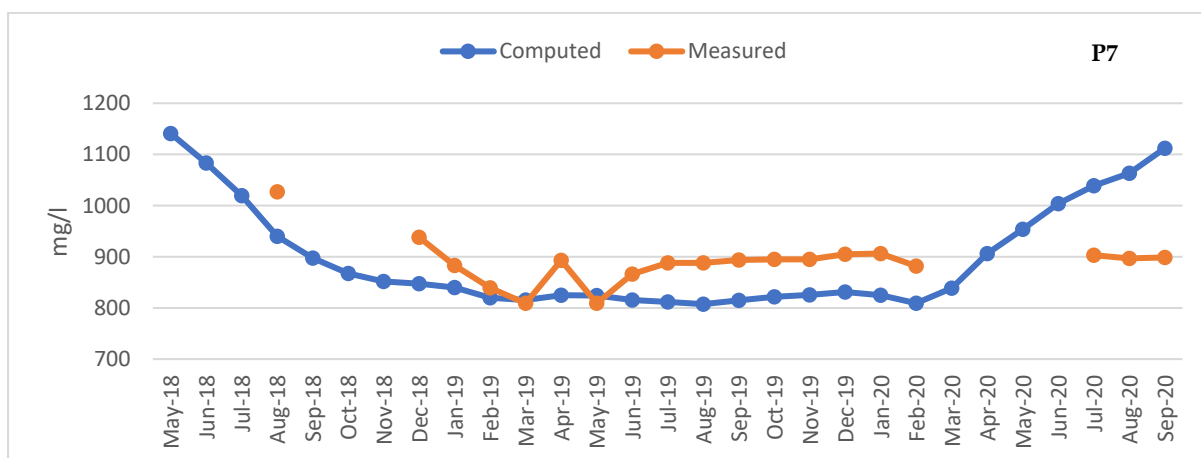**Figure S37.** *Well 5 hydrograph (transport model - variable density)*

Figure S38. *Well 6 hydrograph (transport model - variable density)*

Figure S39. *Well 7 hydrograph (transport model - variable density)*
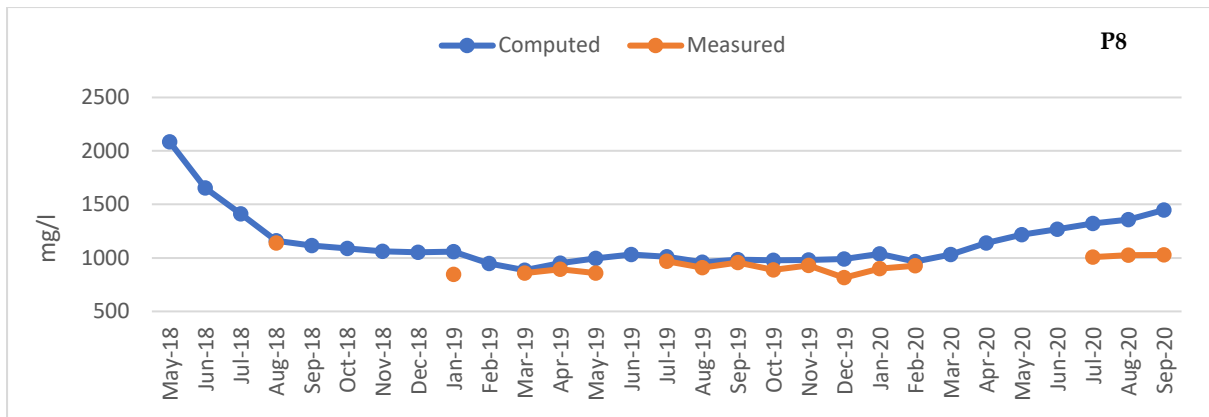
Figure S40. Well 8 hydrograph (transport model - variable density)
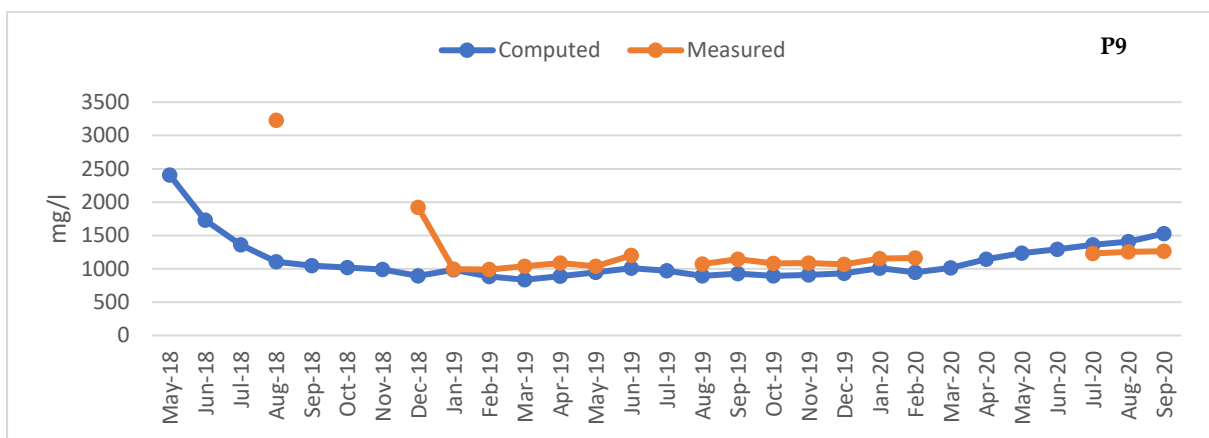

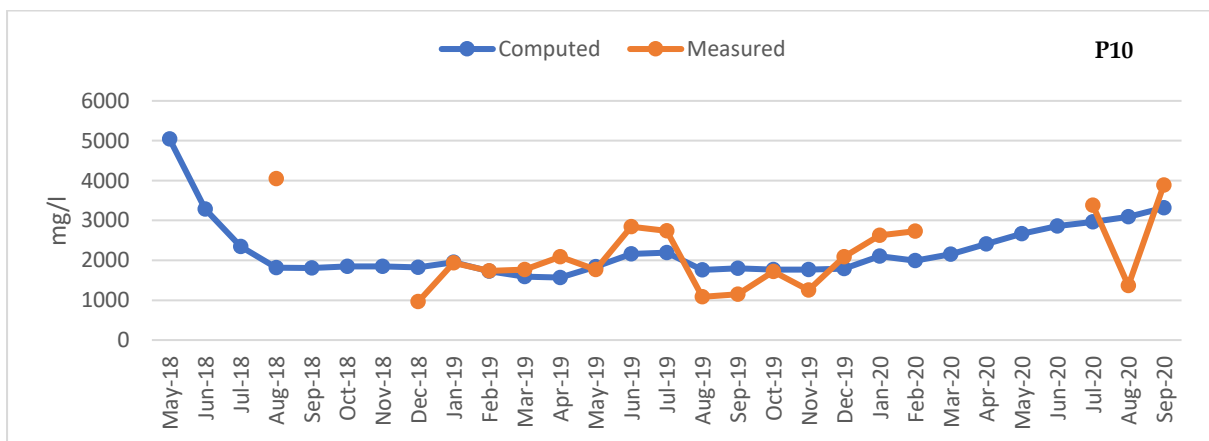*Figure S41. Well 9 hydrograph (transport model - variable density)*

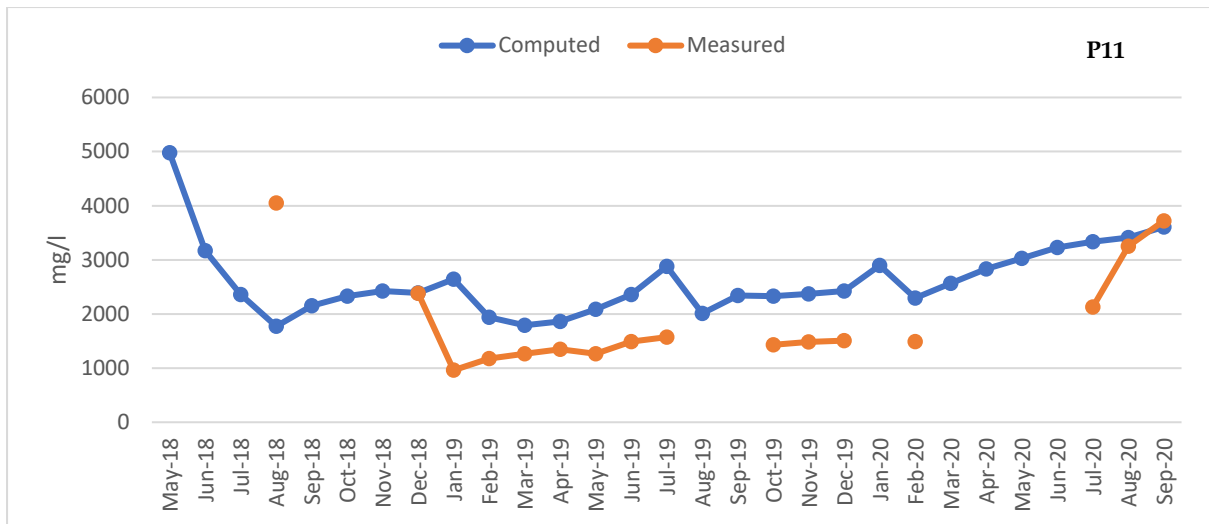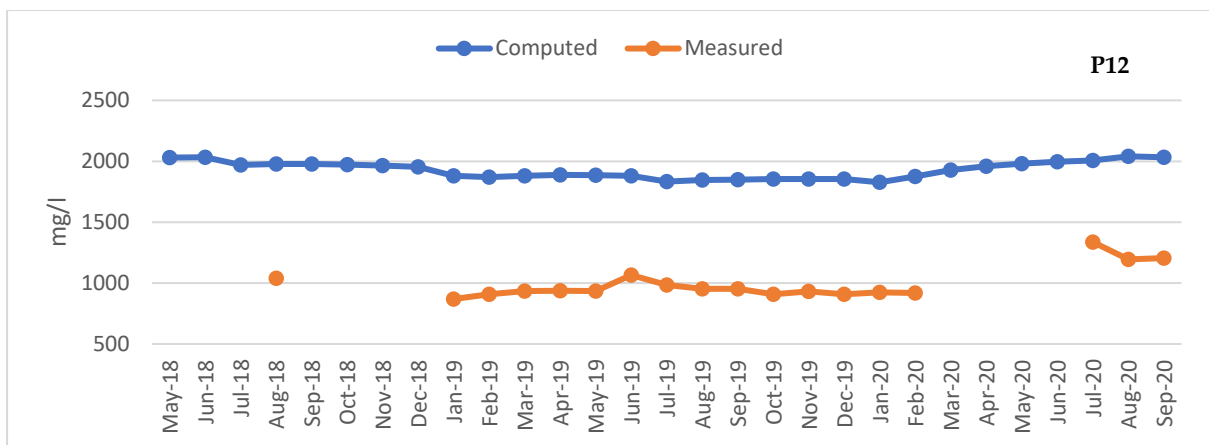*Figure S42. Well 10 hydrograph (transport model - variable density)*

Figure S43. *Well 11 hydrograph (transport model - variable density)*

Figure S44. *Well 12 hydrograph (transport model - variable density)*