

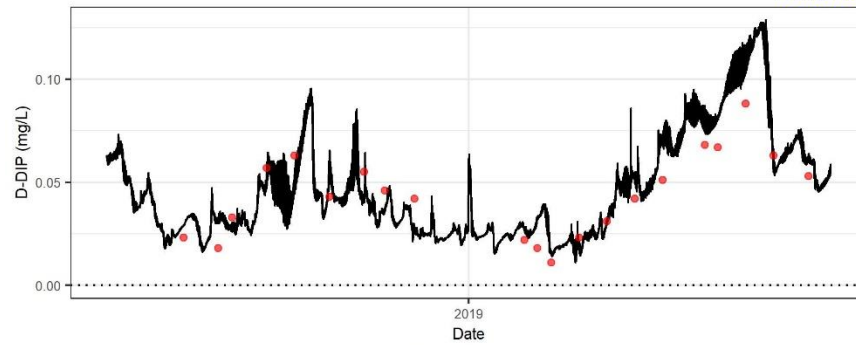
Appendix F: Model to Data Comparisons

Appendix F-3: Boat-run data (Time Series, 1-to-1, and CFD)

This appendix is in connection with Section 3.2.4.1.2 in the main report – Model-data comparisons for individual Boat Run locations. Model comparisons to Boat Run data were investigated using time series plots, 1-to-1 plots, cumulative frequency distributions, and statistical metrics for individual Boat Run stations. This appendix presents the comparisons at three stations within the urban area of the Delaware Estuary: Ben Franklin Bridge (RM 100.2), Paulsboro (RM 87.9), and Marcus Hook (RM 78.1).

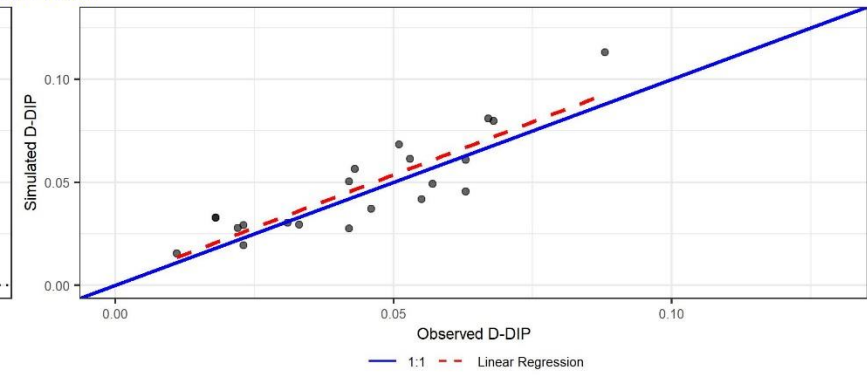
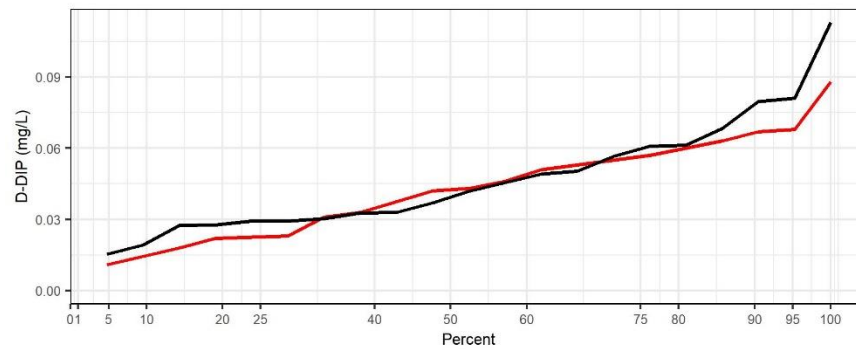
Benjamin Franklin Bridge (RM 100.2)

Parameter: D-DIP



Remark Code • Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.02	0.02	0.04	0.06	0.07	0.044
SIM	0.03	0.03	0.04	0.06	0.08	0.047

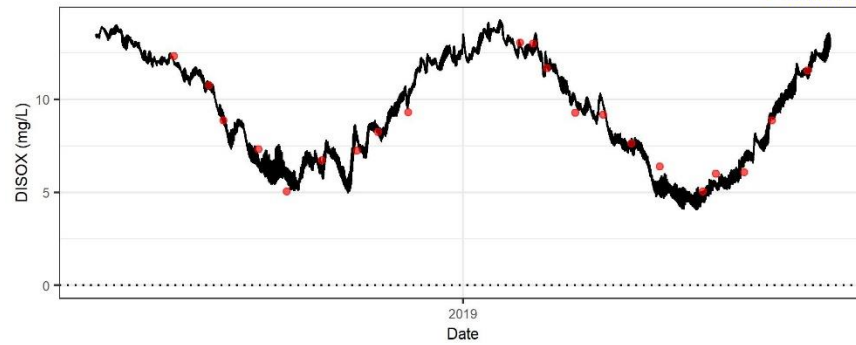
GoF Metric	Value
Num Obs	21.0000
R2	0.7633
NSE	0.6415
RMSE	0.0119
NRMSE %	15.5000
d	0.9203



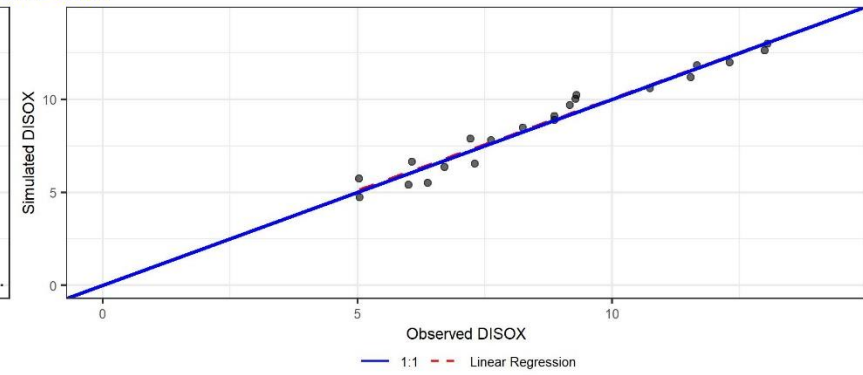
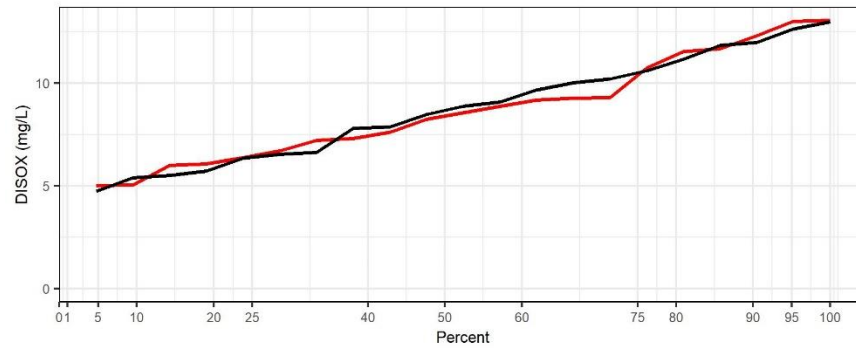
(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)

Parameter: DISOX



Remark Code ● Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	6.00	6.38	8.87	11.55	12.31	8.735
SIM	5.51	6.35	8.89	11.17	11.99	8.768

GoF Metric	Value
Num Obs	21.0000
R2	0.9594
NSE	0.9583
RMSE	0.5051
NRMSE %	6.3000
d	0.9896



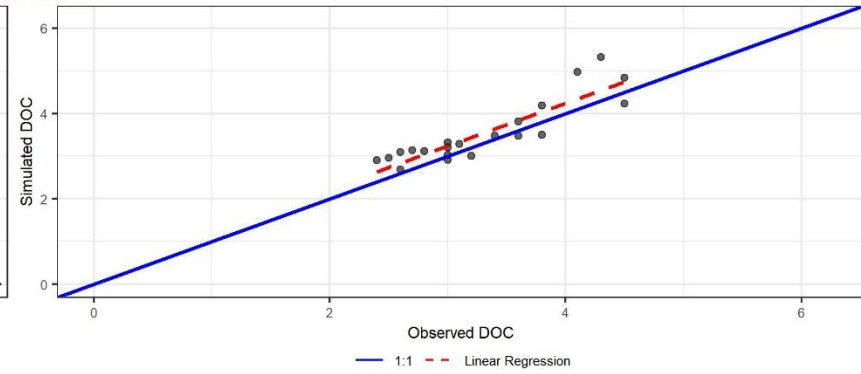
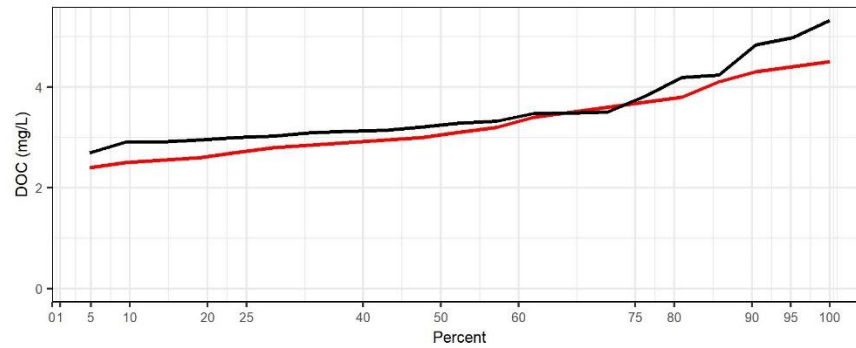
(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)

Parameter: DOC



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	2.60	2.7	3.10	3.80	4.30	3.310
SIM	2.91	3.0	3.28	4.19	4.84	3.548

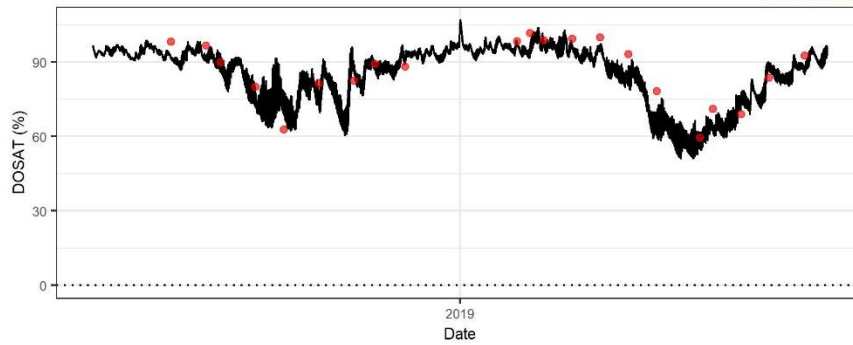
GoF Metric	Value
Num Obs	21.0000
R2	0.7878
NSE	0.5913
RMSE	0.4105
NRMSE %	19.5000
d	0.9076



(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

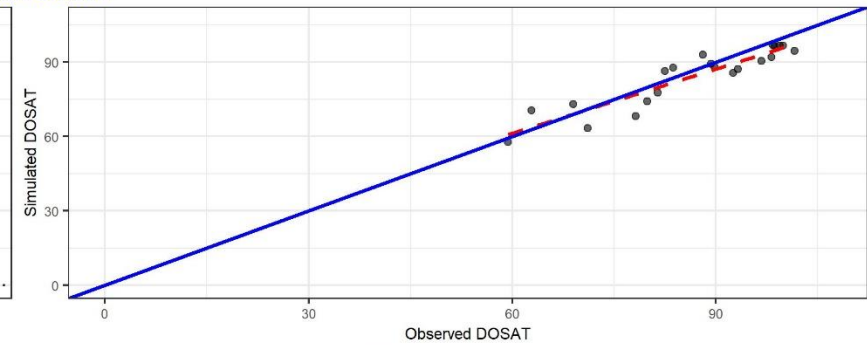
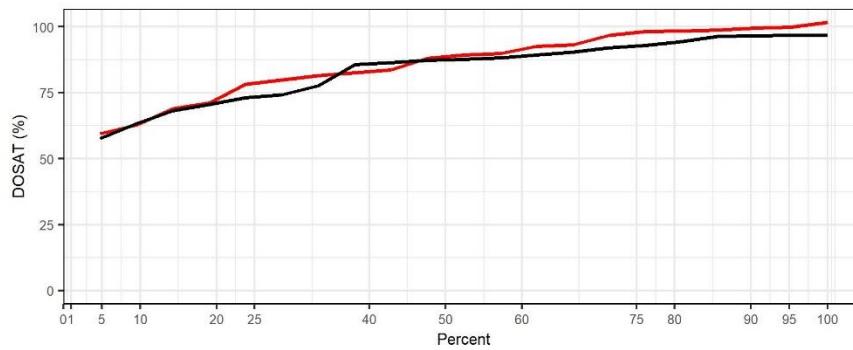
Benjamin Franklin Bridge (RM 100.2)

Parameter: DOSAT



Remark Code • Accepted

— Obs — Sim



— 1:1 - - Linear Regression

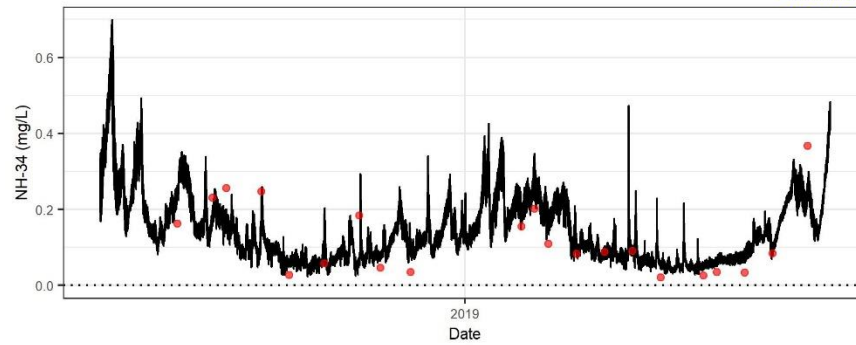
Dataset	10%	20%	50%	80%	90%	Average
OBS	69.00	78.20	89.30	98.40	99.40	86.371
SIM	68.14	73.09	87.73	94.41	96.55	84.059

GoF Metric	Value
Num Obs	21.0000
R2	0.8527
NSE	0.8175
RMSE	5.2809
NRMSE %	12.5000
d	0.9500

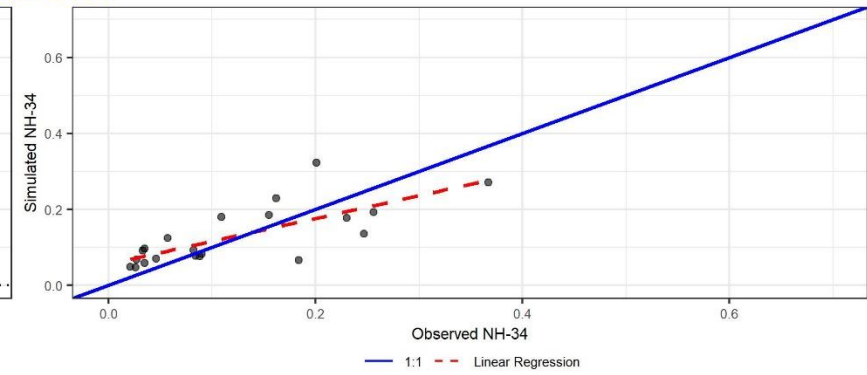
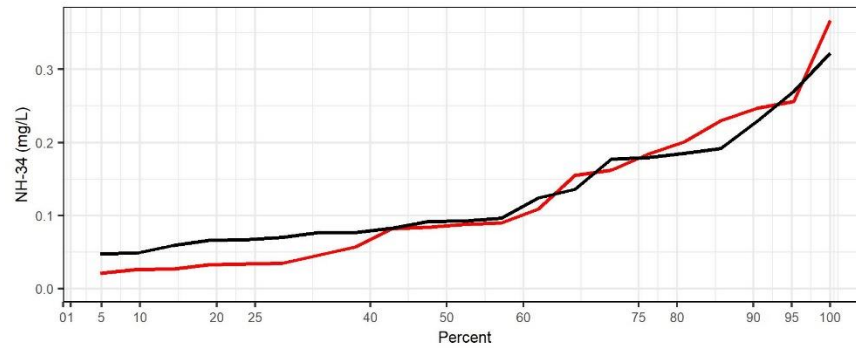


(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)
Parameter: NH-34



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.03	0.04	0.09	0.20	0.25	0.121
SIM	0.06	0.07	0.09	0.19	0.23	0.128

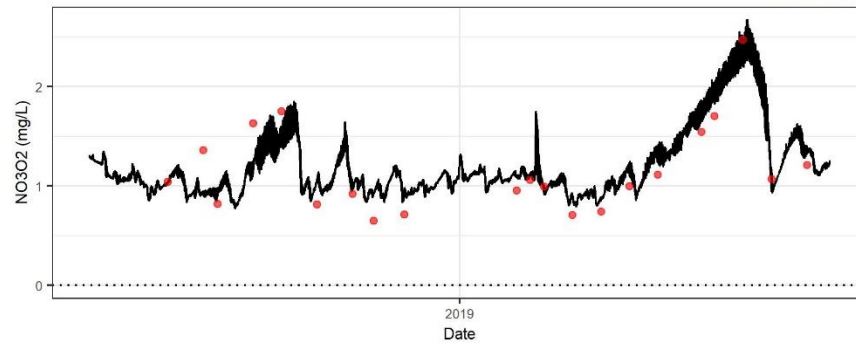
GoF Metric	Value
Num Obs	21.0000
R2	0.5567
NSE	0.5467
RMSE	0.0632
NRMSE %	18.3000
d	0.8465



(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

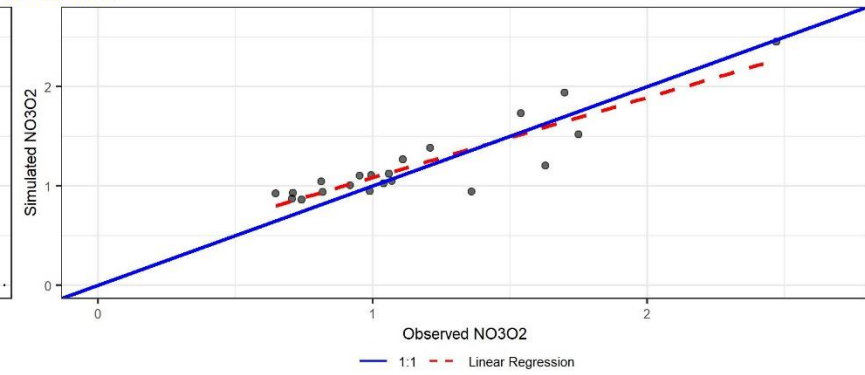
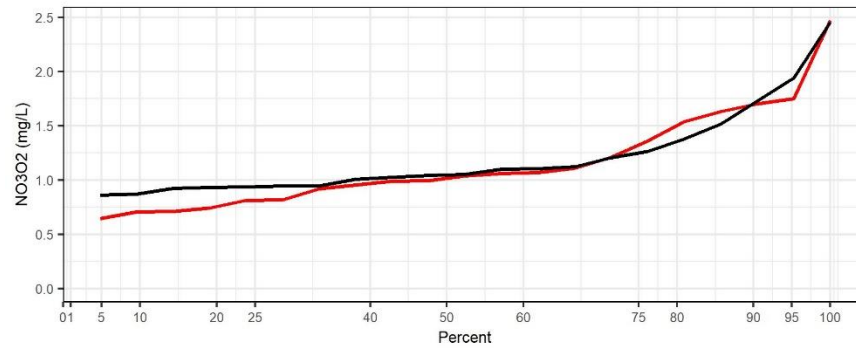
Benjamin Franklin Bridge (RM 100.2)

Parameter: NO3O2



Remark Code • Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.71	0.81	1.04	1.54	1.70	1.154
SIM	0.92	0.94	1.05	1.38	1.73	1.208

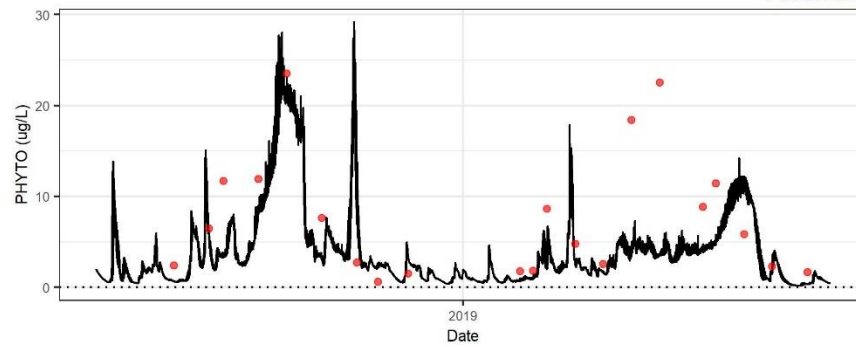
GoF Metric	Value
Num Obs	21.0000
R2	0.8081
NSE	0.7931
RMSE	0.1995
NRMSE %	10.9000
d	0.9404



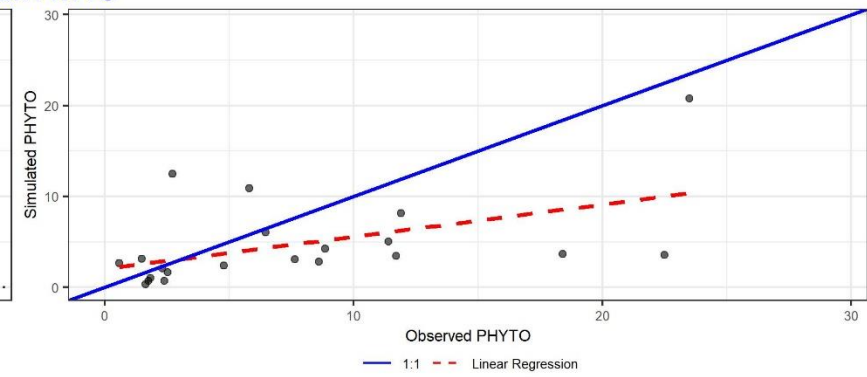
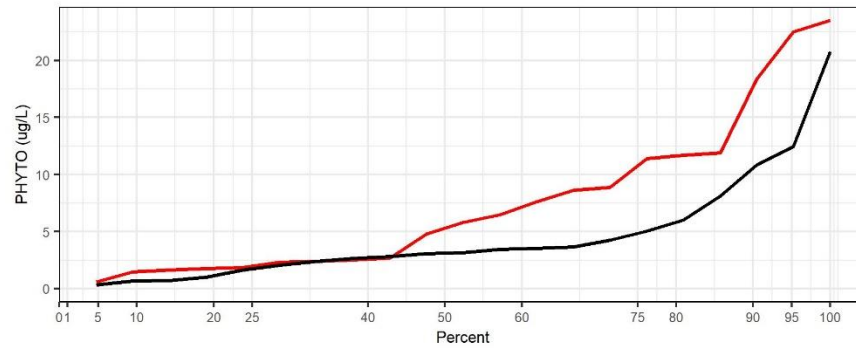
(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)

Parameter: PHYTO



Remark Code ● Accepted
— Obs — Sim



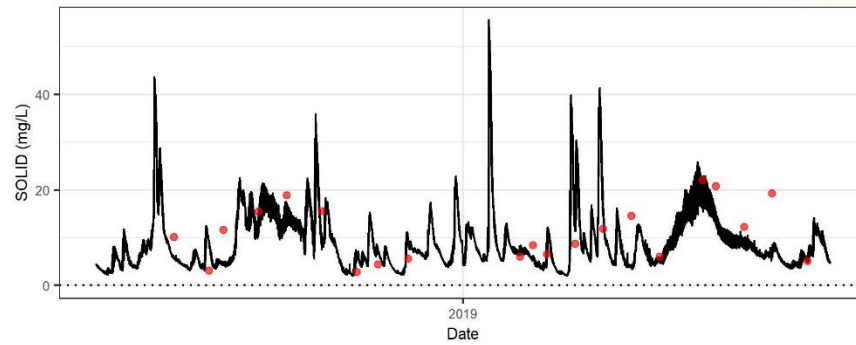
Dataset	10%	20%	50%	80%	90%	Average
OBS	1.64	1.83	5.81	11.70	18.40	7.561
SIM	0.72	1.64	3.14	6.01	10.87	4.701

GoF Metric	Value
Num Obs	21.0000
R2	0.2514
NSE	0.0288
RMSE	6.6306
NRMSE %	28.9000
d	0.6861

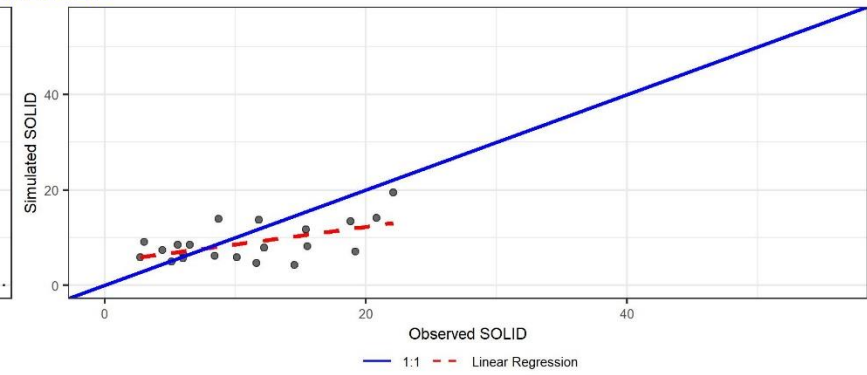
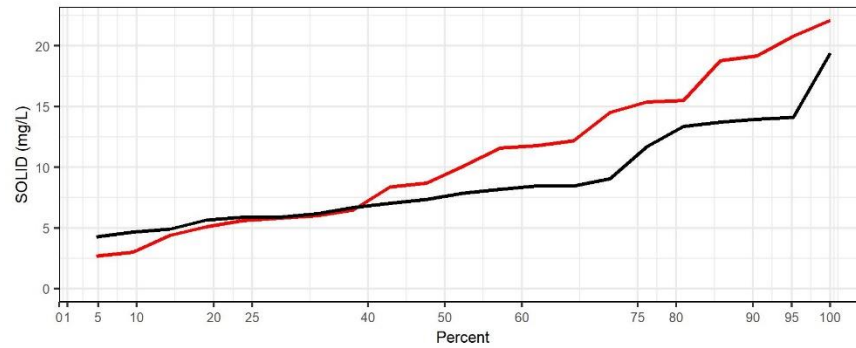


(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)
Parameter: SOLID



Remark Code ● Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	4.40	5.6	10.10	15.50	19.20	10.876
SIM	4.91	5.9	7.89	13.38	13.95	8.898

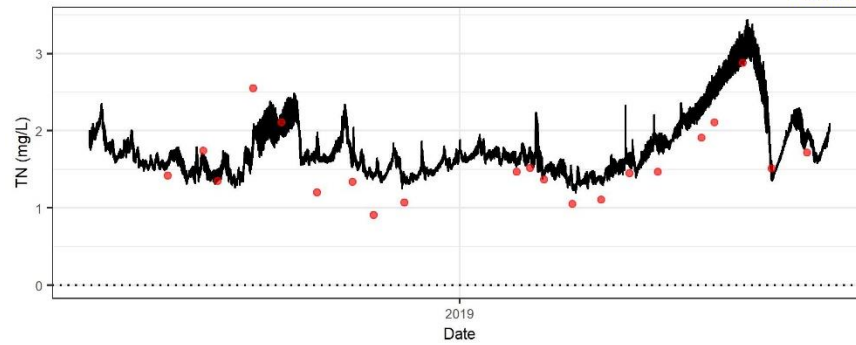
GoF Metric	Value
Num Obs	21.0000
R2	0.3107
NSE	0.1863
RMSE	5.2996
NRMSE %	27.3000
d	0.7043



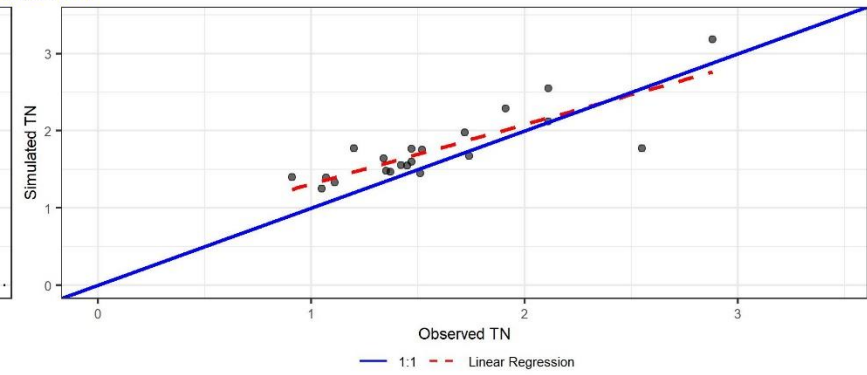
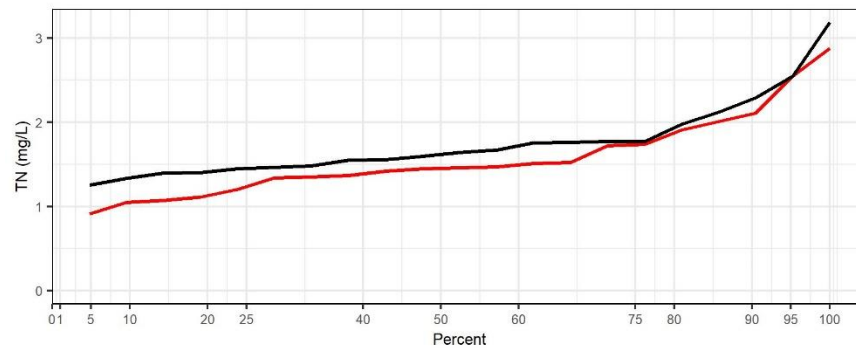
(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

Benjamin Franklin Bridge (RM 100.2)

Parameter: TN



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	1.07	1.20	1.47	1.91	2.11	1.584
SIM	1.40	1.45	1.64	1.98	2.29	1.761

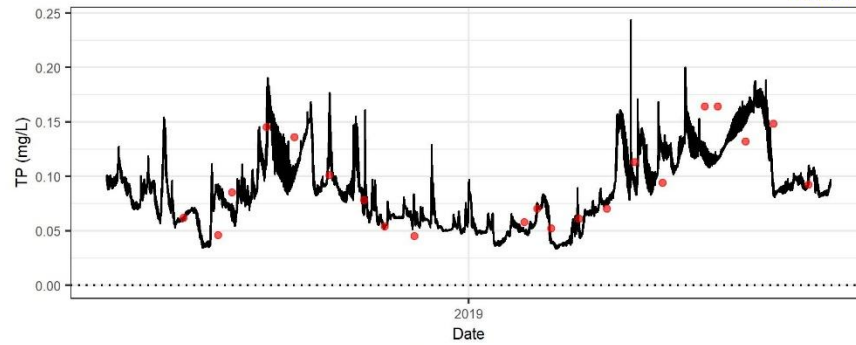
GoF Metric	Value
Num Obs	21.0000
R2	0.6993
NSE	0.5575
RMSE	0.3223
NRMSE %	16.4000
d	0.8780



(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

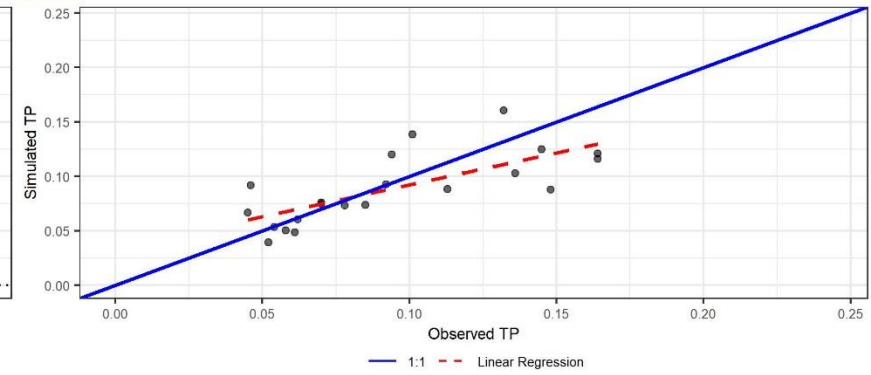
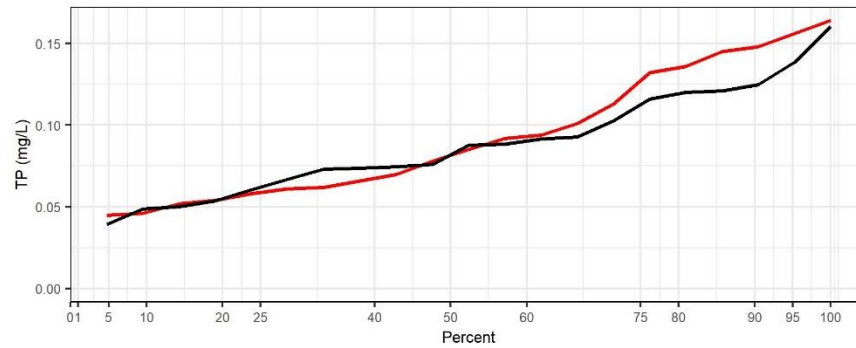
Benjamin Franklin Bridge (RM 100.2)

Parameter: TP



Remark Code • Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.05	0.06	0.09	0.14	0.15	0.094
SIM	0.05	0.06	0.09	0.12	0.12	0.089

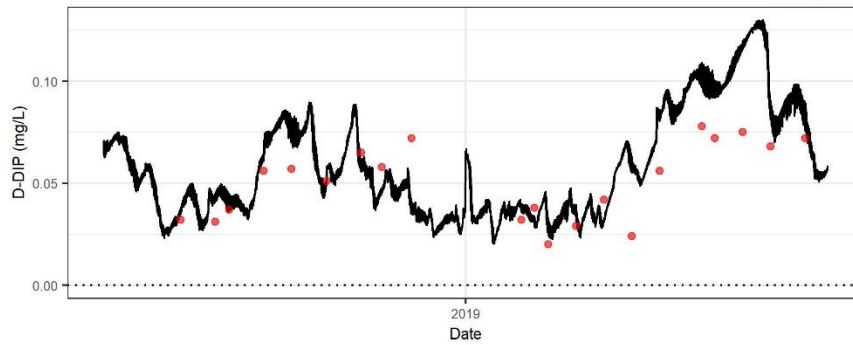
GoF Metric	Value
Num Obs	21.0000
R2	0.5240
NSE	0.4990
RMSE	0.0276
NRMSE %	23.2000
d	0.8267



(Calib Station: 31DELRBC-WQX-892071; WASP Seg: 1281)

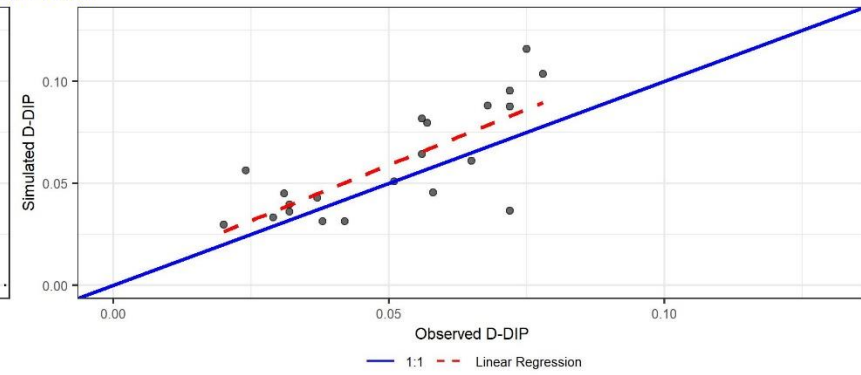
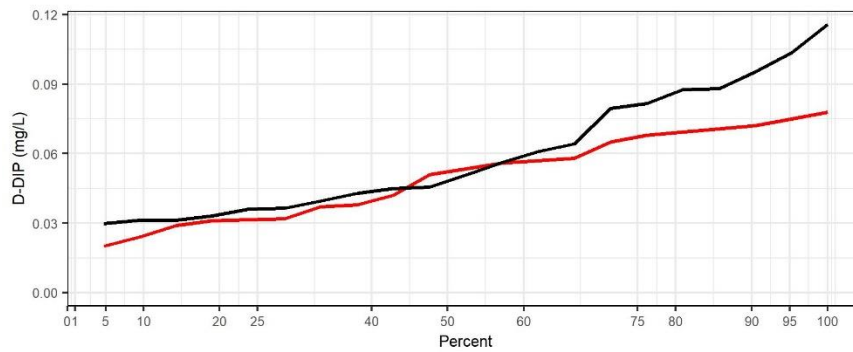
Paulsboro (RM 87.9)

Parameter: D-DIP



Remark Code • Accepted

— Obs — Sim



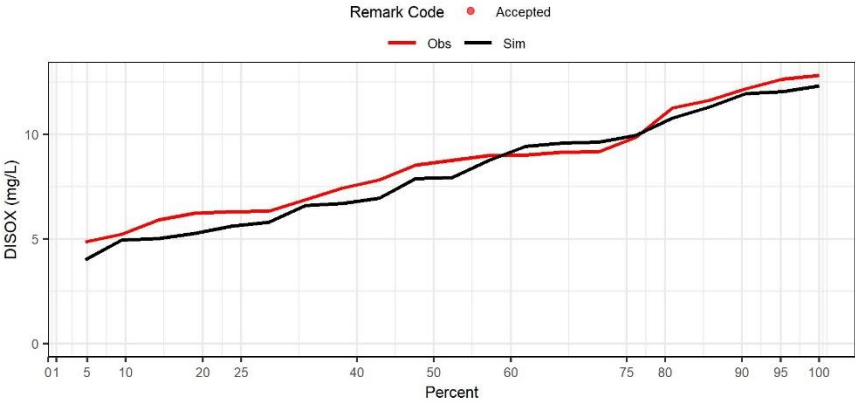
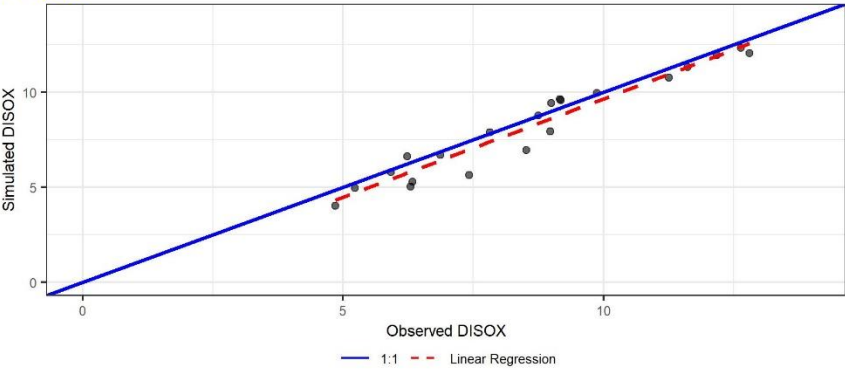
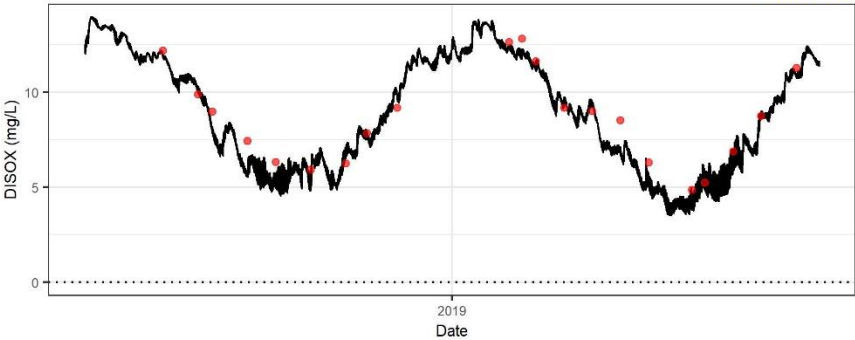
Dataset	10%	20%	50%	80%	90%	Average
OBS	0.03	0.03	0.06	0.07	0.07	0.051
SIM	0.03	0.04	0.05	0.09	0.10	0.060

GoF Metric	Value
Num Obs	21.0000
R2	0.5800
NSE	-0.1132
RMSE	0.0192
NRMSE %	33.2000
d	0.8065



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)
Parameter: DISOX



Dataset	10%	20%	50%	80%	90%	Average
OBS	5.92	6.30	8.75	11.26	12.18	8.616
SIM	5.02	5.63	7.93	10.77	11.95	8.214

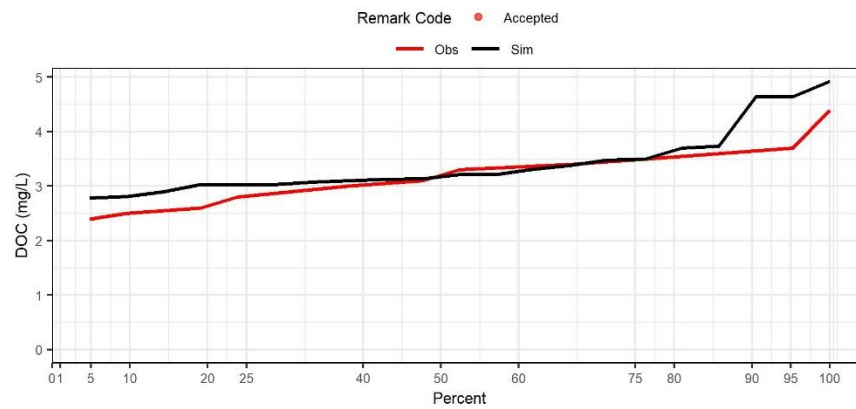
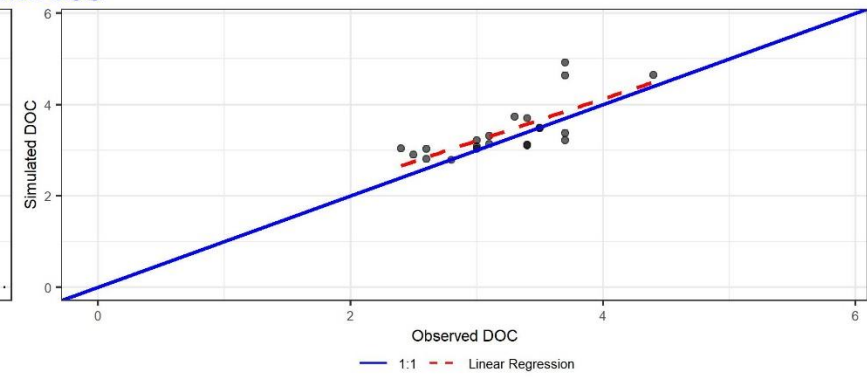
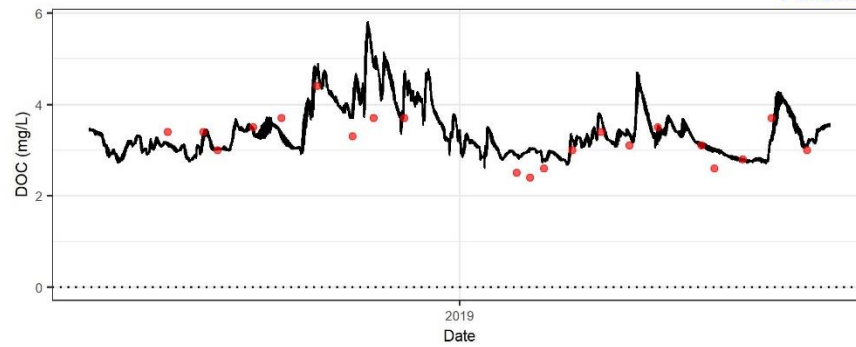
GoF Metric	Value
Num Obs	21.0000
R2	0.9368
NSE	0.8981
RMSE	0.7610
NRMSE %	9.6000
d	0.9760



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)

Parameter: DOC



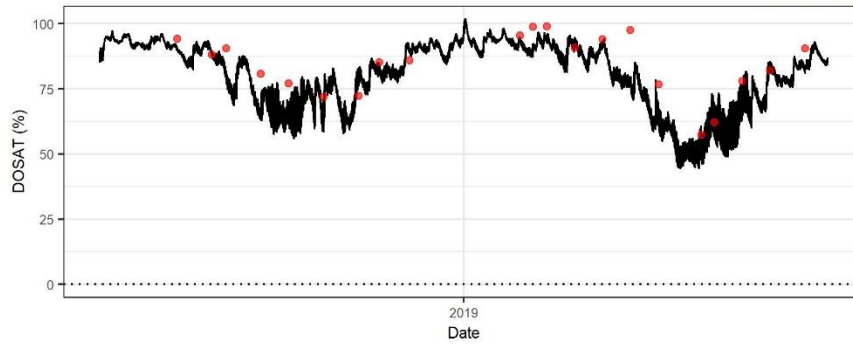
Dataset	10%	20%	50%	80%	90%	Average
OBS	2.6	2.80	3.30	3.7	3.70	3.229
SIM	2.9	3.03	3.22	3.7	4.64	3.418

GoF Metric	Value
Num Obs	21.0000
R2	0.5520
NSE	0.1595
RMSE	0.4421
NRMSE %	22.1000
d	0.8151

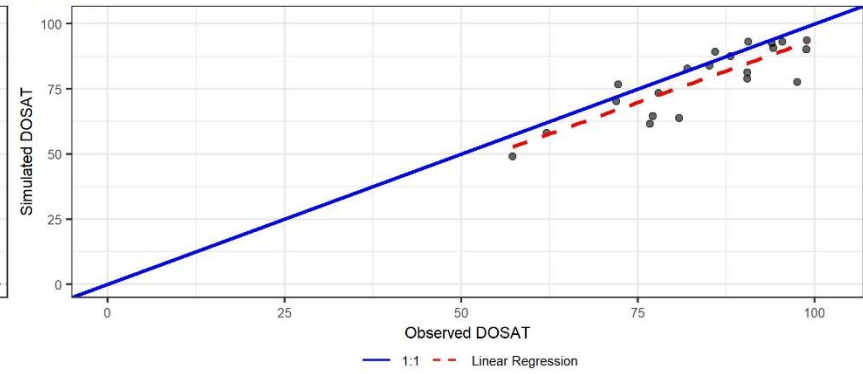
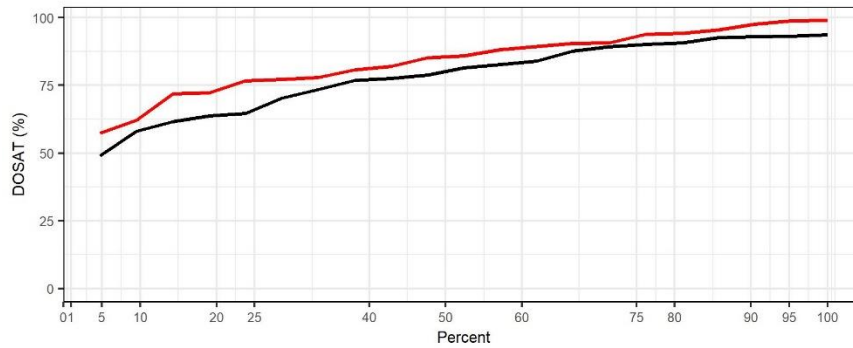


(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)
Parameter: DOSAT

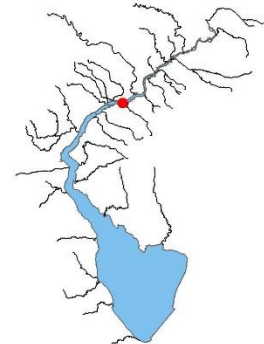


Remark Code ● Accepted
— Obs — Sim



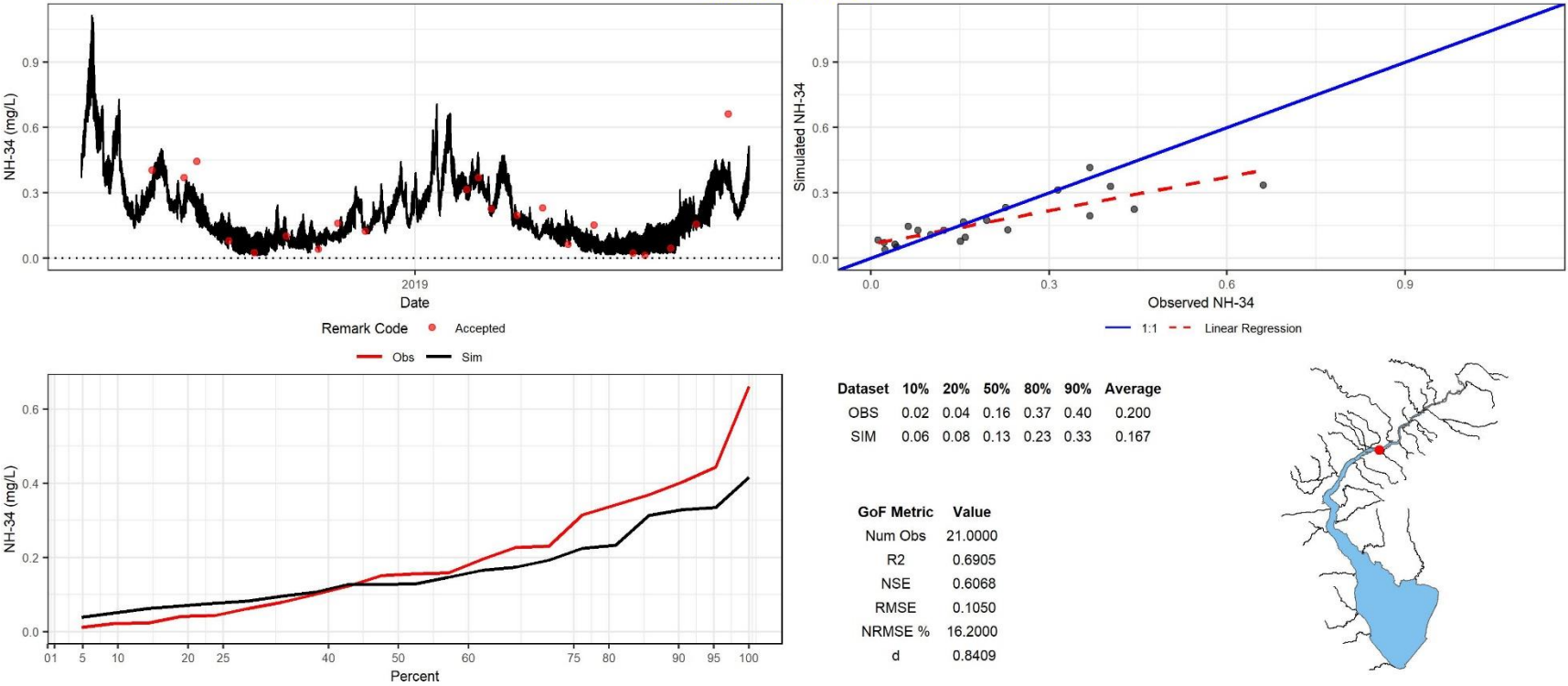
Dataset	10%	20%	50%	80%	90%	Average
OBS	71.90	76.70	85.90	94.10	97.50	84.157
SIM	61.55	64.56	81.37	90.66	92.99	78.654

GoF Metric	Value
Num Obs	21.0000
R2	0.7333
NSE	0.4276
RMSE	8.6312
NRMSSE %	20.7000
d	0.8765



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

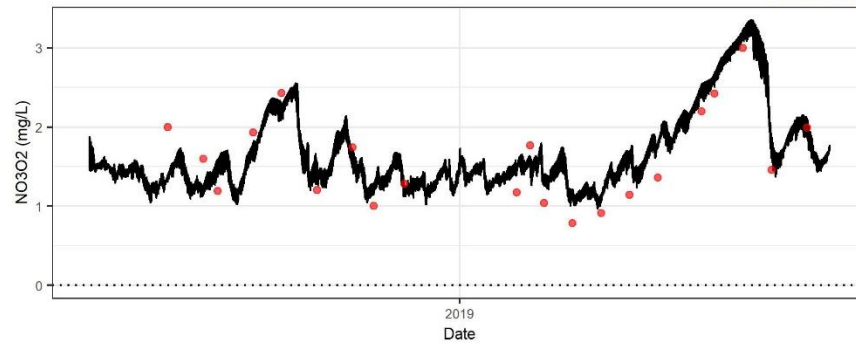
Paulsboro (RM 87.9)
 Parameter: NH-34



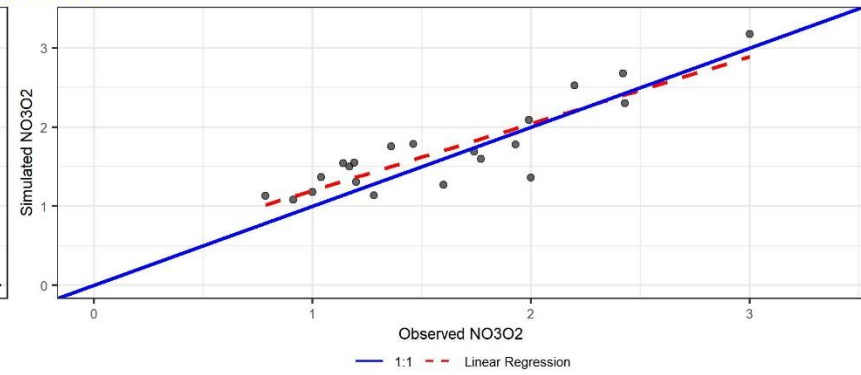
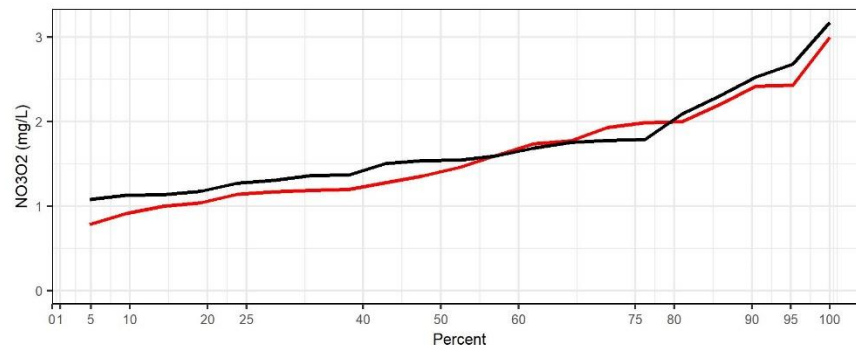
(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)

Parameter: NO3O2



Remark Code • Accepted
— Obs — Sim



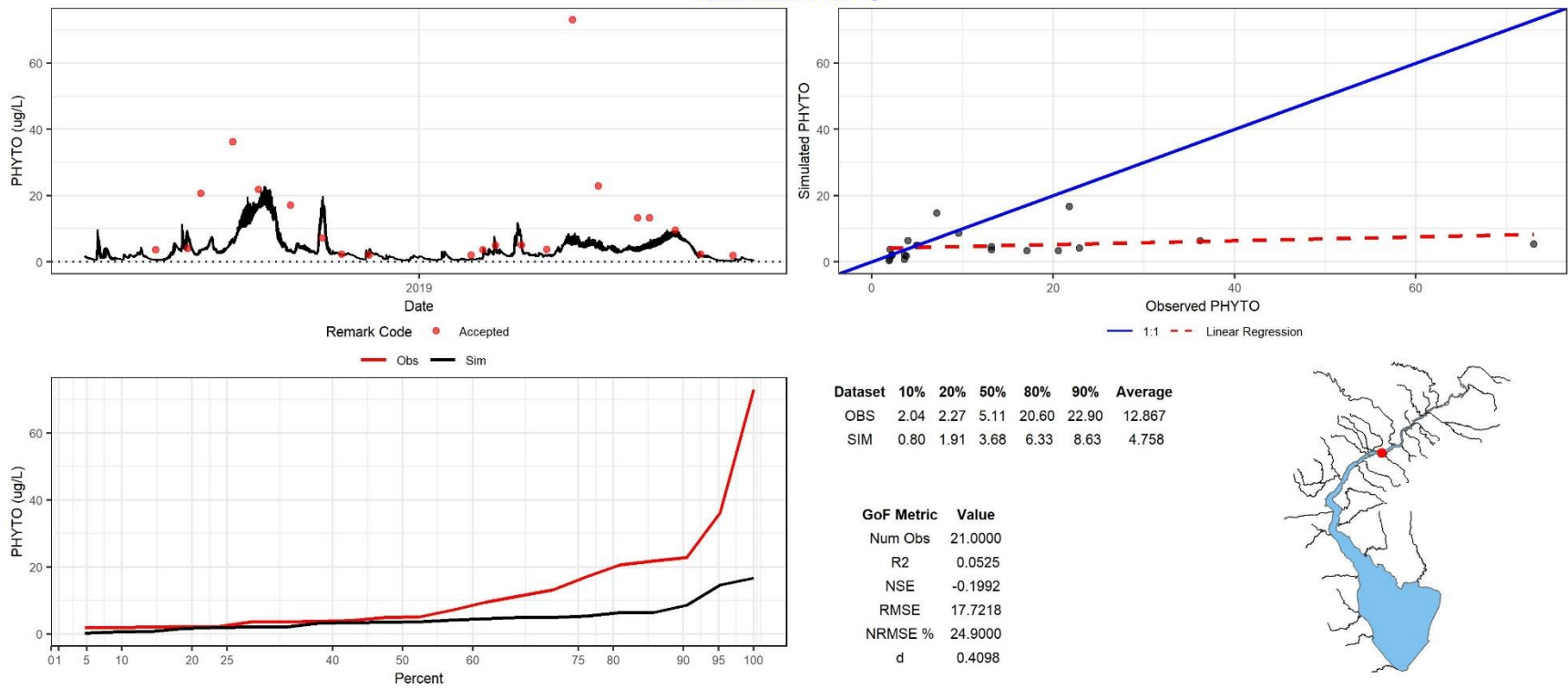
Dataset	10%	20%	50%	80%	90%	Average
OBS	1.00	1.14	1.46	2.00	2.42	1.601
SIM	1.14	1.27	1.55	2.09	2.53	1.705

GoF Metric	Value
Num Obs	21.0000
R2	0.7791
NSE	0.7402
RMSE	0.2915
NRMSE %	13.2000
d	0.9305



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)
Parameter: PHYTO



Dataset	10%	20%	50%	80%	90%	Average
OBS	2.04	2.27	5.11	20.60	22.90	12.867
SIM	0.80	1.91	3.68	6.33	8.63	4.758

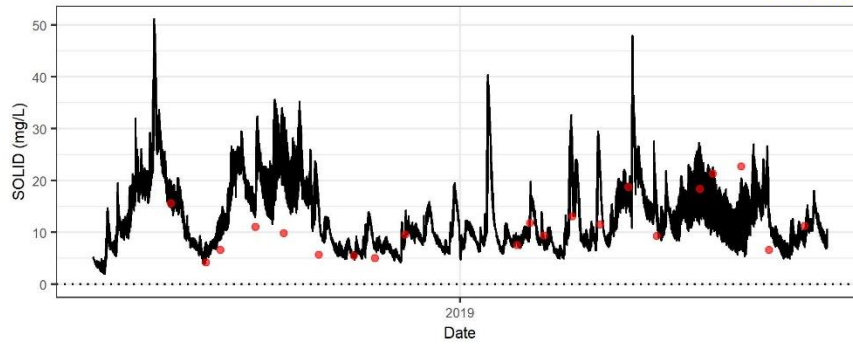
GoF Metric	Value
Num Obs	21.0000
R2	0.0525
NSE	-0.1992
RMSE	17.7218
NRMSE %	24.9000
d	0.4098



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

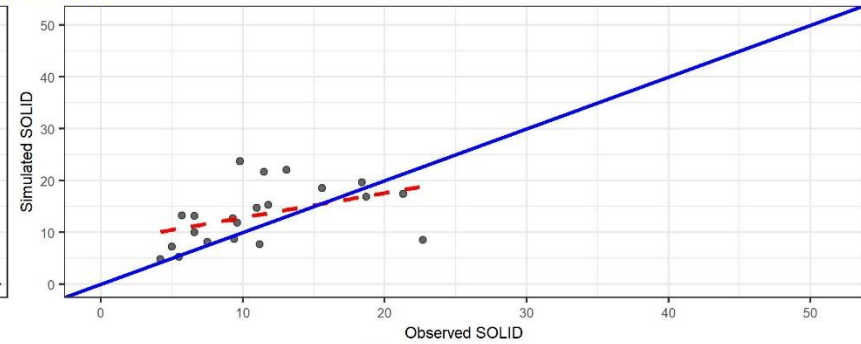
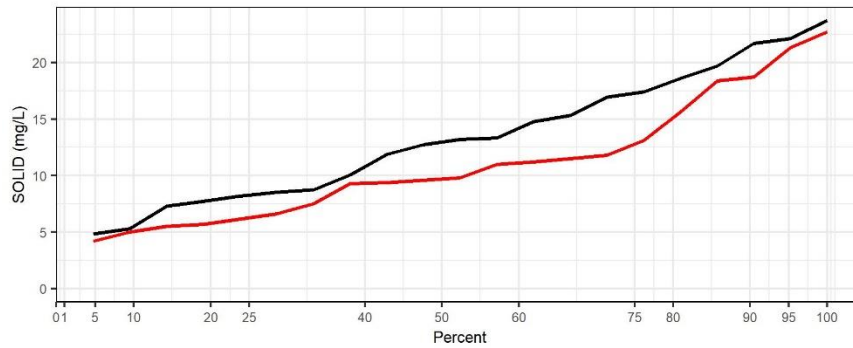
Paulsboro (RM 87.9)

Parameter: SOLID



Remark Code • Accepted

— Obs — Sim



— 1:1 - - Linear Regression

Dataset	10%	20%	50%	80%	90%	Average
OBS	5.50	6.60	9.80	15.60	18.7	11.167
SIM	7.28	8.18	13.22	18.57	21.7	13.429

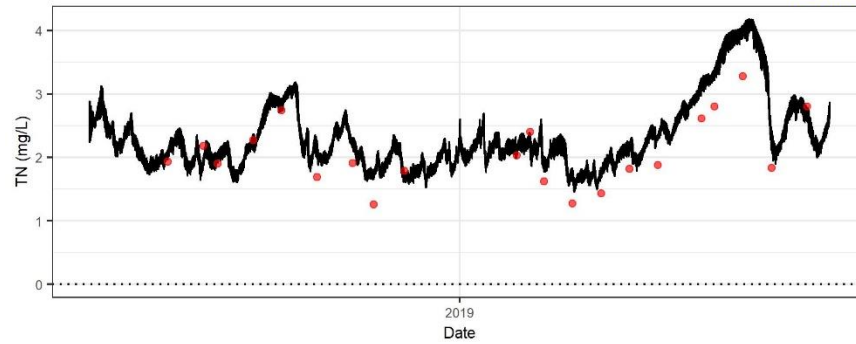
GoF Metric	Value
Num Obs	21.0000
R2	0.2032
NSE	-0.3440
RMSE	6.1102
NRMSE %	33.0000
d	0.6411



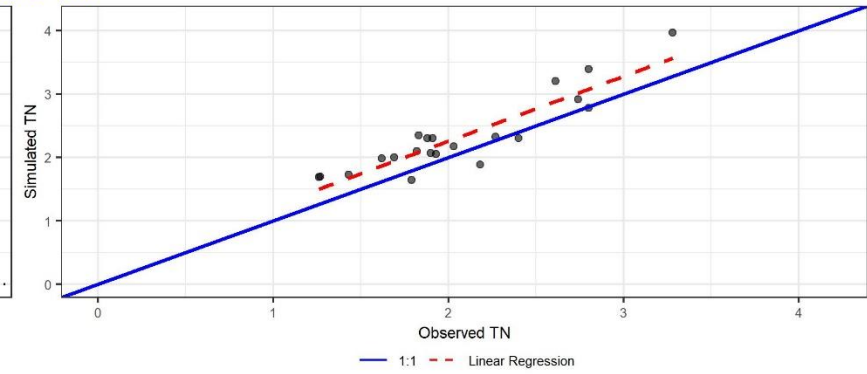
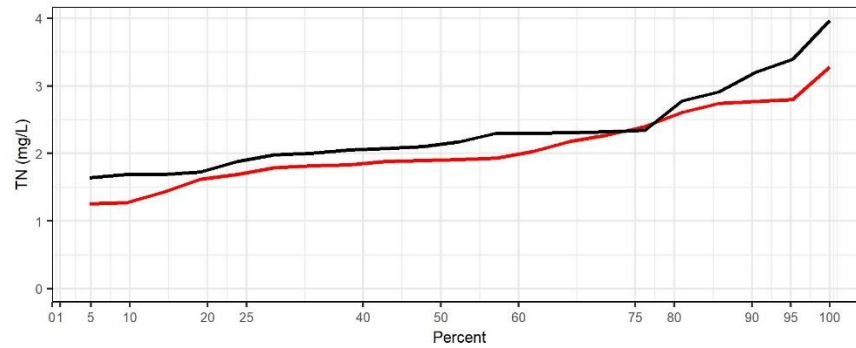
(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

Paulsboro (RM 87.9)

Parameter: TN



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	1.43	1.69	1.91	2.61	2.8	2.069
SIM	1.69	1.88	2.17	2.78	3.2	2.326

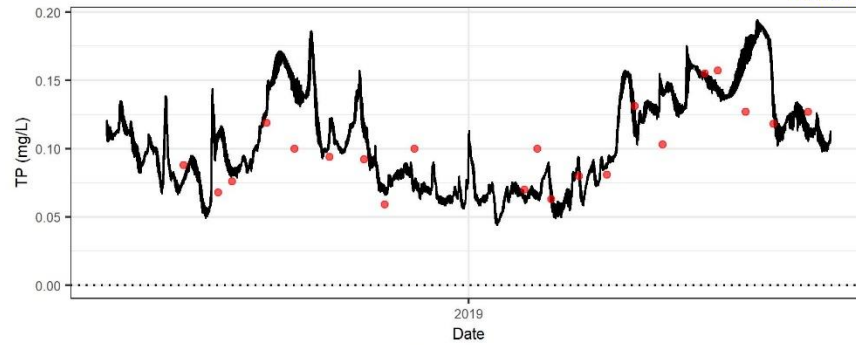
GoF Metric	Value
Num Obs	21.0000
R2	0.8176
NSE	0.5254
RMSE	0.3619
NRMSE %	17.9000
d	0.8989



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

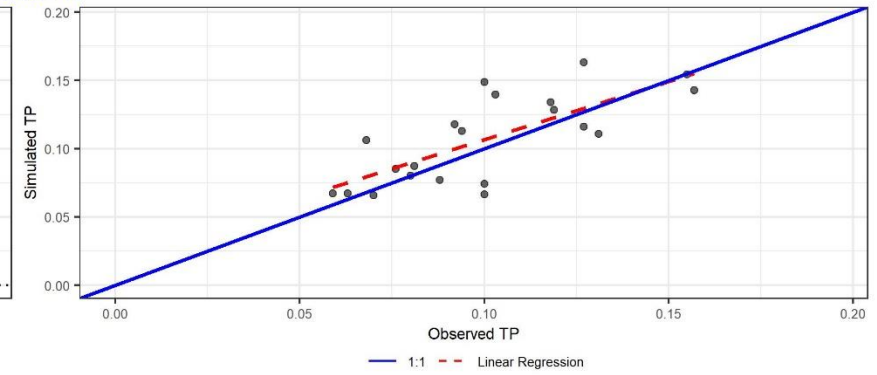
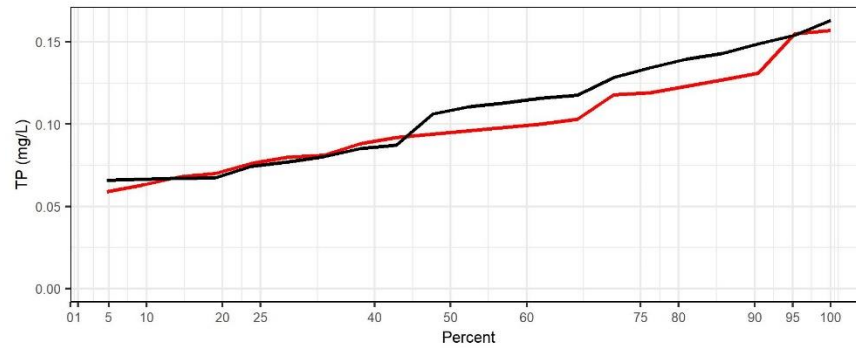
Paulsboro (RM 87.9)

Parameter: TP



Remark Code • Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.07	0.08	0.10	0.13	0.13	0.100
SIM	0.07	0.07	0.11	0.14	0.15	0.107

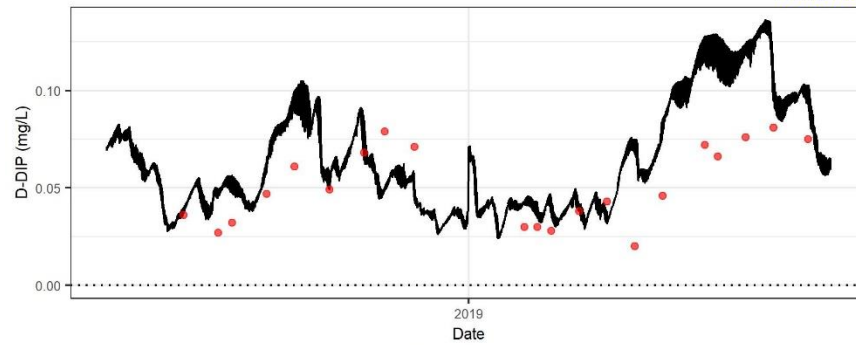
GoF Metric	Value
Num Obs	21.0000
R2	0.5489
NSE	0.3281
RMSE	0.0226
NRMSE %	23.0000
d	0.8393



(Calib Station: 31DELRBC-WQX-332052; WASP Seg: 1087)

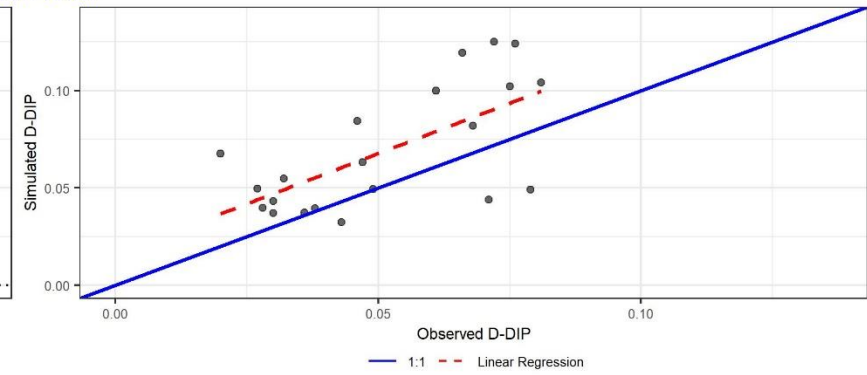
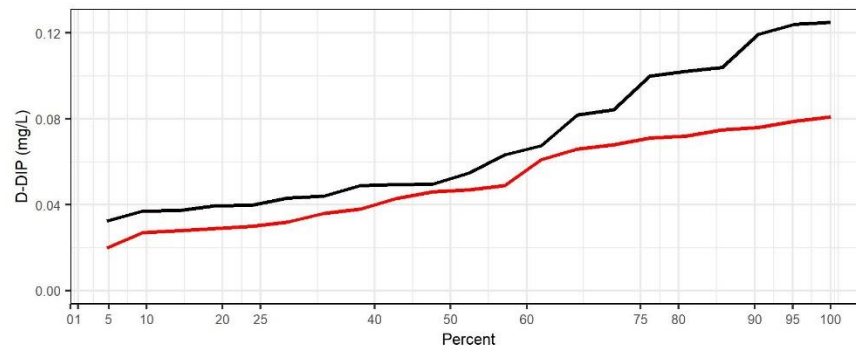
Marcus Hook (RM 78.1)

Parameter: D-DIP



Remark Code • Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.03	0.03	0.05	0.07	0.08	0.051
SIM	0.04	0.04	0.05	0.10	0.12	0.069

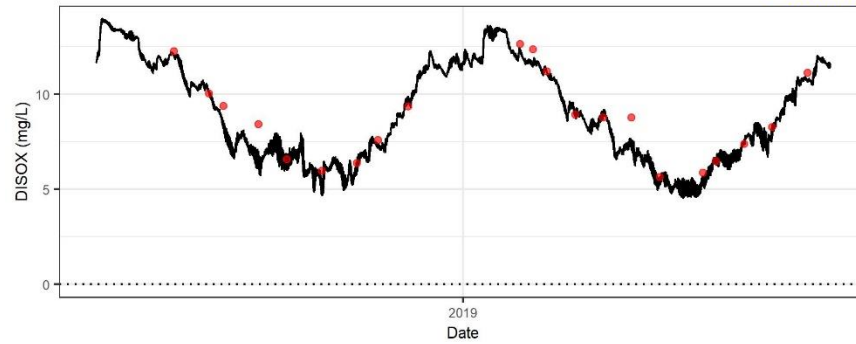
GoF Metric	Value
Num Obs	21.0000
R2	0.4323
NSE	-1.2139
RMSE	0.0293
NRMSE %	48.1000
d	0.6763



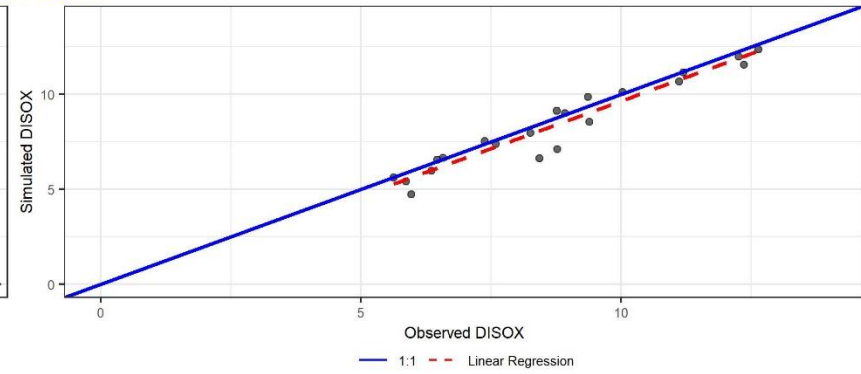
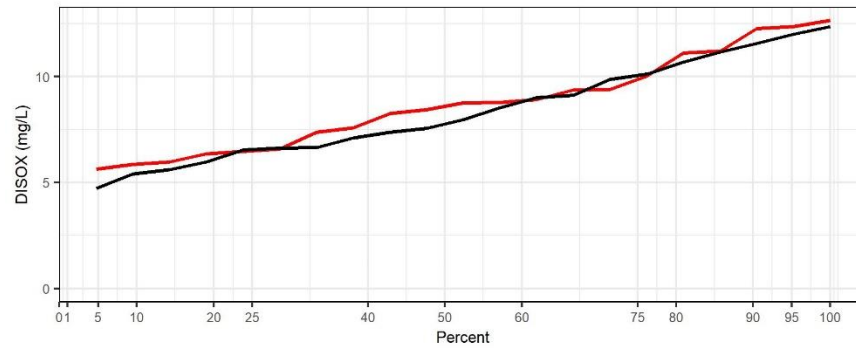
(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

Marcus Hook (RM 78.1)

Parameter: DISOX



Remark Code ● Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	5.97	6.47	8.76	11.12	12.26	8.731
SIM	5.61	6.54	7.97	10.68	11.56	8.374

GoF Metric	Value
Num Obs	21.0000
R2	0.9289
NSE	0.8970
RMSE	0.6984
NRMSE %	10.0000
d	0.9749



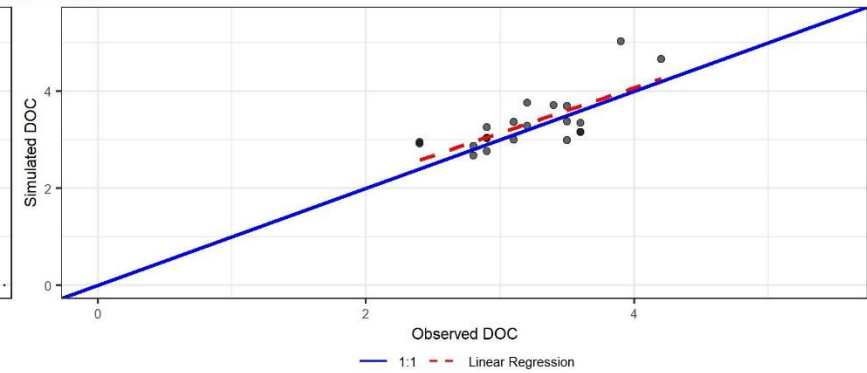
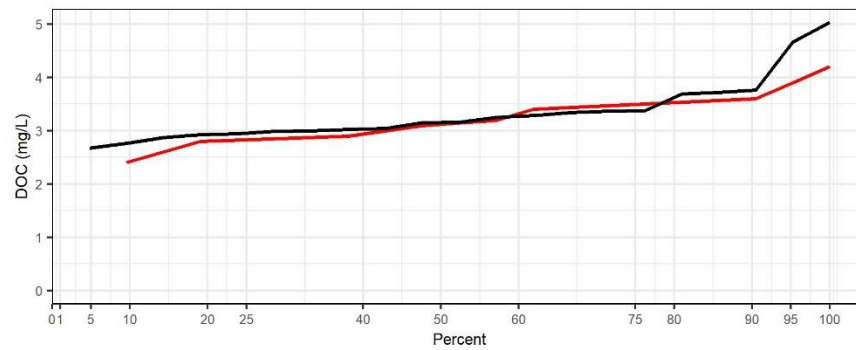
(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

Marcus Hook (RM 78.1)

Parameter: DOC



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	2.80	2.90	3.20	3.60	3.60	3.210
SIM	2.87	2.95	3.16	3.69	3.76	3.335

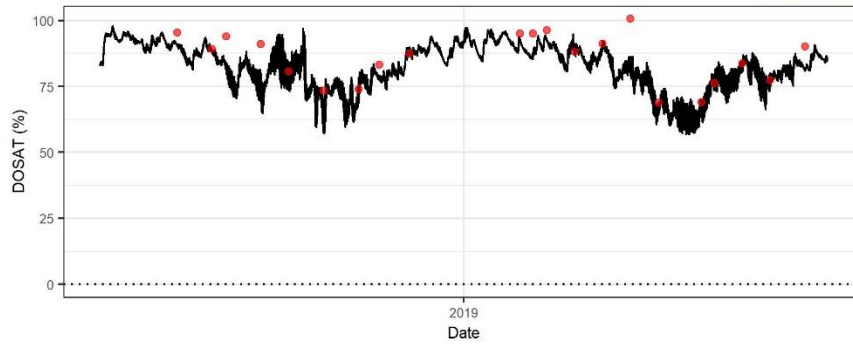
GoF Metric	Value
Num Obs	21.0000
R2	0.5351
NSE	0.1672
RMSE	0.4109
NRMSE %	22.8000
d	0.8222



(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

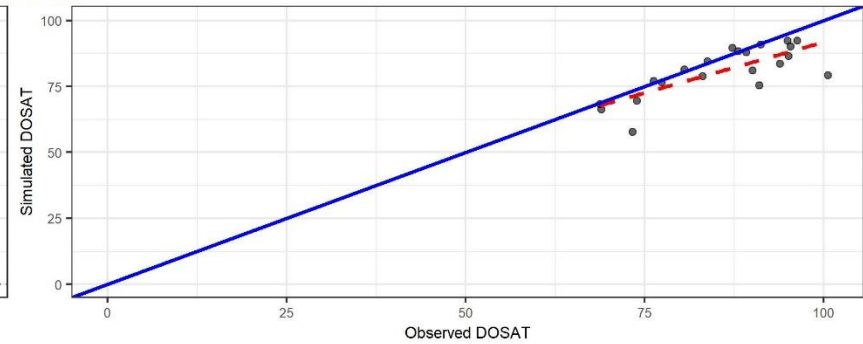
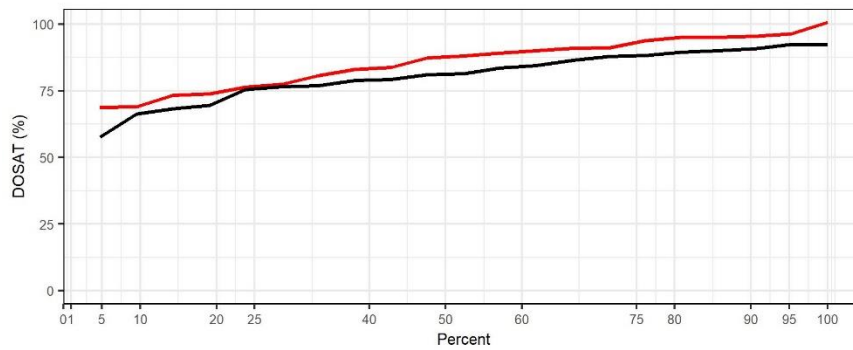
Marcus Hook (RM 78.1)

Parameter: DOSAT



Remark Code ● Accepted

— Obs — Sim



— 1:1 - - Linear Regression

Dataset	10%	20%	50%	80%	90%	Average
OBS	73.30	76.30	88.10	95.00	95.40	85.686
SIM	68.24	75.44	81.39	89.58	90.81	80.819

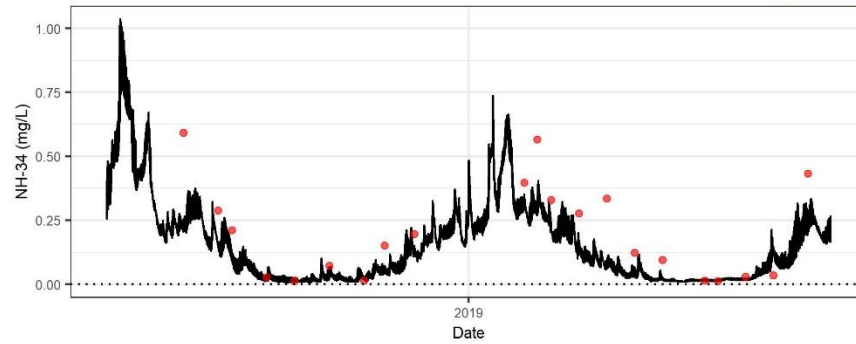
GoF Metric	Value
Num Obs	21.0000
R2	0.5999
NSE	0.2795
RMSE	7.9018
NRMSE %	24.8000
d	0.8288



(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

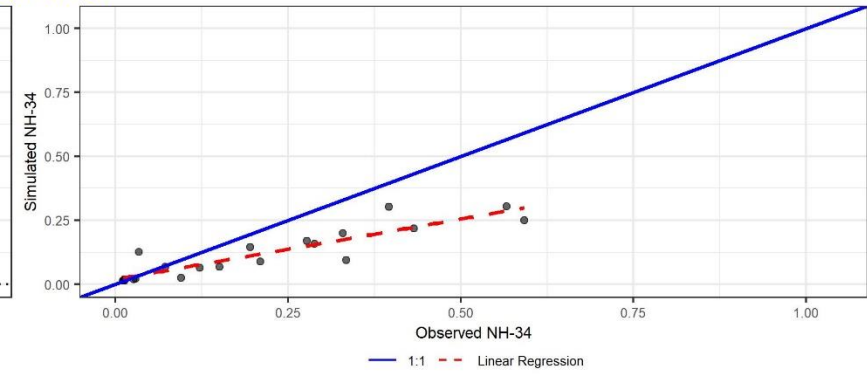
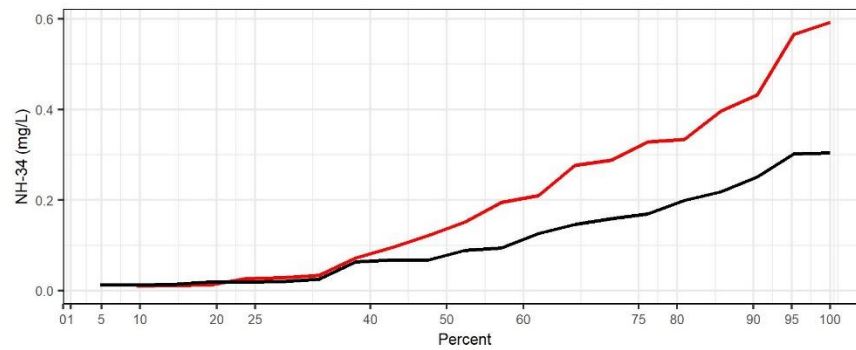
Marcus Hook (RM 78.1)

Parameter: NH-34



Remark Code • Accepted

— Obs — Sim



— 1:1 - - Linear Regression

Dataset	10%	20%	50%	80%	90%	Average
OBS	0.01	0.03	0.15	0.33	0.43	0.200
SIM	0.01	0.02	0.09	0.20	0.25	0.113

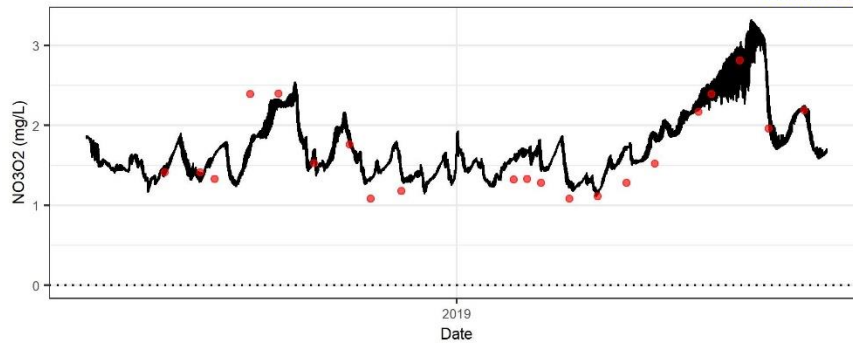
GoF Metric	Value
Num Obs	21.0000
R2	0.8244
NSE	0.4479
RMSE	0.1349
NRMSE %	23.2000
d	0.7847



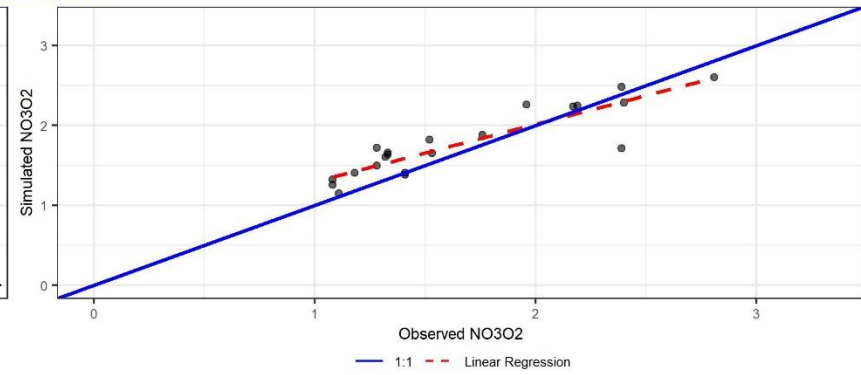
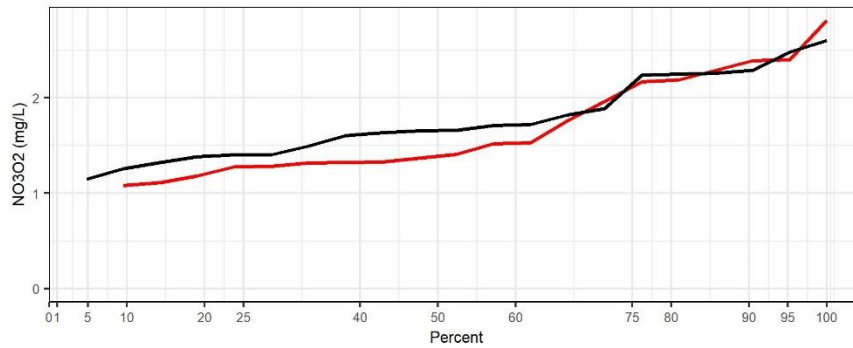
(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

Marcus Hook (RM 78.1)

Parameter: NO3O2



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	1.11	1.28	1.41	2.19	2.39	1.663
SIM	1.32	1.40	1.66	2.25	2.29	1.772

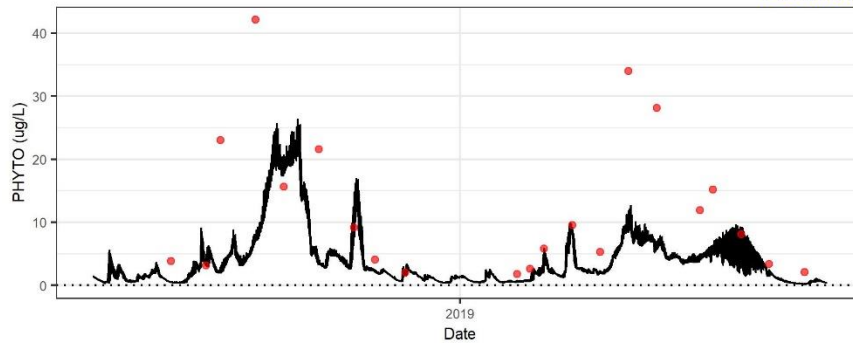
GoF Metric	Value
Num Obs	21.0000
R2	0.8007
NSE	0.7476
RMSE	0.2586
NRMSE %	15.0000
d	0.9201



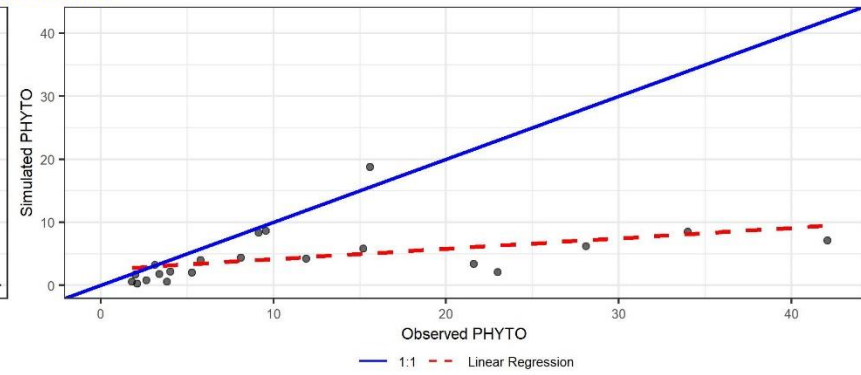
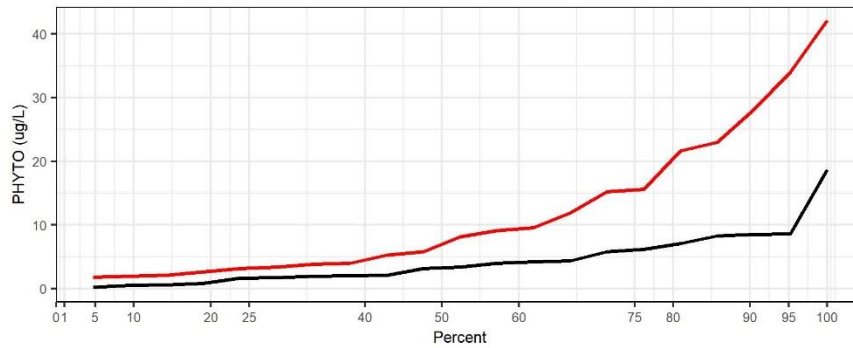
(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

Marcus Hook (RM 78.1)

Parameter: PHYTO



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	2.11	3.14	8.11	21.60	28.10	12.013
SIM	0.58	1.69	3.37	7.08	8.48	4.476

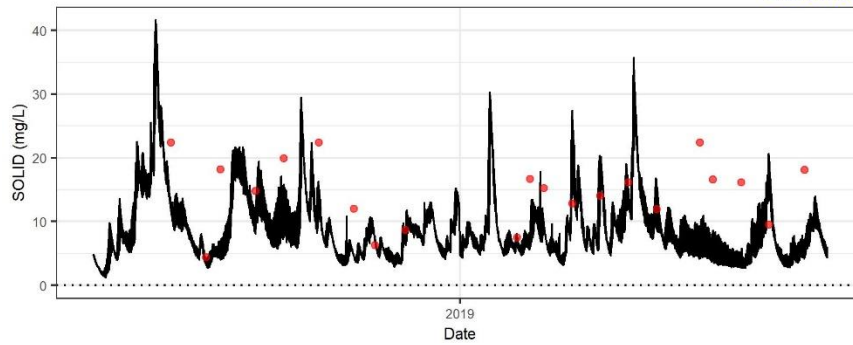
GoF Metric	Value
Num Obs	21.0000
R2	0.2023
NSE	-0.2511
RMSE	12.6164
NRMSE %	31.3000
d	0.5381



(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

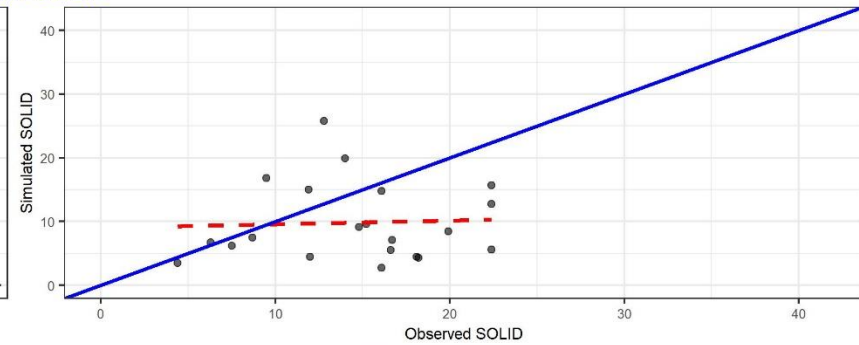
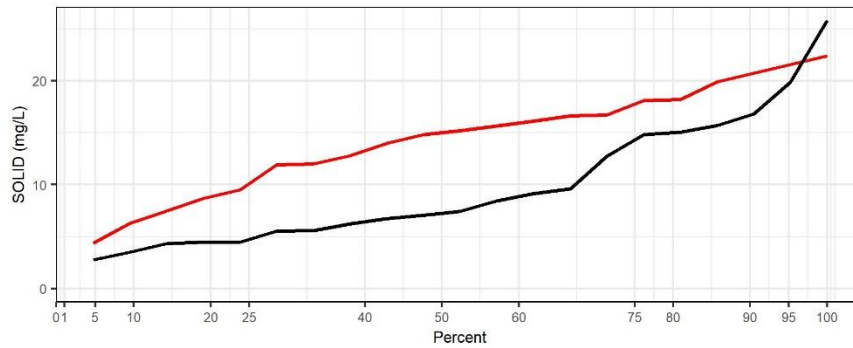
Marcus Hook (RM 78.1)

Parameter: SOLID



Remark Code • Accepted

— Obs — Sim



— 1:1 — Linear Regression

Dataset	10%	20%	50%	80%	90%	Average
OBS	7.50	9.50	15.20	18.20	22.4	14.571
SIM	4.33	4.47	7.44	15.04	16.8	9.813

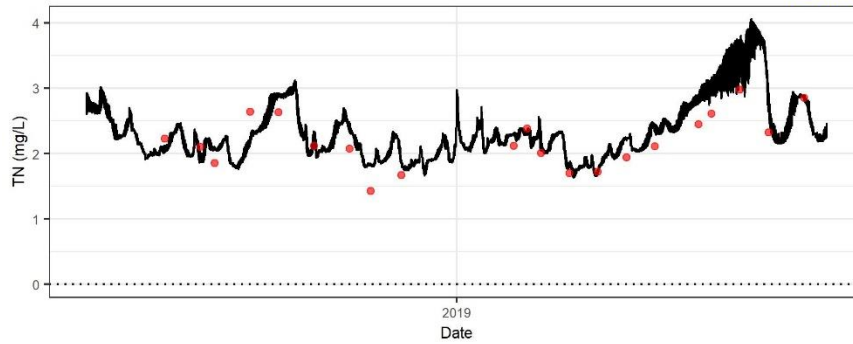
GoF Metric	Value
Num Obs	21.0000
R2	0.0024
NSE	-2.1137
RMSE	9.0380
NRMSE %	50.2000
d	0.4223



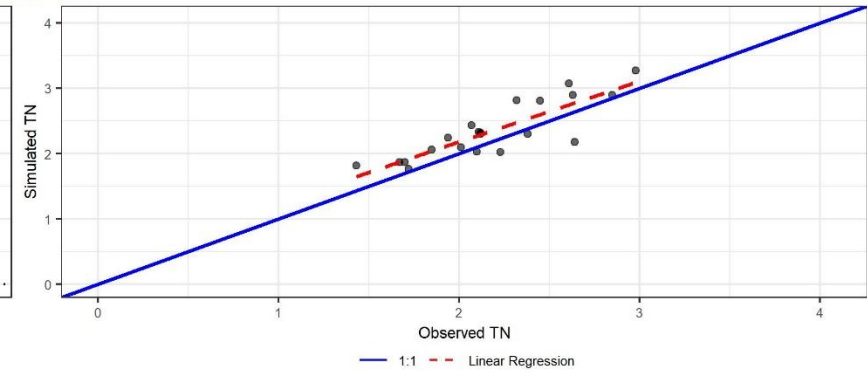
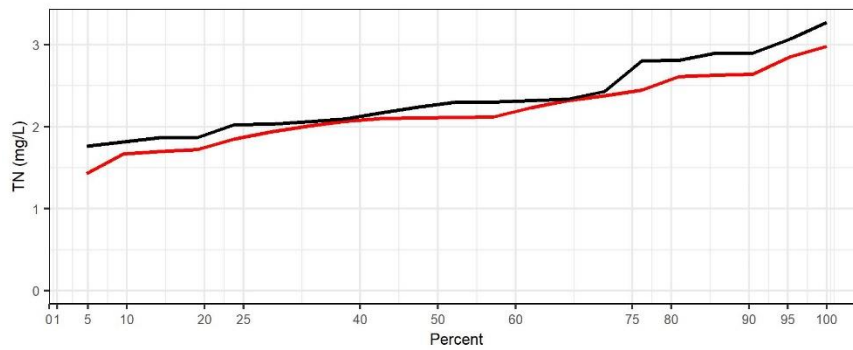
(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

Marcus Hook (RM 78.1)

Parameter: TN



Remark Code • Accepted
— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	1.70	1.85	2.12	2.61	2.64	2.187
SIM	1.87	2.02	2.30	2.81	2.90	2.352

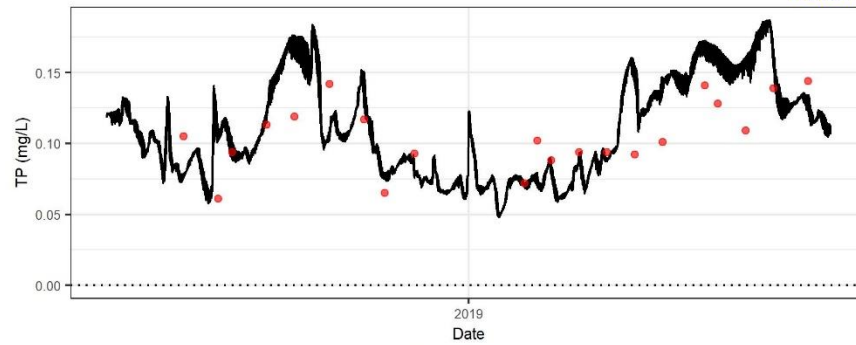
GoF Metric	Value
Num Obs	21.0000
R2	0.7342
NSE	0.5095
RMSE	0.2782
NRMSE %	17.9000
d	0.8863



(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)

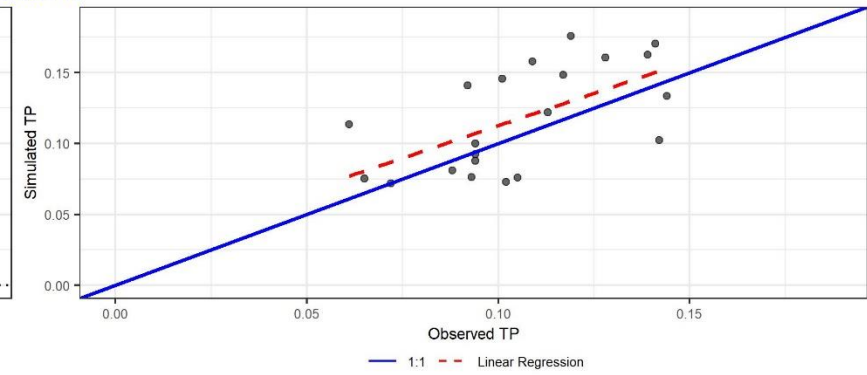
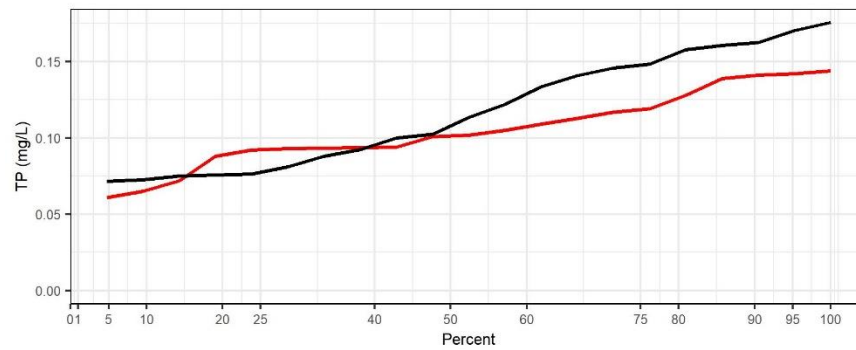
Marcus Hook (RM 78.1)

Parameter: TP



Remark Code ● Accepted

— Obs — Sim



Dataset	10%	20%	50%	80%	90%	Average
OBS	0.07	0.09	0.10	0.13	0.14	0.105
SIM	0.08	0.08	0.11	0.16	0.16	0.117

GoF Metric	Value
Num Obs	21.0000
R2	0.3695
NSE	-0.6916
RMSE	0.0310
NRMSE %	37.3000
d	0.7045



(Calib Station: 31DELRBC-WQX-332049; WASP Seg: 922)