INTERNATIONAL WATER RESOURCES ASSOCIATION'S
1st ISLANDS WATER CONGRESS
FAROE ISLANDS - SEPTEMBER 4-6, 2024

International Water Resources Association
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JARÐFEINGI
Faroese Geological Survey

Possible mine dewatering impacts on a Philippine community's groundwater supply:

Insight from Analytic Element Method

Jayson Gabriel Pinza

AGHAM (Advocates of Science and Technology for the People)
[Philippines]

The Philippines

Carport, 2012

Groundwater levels have lowered

Holmstad, 2017

Mine operations started

Rappler, 2017

Research Question

Did mine dewatering reduce the groundwater levels?

Challenge:

No monitoring data?

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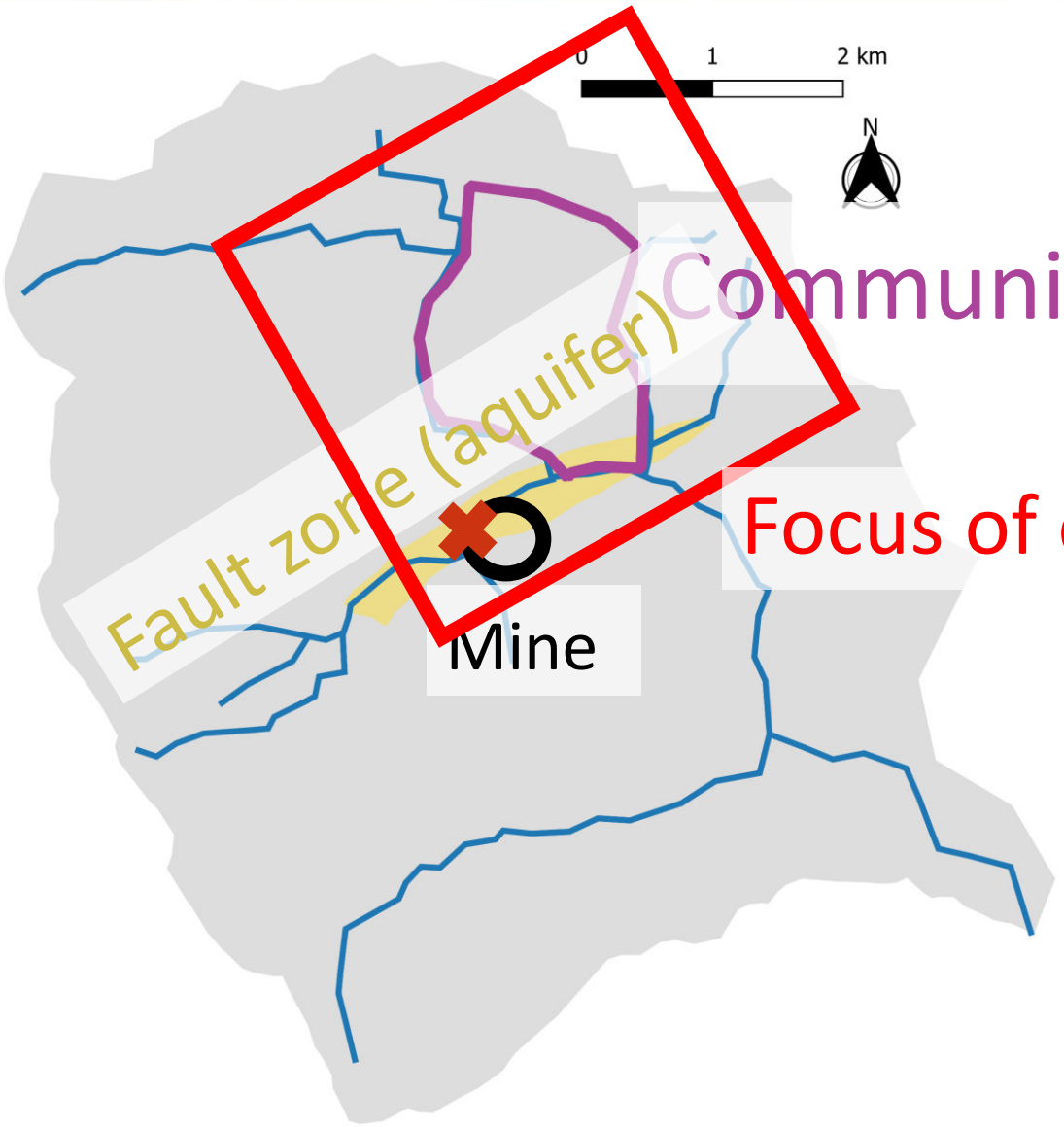
Method:

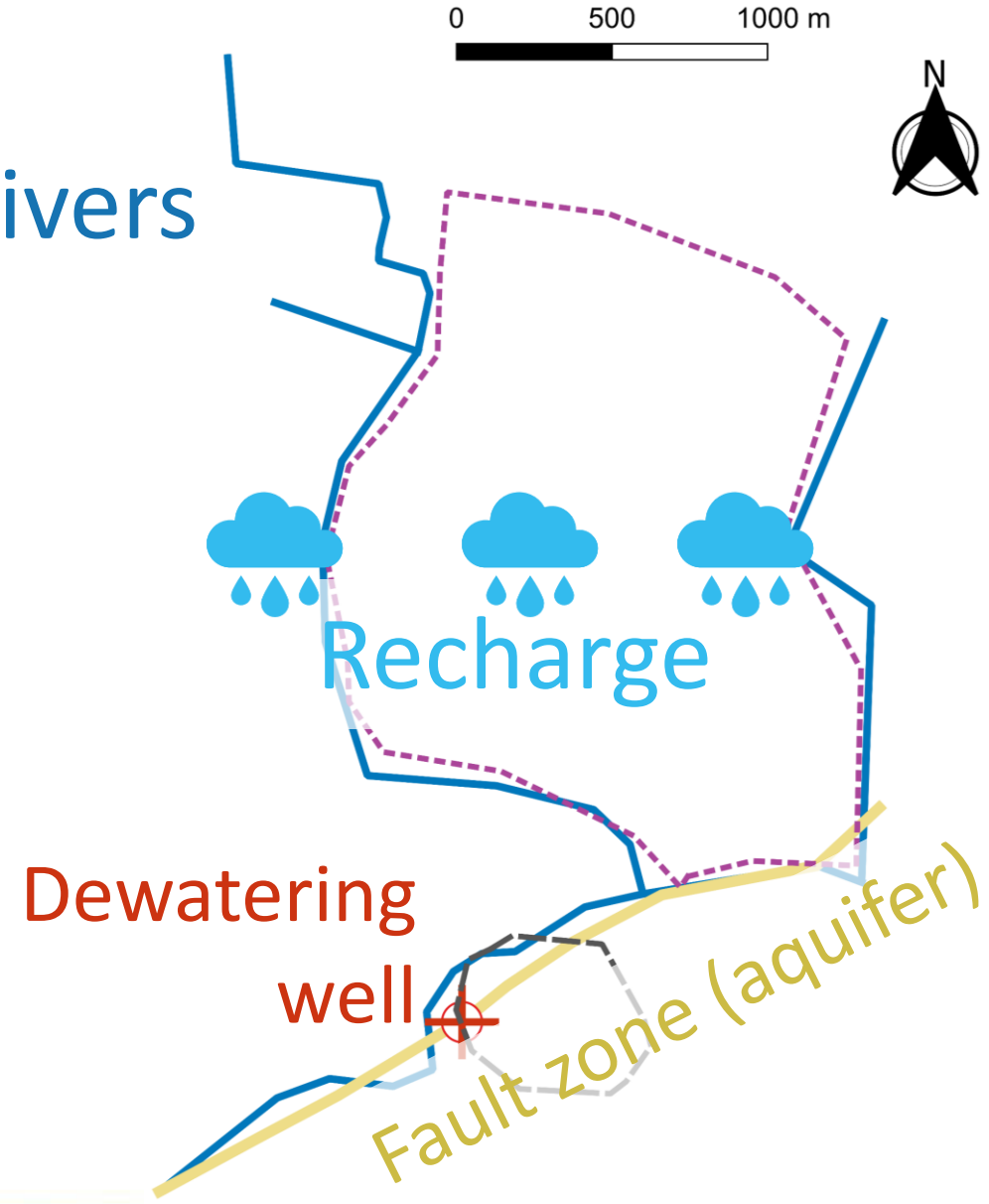
Analytic Element Method (AEM)

Site Description

Rivers

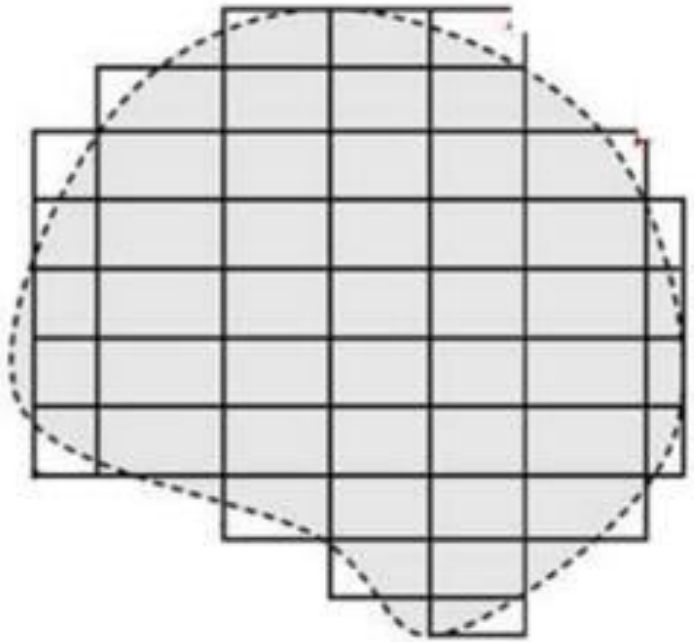


Analytic elements represent hydrogeologic features

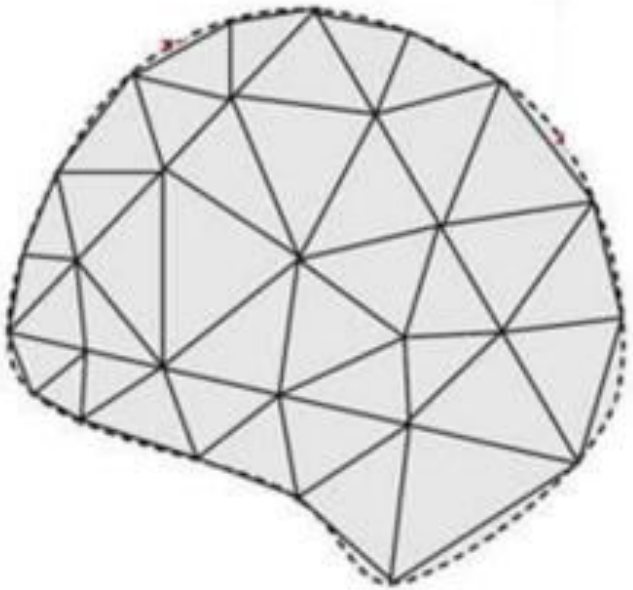


AEM is quick, useful for simple study sites

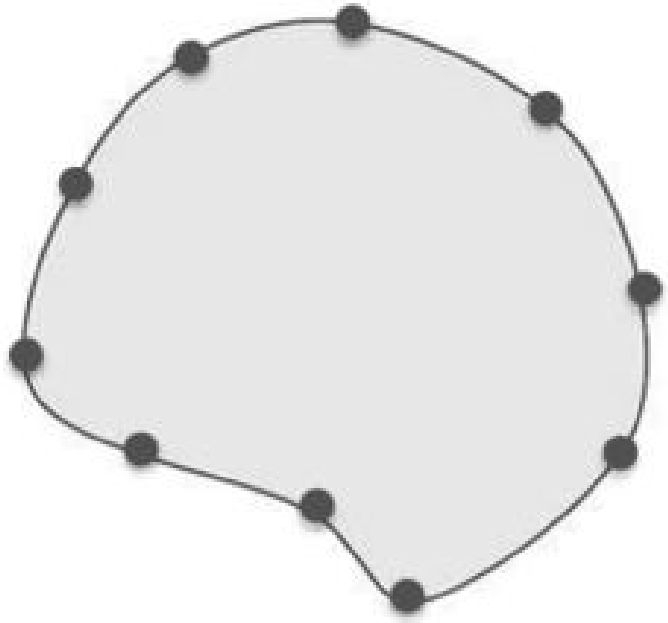
MODFLOW



HYDRUS

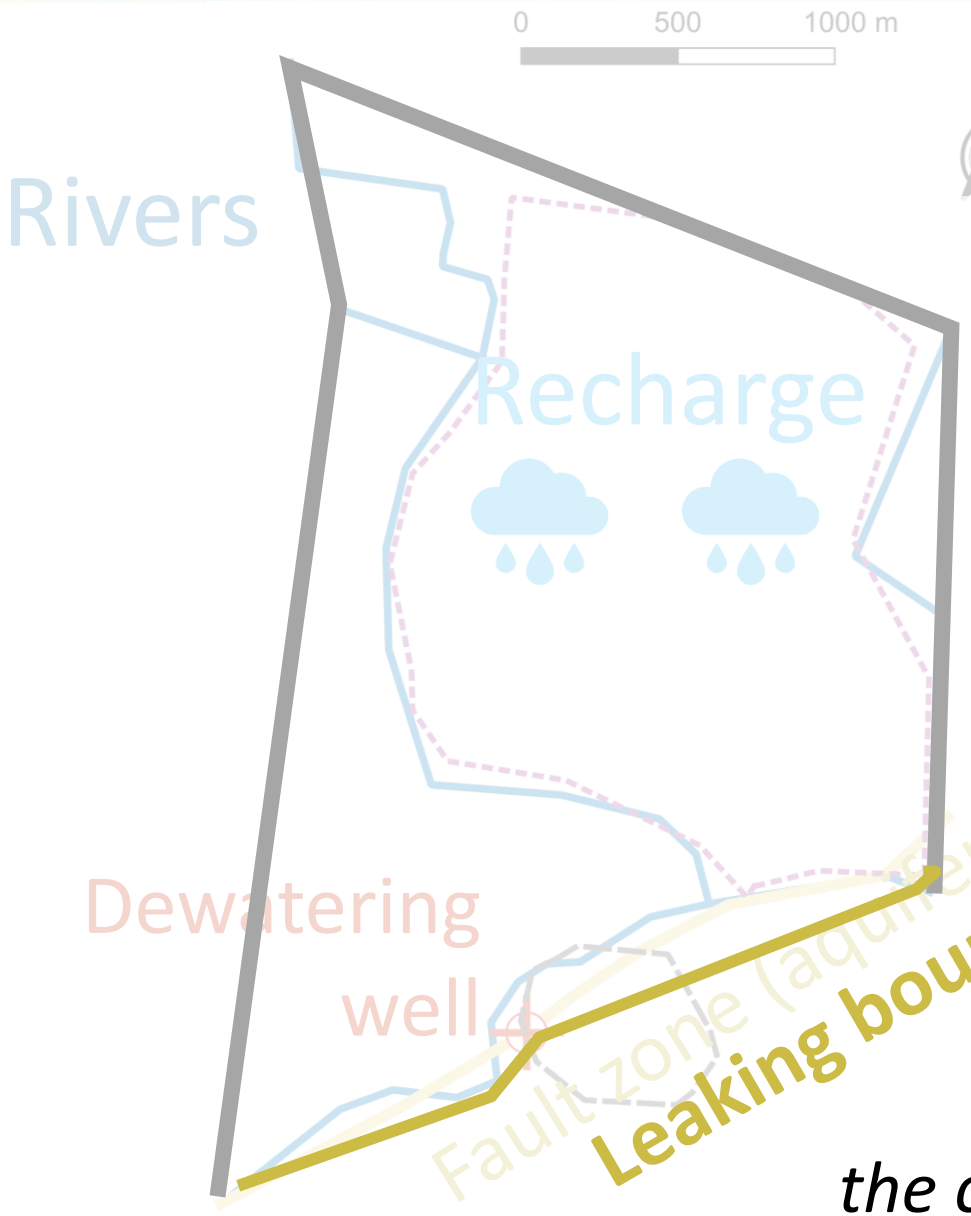


AEM



Modified from Polyzos (2019)

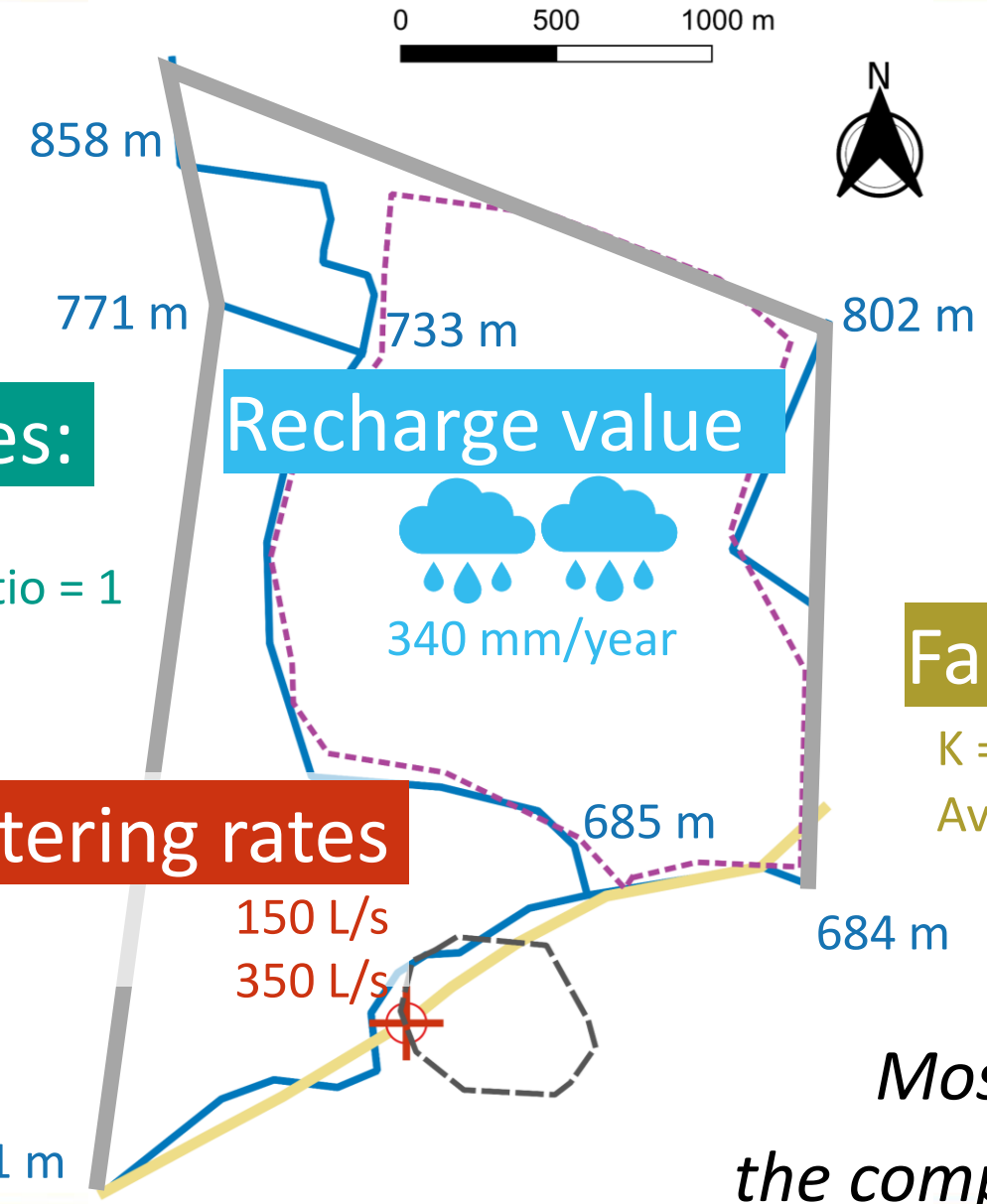
Model Setup Boundaries



Information from the company's technical report

Model Setup: Parameter Values

River levels:



Riverbed properties:

Vertical K = 0.0137 m/day

River width/Riverbed thickness ratio = 1

Recharge value

340 mm/year

Dewatering rates

150 L/s

350 L/s

Hard rock properties

Specific yield = 150 L/s

Horizontal K = 0.026 m/day

Vertical K = 0.26 m/day

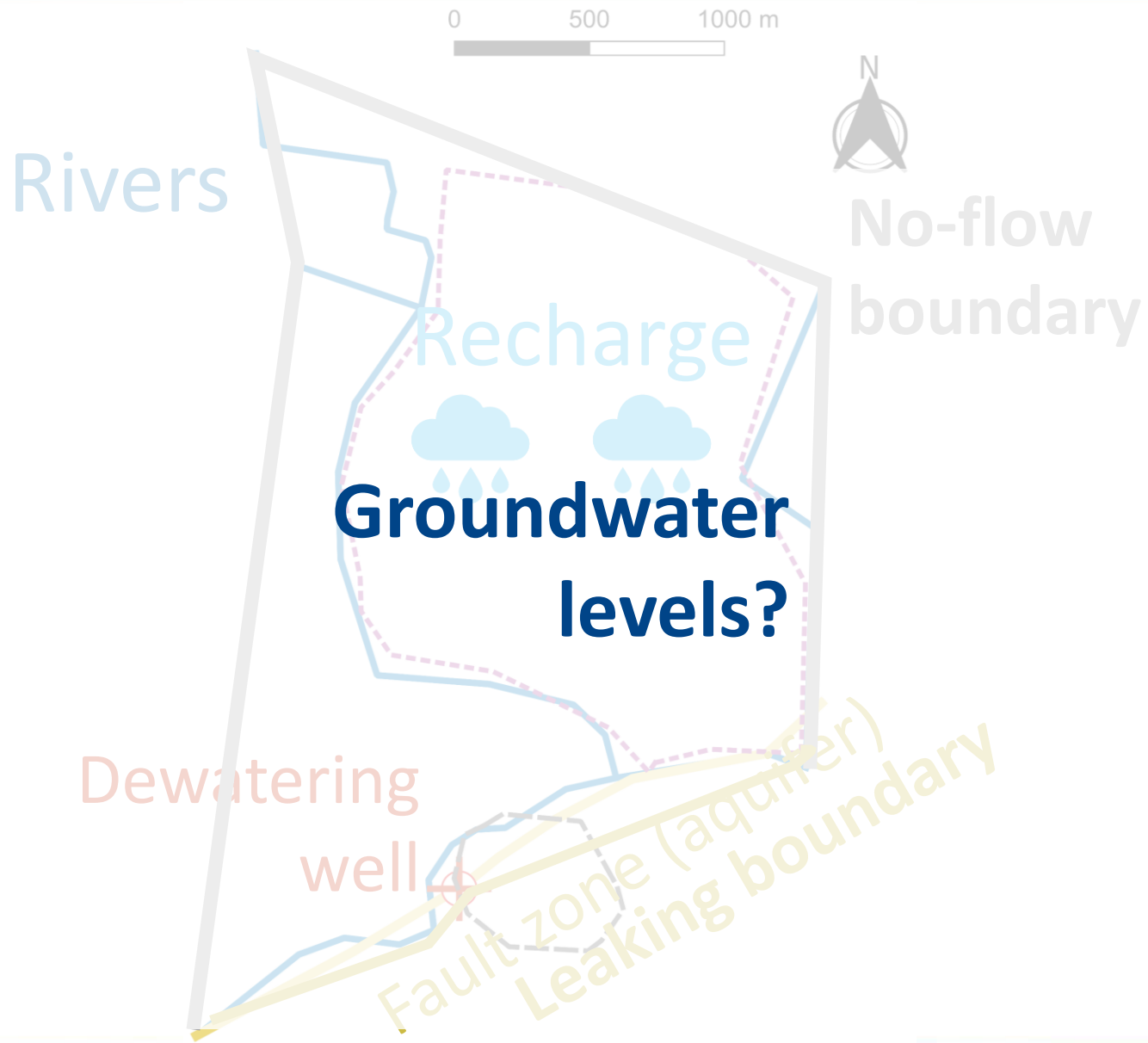
Fault zone properties:

K = 0.33 m/day

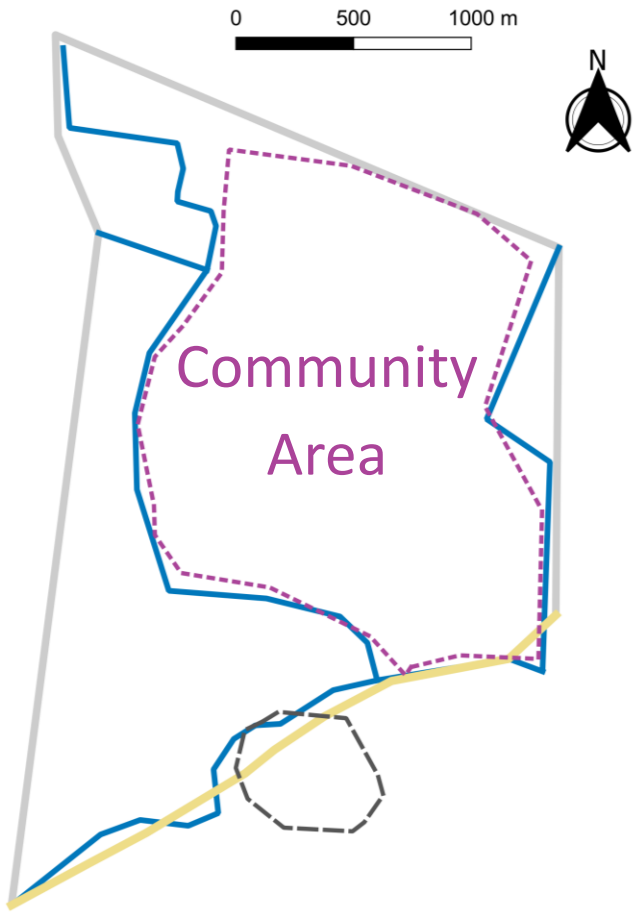
Average width = 15 m

Most values are from the company's technical report

Model Output: Groundwater Levels

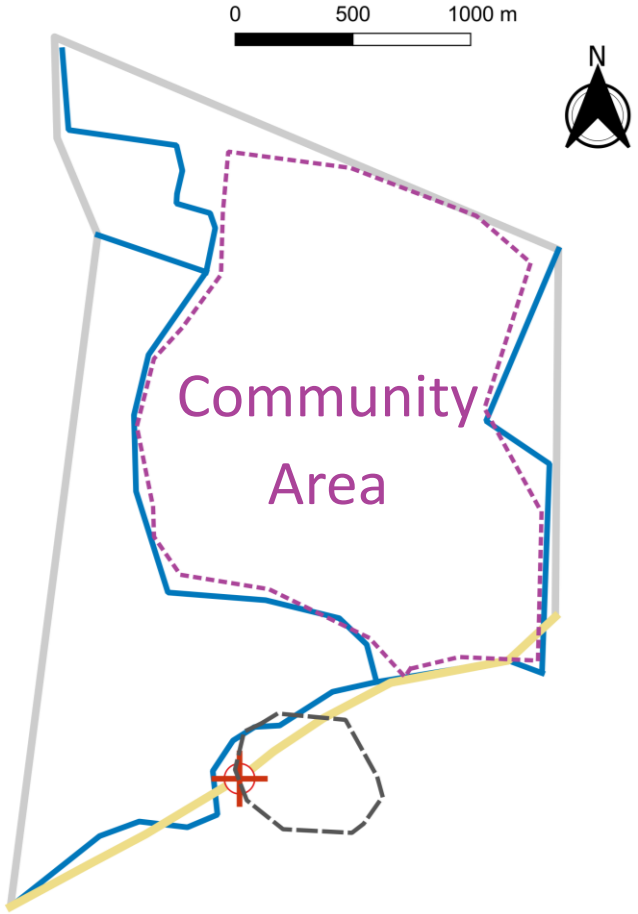


Model Scenarios



Scenario 1:

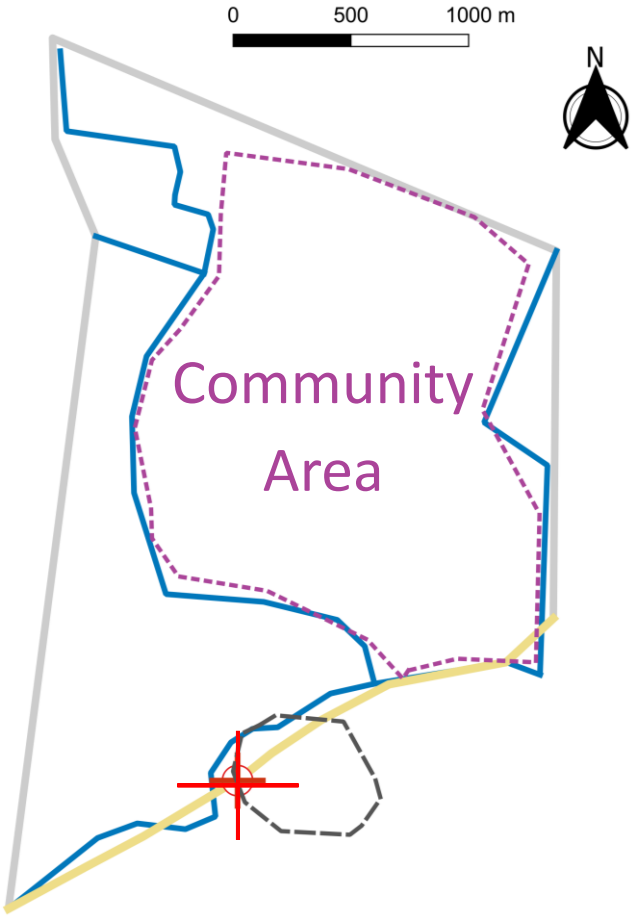
No Dewatering



Scenario 2:

With Open-pit Dewatering

(150 L/s)



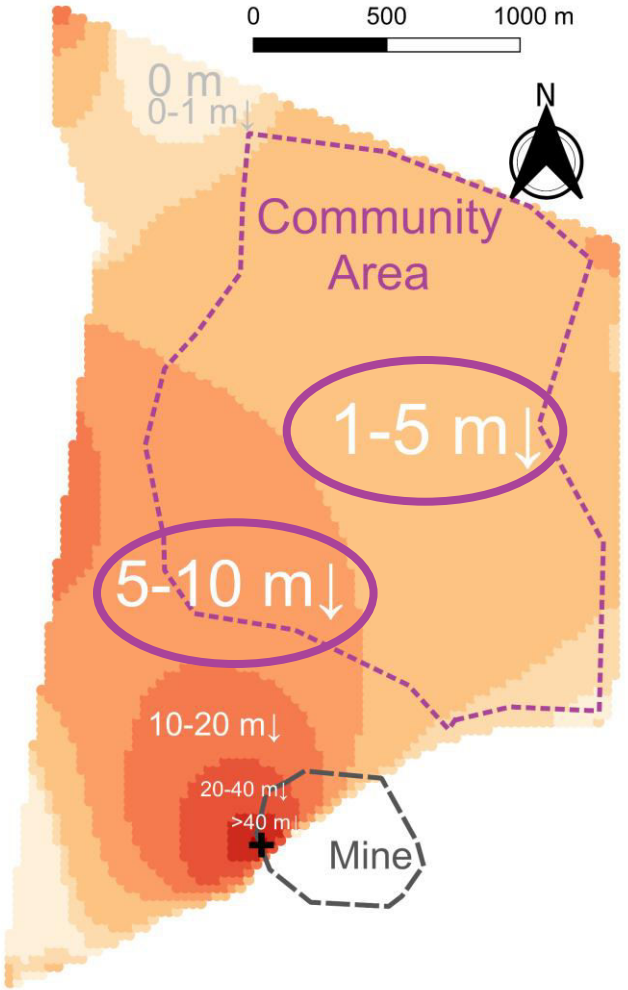
Scenario 3:

With Underground Dewatering

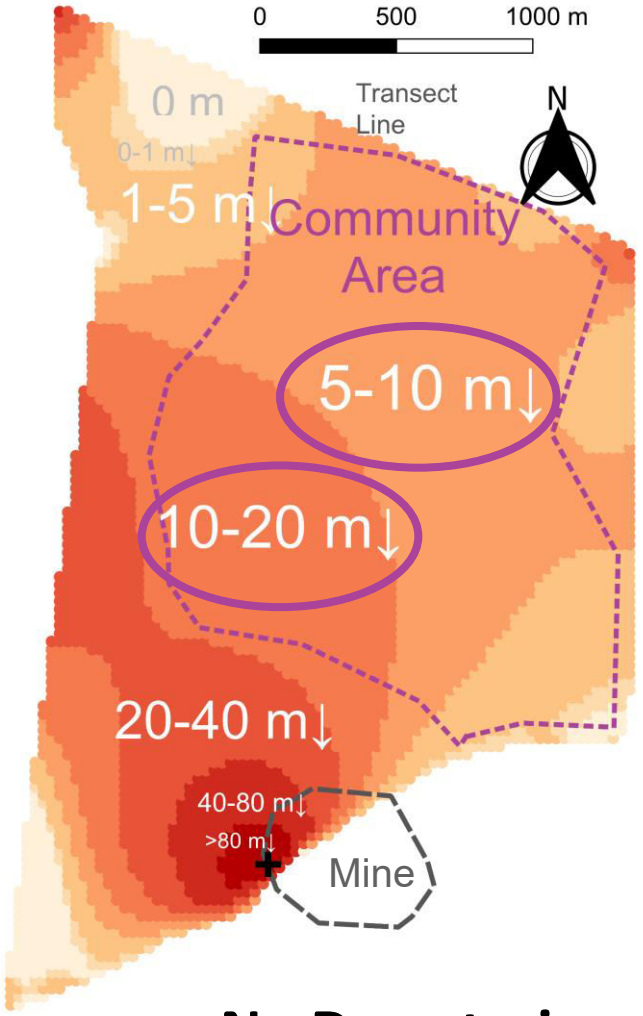
(350 L/s)

Results

Results: Dewatering has lowered groundwater levels by few meters

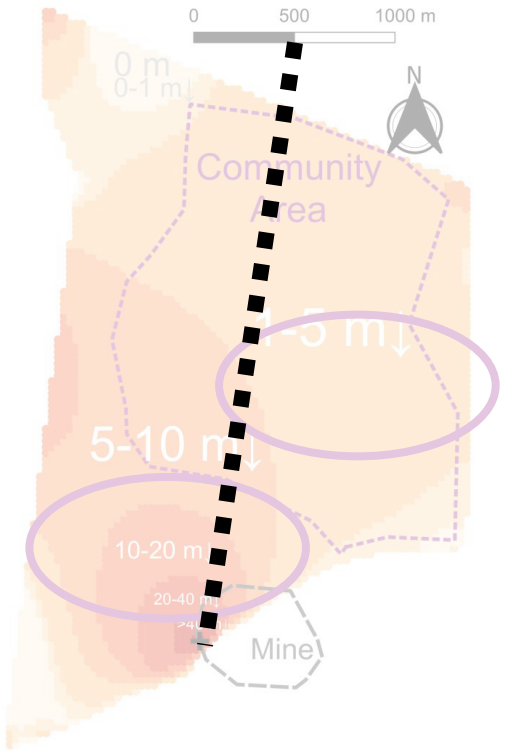


No Dewatering minus Open-pit Dewatering

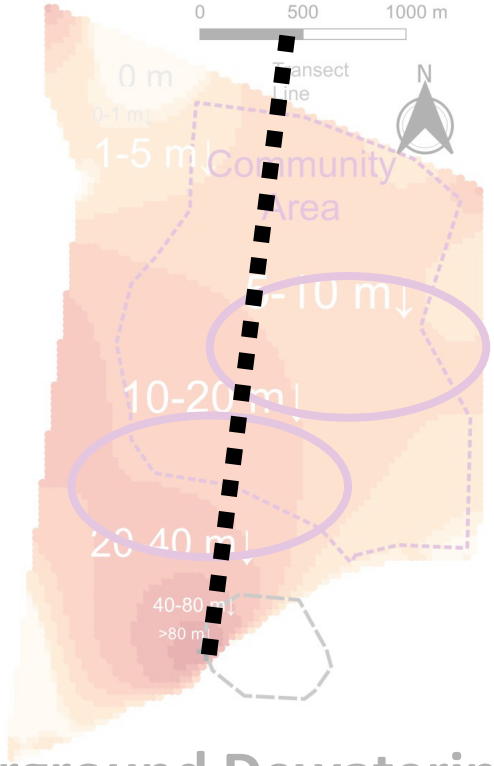


No Dewatering minus Underground Dewatering

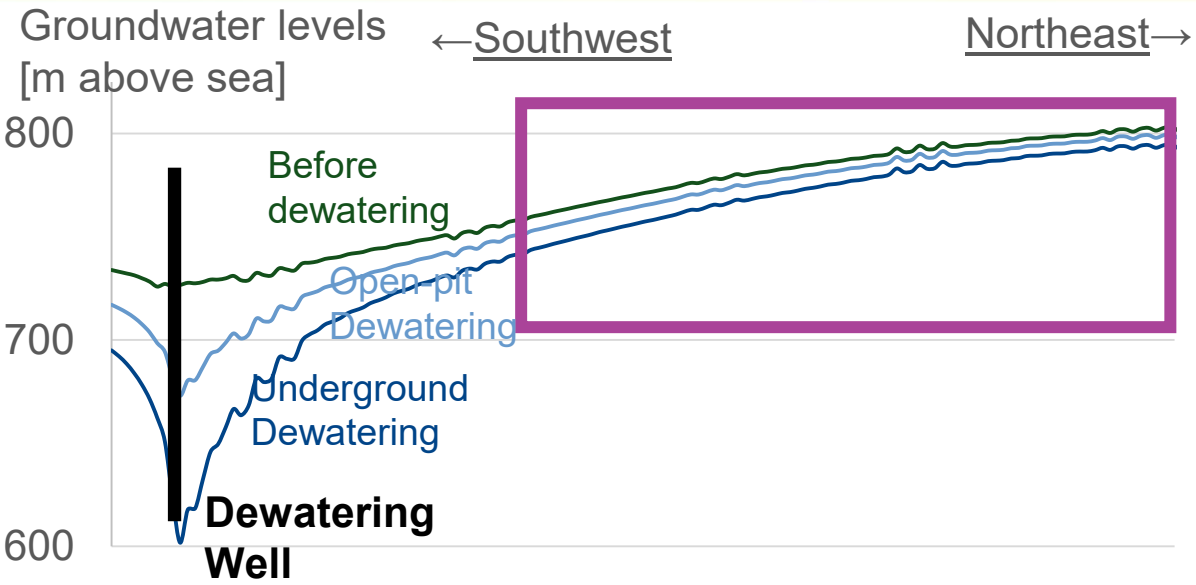
Results: Dewatering has lowered groundwater levels by few meters

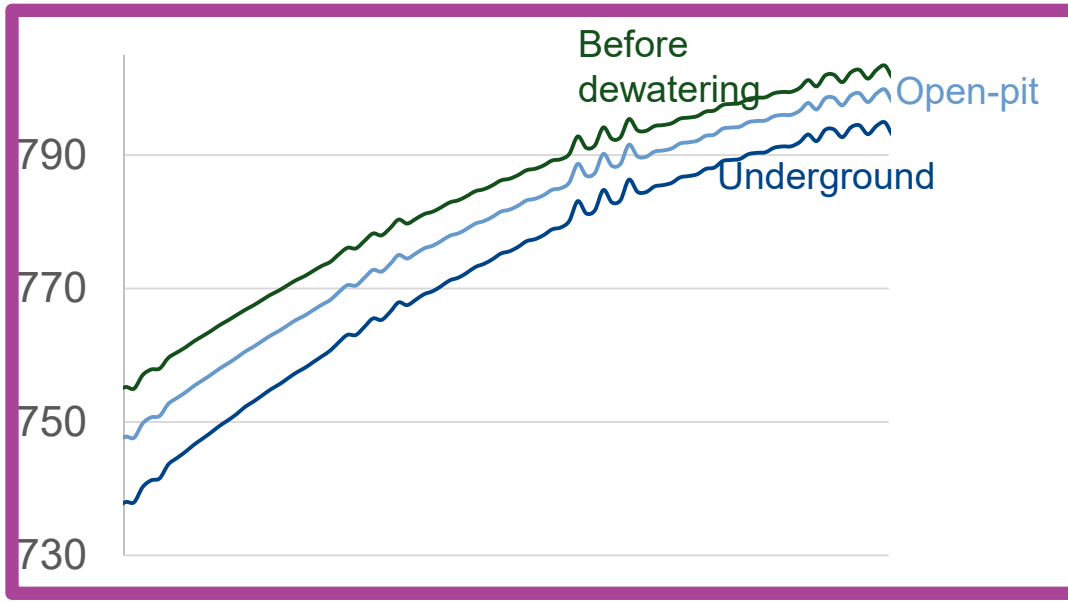


Open-pit Dewatering minus No Dewatering

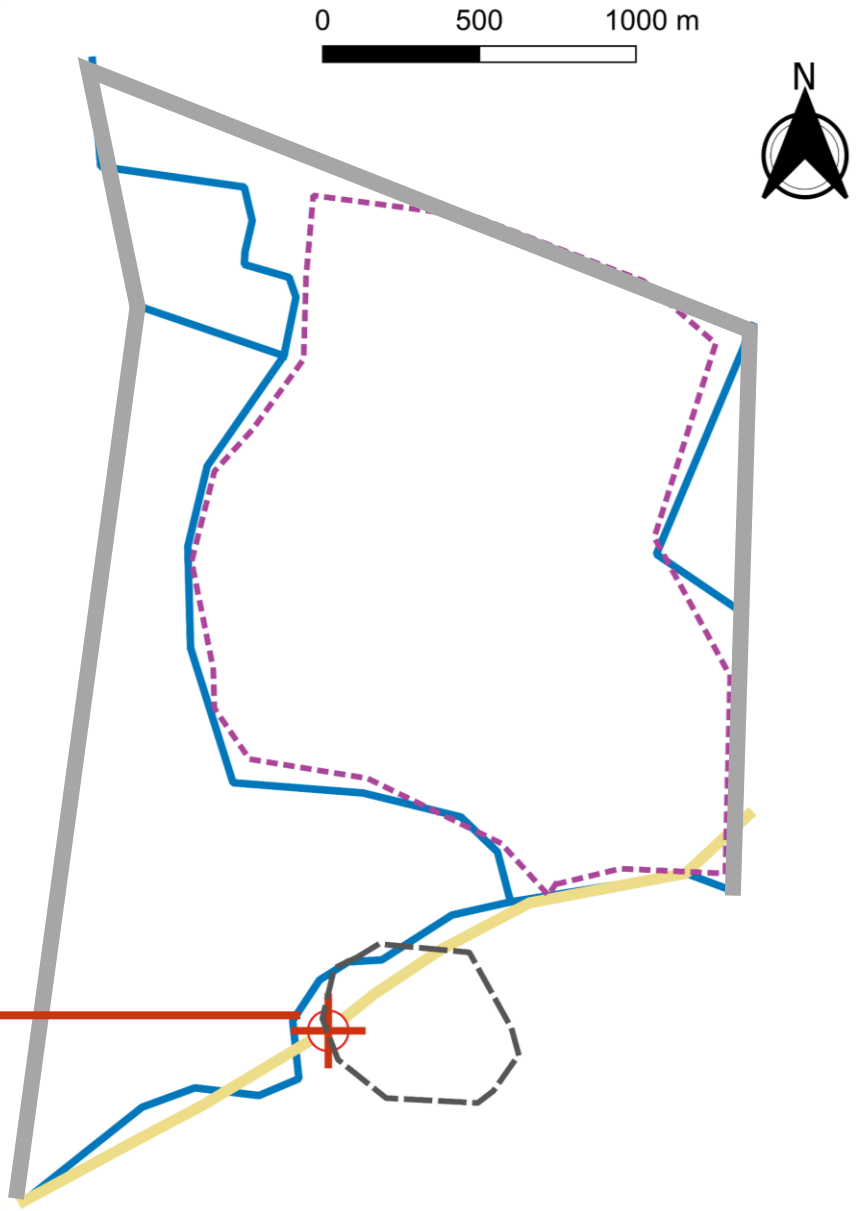


Underground Dewatering minus No Dewatering





Results are based on conservative assumption



Dewatering is placed farthest from the community

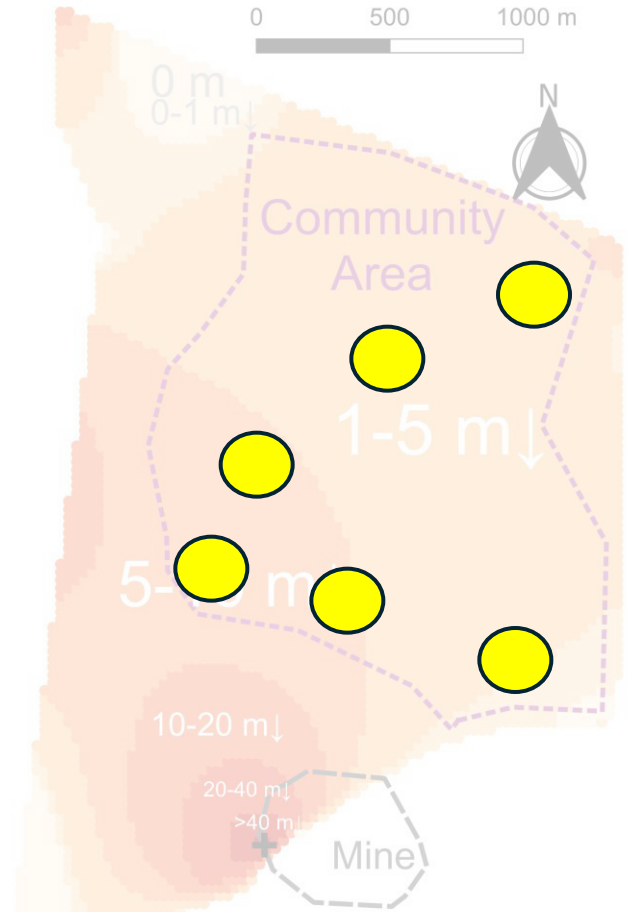
So what?
What's next?

Discuss the findings in stakeholder gatherings

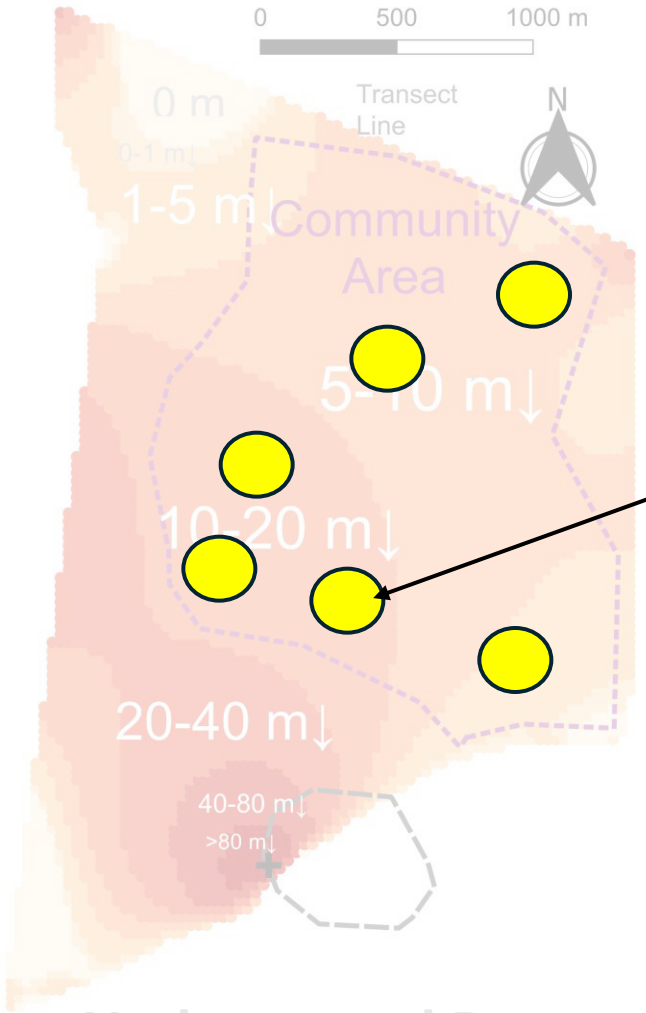
For other mines, consider the community's water supply

Rappler, 2017

Use the model to guide data collection



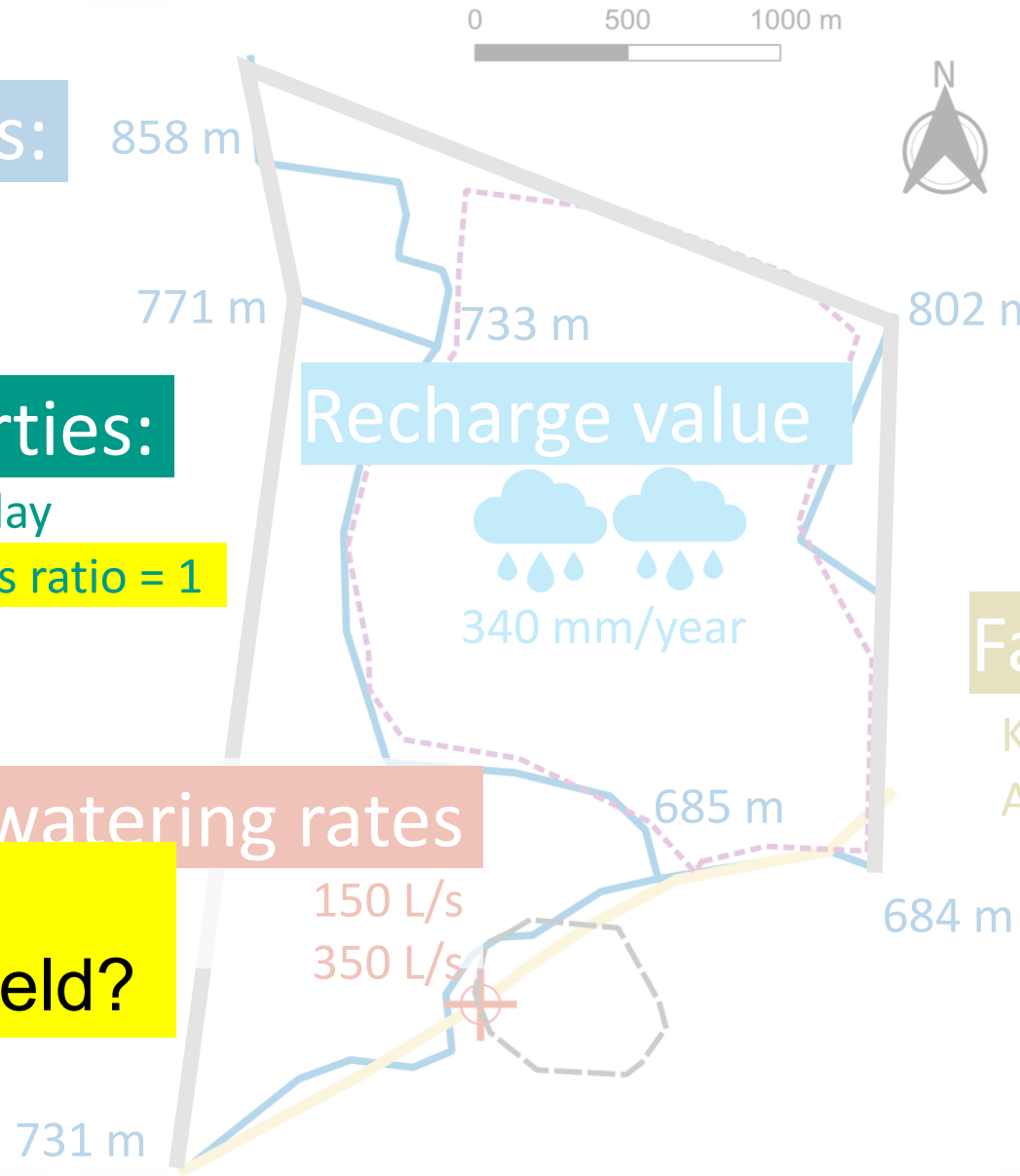
Open-pit Dewatering
minus
No Dewatering



Underground Dewatering
minus
No Dewatering

Install more monitoring wells?

Use the model to guide data collection



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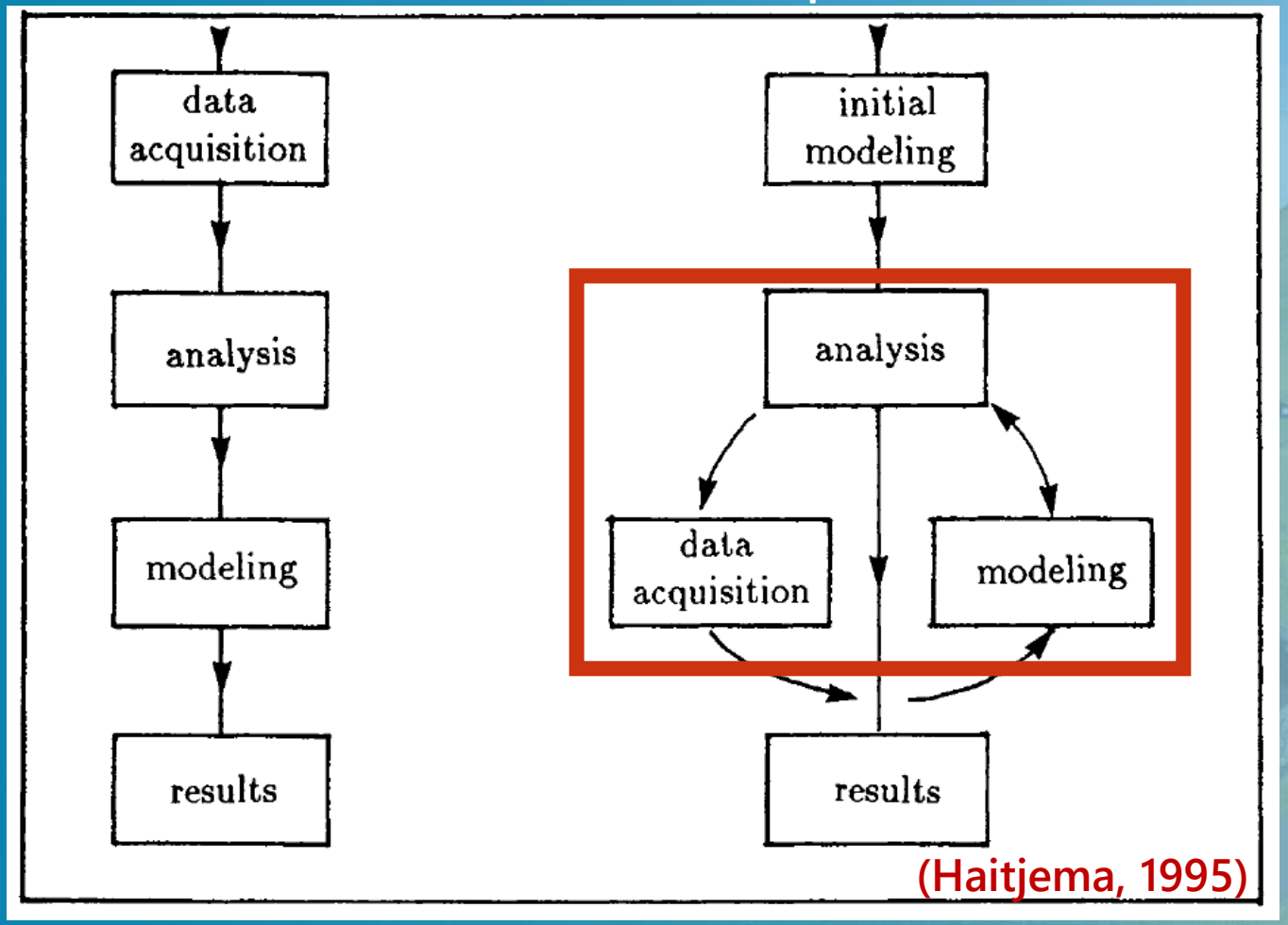
Uncertainty?
Verify this in the field?

Use models to guide yourself

Traditional

Stepwise



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