

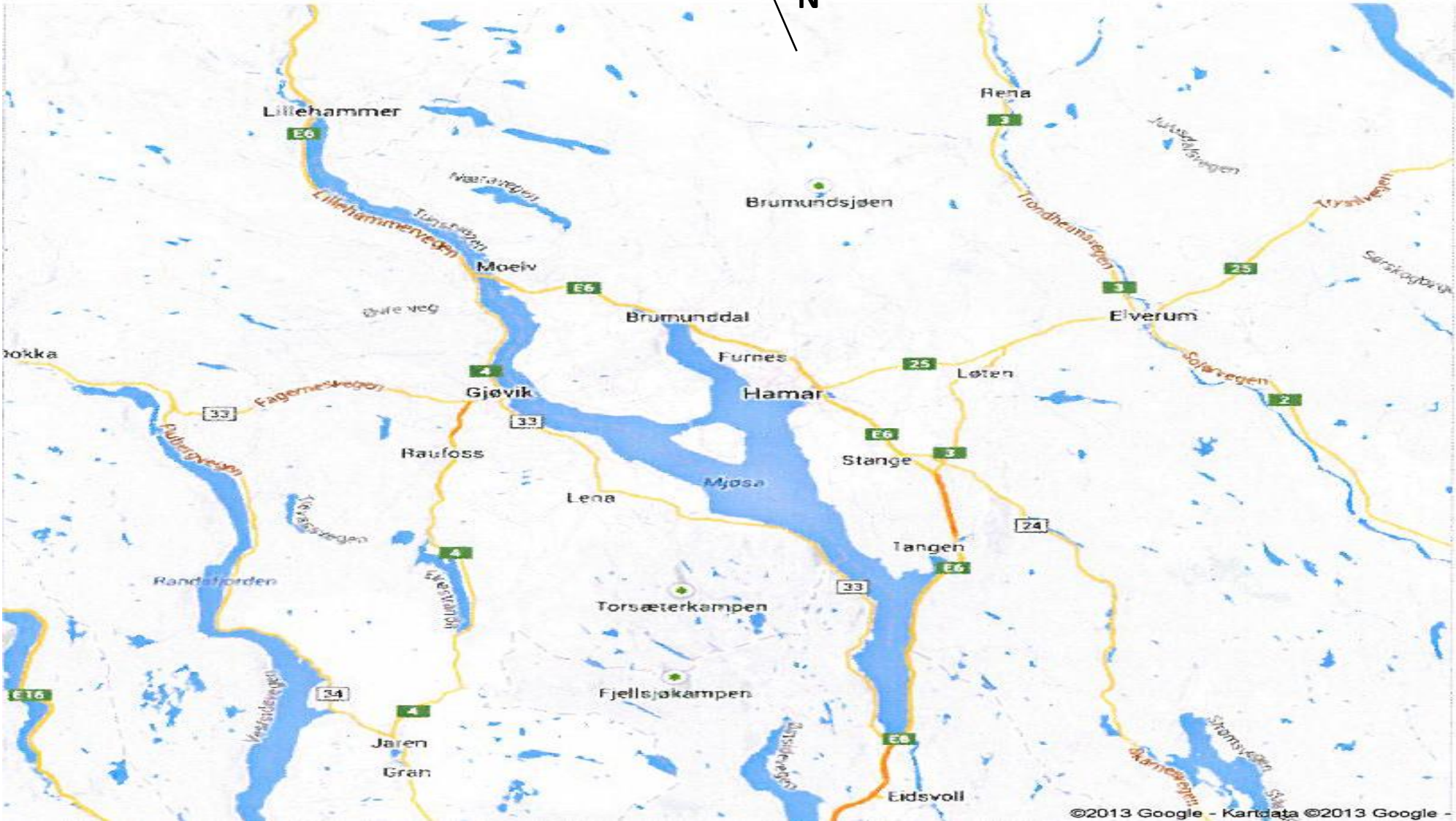
Ruin conservation at Domkirkeodden museum, Hamar, Norway.

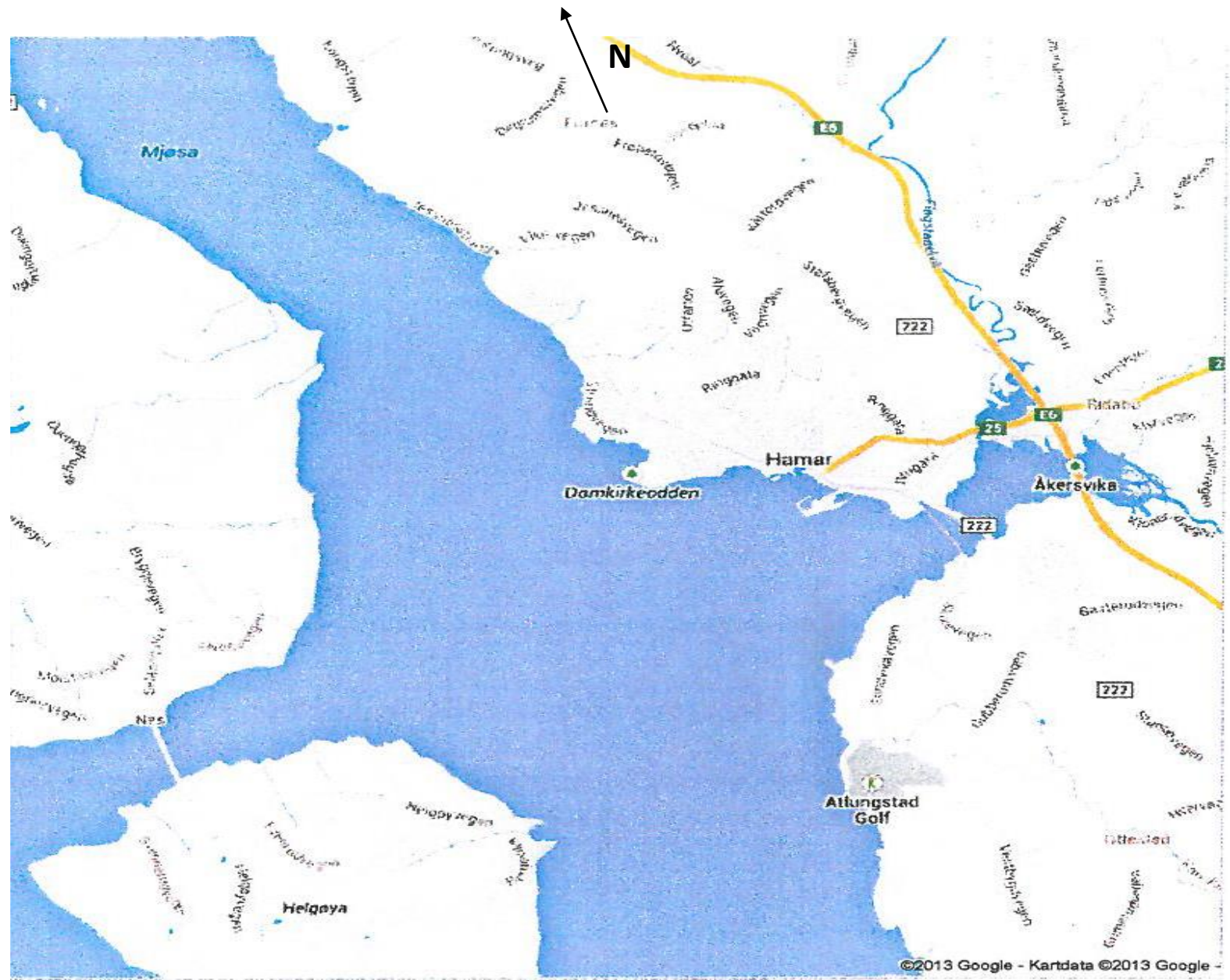


Trondheim 7-10th of September 2017

Anne Kathrine Bakstad







SHORT HISTORY:

- 1152-1537: The only Norwegian medieval catholic diocese not situated at the coastline.
- 1537: The Reformation. The bishops fortress is confiscated by king Christian 3rd, and named Hamarhus castle.
- 1567: The Nordic Seven Years' War: The cathedral and fortress is set on fire by the swedish king Erik 14th. The cathedral collapses and the fortess suffers serious damage.
- 1649: Hamarhus is sold off as a private property. It is now named Storhamar Manor.
- 1906: The open air museum is established on the grounds of the old catholic diocese of Hamar.



The medieval diocese of Hamar:

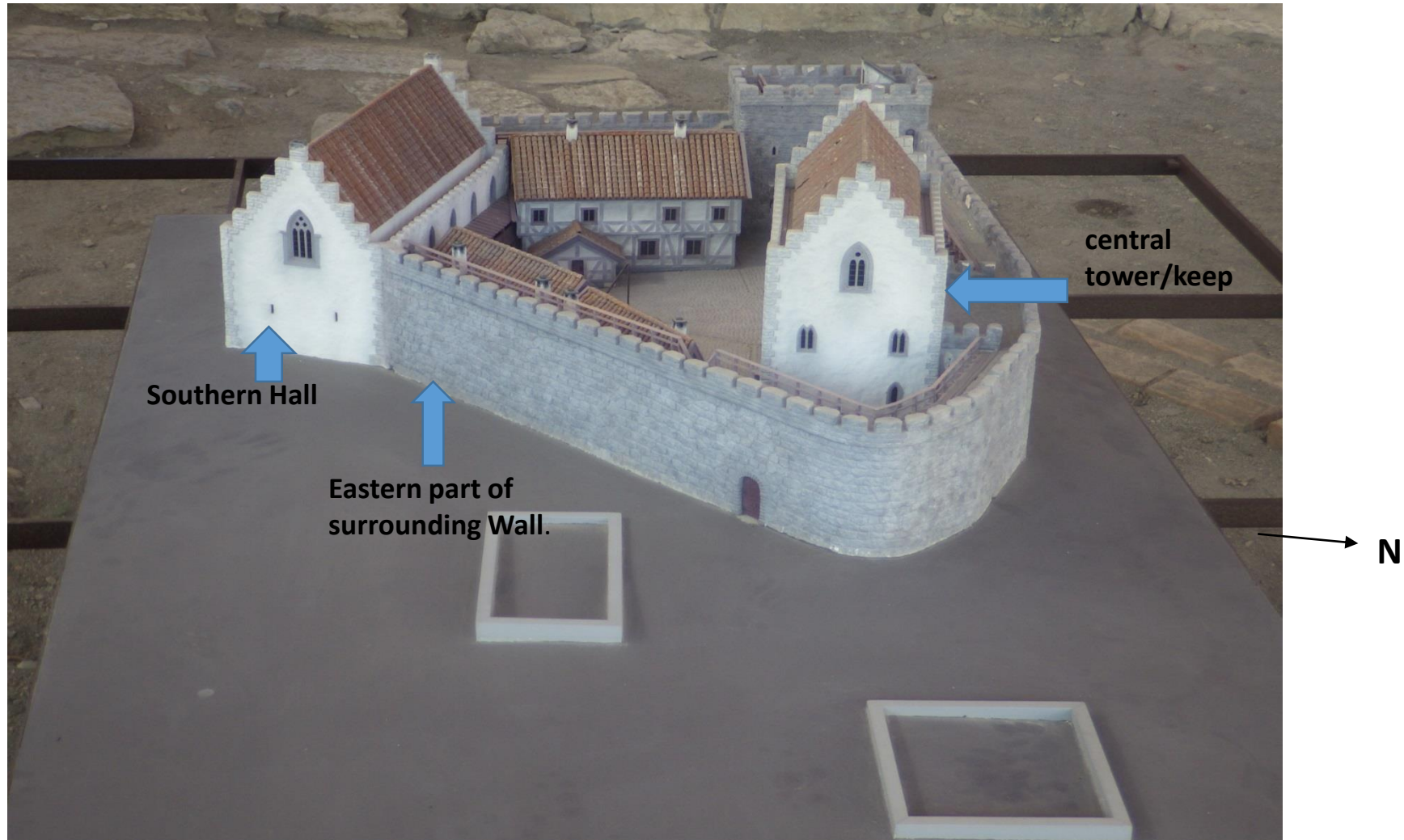
- From the period between 1152-1537 we have ruins of the cathedral(1), the bishops fortress(2), the cathedral school (3)and several houses for the bishops canons(4). There is also ruins of a castellum(5) and the Cross church(6). The area probably also include the unexcavated ruins of the St. Olufs monastery (Dominican)(7).



The Domkirkeodden museum is a part of the Norwegian ruin conservation project.

Since 2011 three of the main ruins at the bishops fortress have been conserved with lime mortars.

The project is being executed by two of the museum workers.



Model of the bishops fortress from 1450



Foto: Hedmarksmuseet

Bishops courtyard, picture from 2000.



The bishops courtyard used as farm yard from 1695-1925.



Picture from ca. 1900

Excavations in the bishops courtyard from 1947.
(G. Fischer, H. Christie, T. Bleken-Nilssen)



- **After the excavations of the bishops fortress between 1947-63, the ruins were repaired with cement/concrete.**
- **Our project is to replace the concrete with lime mortars. Until now we have used a non-hydraulic lime mortar, hotmix. The pure and non-hydraulic lime (about 99% clean) from Frantzefoss. We also use an aggregate of sand coming from Ramlo, size 0-4 mm.**
- **The hydraulic lime NHL 3,5 has been used for the two upper shifts and for the hard top.**
- **We finish our conservation with a soft top consisting of bentonit clay and roll-on turf.**

Conservation of the eastern room in the southern hall 2011-2014

- The building has recently been carbon dated by bones found in the lime core, dating back to 1219-1284.(95,4%)
- Two of originally three basement rooms can still be seen.
- The southern room was conserved in the 1970s and a roof was added by architect Sverre Fehn.









Conservation of the eastern part of the surrounding wall, 2014-2016

- We assume that the eastern wall was built in the second half of the 15th century.
- The new wall reduced the protected area of the courtyard. At least three known buildings were left outside.
- 33 m. length
- 0,7 - 3,5 m. high.
- 1,6- 1,7 m. thick.



A heated and insulated house makes ruin conservation possible also in wintertime.







Conservation of the main tower/ keep 2017-2019.

- The building has recently been carbon dated by charcoal found in the lime core, dating back to 1169-1270. (95,4%)
- We have started to try out our own lime mortar in a part of this building.





Lime mortars in joints and cores of our ruins



← Lime mortar from joint in the southern hall


Lime mortar from joint in the keep. →

Mortar from the lime core in the eastern wall




The original lime mortar found in our ruins:

- Contains a lot of aggregate, especially the black sand of slate coming from the shores of lake Mjøsa.
Generally this is a rough aggregate containing all sizes from 0-15mm.
- The lime mortar used in the joints contains the same type of aggregate as the core, but the slate is of a smaller size, 0-7mm.
- The lime cores has parts of pure lime, especially seen in the eastern surrounding wall.
- It also seems that the lime generally used in the cores contains lime stones that are not sufficiently burnt.
- A lot of charcoal is also found in the lime cores, as well as bone material.

Joint in the keep with our lime mortar, produced at the  museum in 2017.



 Joint and core with original mortar seen at the top(1), and lime mortar produced at the museum seen to the right and at the bottom(2).



Testing the lime mortar produced at the museum in 2017:

- we tested the lime by dry-slaking it into a dry powder, and then mixed it with water and sand(Ramlo sand 0-4) in the relation 1-1. Then we added a few hands of slate sand.
- At first, the mortar seemed «short» to set in the joints. We therefore placed the mortar in a sealed box for a week. Then it was remixed, without any additions, and the consistence of the mortar had changed dramatically and positively. The mortar now seemed «fat» and more easy to work with.
- The colour of the mortar looks similar to the original lime mortar found in our ruins.
- As the test field with our self-produced mortar started to carbonate, we discovered that the process went surprisingly fast. So far, our experience is that our mortar carbonates much like the NHL 3,5.