

**Table SM0.** List of supplementary material and relevant information.

Nr	Filename	Filetype	Link
SM1	SM1-initial NO3 concentrations.xlsx	excel file (.xlsx); 1 sheet	<a href="#">Link</a>
SM2	SM2-nitrogen_data.nitrom	txt file with changed extension (.nitrom)	<a href="#">Link</a>
SM3	SM3-Video1 (initial state prediction).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM4_1	SM4_1-S1-1-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_2	SM4_2-S1-2-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_3	SM4_3-S1-3-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_4	SM4_4-S1-4-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_5	SM4_5-S1-5-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_6	SM4_6-S2-1-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_7	SM4_7-S2-2-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_8	SM4_8-S2-3-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_9	SM4_9-S2-4-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_10	SM4_10-S2-5-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_11	SM4_11-S3-1-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_12	SM4_12-S3-2-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_13	SM4_13-S3-3-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_14	SM4_14-S3-4-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM4_15	SM4_15-S3-5-all solutions.txt	text file (.txt)	<a href="#">Link</a>
SM5_1	SM5_1-S1 Results.xlsx	excel file (.xlsx); 10 sheets each	<a href="#">Link</a>
SM5_2	SM5_2-S2-Results.xlsx	excel file (.xlsx); 10 sheets each	<a href="#">Link</a>
SM5_3	SM5_3-S3-Results.xlsx	excel file (.xlsx); 10 sheets each	<a href="#">Link</a>
SM6	SM6-All identified solutions.xlsx	excel file (.xlsx); 3 sheets	<a href="#">Link</a>
SM7	SM7-Best 10% solutions.xlsx	excel file (.xlsx); 4 sheets	<a href="#">Link</a>
SM8_1	SM8_1-S1 best solutions graphic.pdf	adobe acrobat file (.pdf)	<a href="#">Link</a>
SM8_2	SM8_2-S2 best solutions graphic.pdf	adobe acrobat file (.pdf)	<a href="#">Link</a>
SM8_3	SM8_3-S3 best solutions graphic.pdf	adobe acrobat file (.pdf)	<a href="#">Link</a>
SM9	SM9-all strategies graphical	adobe acrobat file (.pdf)	<a href="#">Link</a>
SM10_1	SM10_1-Video2 (Strategy A_S1-1_a).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_2	SM10_2-Video3 (Strategy B_S1-5_b).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_3	SM10_3-Video4 (Strategy C_S1-35_c).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_4	SM10_4-Video5 (Strategy D_S1-49_d).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_5	SM10_5-Video6 (Strategy A_S2-1_a1).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_6	SM10_6-Video7 (Strategy E_S2-7_a2).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_7	SM10_7-Video8 (Strategy F_S2-17_b).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_8	SM10_8-Video9 (Strategy G_S2-29_c).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_9	SM10_9-Video10 (Strategy B_S2-34_d).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_10	SM10_10-Video11 (Strategy F_S3-1_a1).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_11	SM10_11-Video12 (Strategy H_S3-55_a2).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM10_12	SM10_12-Video13 (Strategy I_S3-72_b).wmv	Windows Media Video file (.wmv)	<a href="#">Link</a>
SM11	SM10-Concentration vs Time (12 strategies).xlsx	excel file (.xlsx)	<a href="#">Link</a>

## Detailed descriptions of Supplementary Materials

**SM1:** An Excel file with one sheet presenting the 80x80 cell grid representing the flow field, with the initial nitrate concentrations (mg/L) in layer 2 of the Modflow model.

**SM2:** A txt file with the changed extension (.nitrom) for ease of input data reading through code that practically includes the data of SM1 in the form that the application reads them.

**SM3:** A video file presenting the contaminant transport (pollution spread) if no pollution control/management strategy is implemented; the total required freshwater volume (total flow rate of 200 L/s for 300 days) by the existing wells ( $W_1$  and  $W_2$ ) is equally pumped by them ( $Q_1 = Q_2 = 100$  L/s). The pollution of the existing pumping scheme is predicted in approximately 100 days if no action is taken.

**SM4\_1 to SM4\_5:** 5 text files presenting the results of the five runs of Scenario 1 results; they are the original produced result files by the “Modflow-GA\_Nitro” software for Scenario 1.

**SM4\_6 to SM4\_10:** 5 text files presenting the results of the five runs of Scenario 2 results; they are the original produced result files by the “Modflow-GA\_Nitro” software for Scenario 2.

**SM4\_11 to SM4\_15:** 5 text files presenting the results of the five runs of Scenario 3 results; they are the original produced result files by the “Modflow-GA\_Nitro” software for Scenario 3.

**SM5\_1 to SM5\_3:** 3 Excel files, one for each Scenario. Each one presents all the results of the three scenarios (the same as the original result files: SM5\_1 = SM4\_1 to SM4\_5; SM5\_2 = SM4\_6 to SM4\_10; SM5\_3 = SM4\_11 to SM4\_15) in a more easily readable/editable fashion, including diagrams of the evolution of FV, VB1, and VB3 vs the nr of generations. For example, in SM05\_1, sheets 1,3,5,7,9 cite all results of each run for Scenario 1, including all chromosomes (PS = 60) for all generations (NG = 200). Sheets 2,4,6,8,10 present only the best solution (1st chromosome) per generation. The same applies to the other sheets and scenarios.

**SM6:** An Excel file with three sheets presenting all identified discrete solutions’ features for the 3 Scenarios S1-, S2, and S3.

SM6-Sheet 1 presents the 170 discrete solutions’ features of Scenario S1, including values of FV, VB1, VB2, VB3, coordinates of the AWs ( $X_{add,hi}$ ,  $Y_{add,hi}$ ,  $X_{add,lo}$ ,  $Y_{add,lo}$ ) and flow-rates of all wells ( $Q_{ex,1}$ ,  $Q_{ex,2}$ ,  $Q_{add,hi}$ ,  $Q_{add,lo}$ ), as well as the ratio of flow-rates of the EWs ( $Q_{ex,1}/Q_{ex,2}$ ), the same ratio concerning AWs (high to low,  $Q_{add,hi}/Q_{add,lo}$ ), the sum of flow-rates of the AWs ( $\Sigma Q_{add}$ ), and the sum of AWs’ pumped nitrate mass (overload\_ad). While the raw produced results include AWs’ results in an enumerated fashion ( $Q_3$ ,  $Q_4$  meaning  $Q_{add,1}$ ,  $Q_{add,2}$ ), they are processed to filter possible duplicate results (identical solutions with a different enumeration of AWs) and also for easier post-processing for identification of discrete solutions and categorization into different strategies. Thus, the results are presented by classifying AWs as high ( $Q_{add,hi}$ ) and low ( $Q_{add,lo}$ ), regarding their flow rates. Sheet 1 also shows statistics of the 170 discrete solutions produced by the algorithm’s five runs, i.e., average, median, min, median, mean, max, and standard deviation values.

SM6-Sheet 2 presents the respective 154 discrete solutions’ features for Scenario S2 and relevant statistics.

SM6-Sheet 3 presents the respective 221 discrete solutions’ features for Scenario S2 and relevant statistics.

**SM7:** An Excel file with three sheets presenting all identified solutions that exhibit up to a 10% increase in the FV value compared to the best solution of the respective Scenario, S1 or S2 or S3.

SM7-Sheet 1 presents all identified solutions that exhibit up to a 10% increase in the FV value ("best 10%") compared to the best solution of S1 (50 solutions out of 170 discrete solutions identified in the 5 GA runs of 500 generations each).

SM7-Sheet 2 presents the "best 10%" for S2 (54 out of 154 discrete solutions identified in the 5 GA runs of 500 generations each).

SM7-Sheet 3 presents the "best 10%" for S3 (103 solutions out of 221 discrete solutions identified in the 5 GA runs of 500 generations each).

**SM8\_1 to SM8\_3:** 3 pdf files, one for each Scenario (S1, S2, S3).

SM8\_1 features 50 pages, each depicting one of the 50 "best 10%" solutions of S1.

SM8\_2 features 54 pages, each depicting one of the 54 "best 10%" solutions of S2.

SM8\_3 features 103 pages, each depicting one of the 103 "best 10%" solutions of S3.

**SM9:** One pdf file with 12 pages, each page presenting the best algebraical version of all 12 scenario-specific (and nine overall) strategies identified.

**SM10\_1 to SM10\_12:** 12 video files presenting the pollution spread for all the best versions of each strategy (12 scenario-specific strategies; 9 strategies overall); they relate to SM10\_1: Strategy A, S1-1; an SM10\_2: Strategy B; S1-5; b, SM10\_3: Strategy C; S1-35; c, SM10\_4: Strategy D; S1-49; d, SM10\_5: Strategy A; S2-1; a1, SM10\_6: Strategy E; S2-12; a2, SM10\_7: Strategy F; S2-25; b, SM10\_8: Strategy G; S2-41; c, SM10\_9: Strategy B; S2-46; d, SM10\_10: Strategy F; S3-1; a1, SM10\_11: Strategy H; S3-55; a2, SM10\_12: Strategy I; S3-72; b

**SM11:** An Excel file with one sheet presenting the concentration vs time data of all pumping wells for all runs of all scenarios, which are shown in Figure 13.