Model Discretization

Stephen Hundt

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In a nutshell:

- Modelling in space and time

- Reality is infinitely detailed and continuously varying

- Models simplify: cut reality into *discrete* bins

- Decide based upon objectives, data, and computing power

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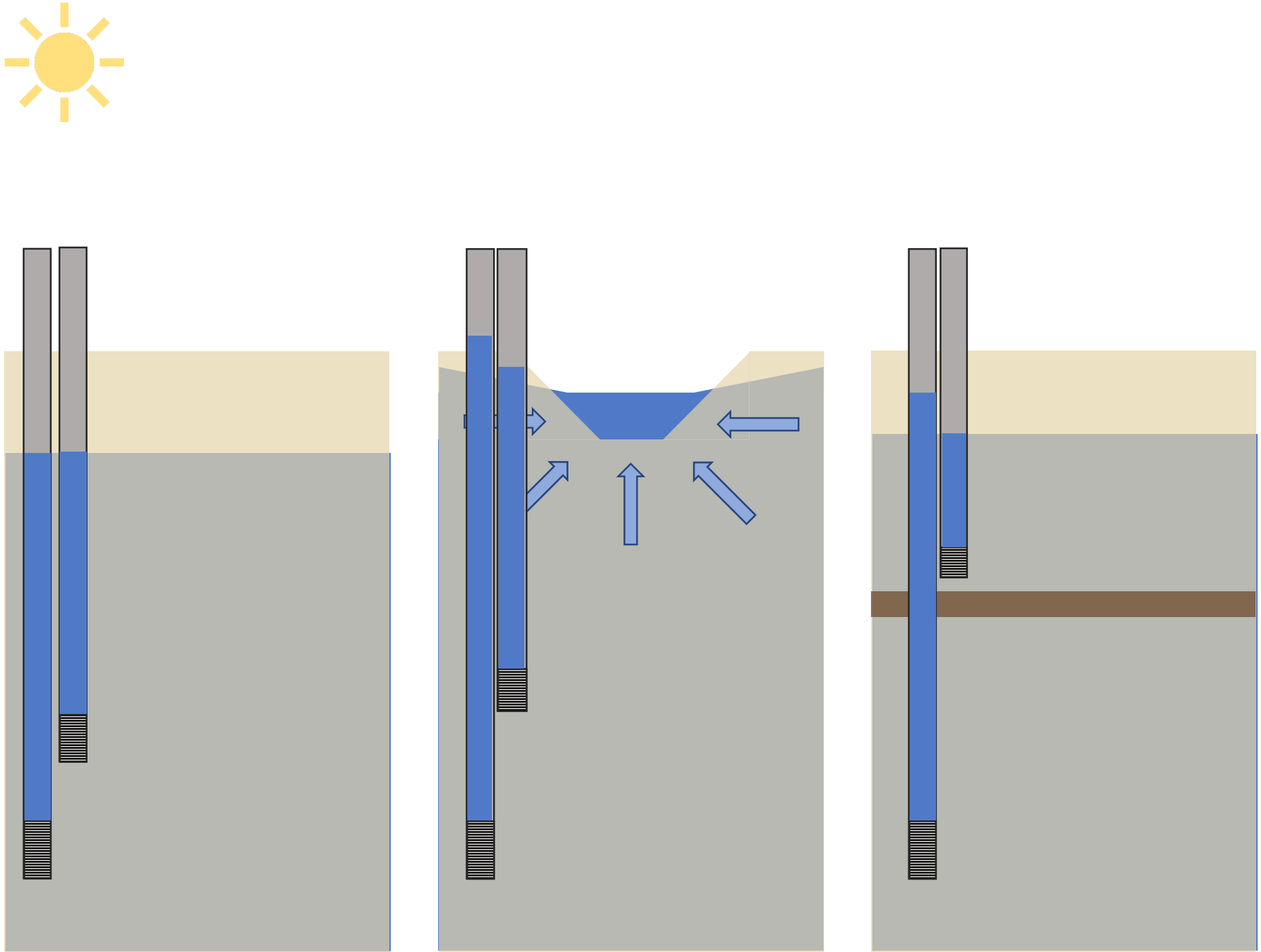
Vertical:
layers

Multilevel wells



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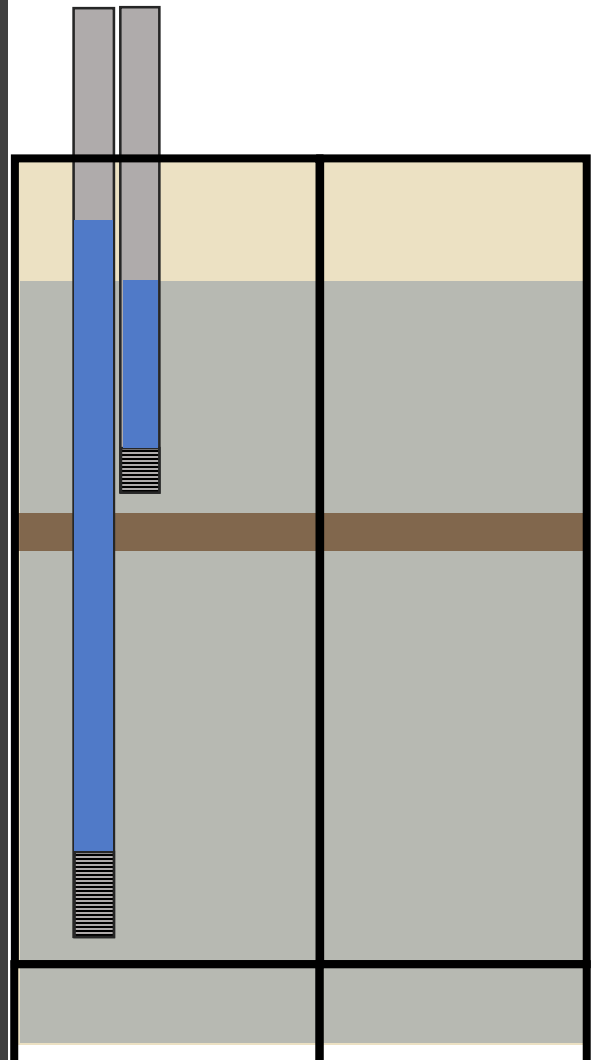
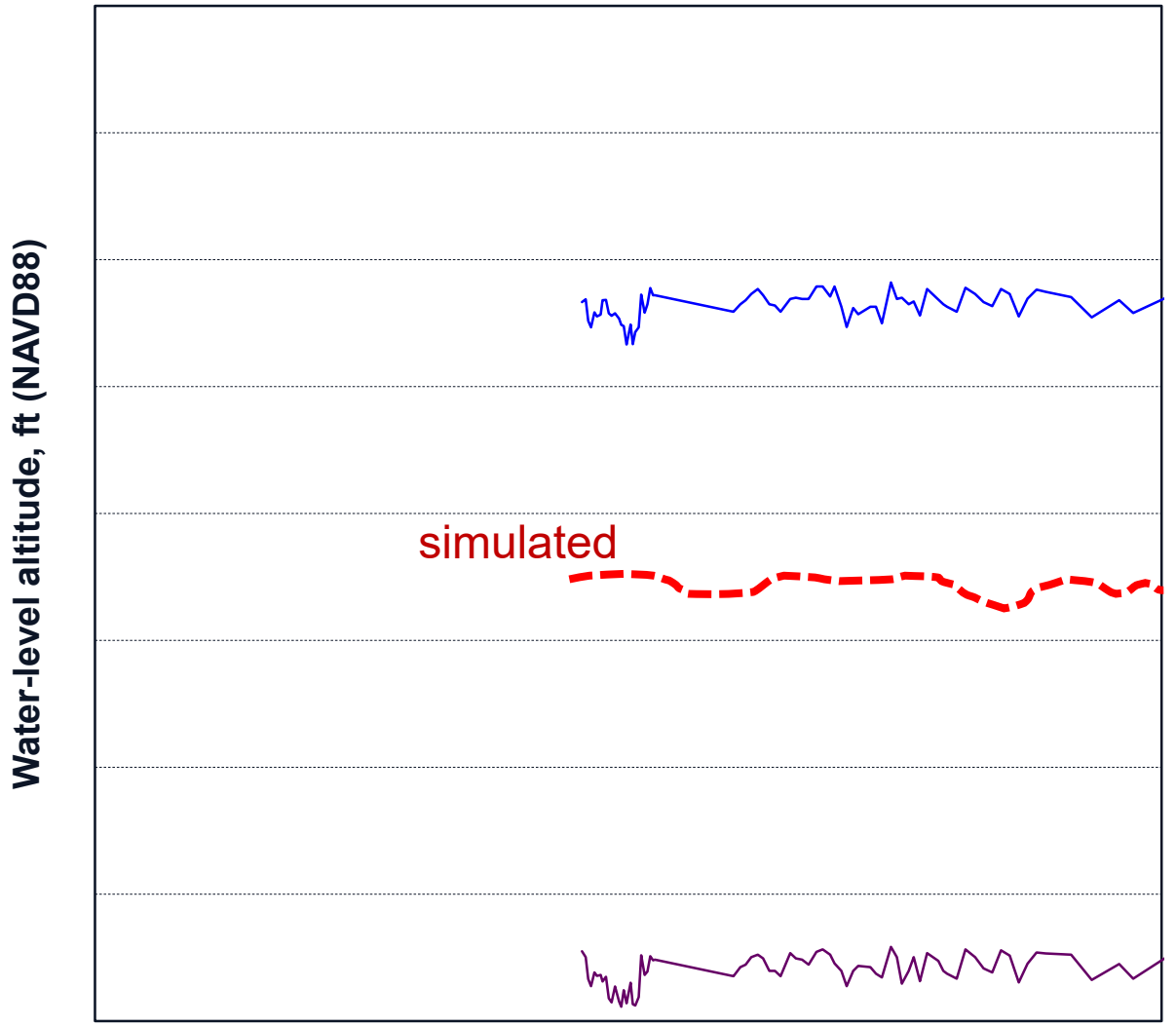
Multilevel wells





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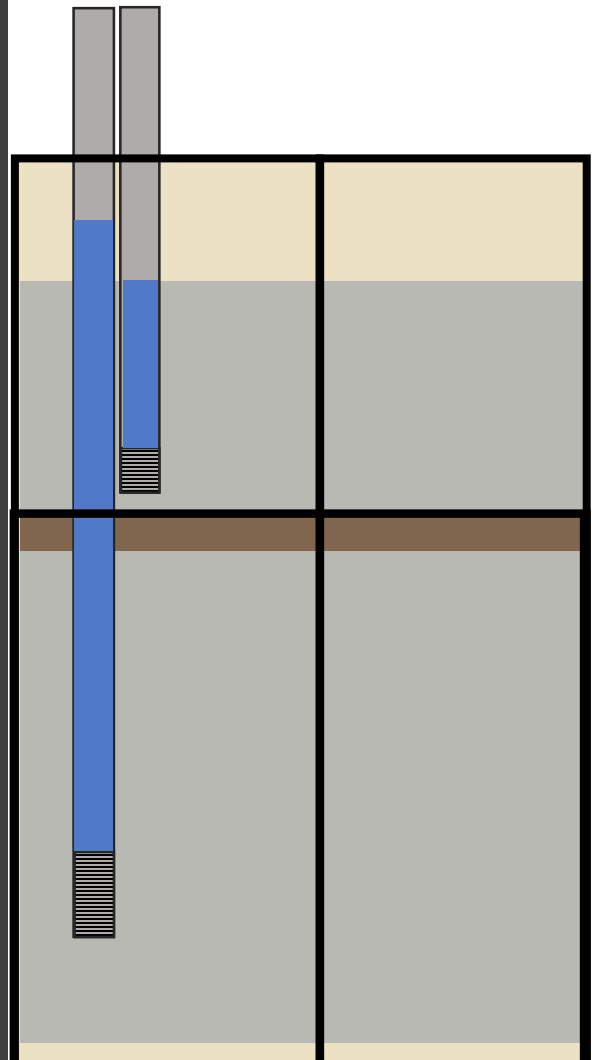
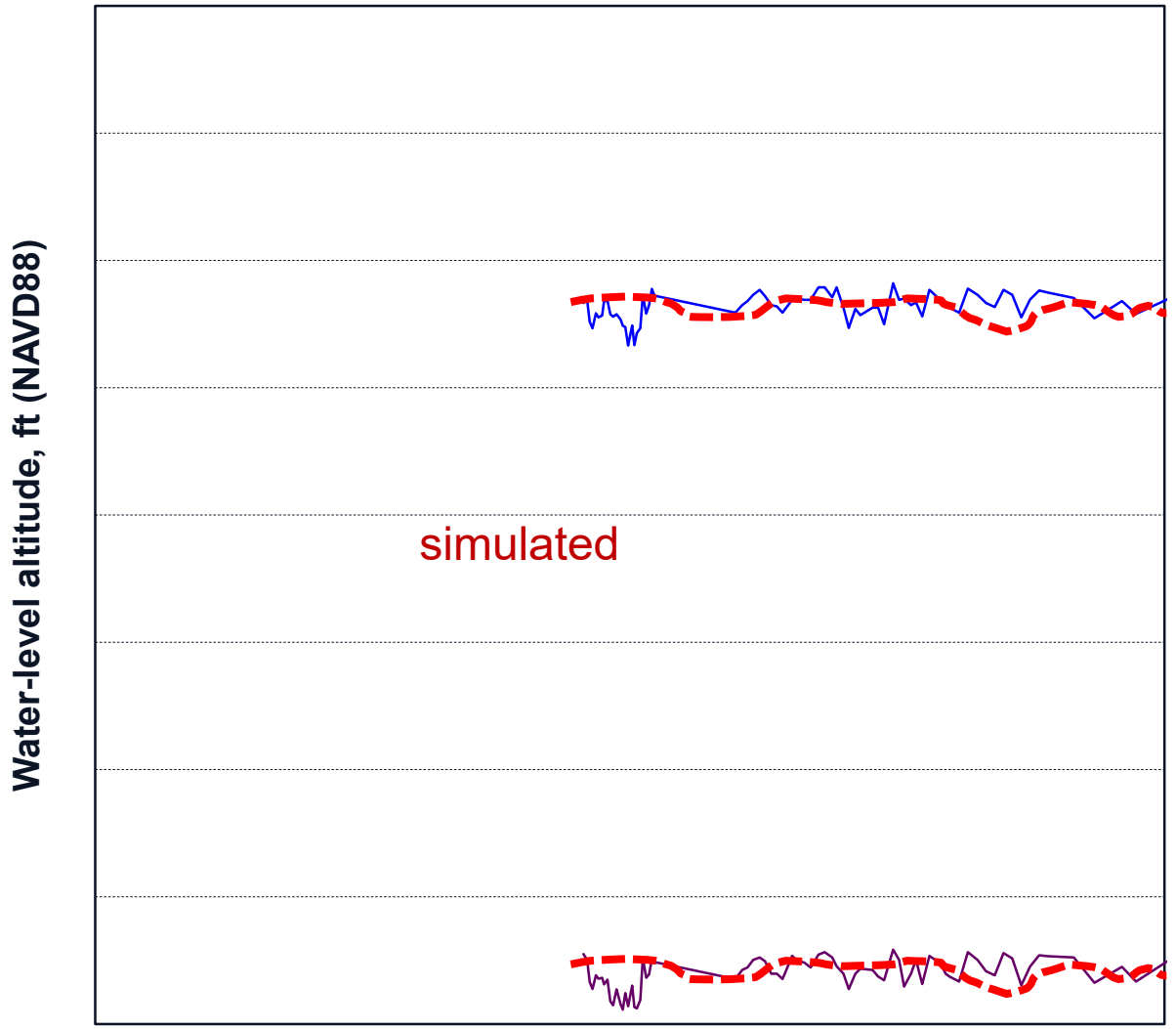
Multilevel wells





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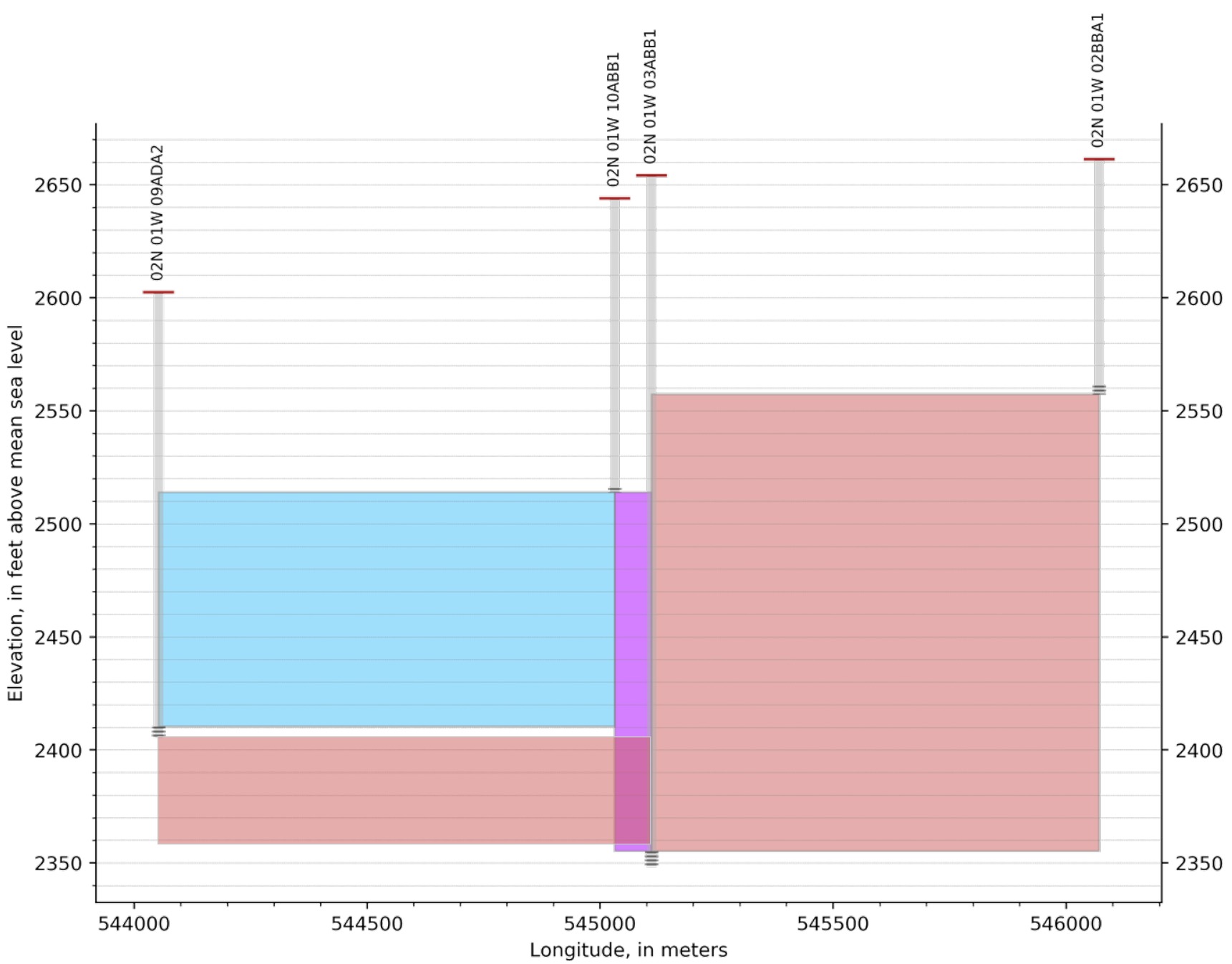
Where to divide?



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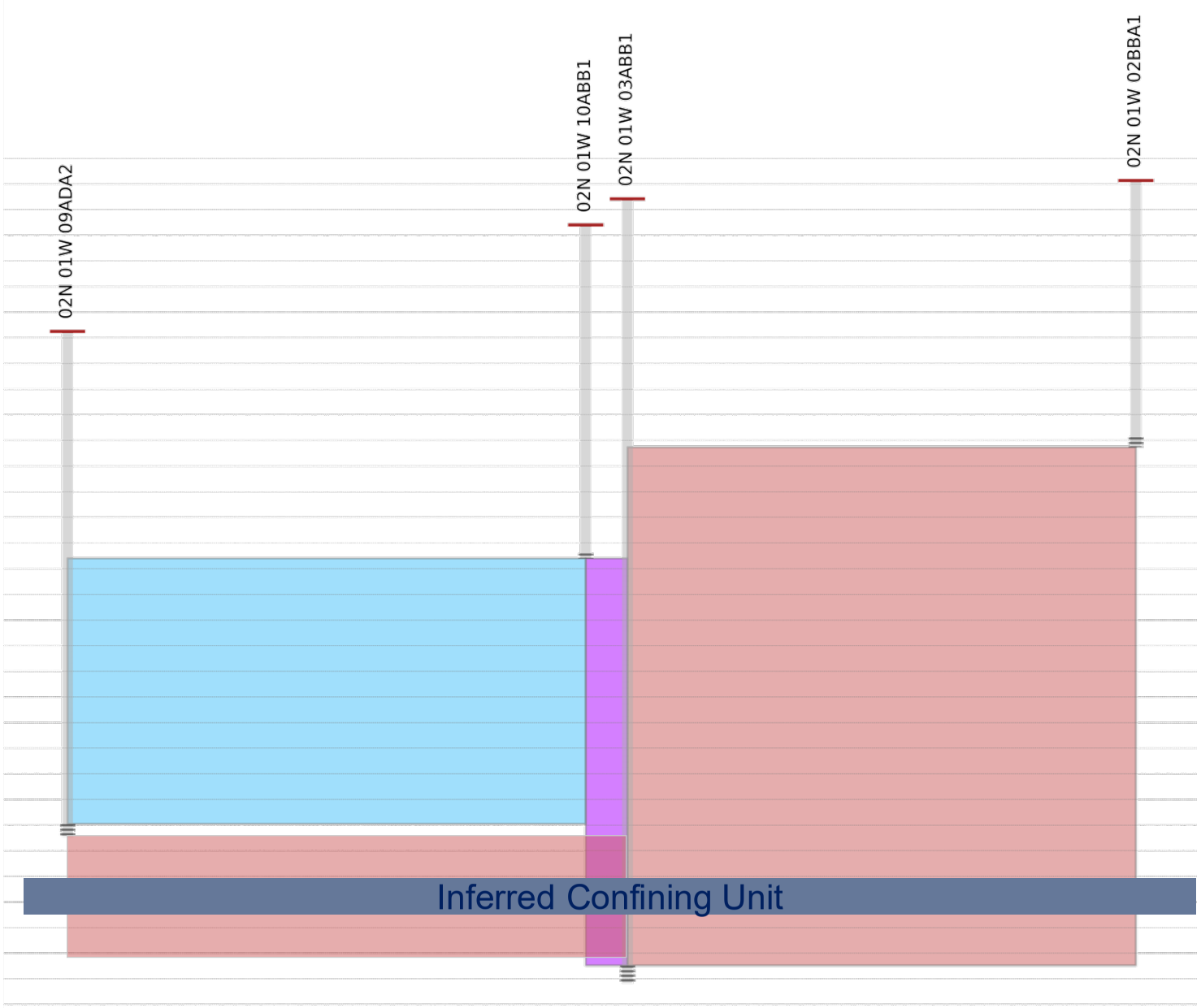
Where to divide?



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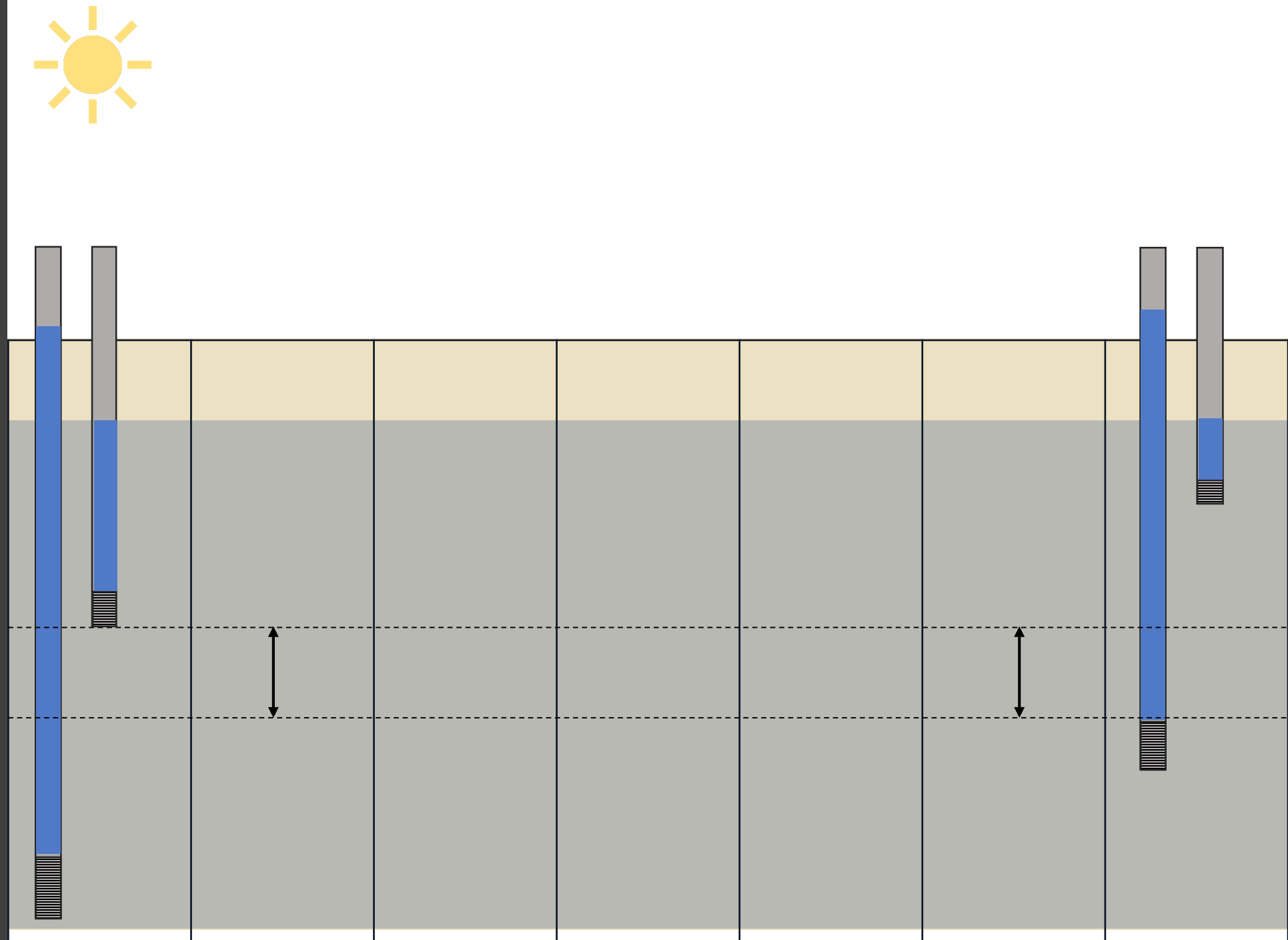
Where to divide?



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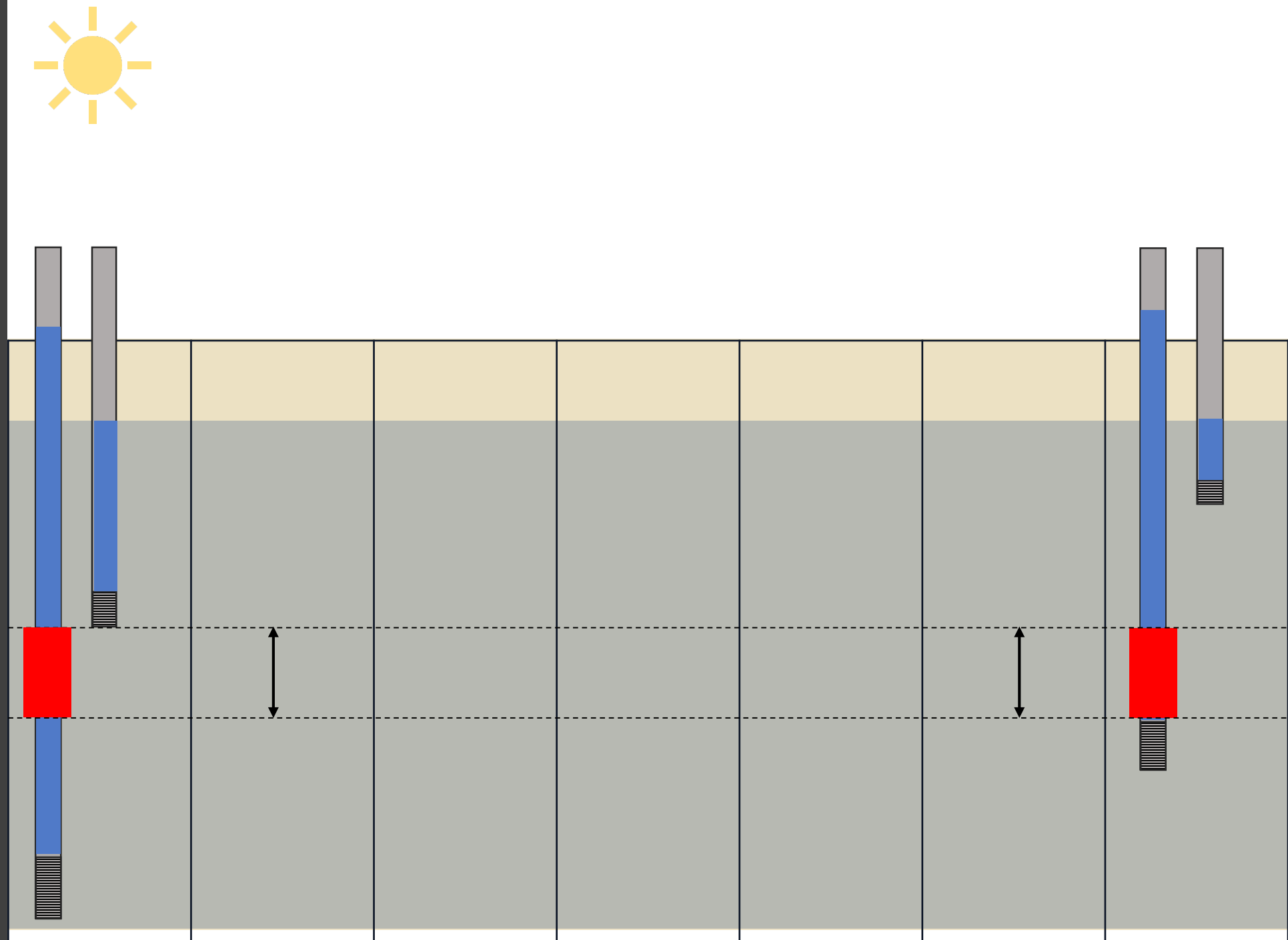
Where to divide?



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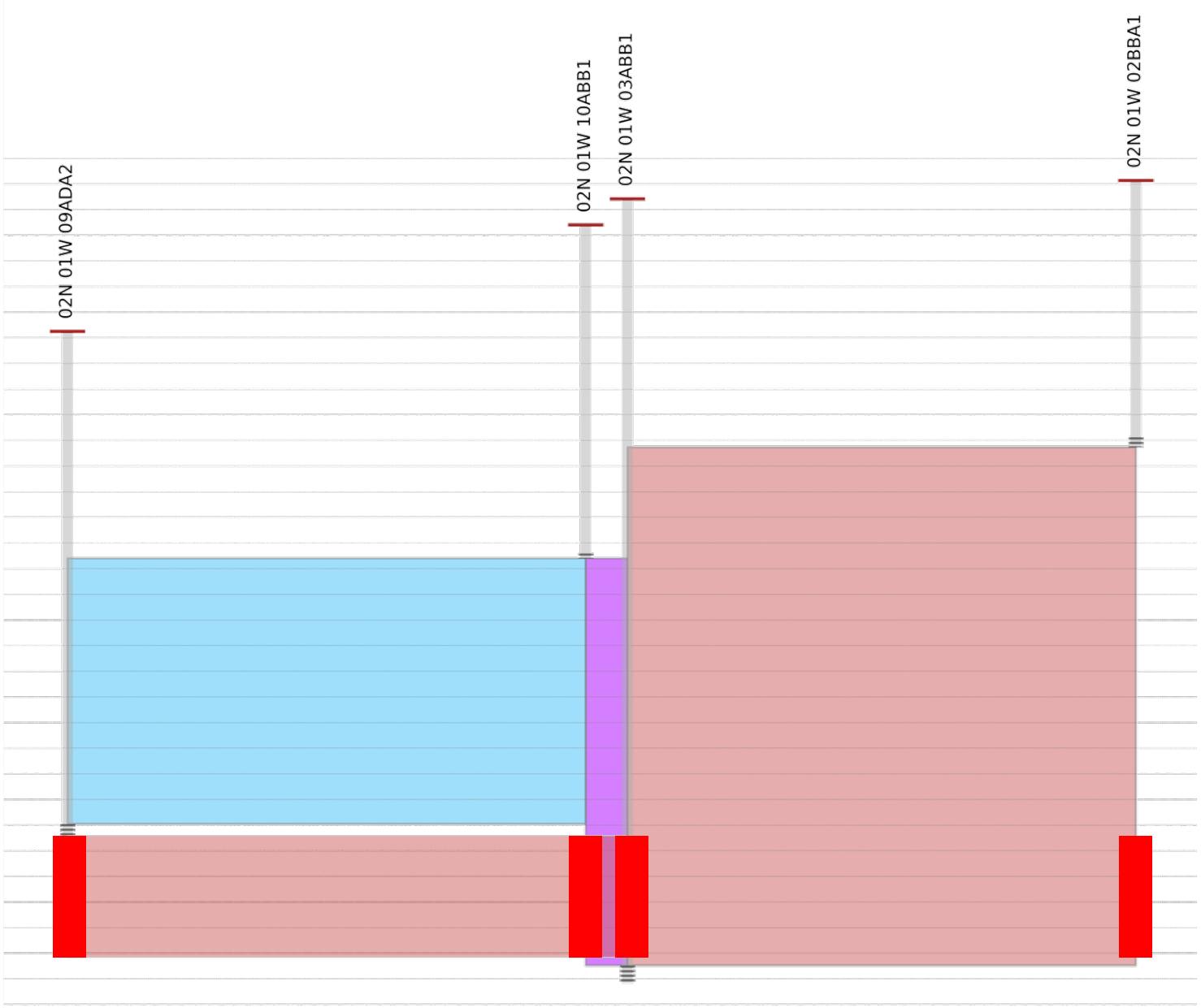
Where to divide?



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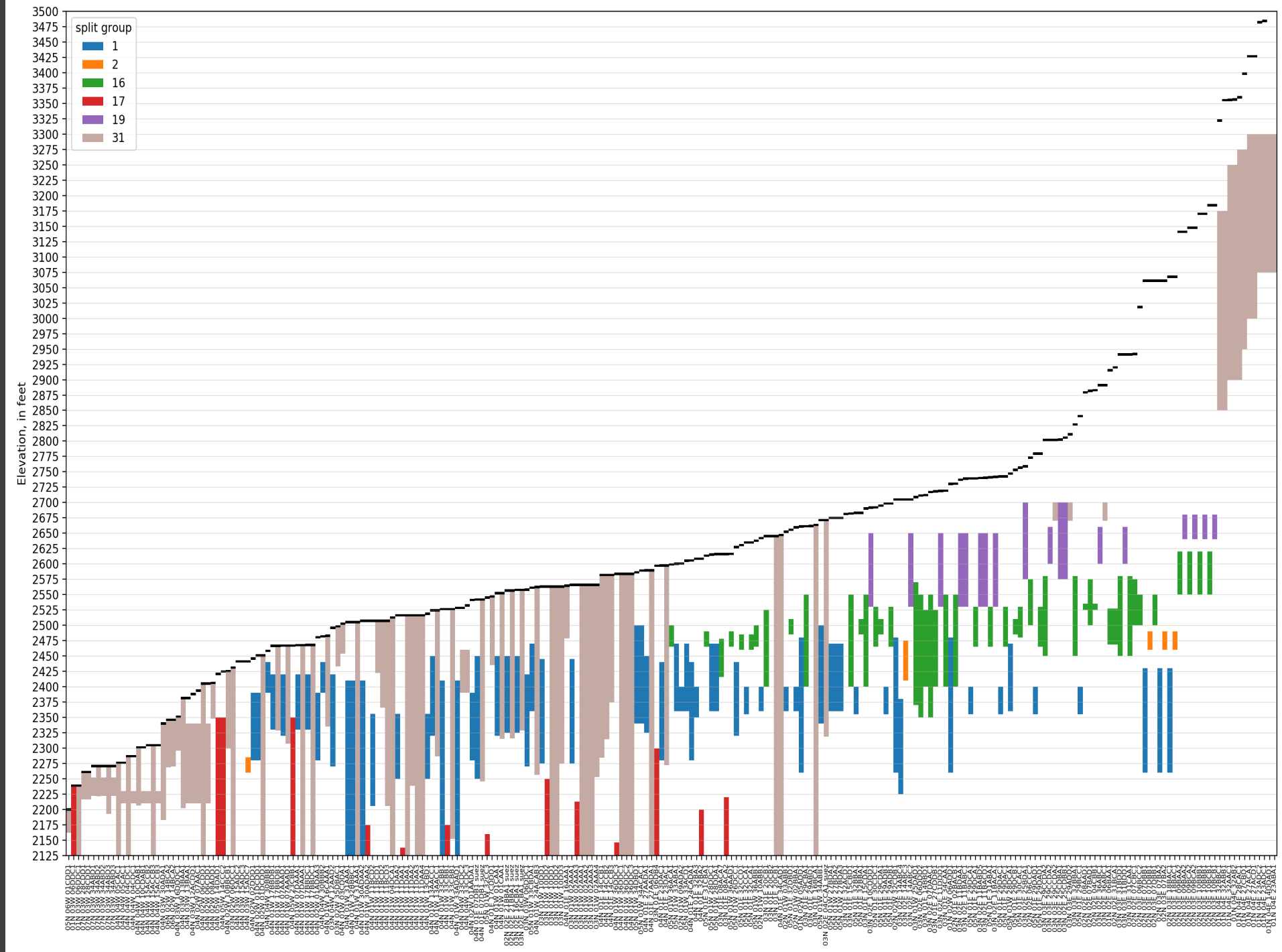
Layering - shallow



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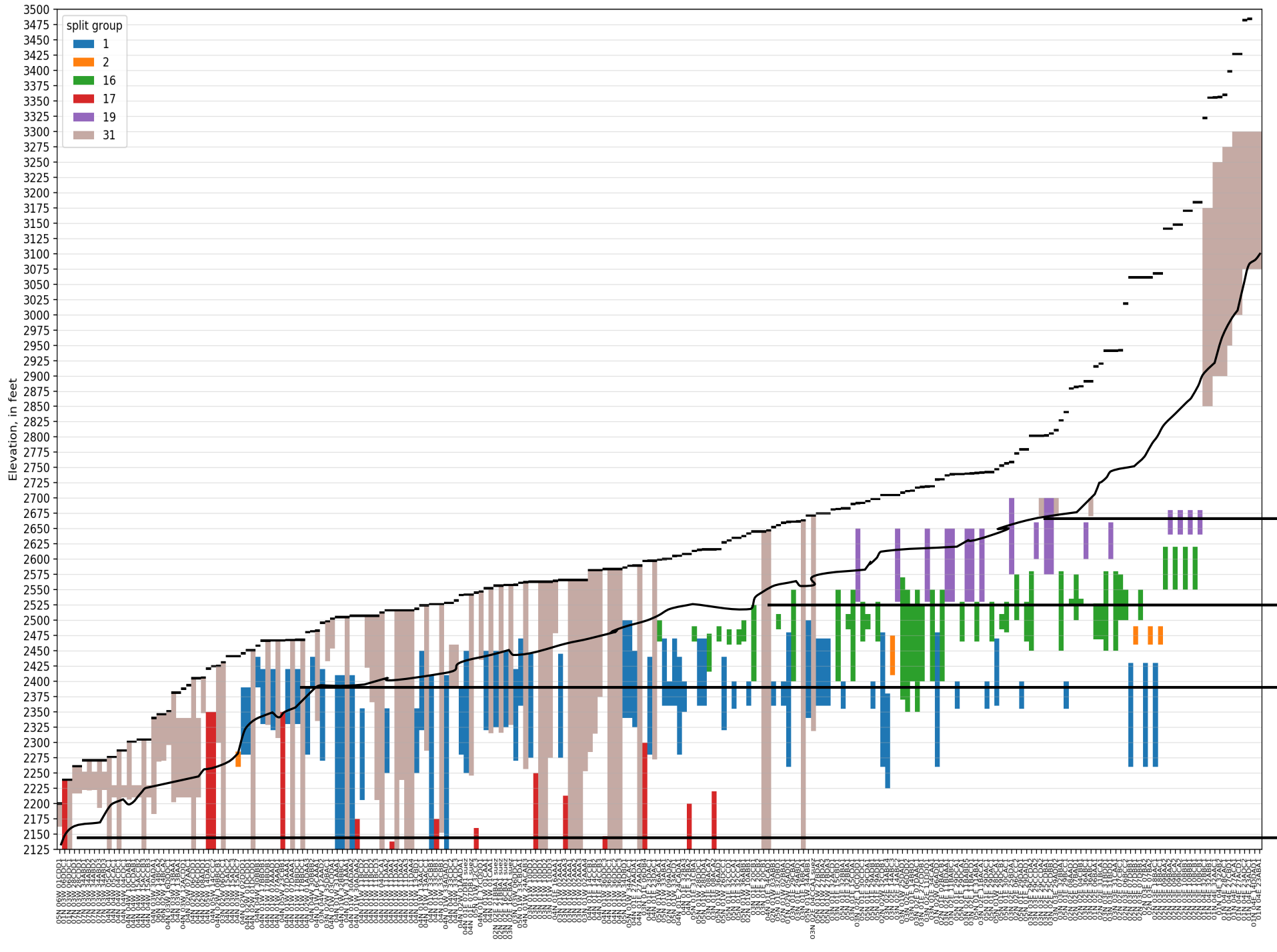
Layering - shallow



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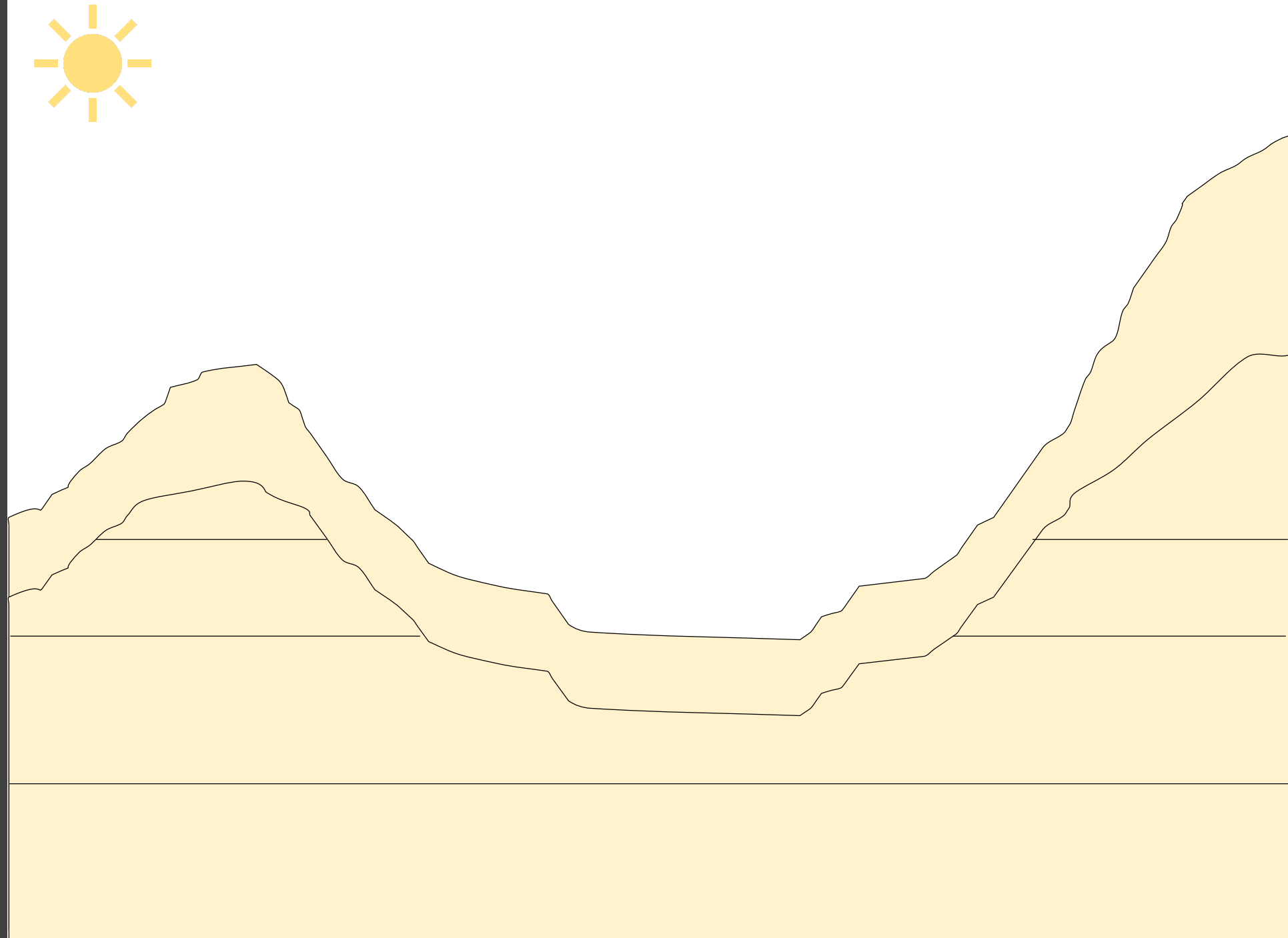
Layering - shallow



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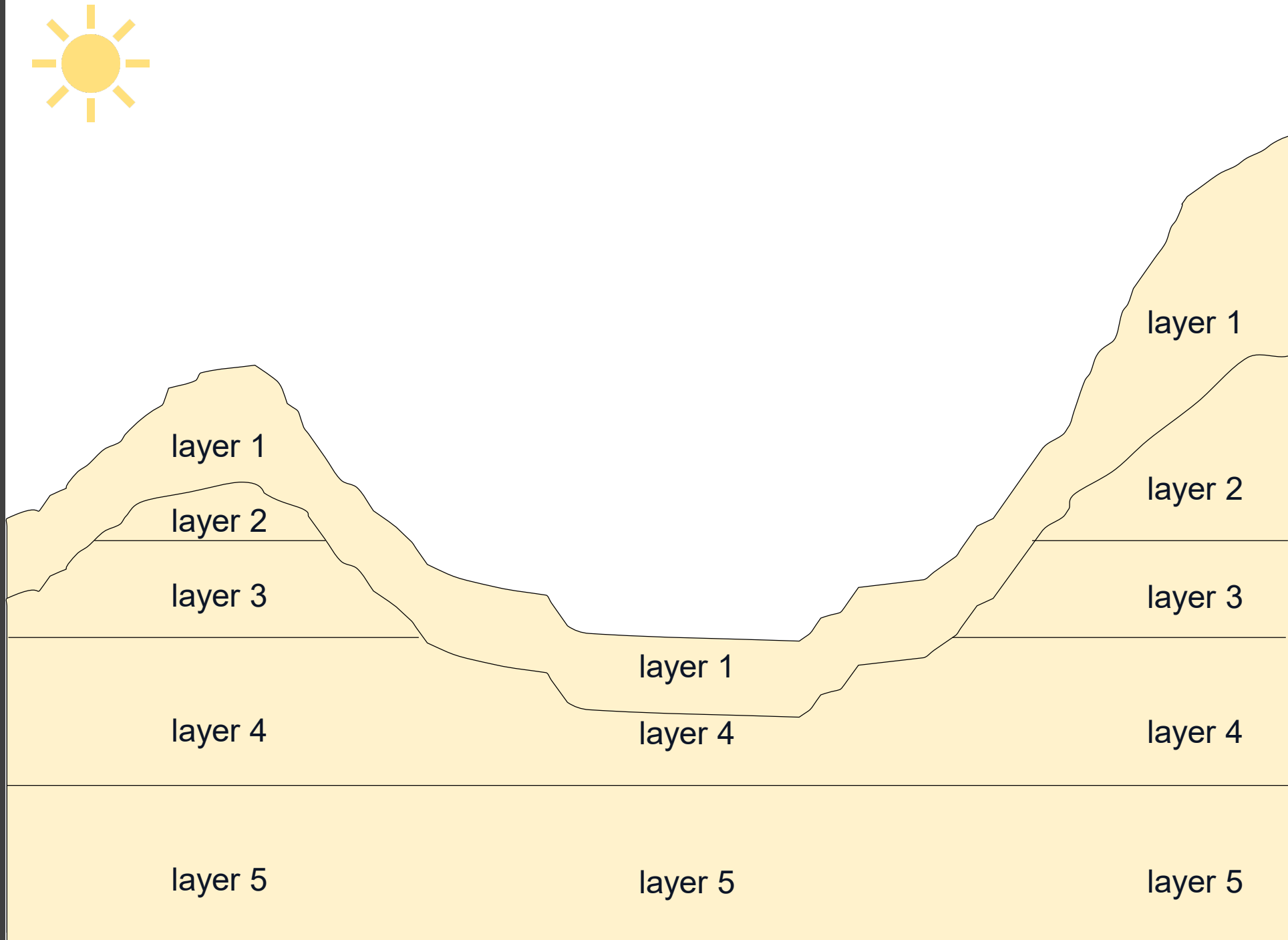
Layering - shallow



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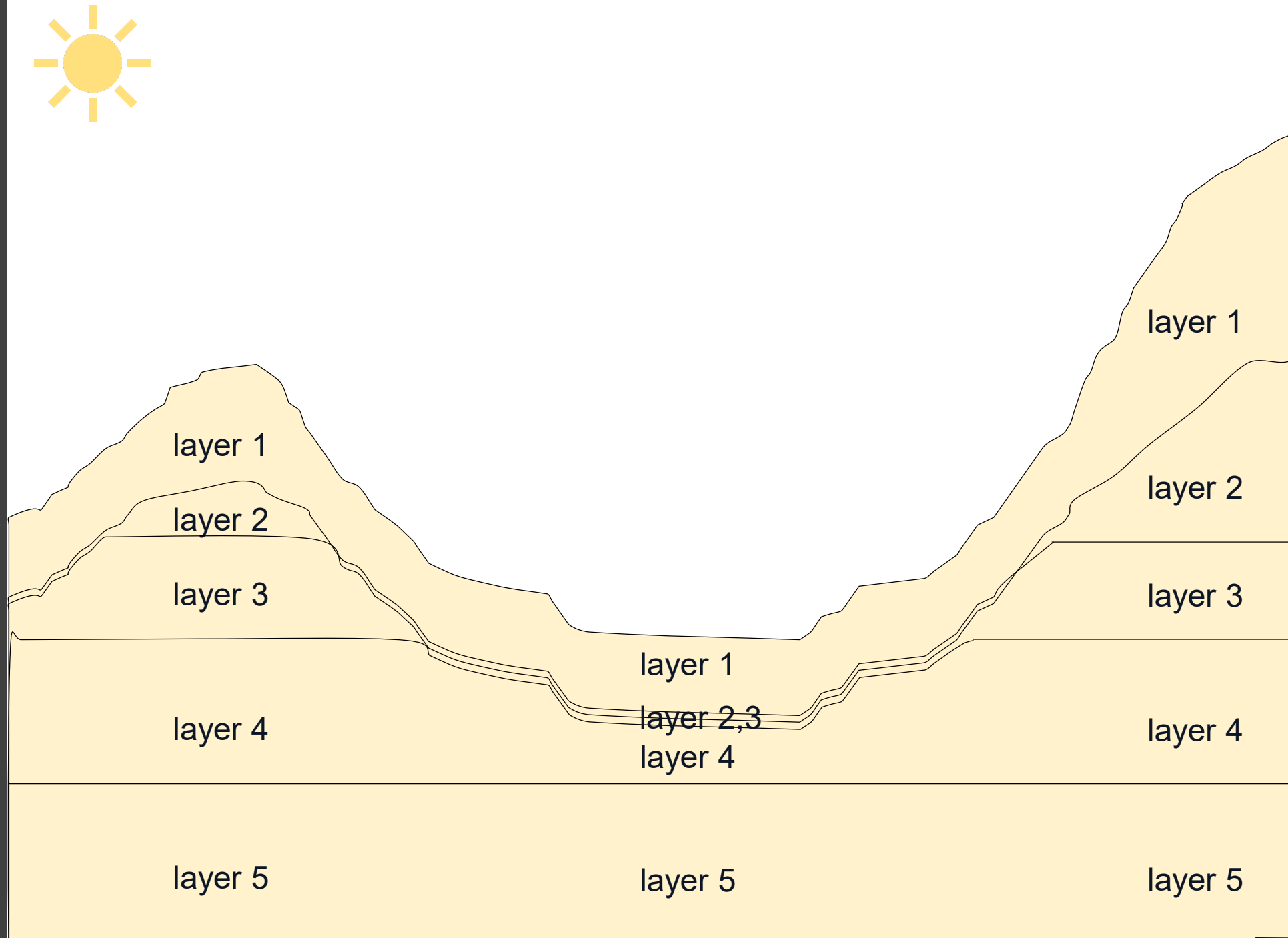
Layering - shallow



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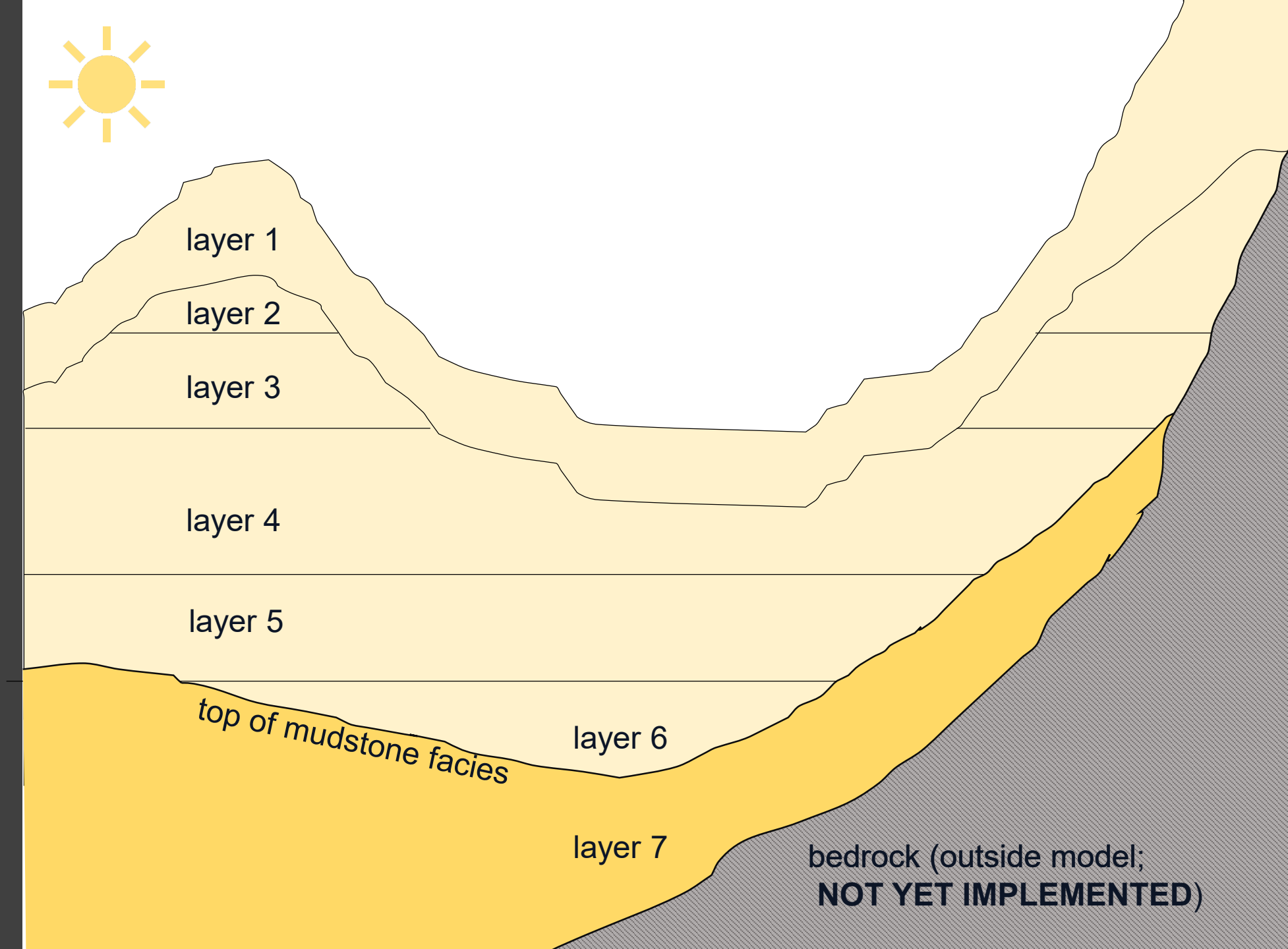
Layering – shallow and deep



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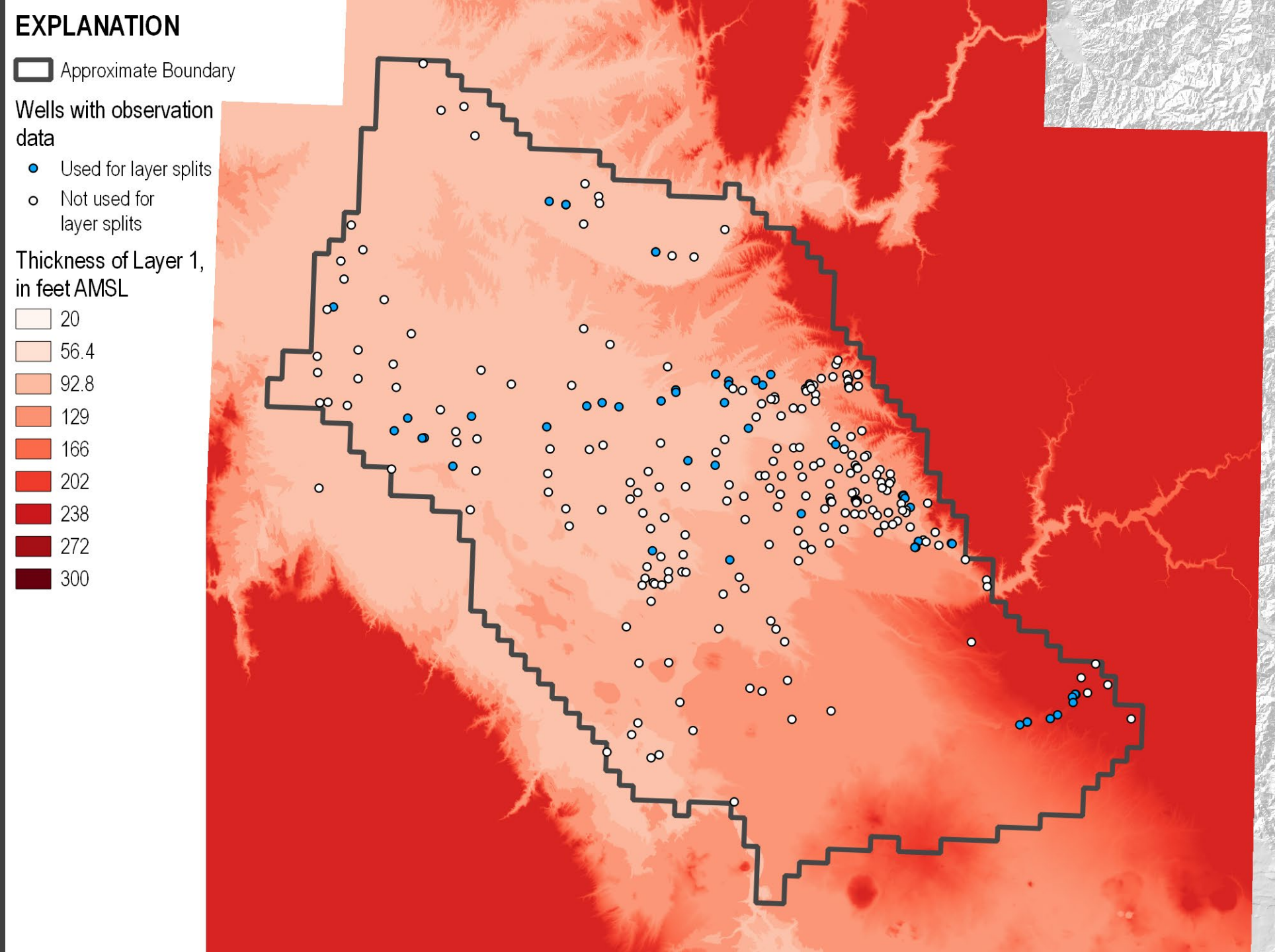
Thickness: Layer 1



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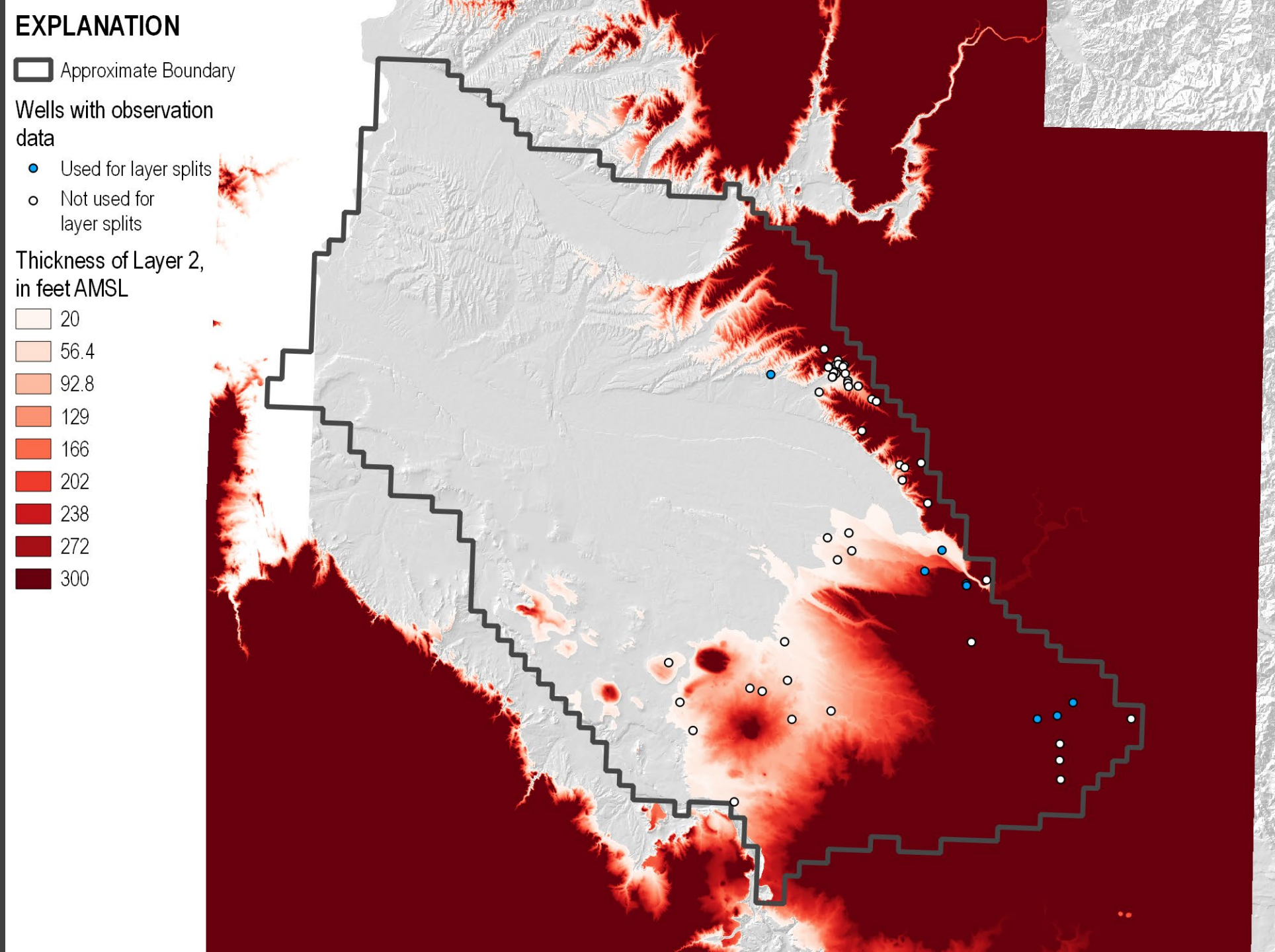
Thickness: Layer 2



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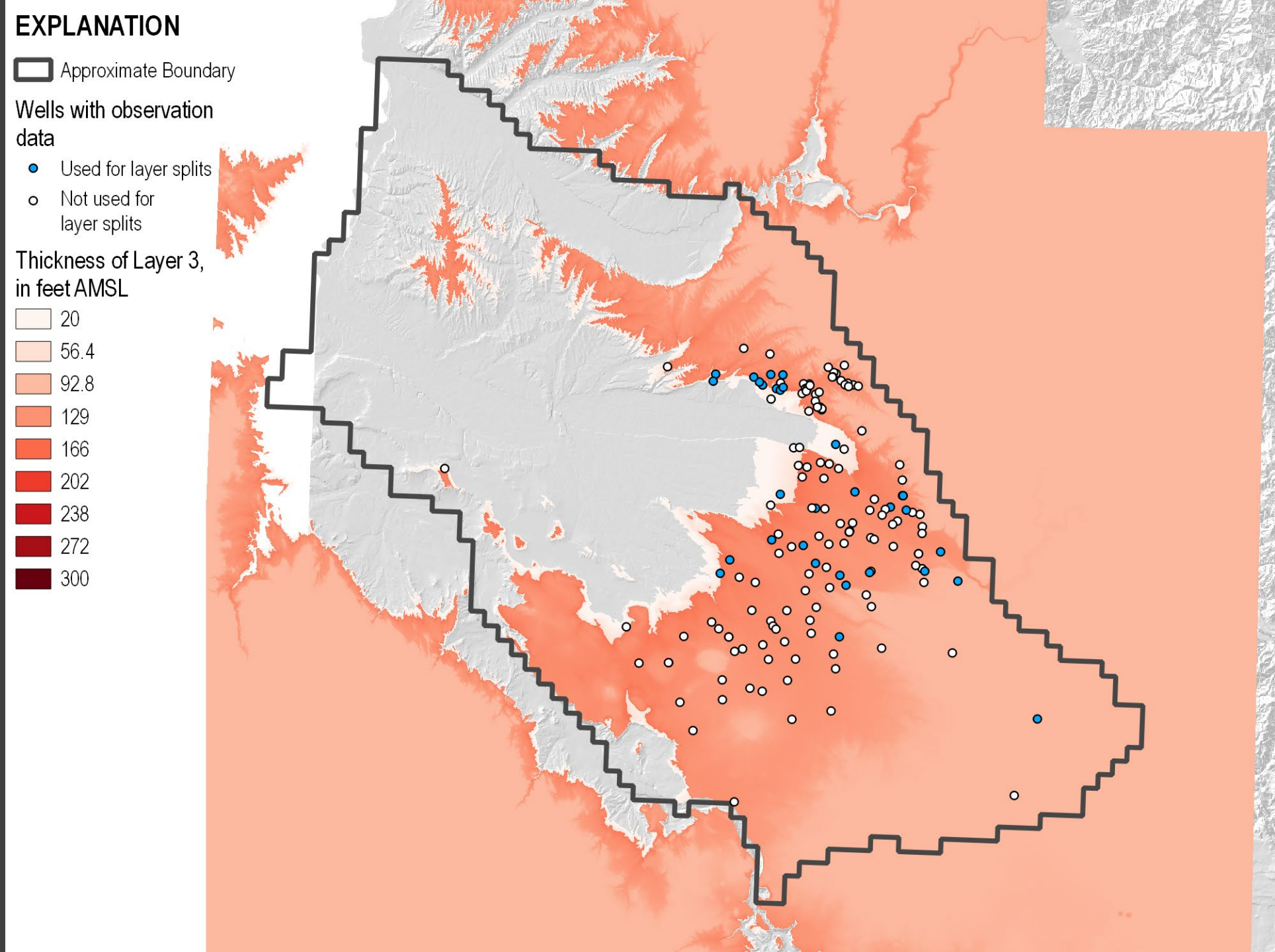
Thickness: Layer 3



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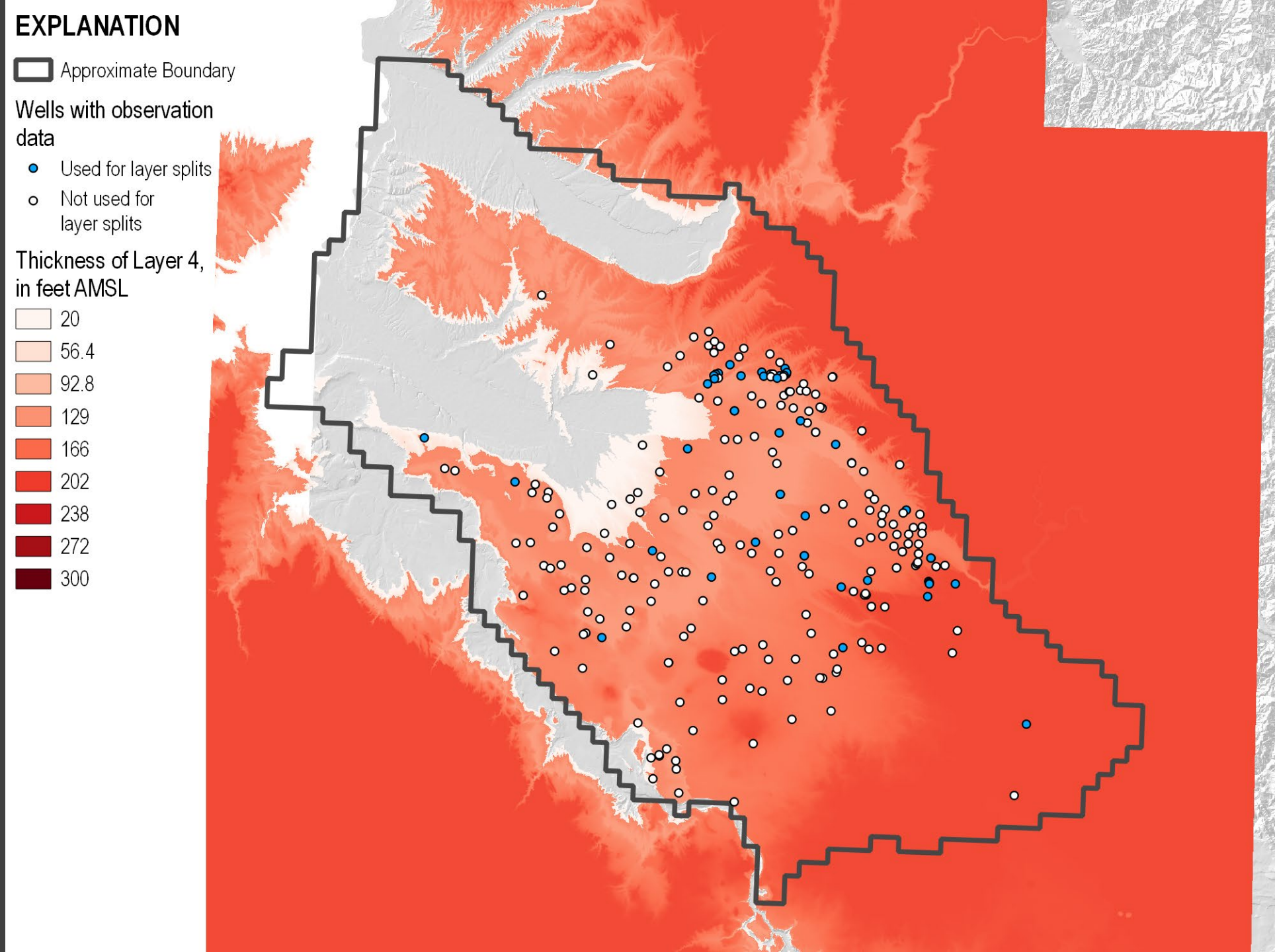
Thickness: Layer 4



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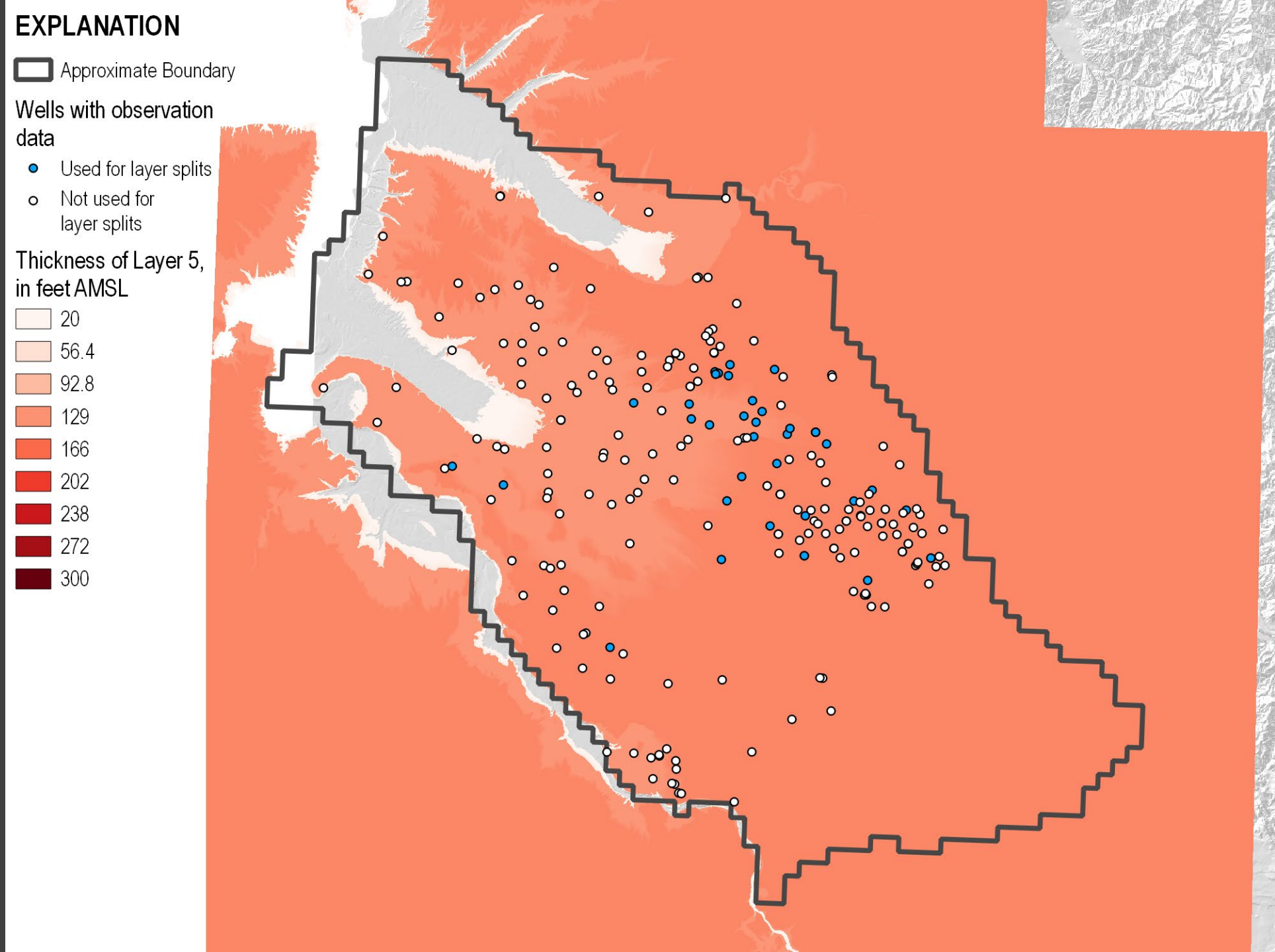
Thickness: Layer 5



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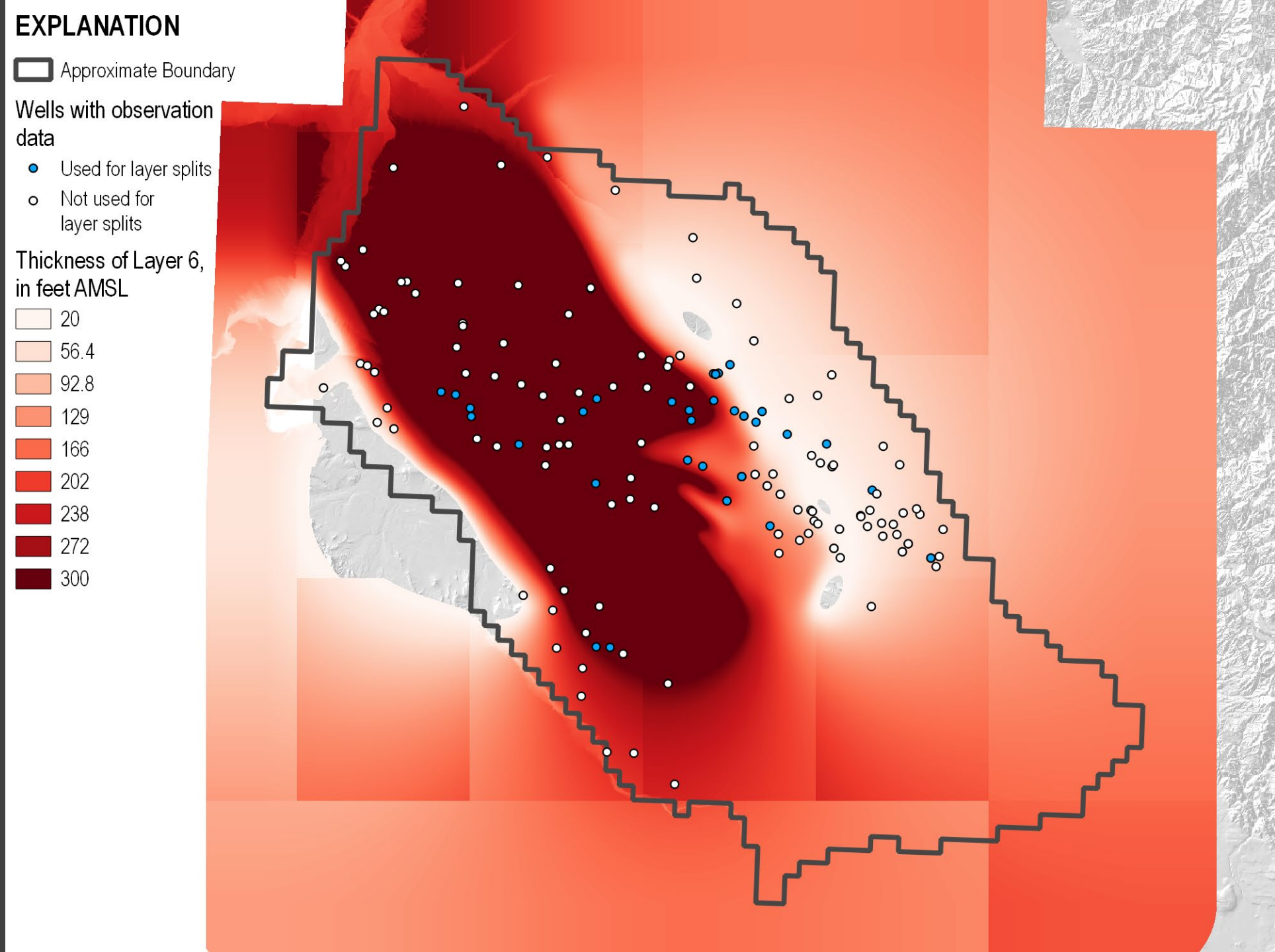
Thickness: Layer 6



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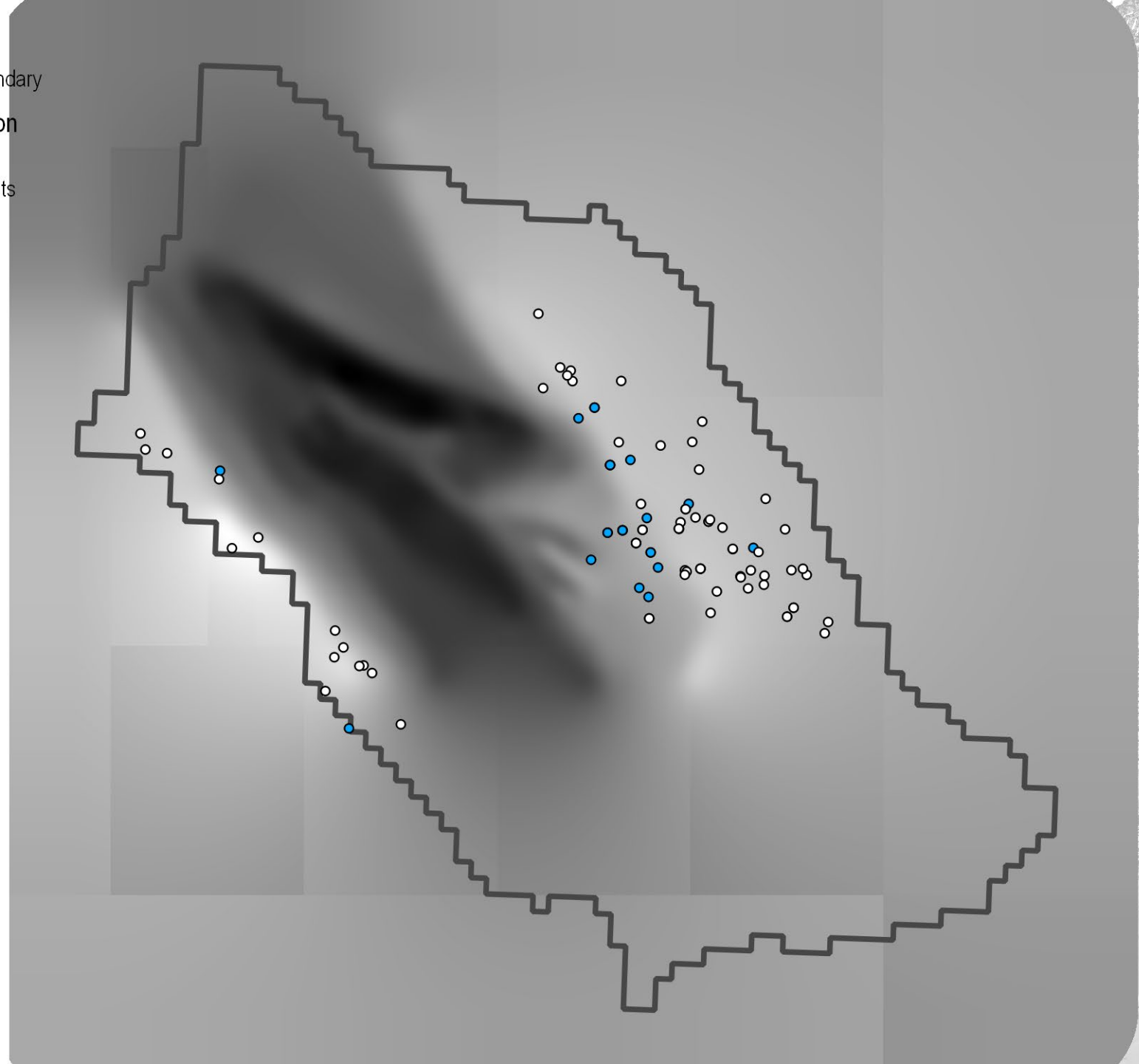
Layer 7

COMING SOON...



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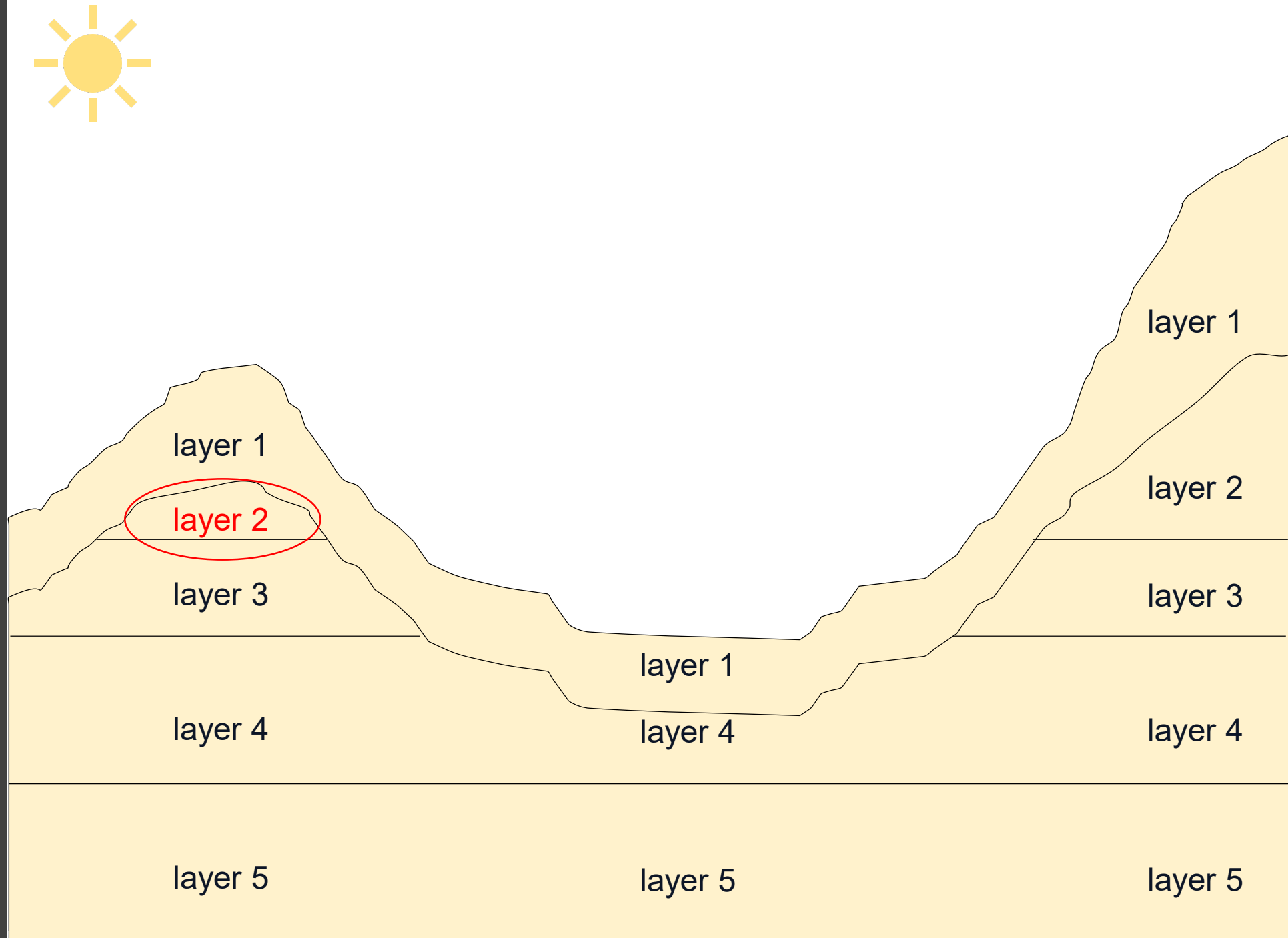
‘Islands’ within layers



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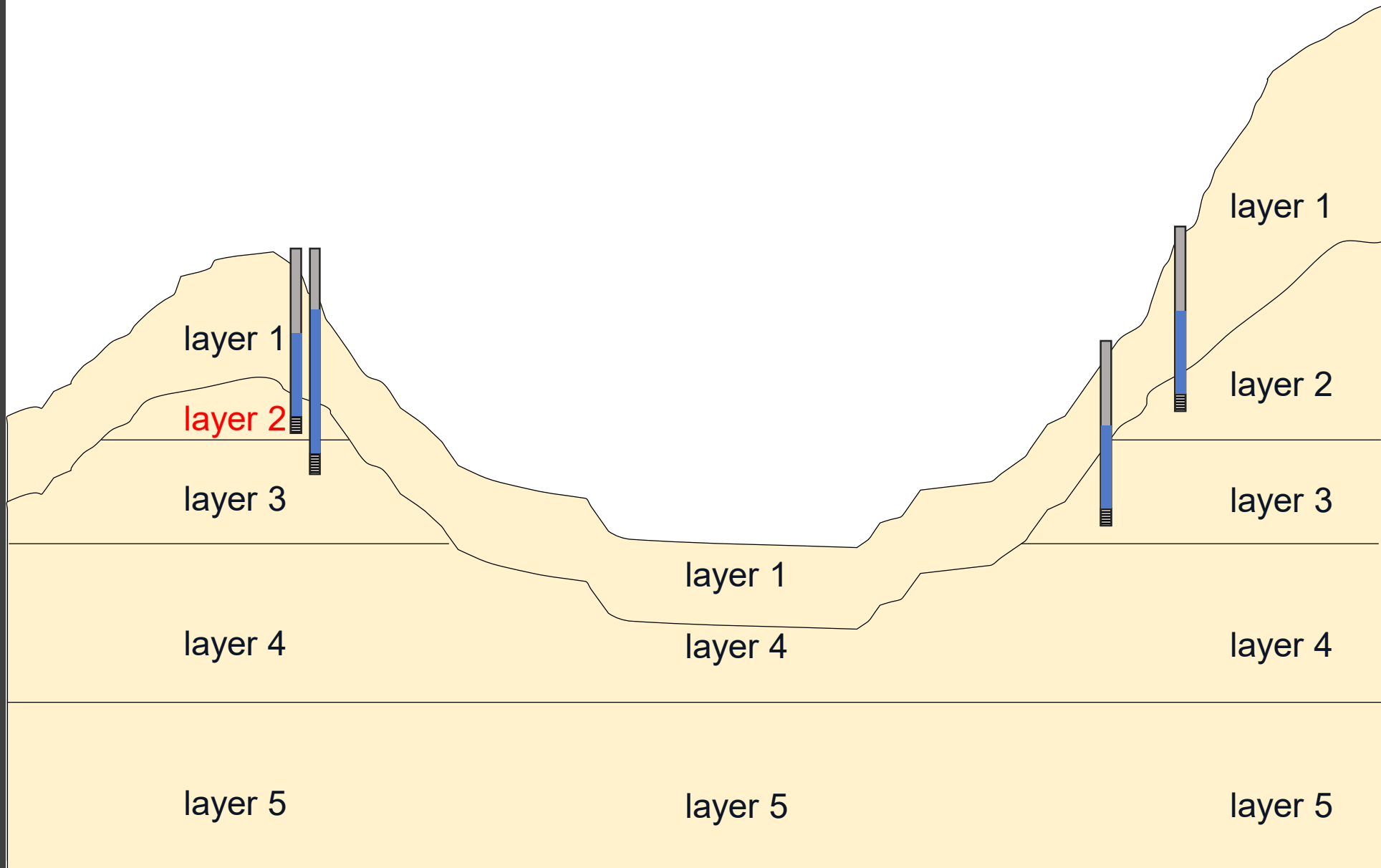
‘islands’ within layers



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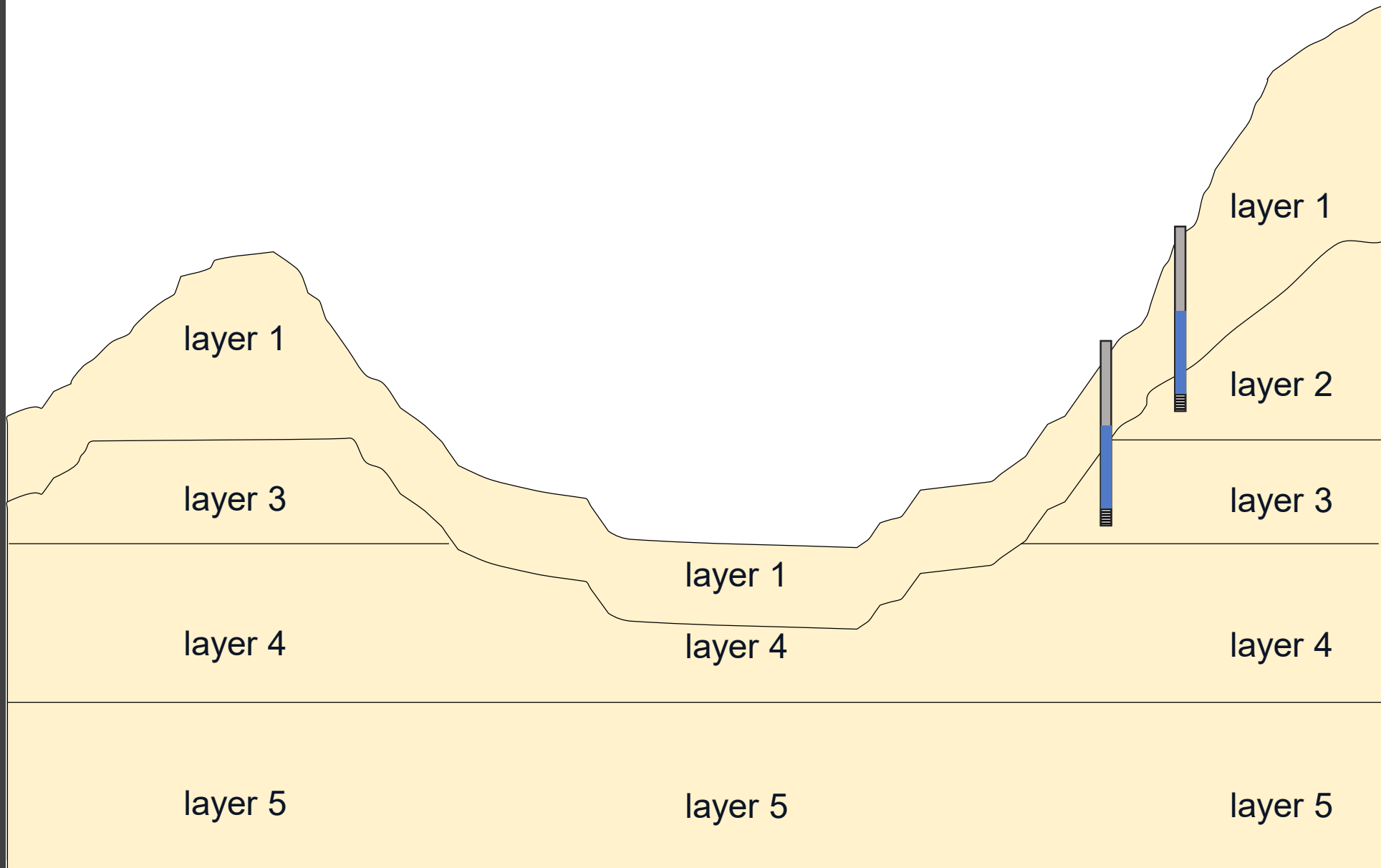
‘islands’ within layers



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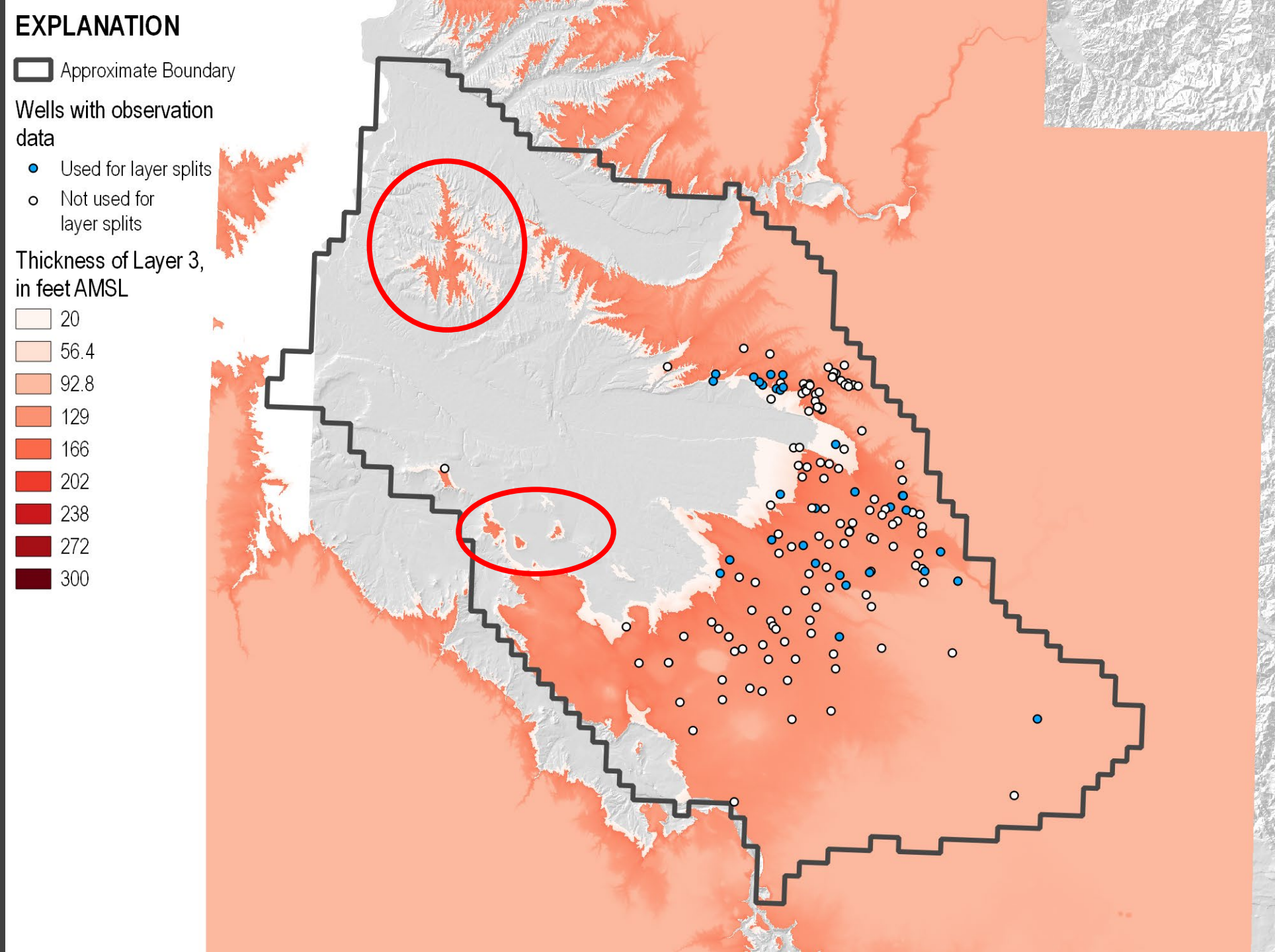
‘islands’ within layers

For example:



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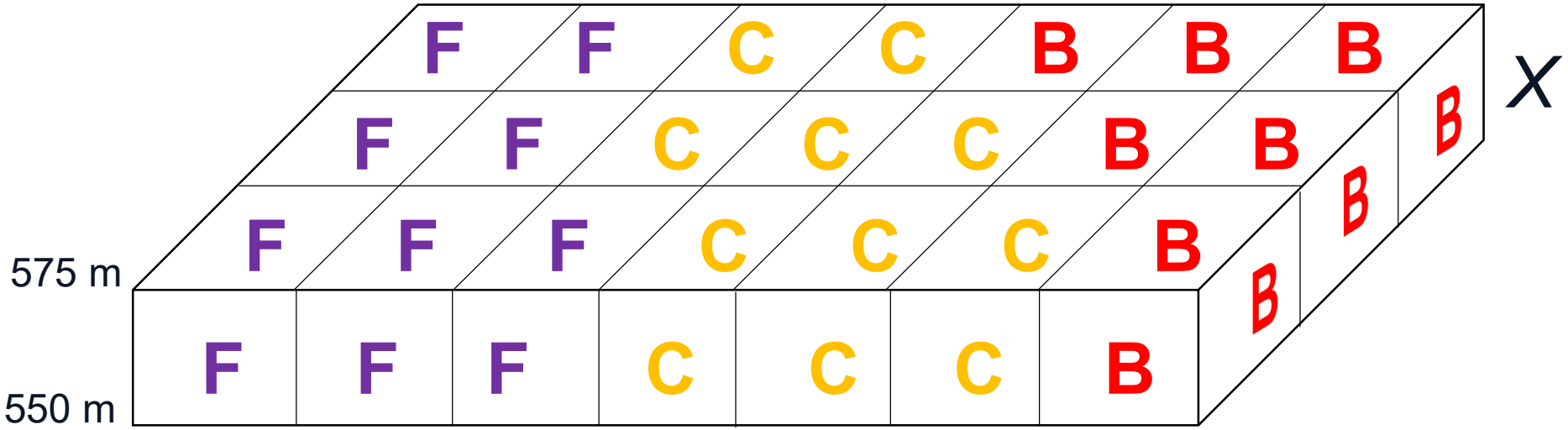
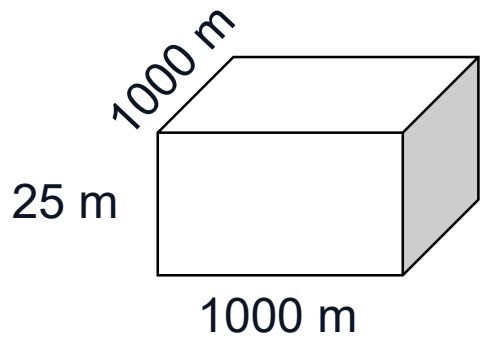
Rockworks hydrogeologic framework model "layer X"





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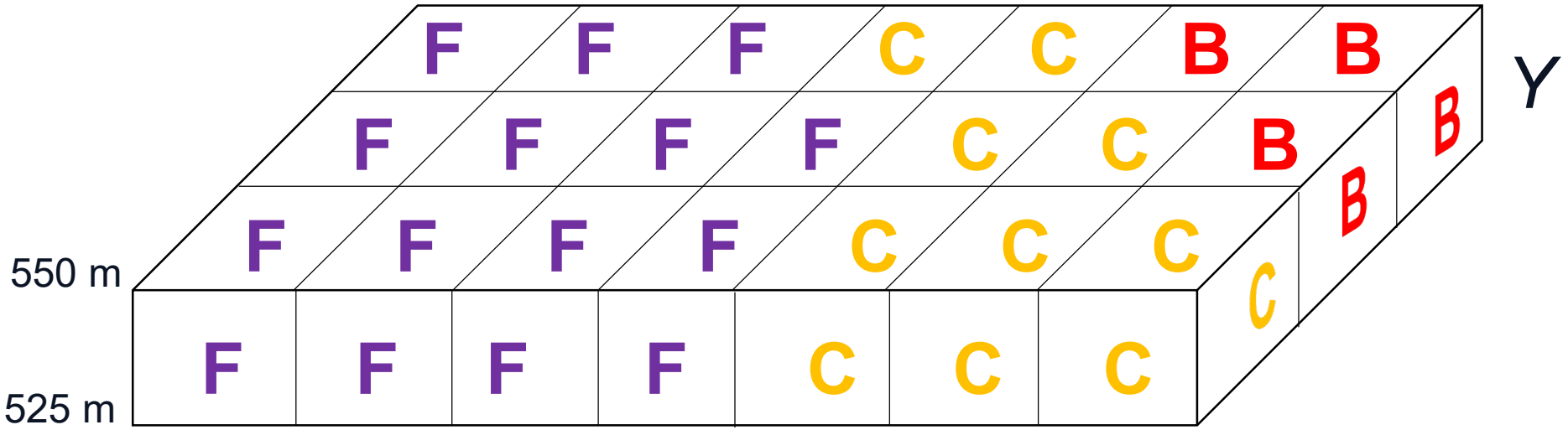
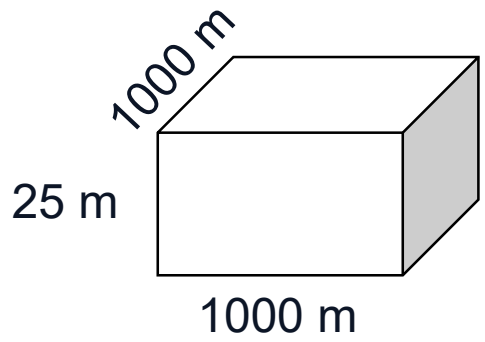
Rockworks hydrogeologic framework model "layer Y"





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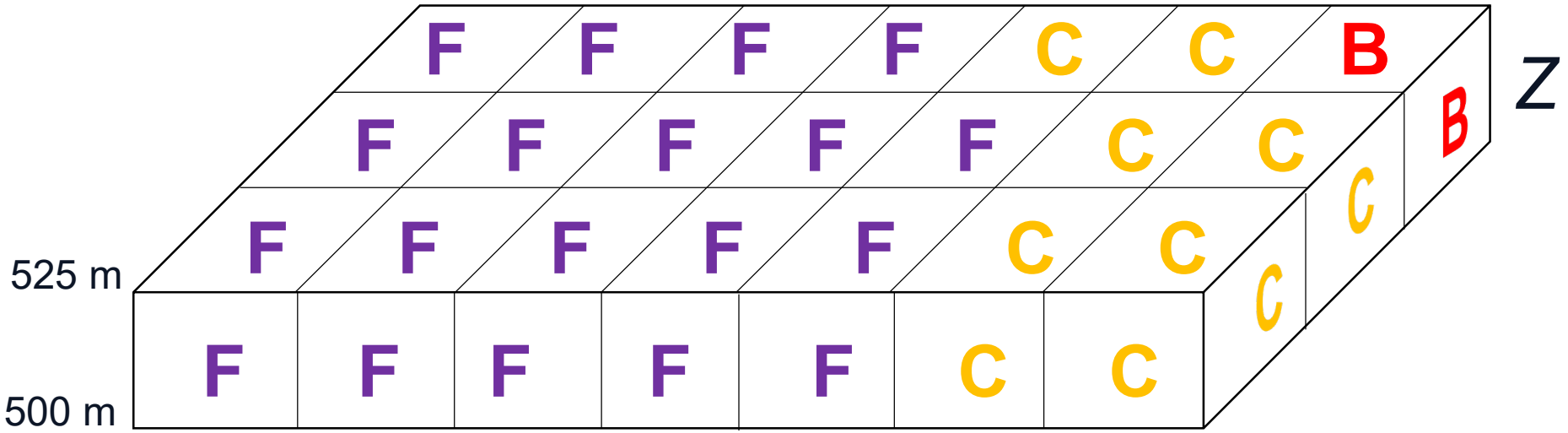
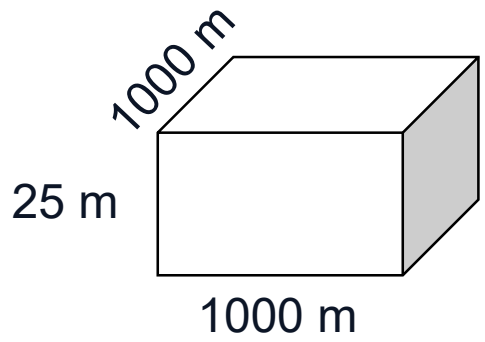
Rockworks hydrogeologic framework model "layer Z"





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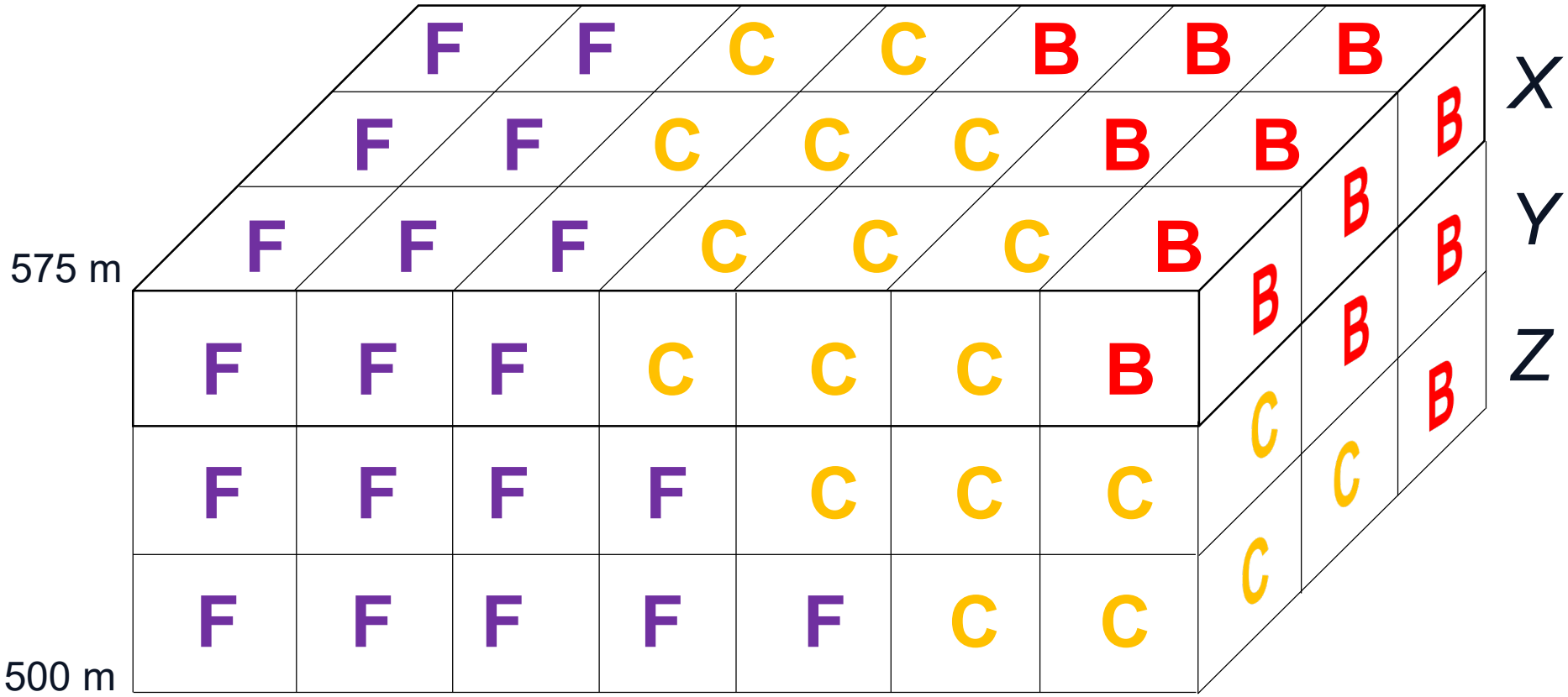
Rockworks hydrogeologic framework model



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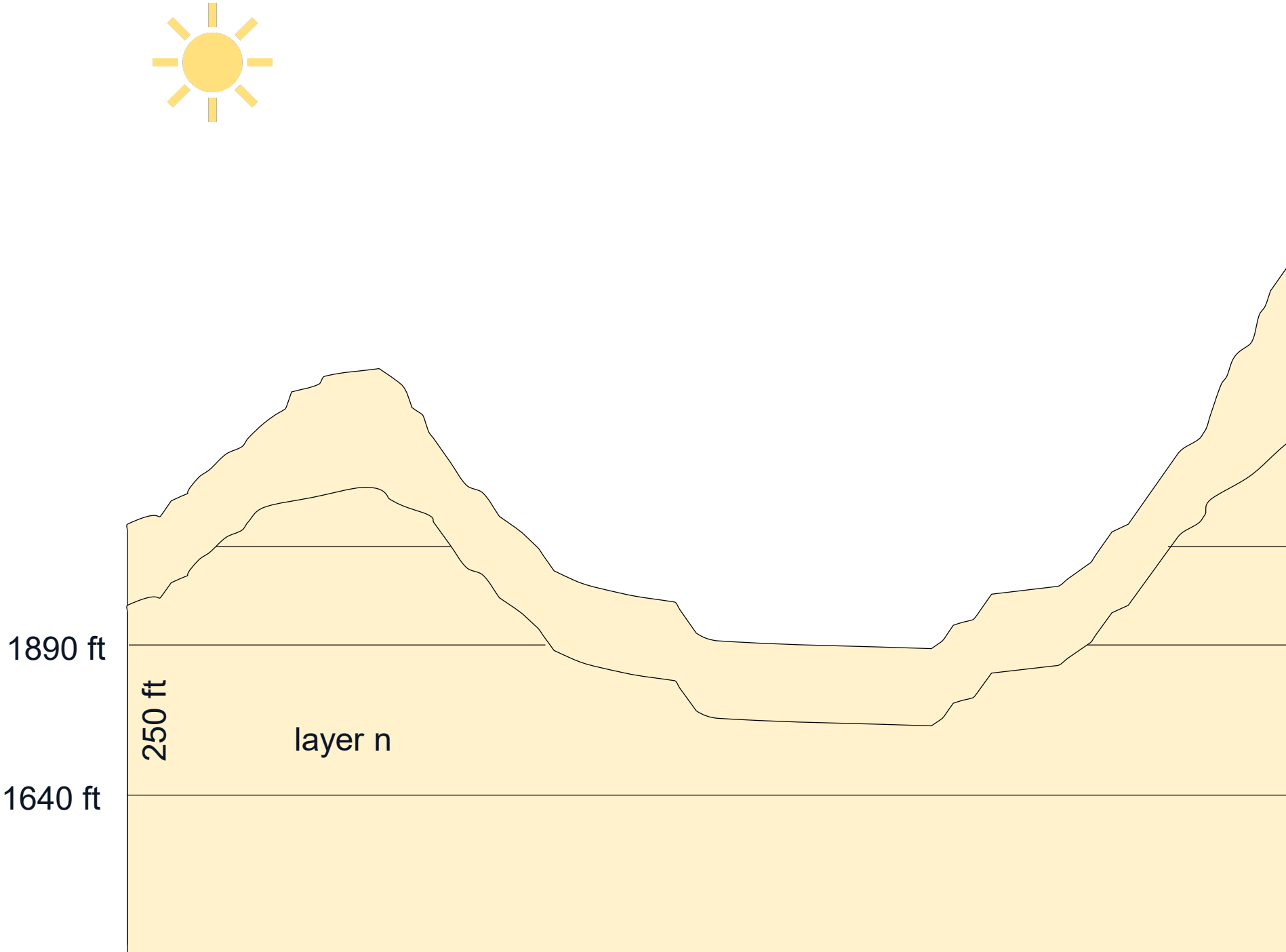
Flow model layer



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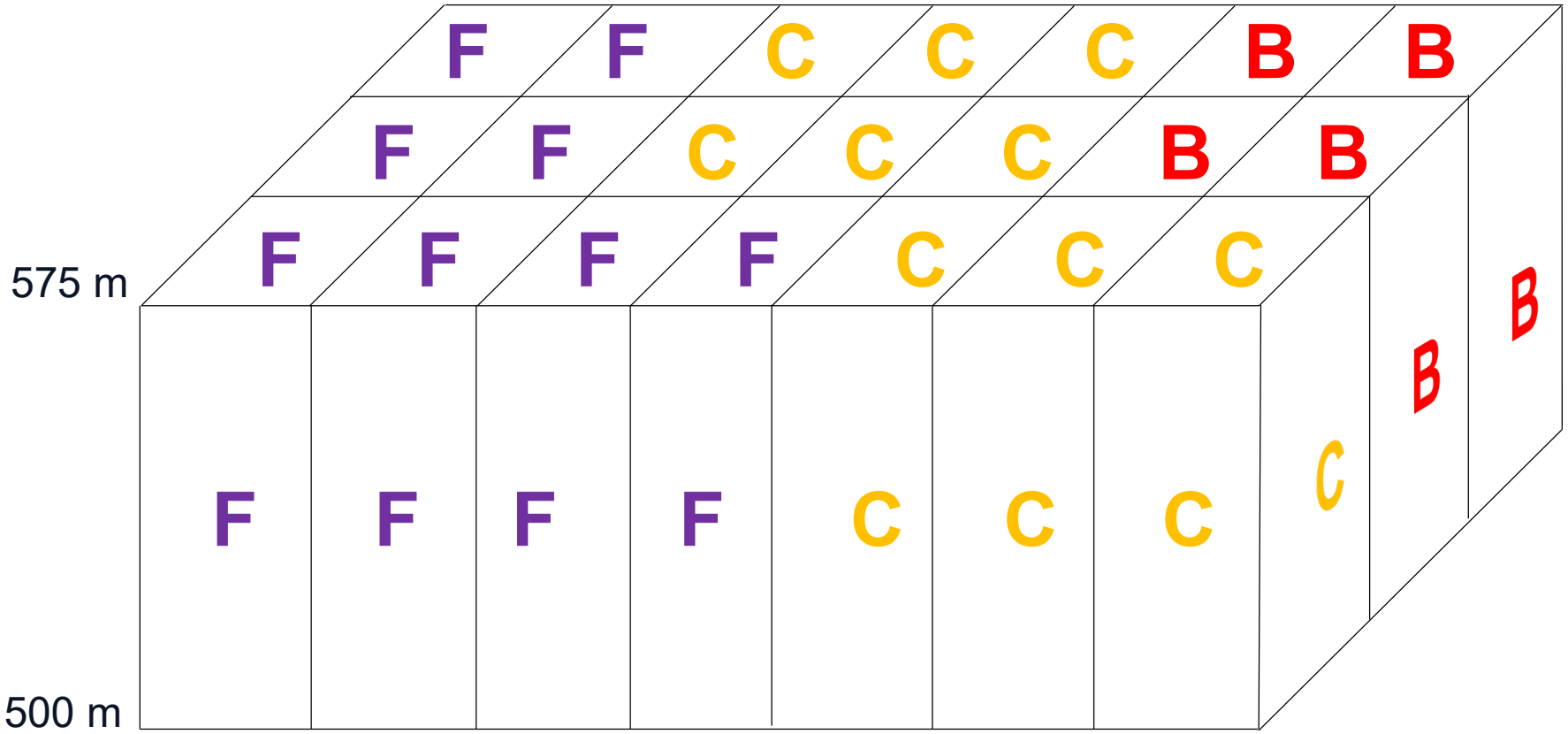
Lithology for the flow model layer (several options for determining average)



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Horizontal:
grid and cells

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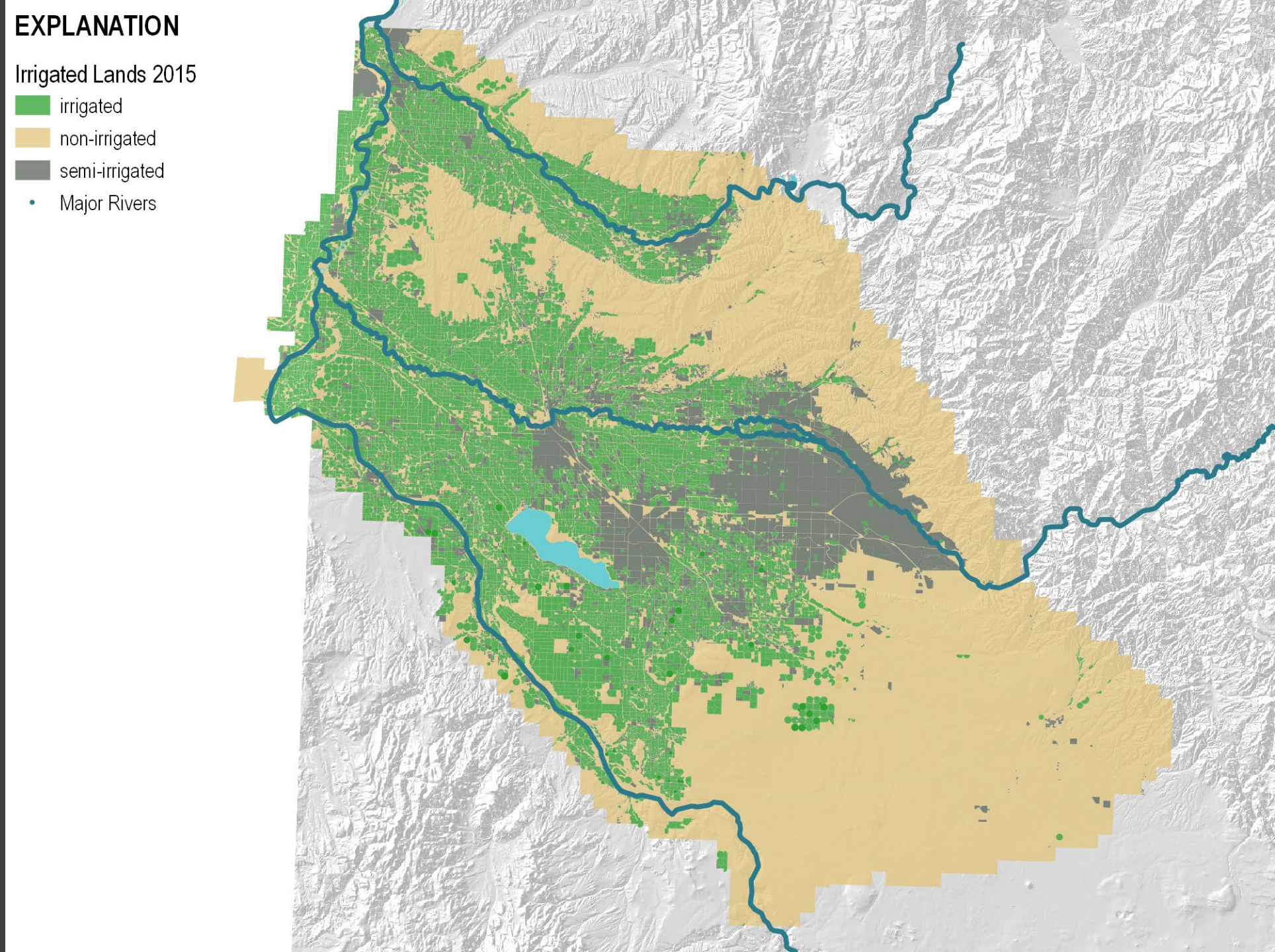
How to grid?



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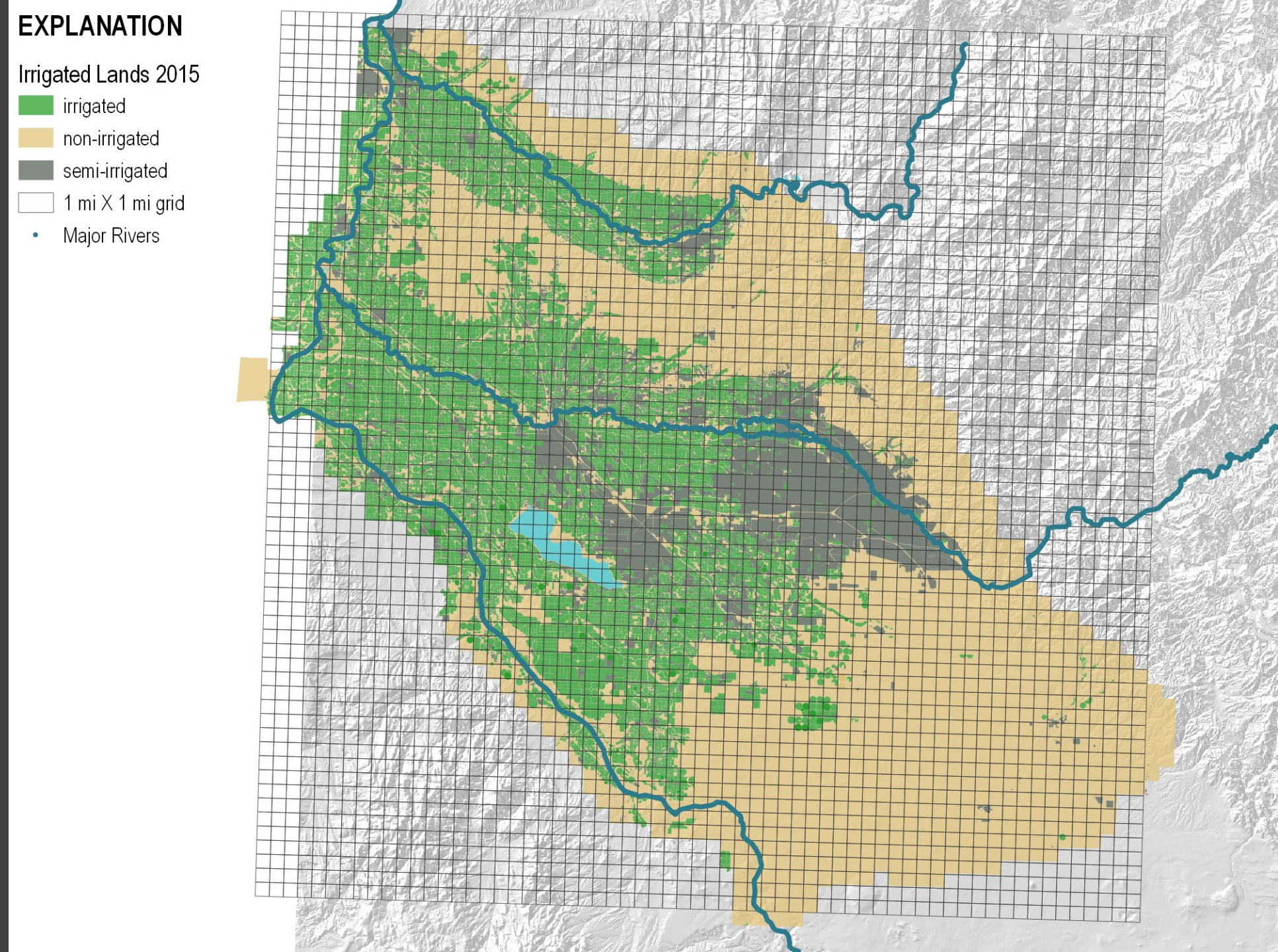
1 mile X 1 mile cells

FACTORS:

- Resolution of input and calibration data

- Regional-scale management objectives

- Computation time



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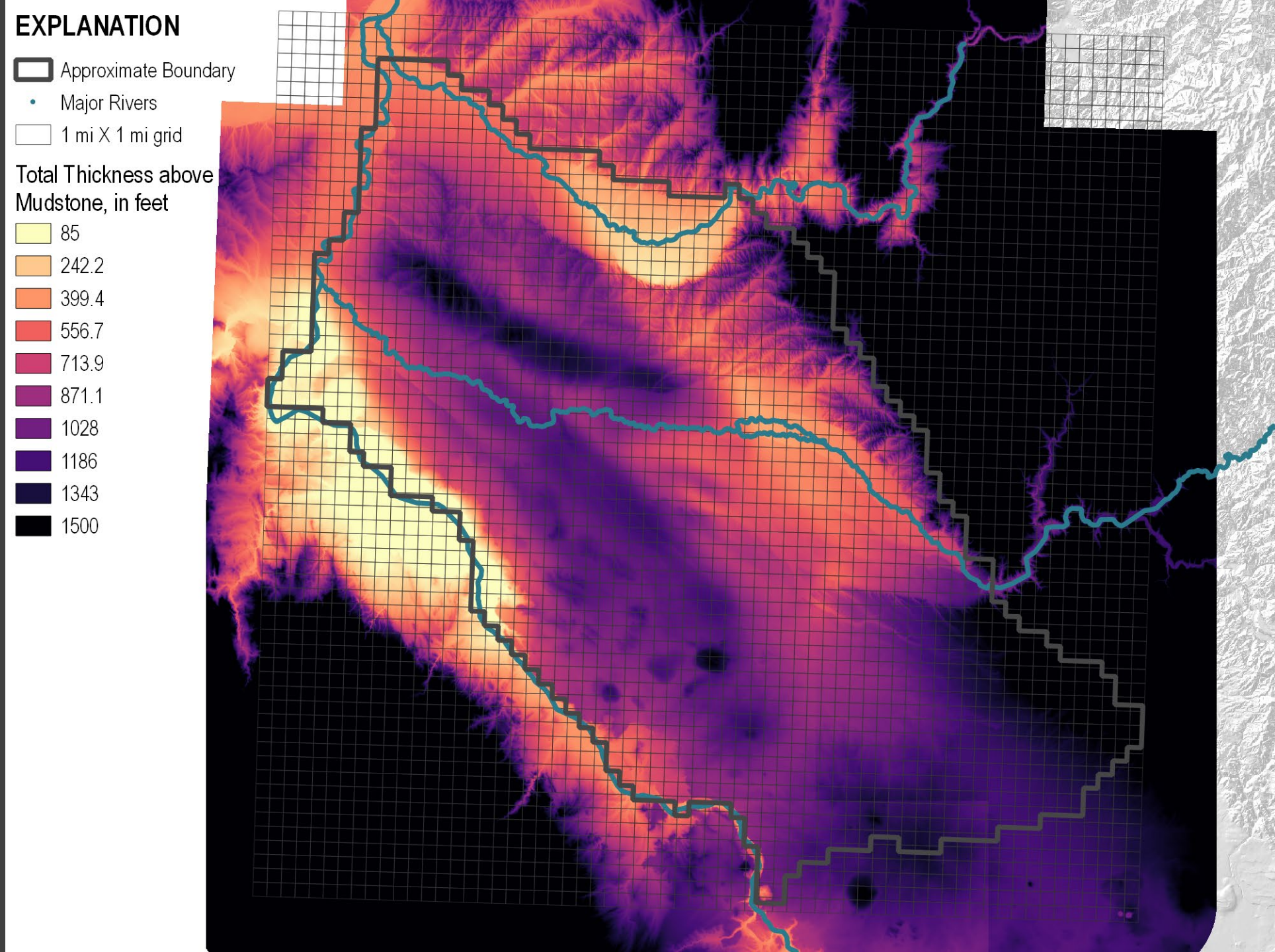
Properties to grid



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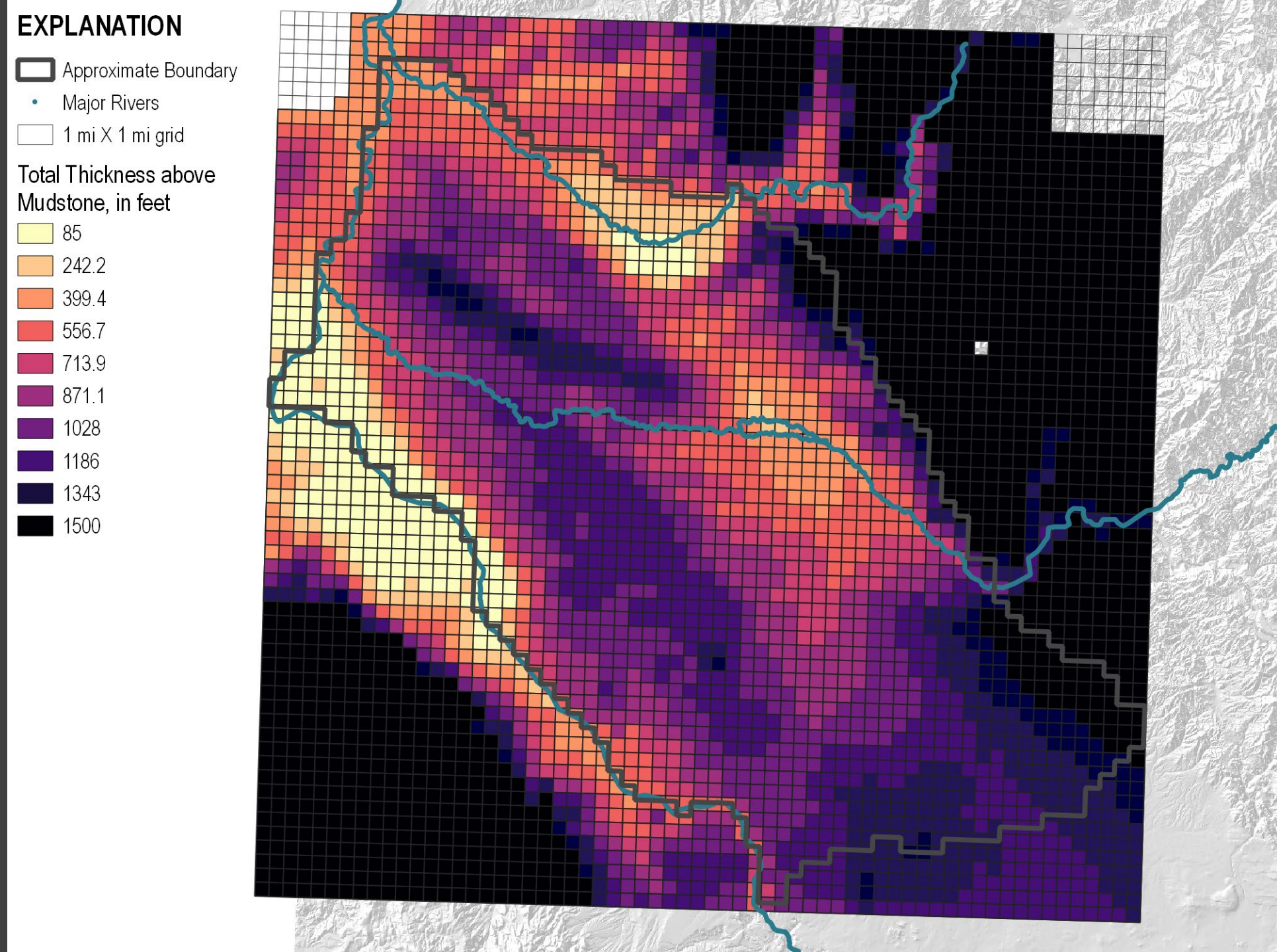
Properties to grid



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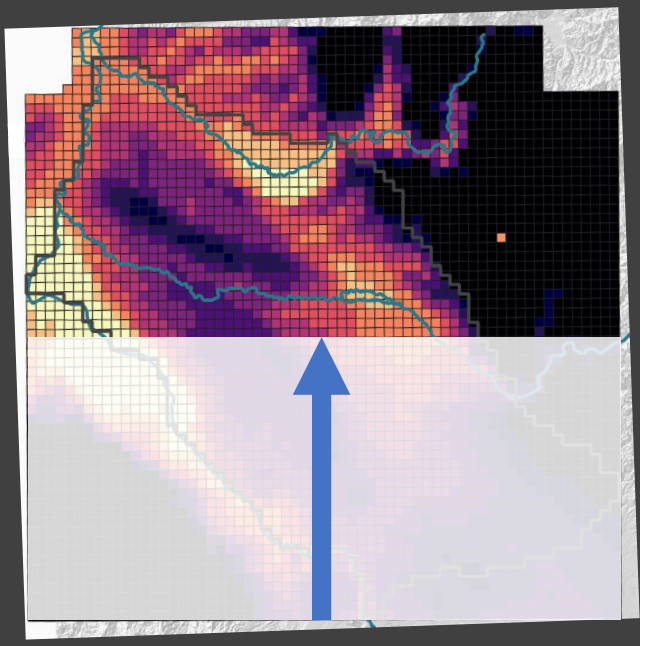
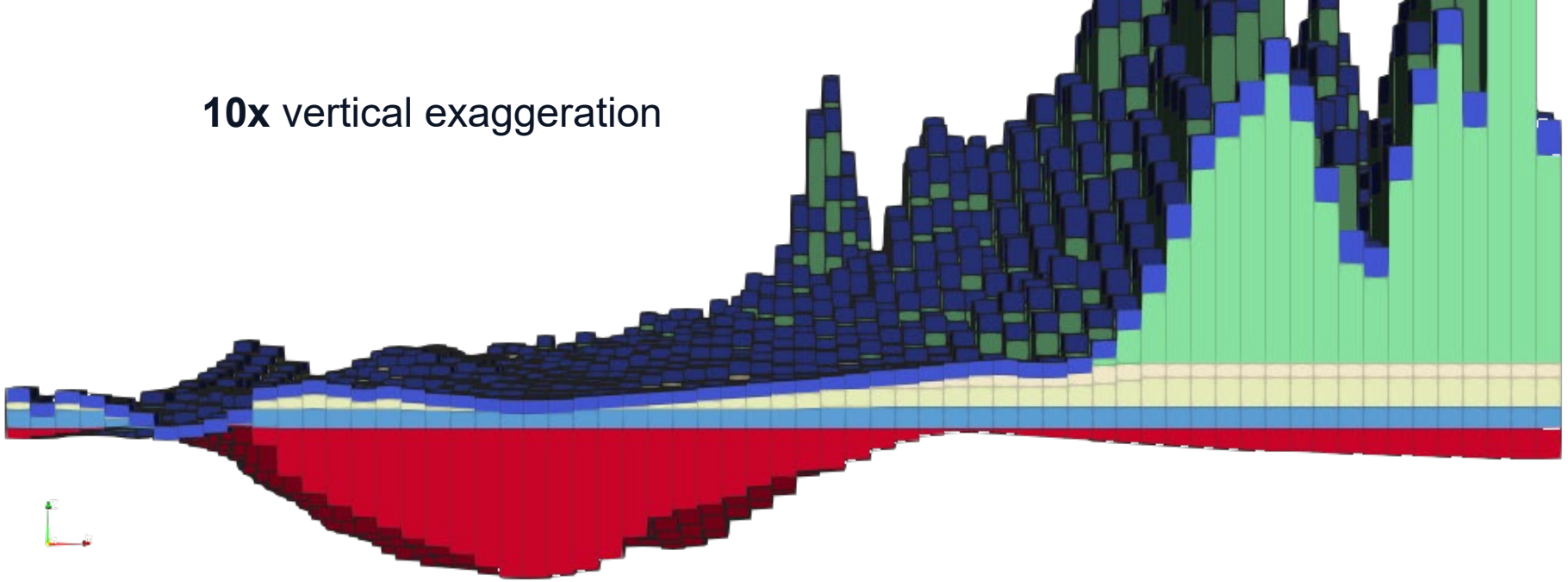
Cross section Looking North



10x vertical exaggeration



no vertical exaggeration

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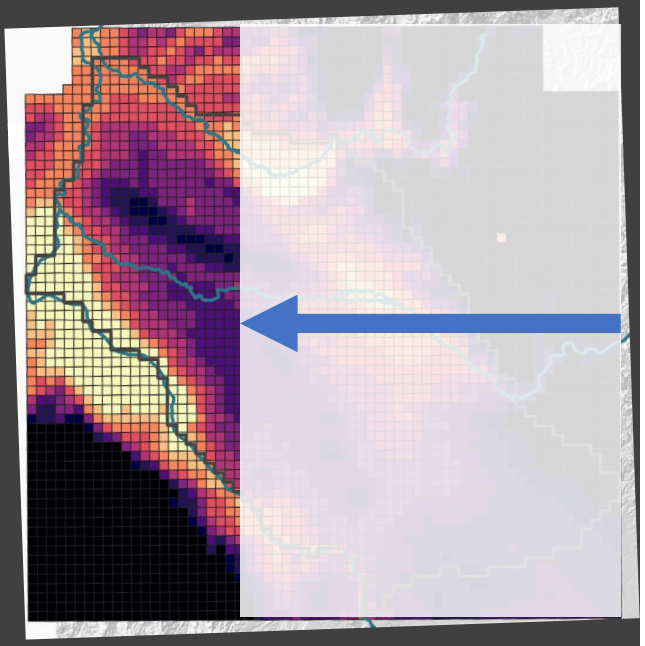
Cross section Looking West



10x vertical exaggeration

no vertical exaggeration

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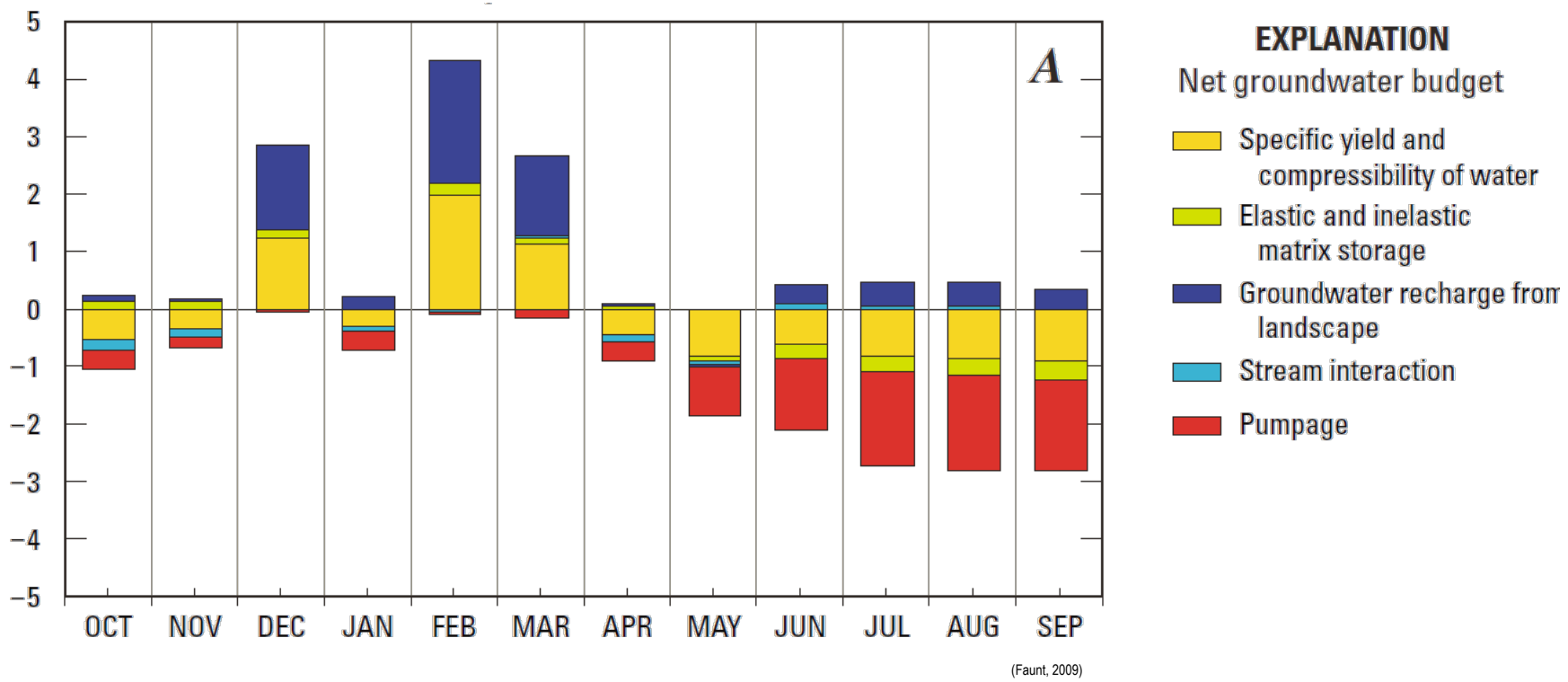
Time:
stress periods and time steps

Time

Monthly Stress Periods
- Inputs are constant for each month
- 360 total (12 months * 30 years)

Time Steps:
- Numerical issue
- How many times the system of equations are solved for each stress period
- TBD (1 step per period if possible)



(Faunt, 2009)

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