

Geotechnical stabilization of sulfide soils

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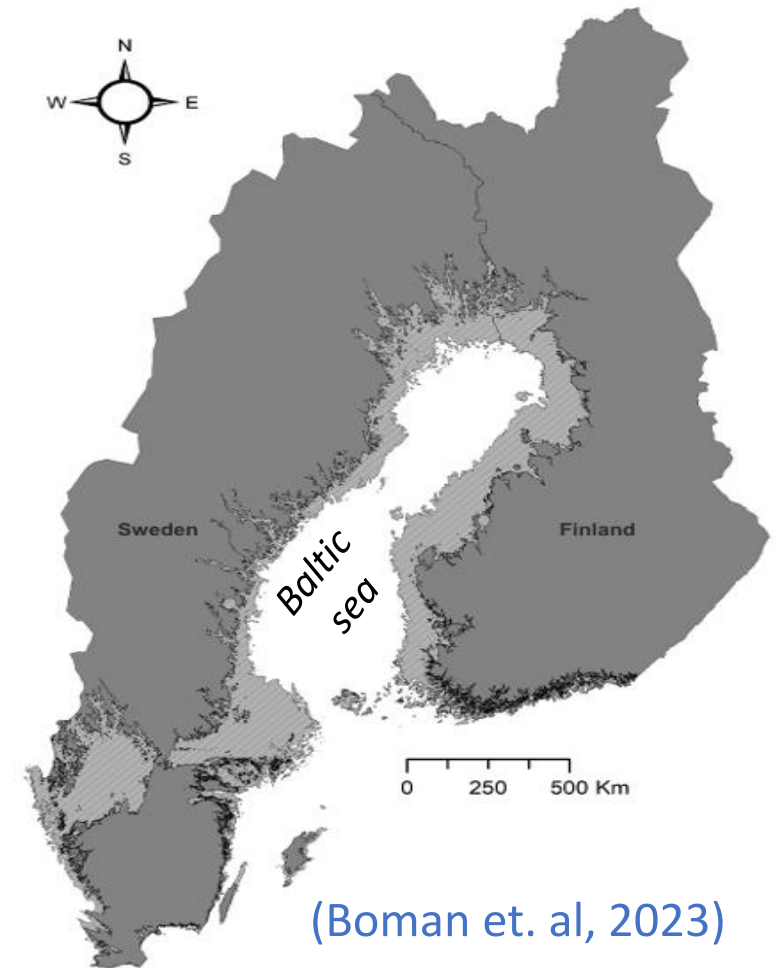
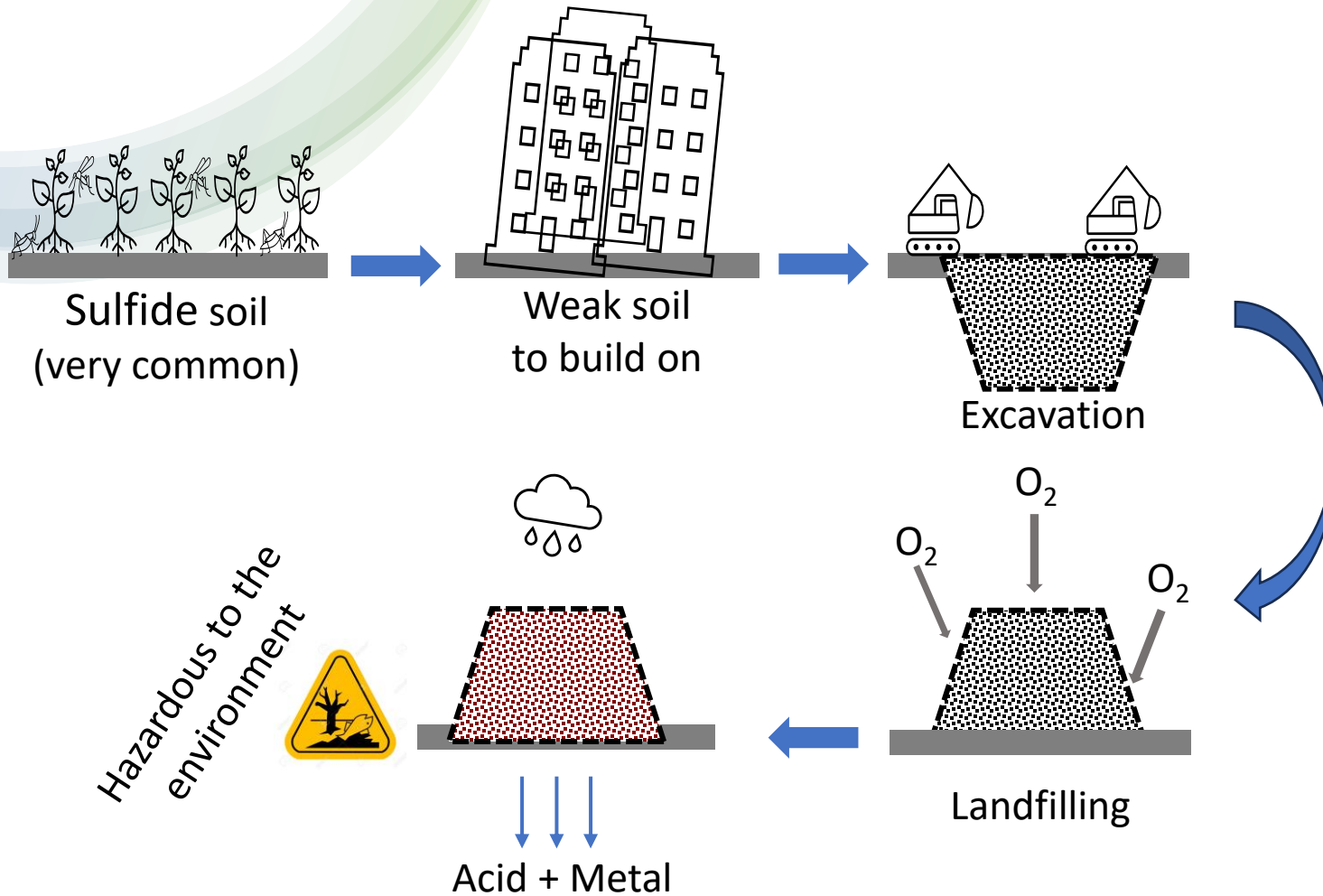


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Why sulfide soil needs careful handling?



Management of excavated sulfide soil - recommendation

1

Characterization

2

Design a recipe

3

Mixing

4

Testing

5

Application

Characterization and grouping

1

Suitable for stabilization

- Low sulfur content (<0,5%) & high solid contents (>60%)
- Low organic matter & acidification potential

2

Needs pre-treatment before stabilization

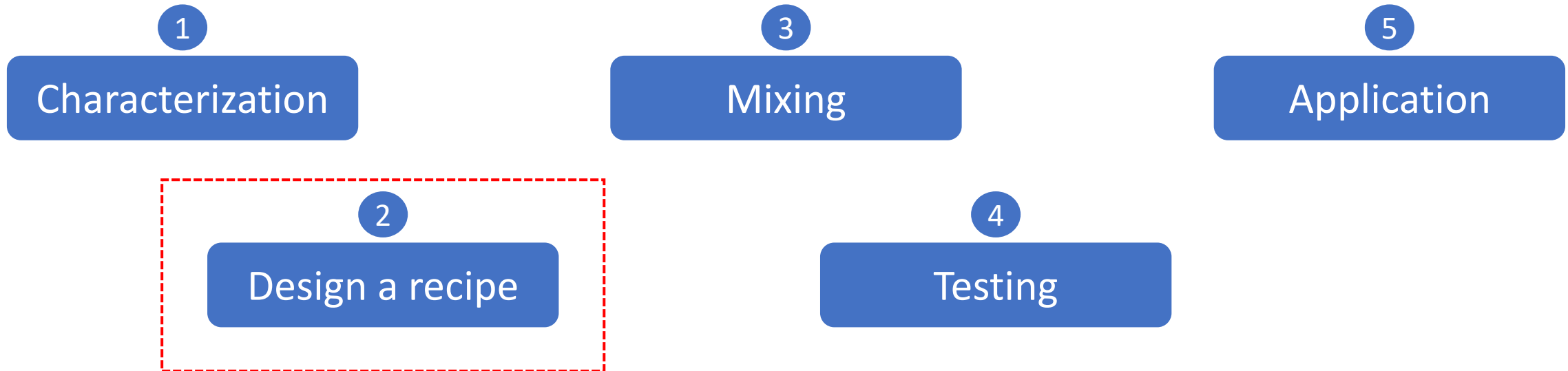
- Medium sulfur content (0,2 – 1,0%) & solid contents (50-60%)
- Low to medium organic content & acidification potential

3

Unsuitable for stabilization

- High sulfur content (>1,0%) & low solid contents (<40%)
- High organic content & acidification potential

Management of excavated sulfide soil workflow



Materials and design of recipe

Soil

- Sulfur content (0,5%)
- Solid contents (79%)
- Low organic matter (2%)
- From Umeå landfill
- Sandy silt

Treatments

- 4% Multicem (50% cement & 50% CKD)
- 8% Mesa (industrial by product) – from Pulp and Paper industry
- 2% Multicem + 6% Mesa

4MC



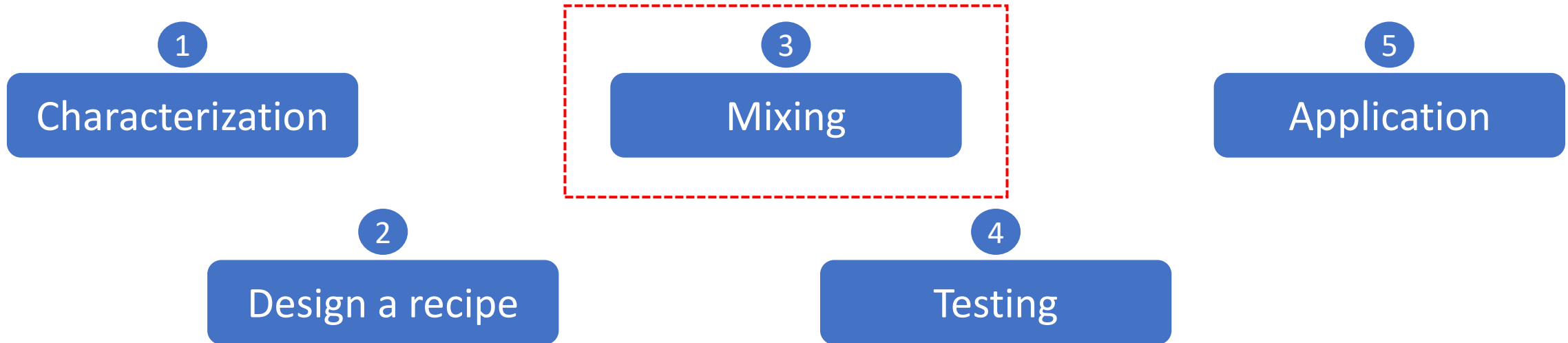
8M



2MC6M

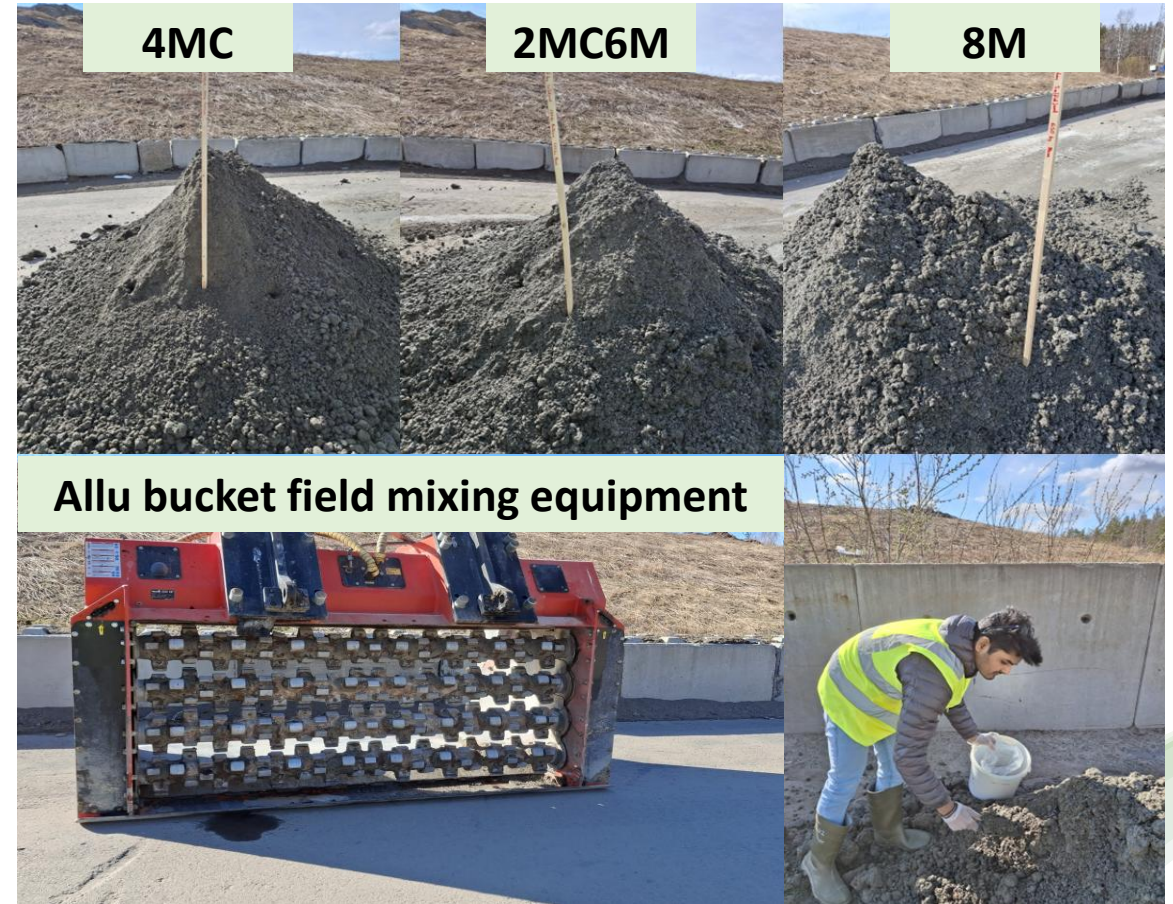


Management of excavated sulfide soil workflow



Field mixing and sampling

- Soil and binder mixed in the field.
- Sample collected (before and after mixing).



Laboratory mixing and compacting

Soil mixing equipment

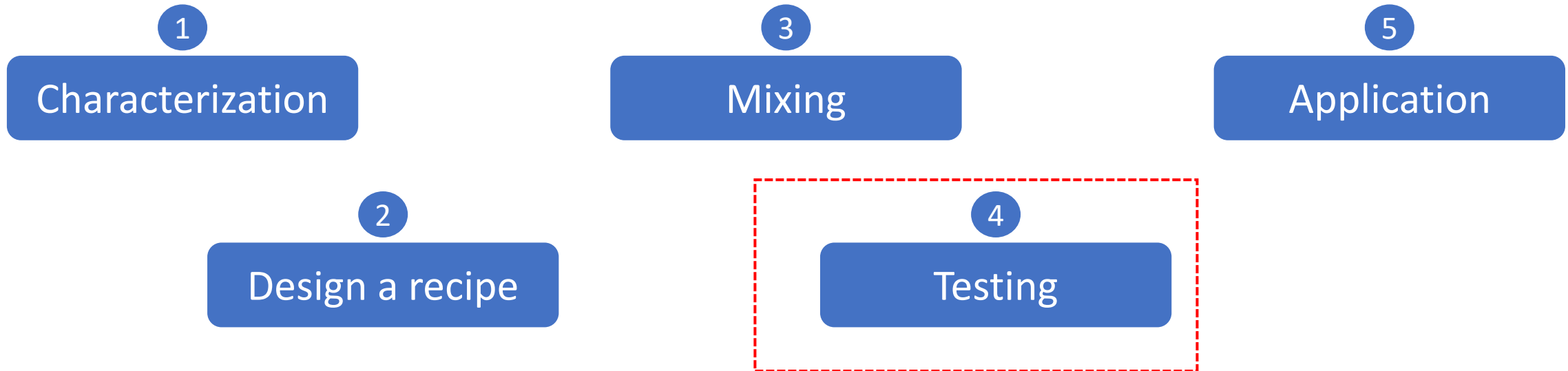


Sample preparation

- By tapping method
- 30 times each layer (5 layers)
- Cured for 7d, 28d & 180d



Management of excavated sulfide soil workflow



Compressive strength (UCS) Test

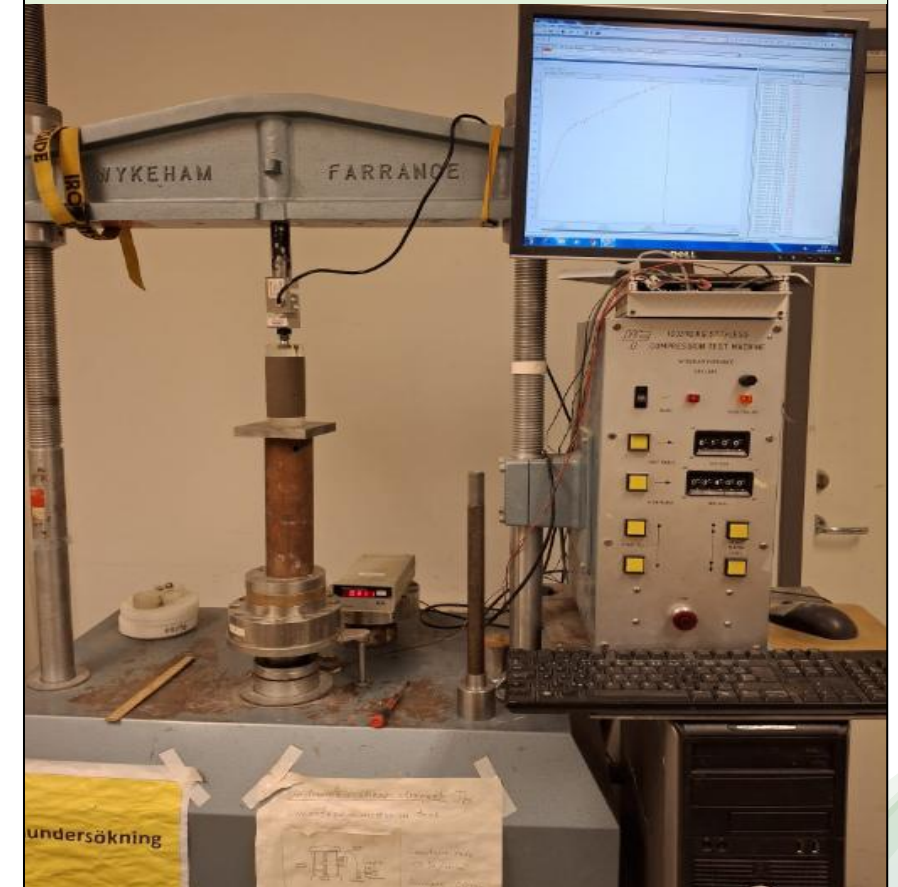


Soil+4MC

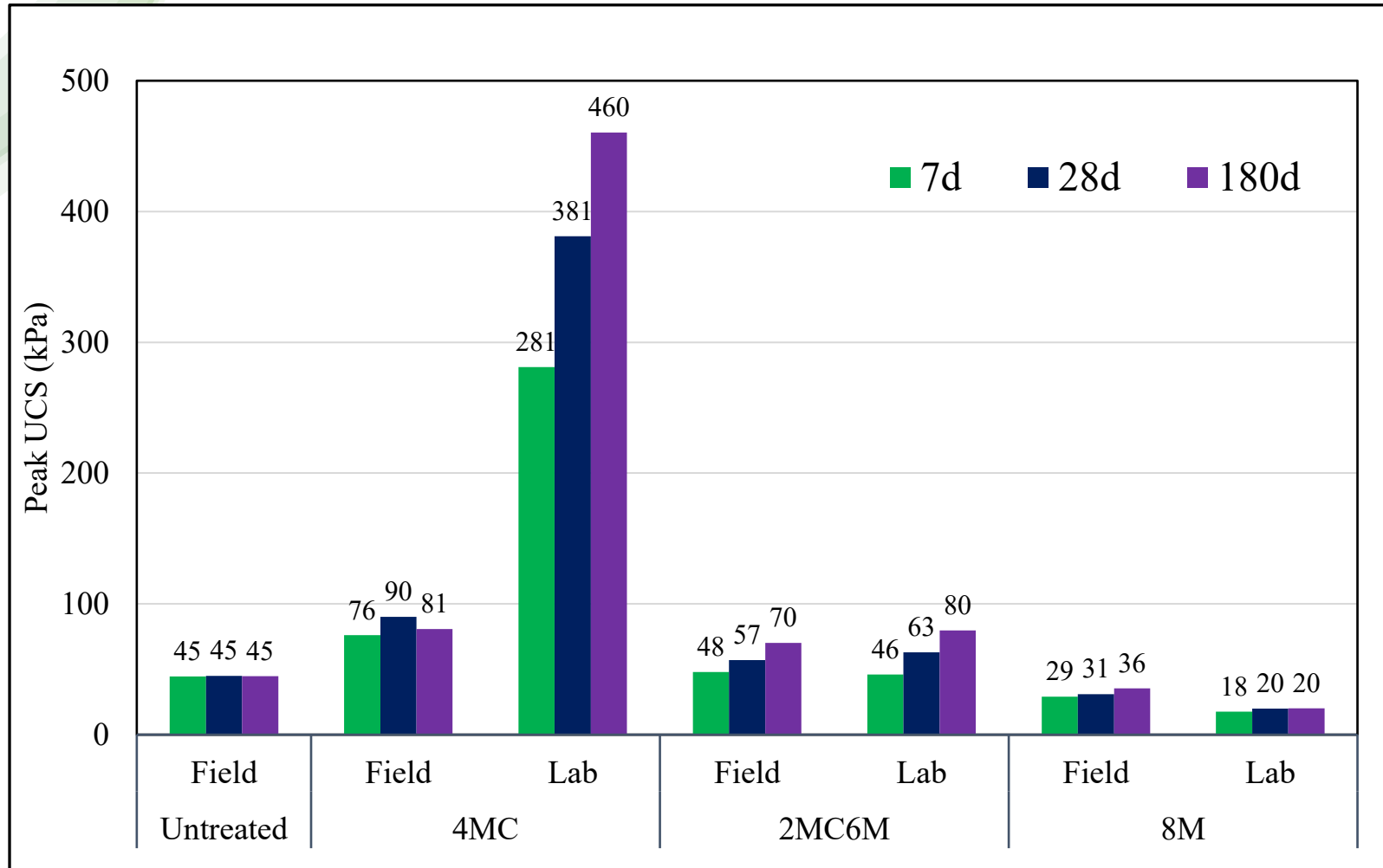
Soil+8M

Soil+2MC+6M

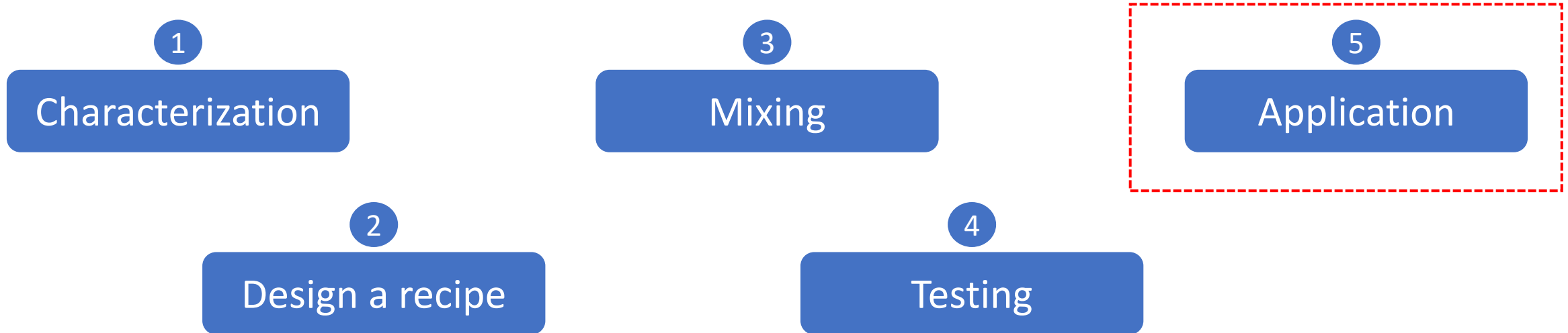
UCS Test machine



Results from compressive strength test (UCS)



Management of excavated sulfide soil workflow



Potential uses of stabilized soil

- Temporary road
- Parking areas
- Service roads/forest roads
- Pedestrian paths
- Embankment fill
- Stabilized soil (having low strength): cover to untreated soil

Key points to consider before Stabilization

- Is the soil suitable for stabilization?
- Can pre-treatment improve it?
- Which binder recipe provides sufficient strength?
- Can field mixing reproduce the laboratory result?

THANK YOU!

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