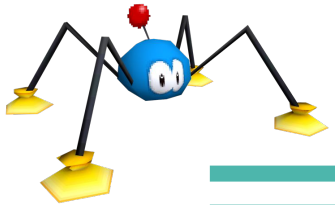
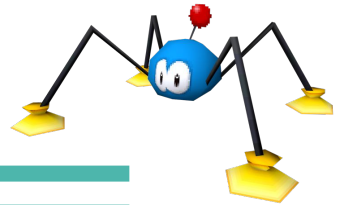
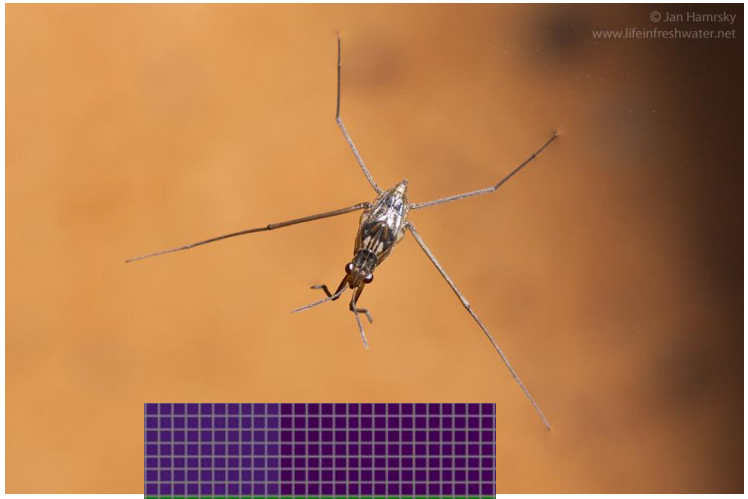




Save the Striders!

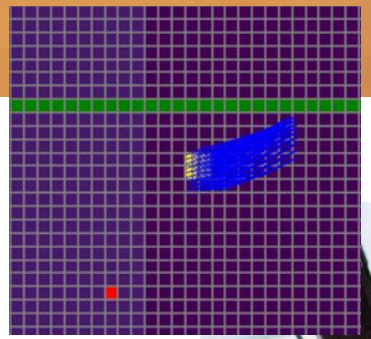
Danielle Tadych, Jacob Ridlinghafer,
Benjamin Mitchell

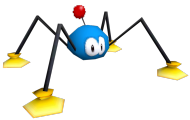
Problems with Current Setup



Too close to the stream and riparian area

- Pollution of the stream
- Too much drawdown from the ag well
  - Gotta protect the water strider!
  - Don’t want to impair the riparian ecosystem
- What matters
  - Head at wells and leakage
    - Head at MW1 is most important
    - Other wells matter because stage in river is not actually infinite
  - Particle pathing because we don’t want to pollute river

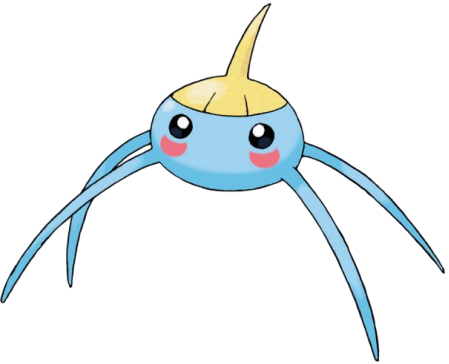




Ensemble Scenarios

Metrics considered

- Head at MW next to the river
- Head from ensembles for each scenario
- Particle tracking
- Leakage calculation



1333113			
Variable	Inputs	#Knob	Level
Kxyz	5	0	Low
Kz:low	0.000001	2	High
Sy	0.3	2	High
rech_mount	0.00005	2	High
ET_val	0.000001	0	Low
ET:rip	1	0	Low
K:streambed	1000	2	High

3133113			
Variable	Inputs	#Knob	Level
Kxyz	100	2	High
Kz:low	0.000001	0	Low
Sy	0.3	2	High
rech_mount	0.00005	2	High
ET_val	0.000001	0	Low
ET:rip	1	0	Low
K:streambed	1000	2	High

3111331			
Variable	Inputs	#Knob	Level
Kxyz	100	2	High
Kz:low	0.0003	0	Low
Sy	0.05	0	Low
rech_mount	0.00001	0	Low
ET_val	0.0001	2	High
ET:rip	3	2	High
K:streambed	10	0	Low

1111331			
Variable	Inputs	#Knob	Level
Kxyz	5	0	Low
Kz:low	0.0003	0	Low
Sy	0.05	0	Low
rech_mount	0.00001	0	Low
ET_val	0.0001	2	High
ET:rip	3	2	High
K:streambed	10	0	Low

2121331			
Variable	Inputs	#Knob	Level
Kxyz	25	1	Mid
Kz:low	0.0003	0	Low
Sy	0.1	1	Mid
rech_mount	0.00001	0	Low
ET_val	0.0001	2	High
ET:rip	3	2	High
K:streambed	10	0	Low

2121311			
Variable	Inputs	#Knob	Level
Kxyz	25	1	Mid
Kz:low	0.0001	0	Low
Sy	0.1	1	Mid
rech_mount	0.00001	0	Low
ET_val	0.0001	2	High
ET:rip	1	0	Low
K:streambed	10	0	Low

2122111			
Variable	Inputs	#Knob	Level
Kxyz	25	1	Mid
Kz:low	0.000001	0	Low
Sy	0.1	1	Mid
rech_mount	0.00003	1	Mid
ET_val	0.000001	0	Low
ET:rip	1	0	Low
K:streambed	10	0	Low

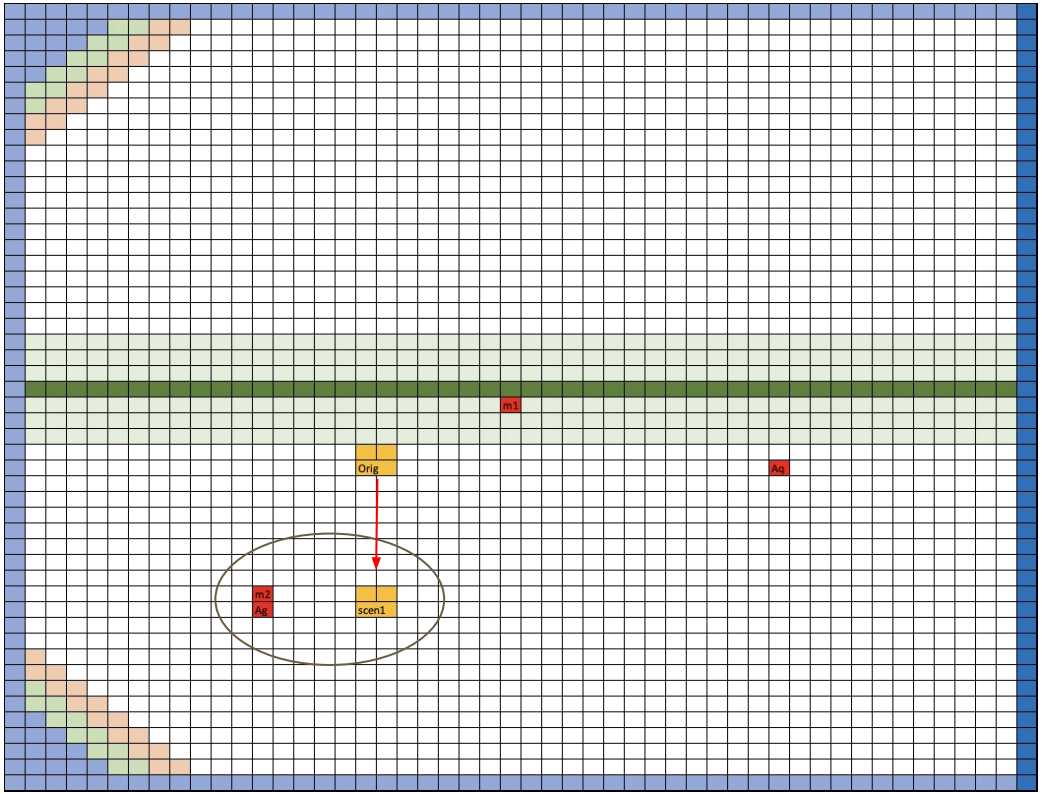
2213223			
Variable	Inputs	#Knob	Level
Kxyz	25	1	Mid
Kz:low	0.00002	1	Mid
Sy	0.05	0	Low
rech_mount	0.00005	2	High
ET_val	0.00001	1	Mid
ET:rip	2	1	Mid
K:streambed	1000	2	High

2211221			
Variable	Inputs	#Knob	Level
Kxyz	25	1	Mid
Kz:low	0.00002	1	Mid
Sy	0.05	0	Low
rech_mount	0.00001	0	Low
ET_val	0.00001	1	Mid
ET:rip	2	1	Mid
K:streambed	10	0	Low

1111111			
Variable	Inputs	#Knob	Level
Kxyz	5	0	Low
Kz:low	1.00E-06	0	Low
Sy	0.05	0	Low
rech_mount	1.00E-05	0	Low
ET_val	1.00E-06	0	Low
ET:rip	1	0	Low
K:streambed	10	0	Low

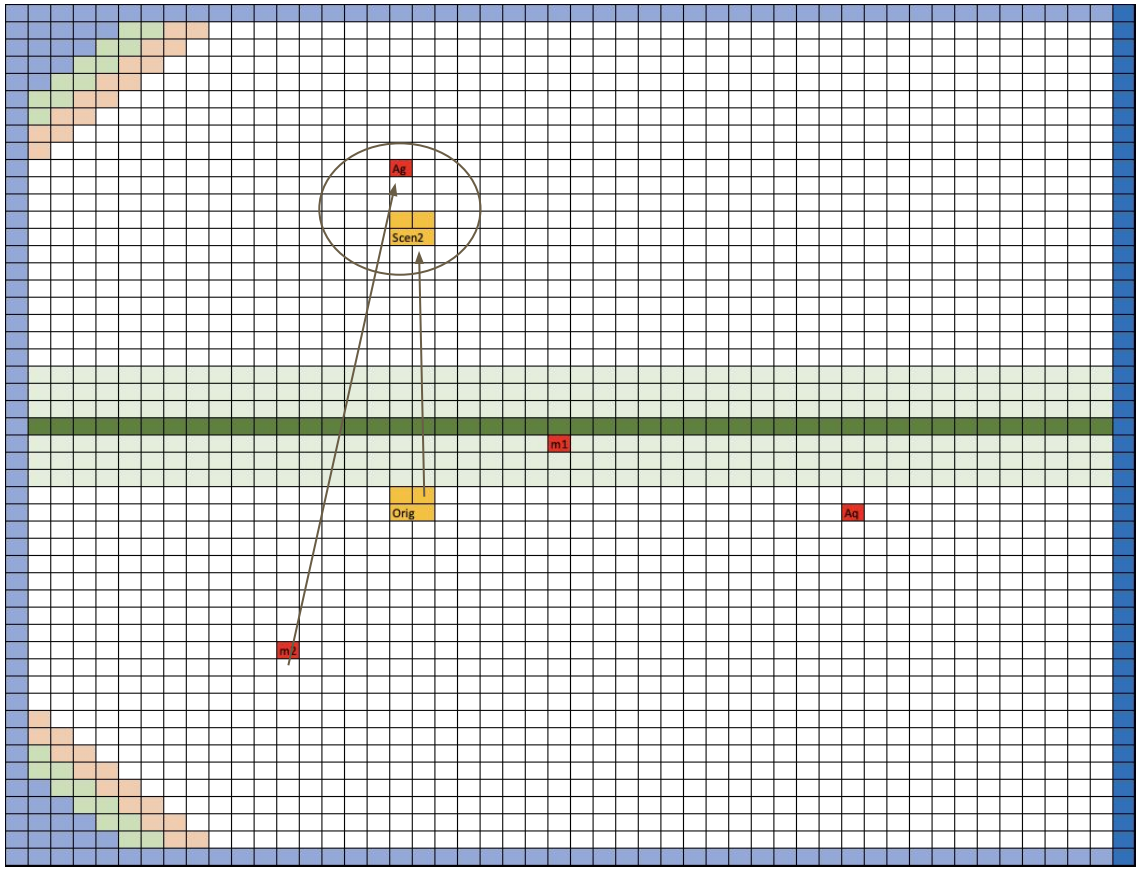
Proposed Scenarios - Scenario 1

1. Moving the Farm farther south
    a. Closer to the ag well, so even though relocation might be difficult, it would save in water transportation costs



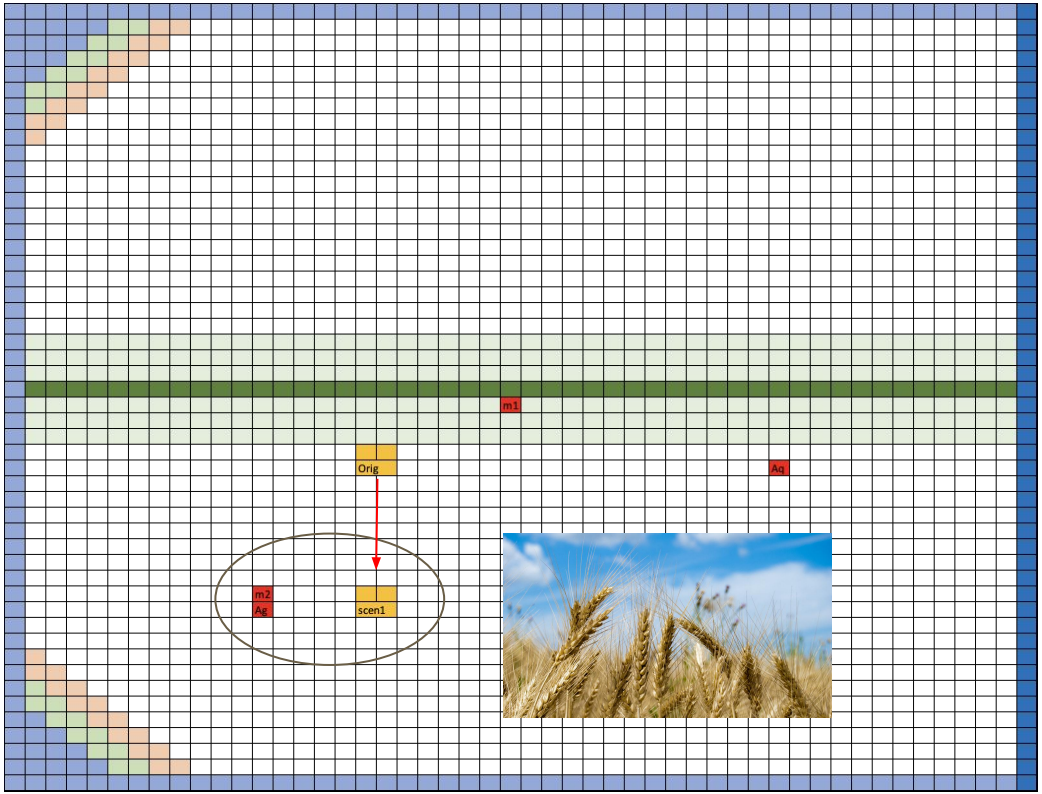
Proposed Scenarios - Scenario 2

1. Moving the Farm farther south
    a. Closer to the ag well, so even though relocation might be difficult, it would save in water transportation costs
2. Moving the farm and ag well north of the stream
    a. Less risk of polluting the town well in the future
    b. Ag well is farther from the stream but also closer to the farm



Proposed Scenarios

1. Moving the Farm farther south
    a. Closer to the ag well, so even though relocation might be difficult, it would save in water transportation costs
2. Moving the farm and ag well north of the stream
    a. Less risk of polluting the town well in the future
    b. Ag well is farther from the stream but also closer to the farm
3. Scenario 1 locations but change crop to wheat (less water demand)
    a. ET 3000 -> 4500

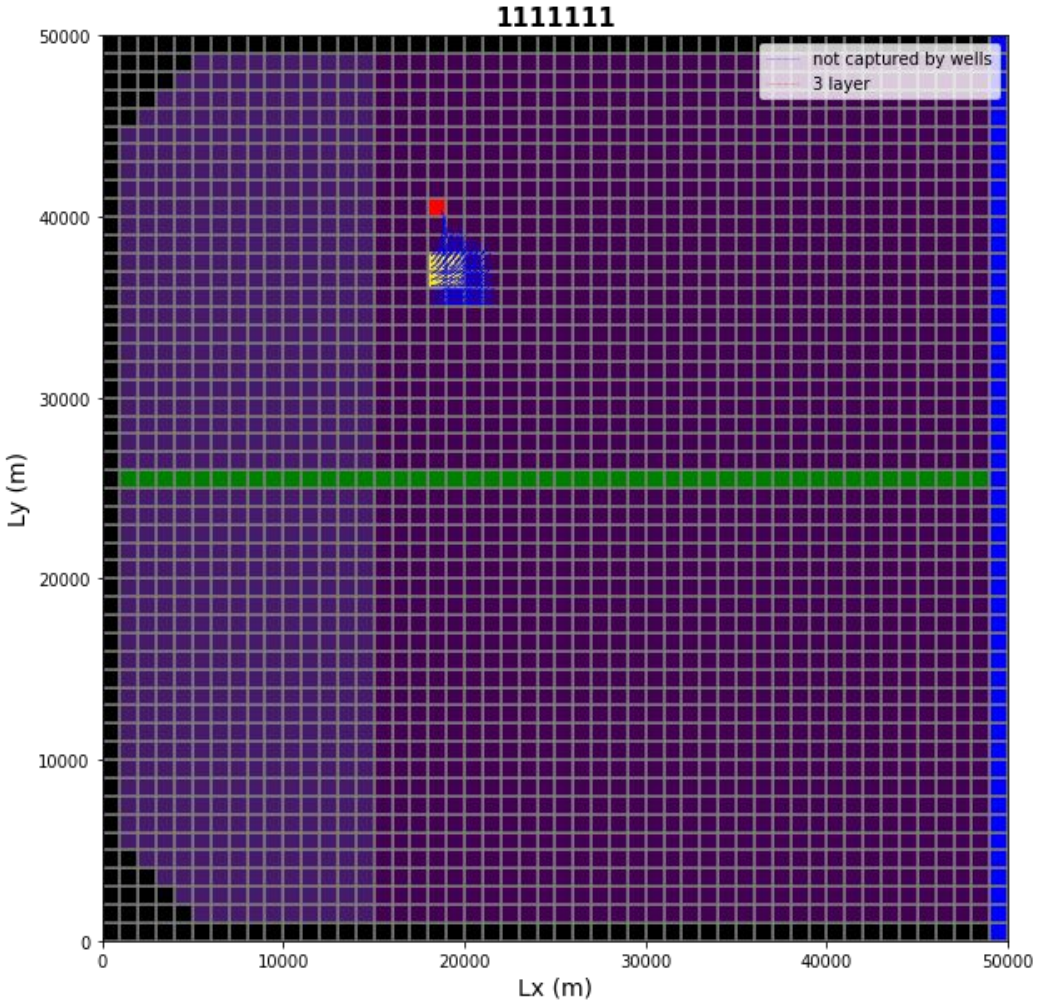


Scenarios we trashed and other problems

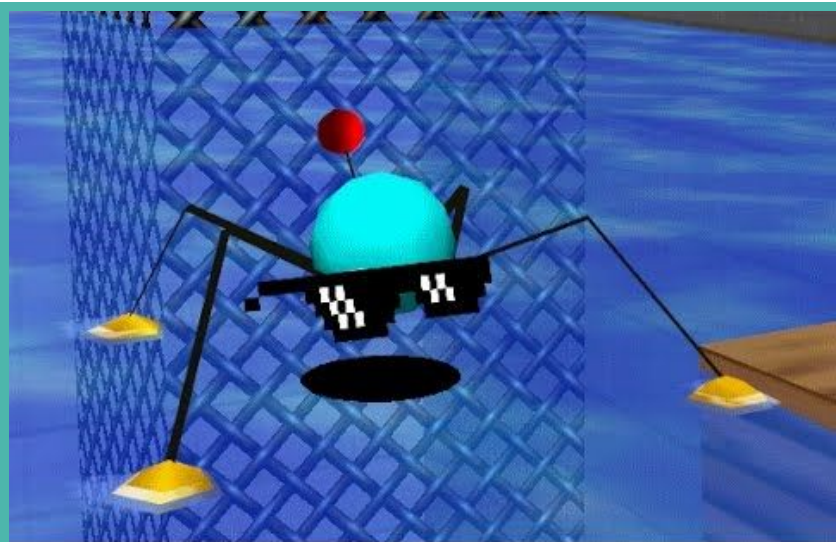
Had to move the ag well location for Scenario 2 to one cell to the left

Ensembles with high top and bottom aquifer K would not converge

- 3133113 and 3111331



Results



Ensemble comparison

	Scenario 1					
	Esemble	town well	mw1	mw2	ag well	Leakage
1	1333113	74.34	78.98	89.333	86.81471	150750
2	3133113					
3	3111331	75.43	78.65	85.06	84.74	2504950
4	1111331	71.88	76.28	81.30	78.30	296350
5	2121331	74.57	77.99	84.75	84.03	1119850
6	2121311	75.06	78.35	85.02	84.30	1072550
7	2122111	76.08	78.50	82.78	79.81	225650
8	2213223	75.98	78.55	87.33	86.70	1131750
9	2211221	75.77	78.56	85.11	84.38	1054350
10	1111111	75.77	78.56	85.11	84.38	225650
	Average	74.99	78.27	85.09	83.72	864650

Ensemble comparison

	Scenario 2					
	Ensemble	town well	mw1	mw2	ag well	Leakage
1	1333113	74.34	79.01	93.13	82.33	148550
2	3133113					
3	3111331					
4	1111331	71.93	76.36	87.21	75.89	293350
5	2121331	74.63	78.02	86.04	82.08	1116450
6	2121311	75.11	78.38	86.30	82.32	1069050
7	2122111	76.11	78.71	87.58	83.37	981350
8	2213223	76.04	78.59	88.60	84.16	1127950
9	2211221	75.84	78.59	86.41	82.39	1050750
10	1111111	75.84	78.59	86.41	82.39	222150
	Average	74.98	78.28	87.71	81.87	751200

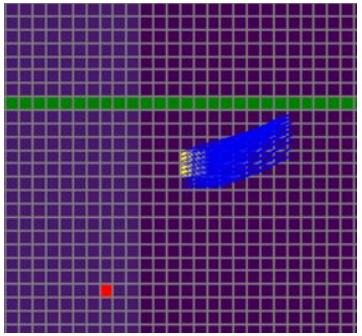
Ensemble comparison

	Scenario 3					
	Esemble	town well	mw1	mw2	ag well	Leakage
1	1333113	74.34	78.99	90.61	88.98	149750
2	3133113					
3	3111331					
4	1111331	71.89	76.31	83.33	81.38	293250
5	2121331	74.59	78.00	85.19	84.66	1115750
6	2121311	75.08	78.37	85.46	84.92	1068350
7	2122111	76.12	78.55	84.80	82.86	222050
8	2213223	76.00	78.57	87.76	87.31	1127150
9	2211221	75.79	78.57	85.55	85.01	1049950
10	1111111	75.79	78.57	85.55	85.01	222050
	Average	74.95	78.24	86.03	85.01	656037.5

Head and Leakage Averages across Ensembles

Scenario #	town well	mw1 (River)	mw2	ag well	Leakage
1	74.987	78.269	85.090	83.717	864650
2	74.978	78.282	87.707	81.868	751200
3	74.952	78.241	86.033	85.0177	656037.5

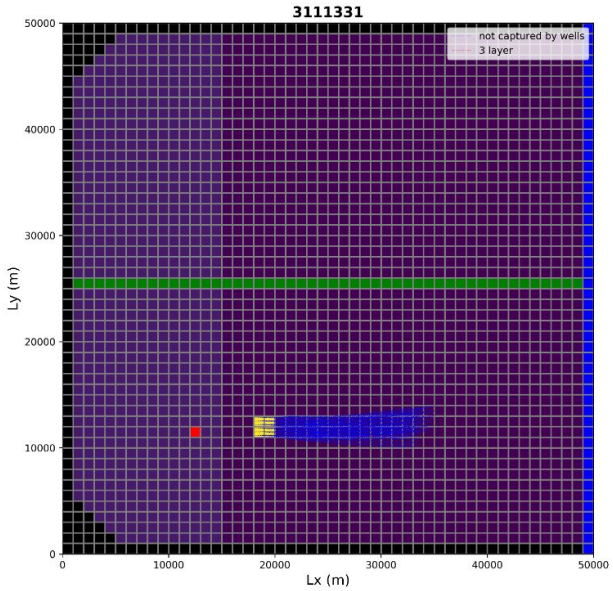
Path comparison - longest paths



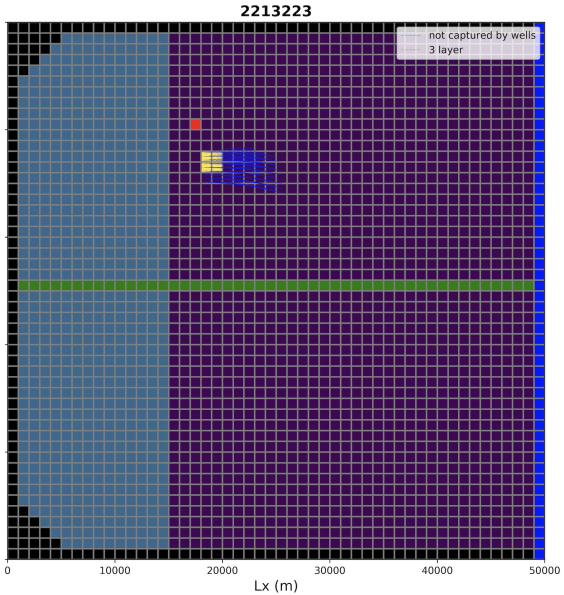
Original run would have ended in the stream eventually

No particles resulted in the stream or wells for all scenarios

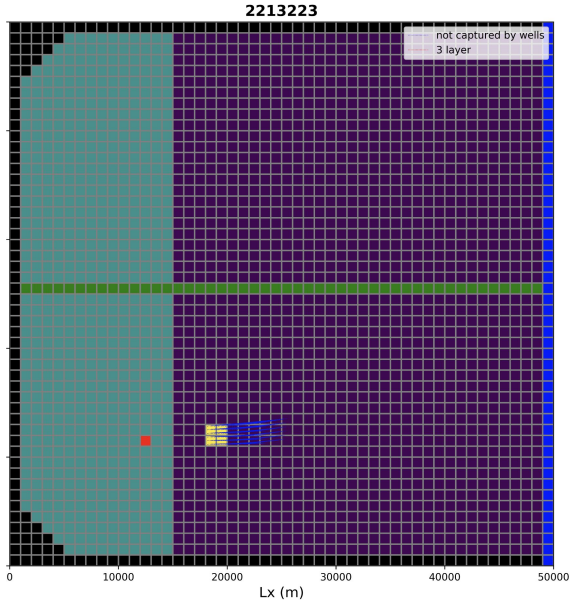
Scenario 1



Scenario 2



Scenario 3



Head comparison (graphs) MW2

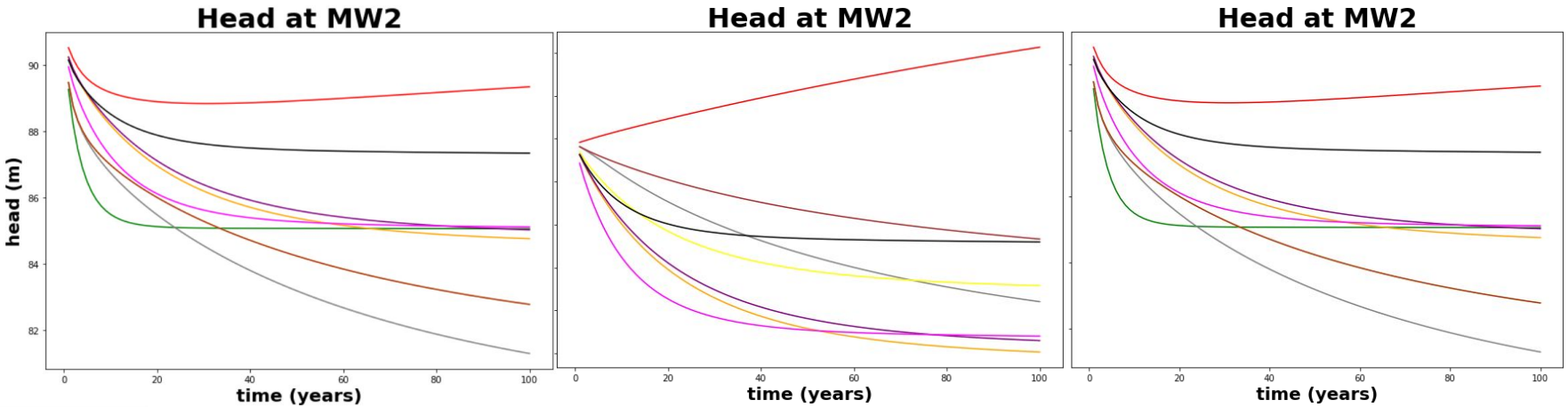
Legend

Ensemble	Line	Ensemble	Line
1333113	red	2121311	purple
~~3133113~~	~~blue~~	2122111	yellow
~~3111331~~	~~green~~	2213223	black
1111331	grey	2211221	pink
2121331	orange	1111111	brown

Scenario 1

Scenario 2

Scenario 3

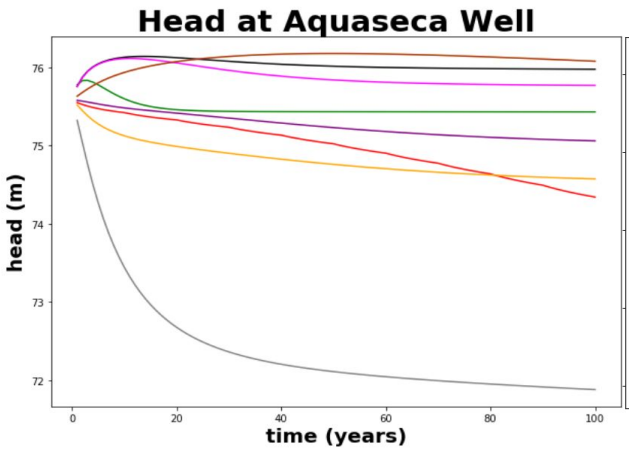


Head comparison (graphs) Town

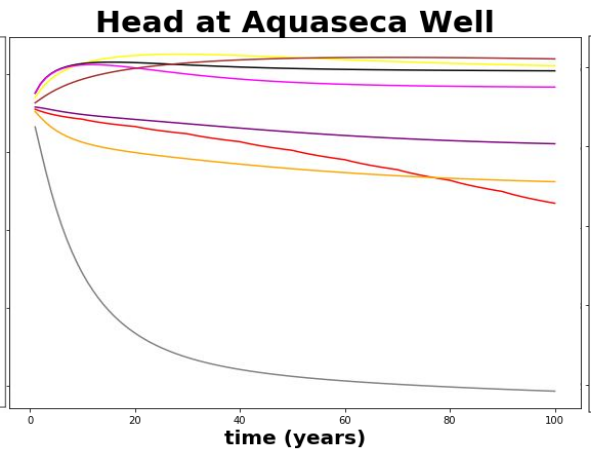
Legend

Ensemble	Line	Ensemble	Line
1333113	red	2121311	purple
~~3133113~~	~~blue~~	2122111	yellow
~~3111331~~	~~green~~	2213223	black
1111331	grey	2211221	pink
2121331	orange	1111111	brown

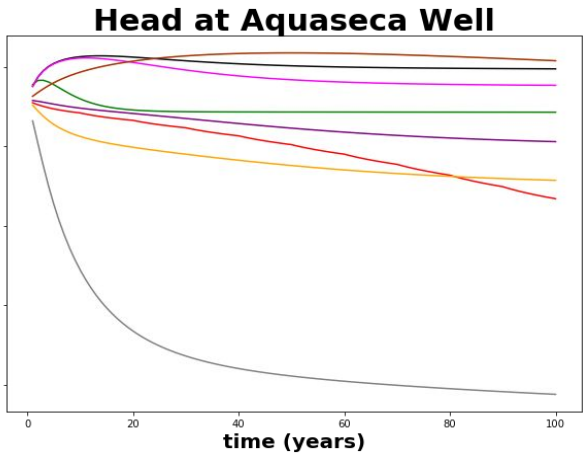
Scenario 1



Scenario 2



Scenario 3



Head comparison (graphs) MW1

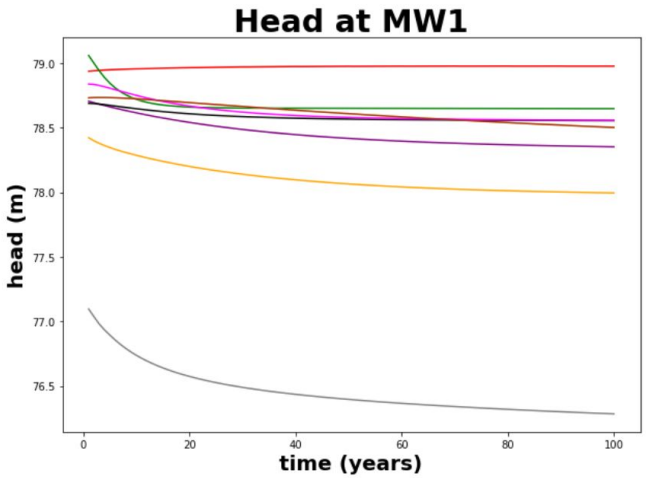
Legend

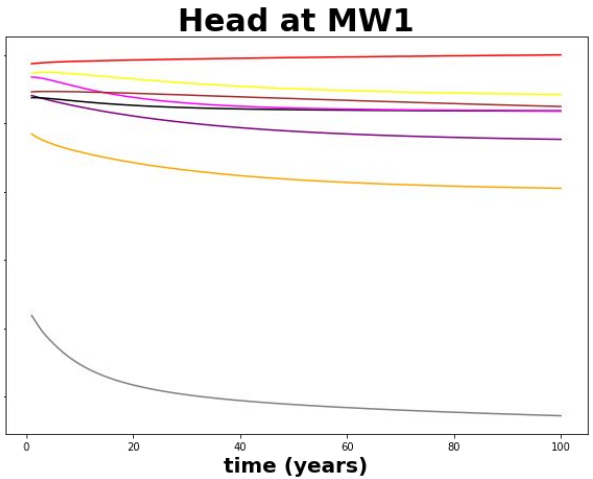
Ensemble	Line	Ensemble	Line
1333113	red	2121311	purple
~~3133113~~	~~blue~~	2122111	yellow
~~3111331~~	~~green~~	2213223	black
1111331	grey	2211221	pink
2121331	orange	1111111	brown

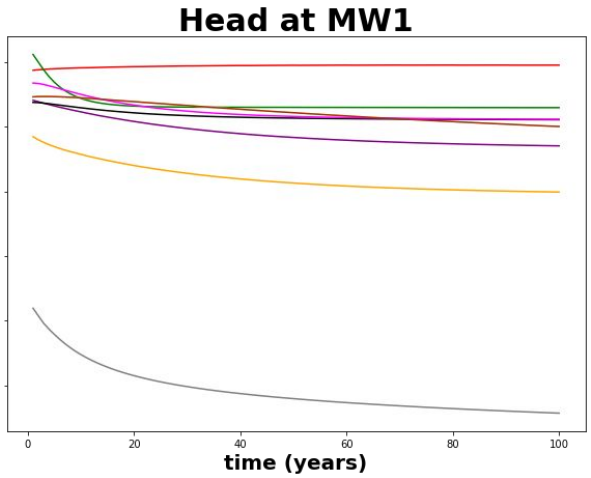
Scenario 1

Scenario 2

Scenario 3







Head comparison (graphs) Ag well

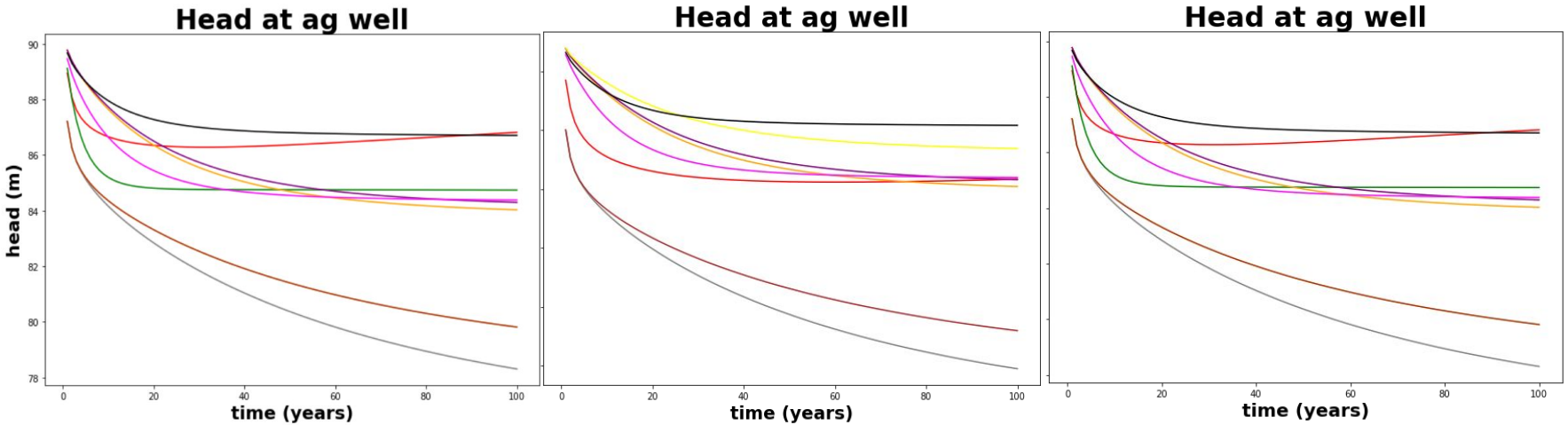
Legend

Ensemble	Line	Ensemble	Line
1333113	red	2121311	purple
~~3133113~~	~~blue~~	2122111	yellow
~~3111331~~	~~green~~	2213223	black
1111331	grey	2211221	pink
2121331	orange	1111111	brown

Scenario 1

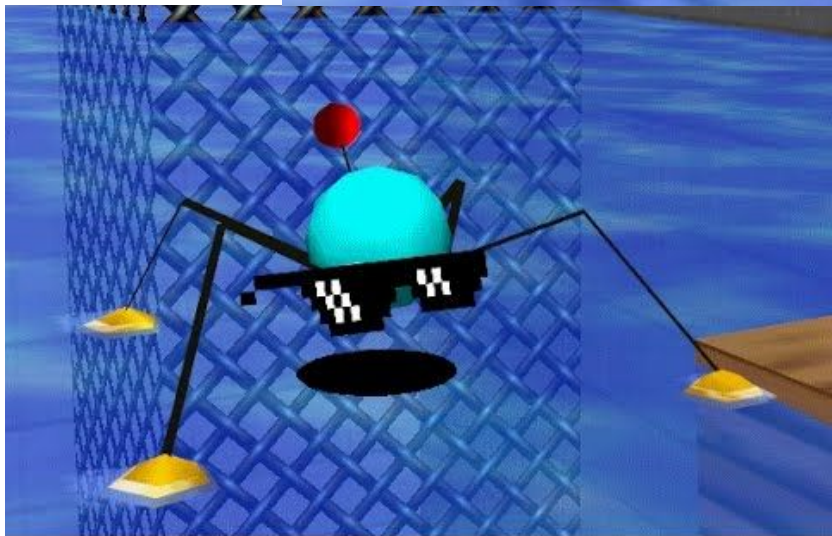
Scenario 2

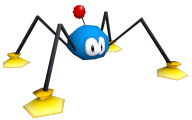
Scenario 3



Selected Hydrologic Design Conclusions

- The differences in head at the river well were small
- Differences at MW1 cannot be used in design 2 because ag well was moved
- Head of the irrigation well showed larger differences design 3 had the least draw down
- The total leakage of each location showed the largest differences in design where design 3 had the least leakage
- So design 3 is our proposed project





Any Questions?

WWJBD