SO-III Reconservation of robust objects using a polyethylene glycol (PEG) and freeze drying

1. Background and justification for project

Challenges with alum-treated wood from Oseberg

Museum collections conserved by discontinued treatments may require specialized knowledge to enable their proper care. This is especially true in cases where older conservation treatments are the cause of unacceptable damage, sometimes only revealed after a great elapse of time. At the Museum of Cultural History (KHM) it took almost 100 years for observable damage, such as new cracks, to manifest itself on a collection of archaeological wooden objects which were conserved in the early 1900s by a once widely used method which is now obsolete. This method used alum salts (potassium aluminum sulfate dodecahydrate, $KAl(SO_4)_2 \cdot 12\ H_2O$) to preserve highly degraded archaeological waterlogged wood. It was actively in use from the mid-1800s to the 1950s, especially in Scandinavia (Christensen, 1970a, 1970b; Eaton, 1962; Häggström, Lindahl, Sahlstedt, & Sandström, 2013; Madsen & Andersen, 2013). Many collections may therefore have alum-treated wooden objects. However, due to the fact that this method is no longer in use and knowledge about it is limited, preservation professionals may not be aware of how to identify alum-treated wood, understand reasons behind the observed damage or which measures are possible to preserve it.

At KHM, alum salts were used to conserve a significant portion of the wooden objects from the Oseberg mound, a Viking Age ship burial for two women constructed in 834 AD, located near Tønsberg, Norway and excavated in 1904 (Bonde & Christensen, 1993). This collection represents one of the richest, most complete collections of Viking Age wooden objects in the world: alongside textiles and metal objects, lay ornately carved wooden objects such as a ceremonial wagon, three ceremonial sleds, animal head posts and hundreds of everyday artefacts (Brøgger, Shetelig, & Falk, 1917). The find was exhibited at the Viking Ship Museum in Oslo and is planned to be re-installed in the new Viking Age Museum, currently under construction.

We now know that the alum treatment has caused both chemical and mechanical degradation of the wood. High acidity originating from the alum method is the main cause of observed degradation, but also metal ions inside the wood, present from burial or from corrosion of metals used to reconstruct the objects after alum-treatment, contribute to the decay in highly complex mechanisms which are not elucidated.

To chemically and physically stabilize alum-treated objects from the Oseberg find – which present challenges in terms of variability in condition, size and in degree of restoration – a combination of preventive and invasive reconservation approaches is needed.

Step-wise knowledge building

Successful preservation strategies can only be designed if the causes of the observed damage are understood. Few details about the alum treatment method are recorded in archival and published sources, and previous research did not investigate the material's chemical properties (Bojesen-Koefoed, 2012; Häggström et al., 2013). For this reason, the Alum Research Project (2007-13) and later the Saving Oseberg

(SO) research project (Phase I from 2014-17; Phase II from 2017-2020) were established at KHM. Figure 1 shows the gradual build-up of knowledge in previous work, and what we wish to accomplish in the next phase, Saving Oseberg-III.

In SO-I, research was directed towards investigating chemical and physical properties of the material in order to gain a better understanding of the reasons behind the observed deterioration.

In SO-II, we continued to investigate the chemical properties but also investigated reconservation methods, both water-based and solvent-based systems. By the end of SO-II, we had tested and evaluated both aqueous and non-aqueous methods on 75 Oseberg Test Fragments of alum-treated wood (Braovac et al., 2021). (Braovac et al., 2021). We found that reconservation using water-based methods (aqueous) gave the best results for robust wood. However, in order to chemically and mechanically stabilize wood in poorer condition, a non-water based method (non-aqueous or solvent-based) is needed. None of the five non-aqueous methods tested in SO-II stood out, all having pro's and con's; they will require modifications.

In the period after SO-II, named SO-Interim, we took this knowledge and experience to the 'collection' level, specifically aimed at that which is held in storage[1]. This was accomplished through a collection survey undertaken in April 2021 (Braovac & Zisi, 2021).

Collection Survey

During the collection survey, either Aqueous (PEG) or Non-aqueous reconservation was assigned to individual objects or fragments[2]. Objects were then sorted into risk categories, based on the risks relative to aqueous retreatment. Water-based methods are the most efficient at deacidification and strengthening, but it can only be applied to relatively robust objects. Risk categories ranged from Low to Very High. We also included categories named 'Beyond our experience' and 'No retreatment?'. See Figure 2.

The survey uncovered two main object groups which require different approaches and likely different funding sources:

<u>SO-III Reconservation</u>: Low, Medium and Medium-High risk groups (ca 3600 objects). These objects are possible or likely possible to retreat with PEG 2000.
Potential funding source: Internal, ex. REVITA grants

<u>SO-III research</u>: High, Very High, Beyond Experience/No retreatment? risk groups (ca 2790++ objects). Research focuses on aqueous (for ex. pre-consolidation) for the High risk objects (ca 1040 objects), and on non-aqueous and preventive conservation for the Very High, Beyond Experience/No retreatment? risk groups (ca 1750++ objects).
Potential funding source: External, ex. Research grants

[1] The Survey took place at the same time as the dismantling of the exhibition at the Viking Ship Museum (VSH) in preparation for the new building project. As such, the collection which was displayed at VSH was not available for assessment regarding retreatment risks. However, most objects at VSH are reconstructed, and as such represent objects which are not possible to retreat using PEG 2000. The preservation of this part of the collection requires further research, as it includes objects that are highly complex systems.

[2] Here 'object' refers to individual pieces, regardless if they are only part of an object or a whole object.

Each part is planned as a 6-year project, with separate budgets.

SO-III Reconservation is linked with SO-III Research, but it is not necessary that they run simultaneously. However, it would be an advantage if they could overlap, so as to exchange experiences and knowledge.

SO-III Reconservation is described in this document.

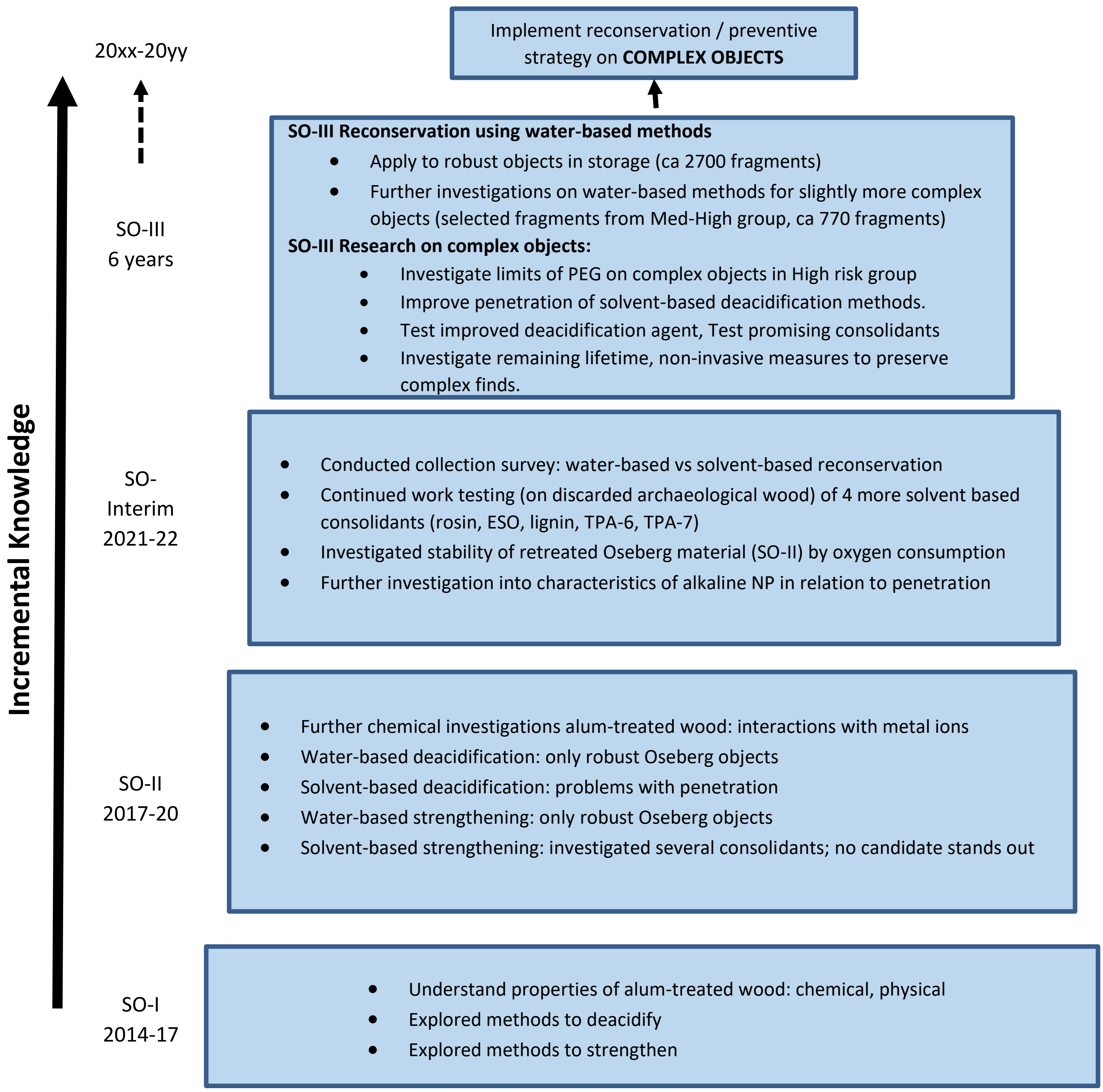

Figure 1. Diagram summarizing knowledge-building in successive Saving Oseberg research phases. The diagram also shows that we reach an Apex at some point in the future, only when we can confidently say we are ready to reconserve complex objects.

Project description

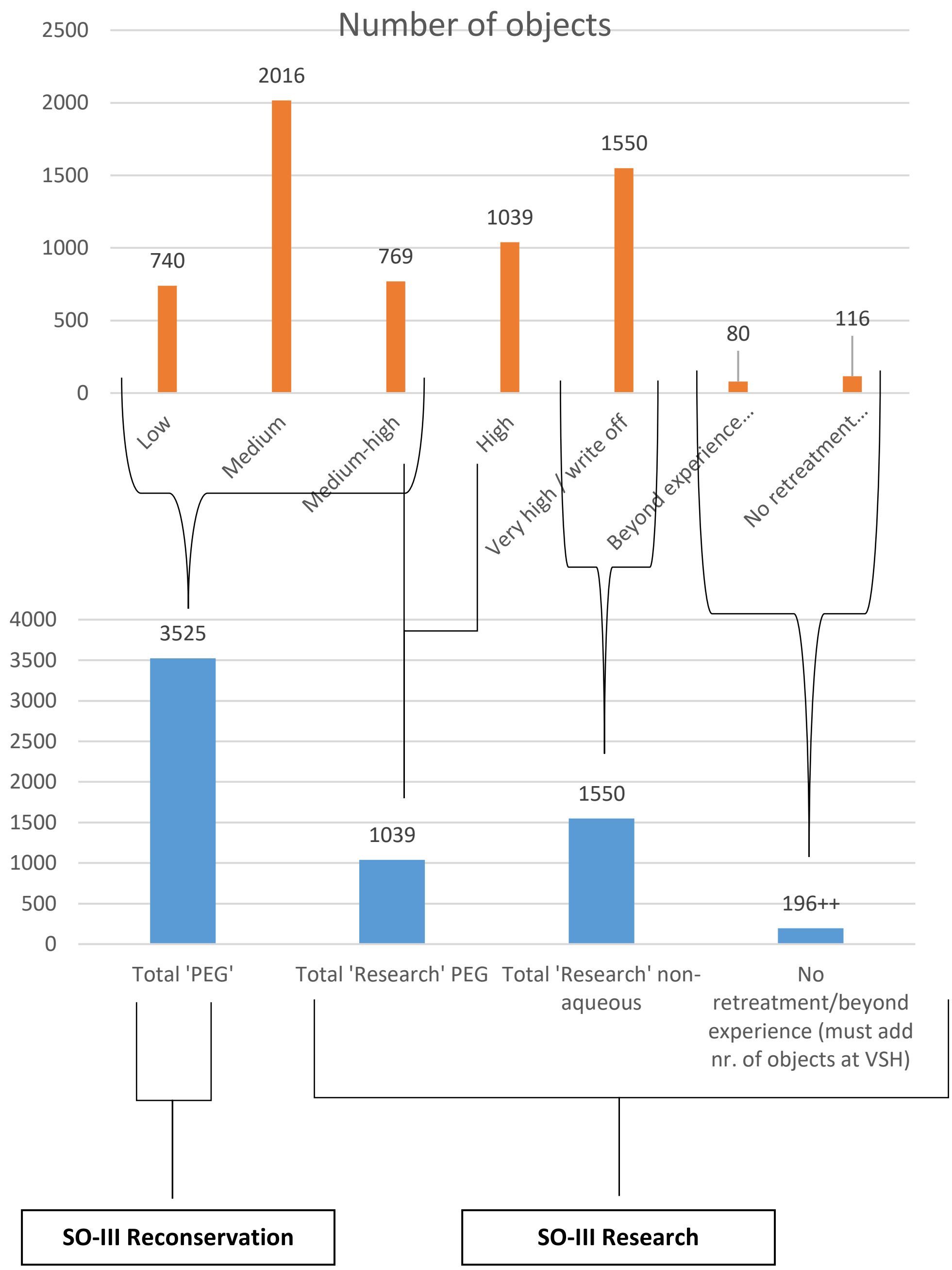

Figure 2. Distribution of alum-treated ‘fragments’ (i.e. individual pieces of wood) into Risk groups.

Risk groups from Low to Medium-High are considered for ‘PEG’ retreatment, and are part of the project **SO-III Reconservation**.

The project **SO-III Research** involves testing of various methods from the High, Very High and Beyond Experience and No retreatment risk groups. High risk objects are considered for ‘Research’ on the PEG method and Very high risk objects are considered for ‘Research’ on non-aqueous retreatment. Beyond Experience and No retreatment will likely be preserved by either non-aqueous retreatment or by preventive conservation measures. Decisions about this group is dependent on results from research on objects from the Very High research group and which preventive options are available.

2. Aims and desired achievements for SO-III Reconservation

By the end of SO-III Reconservation we will have:

- Reconserved objects that can withstand aqueous methods from storage
- Tested limits of the PEG treatment on more complex objects (Medium-High risk group – i.e. those with simple repairs, composites of wood and rope) and feed into SO-III-Research
- Developed methods to repair minor damage from retreatment and make aesthetic corrections where necessary
- Disseminated new knowledge through student mentoring, conferences and publications

Nivå	Beskrivelse	Suksesskriterier
Formål: Mål for UiO som dette prosjektet bidrar til oppfyllelsen av	Preservation of the alum-treated Oseberg collection now held in storage. Potentially greater numbers of objects can be reconstructed, displayed and studied in the future	Chemical and mechanical stability, while preserving appearance
Effektmål (langsiktige positive gevinster. Merk at disse kan være både «harde» og «myke»)	Increased conservation competence in decision making regarding retreatment using water-based methods (feed into SO-III Research) Increased general conservation competence for caring for the Oseberg collection Increased conservation competence regarding retreatment using PEG, not only of alum-treated wood, but archaeological wood in general Student involvement will provide them with experience, and increased understanding of retreatment issues This project builds further on foundations established in SO-I, SO-II, enabling further research on conservation of archaeological wood using PEG. All align with KHMs ambitions in Strategy 2030	Enable more effective strategies for long-term preservation of Oseberg collection Publications and other research output like teaching Transfer of reconservation knowledge gained in project to younger generations
Resultatmål (de målene som prosjektet skal oppnå i prosjektets	Retreatment of single fragments of alum-treated wood using PEG. (Low and Medium risk groups)	Retreatment method described in detail for objects in risk groups Low, Medium and Medium-High in the final report

levetid; f.eks. målt i tid, kostnad, kvalitet)	Gain knowledge about retreatment of slightly more complex objects (Medium-High risk groups) using PEG Scientific and professional output on monitoring and evaluation of retreatments	Limitation of PEG as a method will also be discussed in the final report Effective, practical methods developed for mass reconservation of fragile wood and reported Publications

3. Framework conditions

Facilities required

It is recommended that the project is undertaken at Økern, due to the close follow-up required and due to the presence of other necessary facilities, such as fumehoods, the photo studio, X-ray room, 3D scanning lab and the alum storage room. The project requires:

- Office space for 2 people (even if we use our own staff, we must hire replacements).
- We plan to set up retreatment in the basement, immediately outside of the freeze drying room. Details are given in the main Project Plan (Braovac, 2021).
- Equipment must be ordered and set up, so that ‘everyday’ conservation (from excavations) can continue alongside SO-III Retreatment.
- After PEG impregnation, the objects must be frozen before being freeze dried. If there is space, we can use the existing freezers at Økern. If we can use the freezer room, we can store objects on 3-4 additional trolleys – depending on the amount of space available.
- We plan to use the freeze dryer at Økern, which involves coordination with other projects.
- After freeze drying, we will need space (benches and fumehoods) to surface clean and to make eventual repairs, evaluate results and return fragments to their original storage boxes, and replace in storage room.
- We will also need to use the photo studio and X-ray equipment for documentation before and after re-treatment of selected objects.
- We will also need some access to instruments (for ex. FTIR, SEM), to identify surface coatings, glues and fills previously used on the objects.
- We need to 3D document selected objects before and after reconservation, especially those from the Medium-High risk group. We will be using our own personnel and facilities for this, which must be coordinated with other projects.

4. Project deliverables and limitations

Leveranser	Beskrivelse

Reconserved objects in Risk categories Low, Medium and most Medium-High Understand which types of objects in Medium-High risk category will withstand water-based retreatment methods	Objects in risk categories Low and Medium are more or less composed of single fragments. Most will likely withstand retreatment using the PEG method. The Medium-High risk group includes more complex objects (put together from more fragments using various materials), many of which may benefit from retreatment with PEG.
Retreatment reports, photos, X-rays, etc	Retreatment will be documented following usual conservation guidelines at KHM, which includes entering into MUSIT, the museum database.

5. Evaluation of uncertainties in the projects: risks and mitigation strategies

Trusler	Beskrivelse	Reduserende tiltak
Monotonous work	There is no denying that this work will be very intense and repetitive.	Project is structured to provide competence building with expectations to publish, present at conferences, and mentor students.
Illness, due to work overload	This is a very intensive project with a lot of coordination with other parts of Dept. of Collection Management.	Conservators must not be overloaded with too many other tasks at KHM.
Illness, regular	Regular illness cannot be avoided, and it may be an idea that other KHM conservators can step in if required for shorter periods.	Train extra staff to be able to cover needs if illness arises.
Work can involve heavy lifting.	Ca 2000 liters of water /PEG solutions are involved in the set up. Vats will be placed on trolleys with 3 shelves, to intensify use of space in the basement.	The set up will aims to give minimal lifting of heavy water-laden vats. Water will be emptied and filled with the use of necessary equipment (pumps, hoses, etc). All lifting, however cannot be avoided (for ex. 20kg PEG bags)
It may turn out that many objects assigned to treatment with PEG prove to be too fragile.	During the collection survey we did our best to classify objects into risk groups, based on previous experiences in SO-II. However we did not have the capacity to Xray objects during the survey, which gives additional	The most challenging objects can be reconserved in later batches, not the first one. This will gradually build up experience as reconservation proceeds,

	information. It may turn out that some objects will have to be placed into higher risk groups.	so decisions of whether to use PEG or not can be made with greater confidence. Good dialog with Head of Collections and Reference Group are important.
Objects fall apart	Despite efforts to avoid this, it is possible that objects become irreparably damaged during reconservation.	Use experienced staff, especially in beginning of the project. Most important objects must be documented by photography and by 3D; These objects will require full physical supports during reconservation.
Limited access to resources outside of the main project.	For example, using freezer, freeze dryer, and not enough KHM staff to undertake 3D documentation before and after retreatment on selected objects, which will affect the reconservation schedule.	Good planning will highlight such needs. We have budgeted for 'frikjøp' of 3D personnel for this reason. Early dialog with colleagues to coordinate use of facilities. The new freeze dryer at Brobekk may take some pressure off the use of the freeze dryer at Økern.
Increase in costs due to world events	Price increases have been unpredictable, and surprisingly high.	The equipment budget from 2021 includes a buffer of 20%.
Failing equipment	Essential equipment may take months to repair.	The budget includes contributions to maintenance contracts for essential equipment, such as the freeze dryer and the Xray unit. The new freeze dryer at Brobekk may offer some backup capacity.
Muligheter	**Beskrivelse**	**Tiltak**
Lasting impact on conservation methods	Decision making with confidence! Knowing the risks and benefits of reconservation of alum-treated wood is transferrable to general reconservation of archaeological wood. This also includes improved knowledge on post-retreatment repair: what is possible, what is not.	Publish the methods that are of wider interest in professional journals and handbooks.

Attract new research projects	With our experience on characterizing and retreating archaeological wood, we become attractive collaboration partners in projects on the preservation of organic archaeological materials.	Ensure visibility of the scientific and practical work by means of publications, conference presentations and future workshops.
Retreatment competence is transferrable to other collections	Other museums, in Scandinavia, and also world-wide, have collections of alum-treated objects.	We can provide guidance to other museums for the best care strategies.
Honing our teaching and mentoring skills for conservation students and providing them with work experience.	We intend to hire students to help with various tasks during the project, such as X-raying, photography, cleaning, changing baths, repairing, packing, entering into MUSIT, etc.	A budget allowing conservation students to be paid is set aside for 2 months each year. Time is set aside to mentor.

6. Alternative choices and Overview of achievements

6.1 Alternative solutions or concepts

The alternative for retreatment is the status quo. Research so far indicates that the degradation of the objects is critical and ongoing, even though a rate of decay has not been established. As the collection is considered to be invaluable, this is not an attractive solution.

Reconservation needs several types of facilities (xray, photo room, fume hoods, etc) and close follow up. It was thought that it was best covered at Økern. However, it is also possible to set up at Brobekk, but there would be less follow up, greater risk transporting objects in cars, etc. This must be considered if Brobekk is chosen to set up SO-III Reconservation.

6.2 Overview of achievements

Gevinster	For hvem, og hvordan fremkommer gevinsten?	Forutsetninger for at gevinsten skal kunne realiseres
Oseberg collection remains available for research and education	UiO-KHM, research community and general public and tourist industry in Oslo. Slower degradation can be shown by long-term monitoring of objects and a few reference samples that have not been retreated.	Enough resources for retreatment and enough resources and awareness to ensure health of conservators during the project.

Improved knowledge on the conservation of alum-treated objects and retreatment options	Object conservators globally	Publication of scientific results and conservation methods
See 'Muligheter' table for more information		

7. Estimated time plan and milestones

Objects to undergo PEG retreatment

Experiences thus far show that the PEG method is the most efficient to ensure long-term stability of the alum-treated wood from Oseberg. This is because immersion in water removes both alum salts and acidic products from the wood, giving a final pH of ca 5, which is acceptable for long-term preservation.

Objects in risk groups Low, Medium and Medium-High, will undergo aqueous retreatment using PEG 2000 and freeze drying (ca 3600 objects). That is, alum-treated wooden objects reconstructed with simple repairs, or those still in a fragmented state. None of these have been previously displayed. Figures 3, 4, 5 show representative objects from each risk group.

The main steps in the PEG treatment include:

a) De-acidify objects by rinsing in water baths; alum salts also removed during this step.
b) Strengthen objects using PEG 2000
c) Freeze dry

So far we have only tested this method on single fragments (max size was ca 50 cm long and 7 cm diameter). We would like to test it on wider pieces and longer pieces. We would also like to test it on pieces with simple repairs, such as those only involving adhesives and on composite objects of wood and rope. These types of objects have been assigned to the Medium-High risk group.

Incremental knowledge will be an underlying principle in the work. As such, some objects may shift categories initially assigned during survey.

Low

Figure 3. Low Risk profiles are characterized by objects:

- Which do not powder spontaneously
- Without repairs, or with repairs with glue only
- Mainly with surface coatings
- Which are worked or are branches less than 3 cm diameter

Medium

Figure 4. Medium Risk profiles are characterized by objects:

- Which do not powder spontaneously
- Without repairs, or with repairs with glue only
- Mainly with surface coatings

Medium-High

Figure 5. Medium-High Risk profiles are characterized by objects:

- Most of which have new breaks or spontaneously powder
- Mainly without repairs, or with repairs with glue only, but there are some which are more complex
- Mainly with surface coatings
- Many of these objects have carved surface details, or are longer and/or thicker than those in the Medium Risk group.

Work space set-up

In the space we have available at Økern, we can fit 54 large 'high blue boxes' (ca 2000 L PEG solution), and one large tank for XXL objects. This volume accommodates ca 1100 objects if ca 20 are placed in each vat. Objects will be therefore reconserved in Batches.

Different objects require different amounts of time in the treatment baths, based on size and whether or not they have surface coatings. Time estimates are based on experiences from Saving Oseberg-II. Generally we have three main 'Time' groups for desalination and PEG impregnation (Steps a and b, above):

- Fast (104 fragments): 5 months per object
- Medium (421 fragments): 9 months per object and
- Slow (3008 fragments): 16 months per object.

Corresponding freeze drying times (Step c, above) for each group are 1.5, 2 and 3 months per object, respectively.

Once the first batch of objects are being freeze dried, the vats are freed up, and we can start with the next batch of objects.

In this Project Description we combined the Fast and Medium times, to simplify the timelines. Figure 4 shows how four batches may be distributed over 6 years. This can of course be adjusted to 5 batches if necessary.

Figures 5 and 6 show reconservation during SO-II. Similar blue boxes will be used in this project.

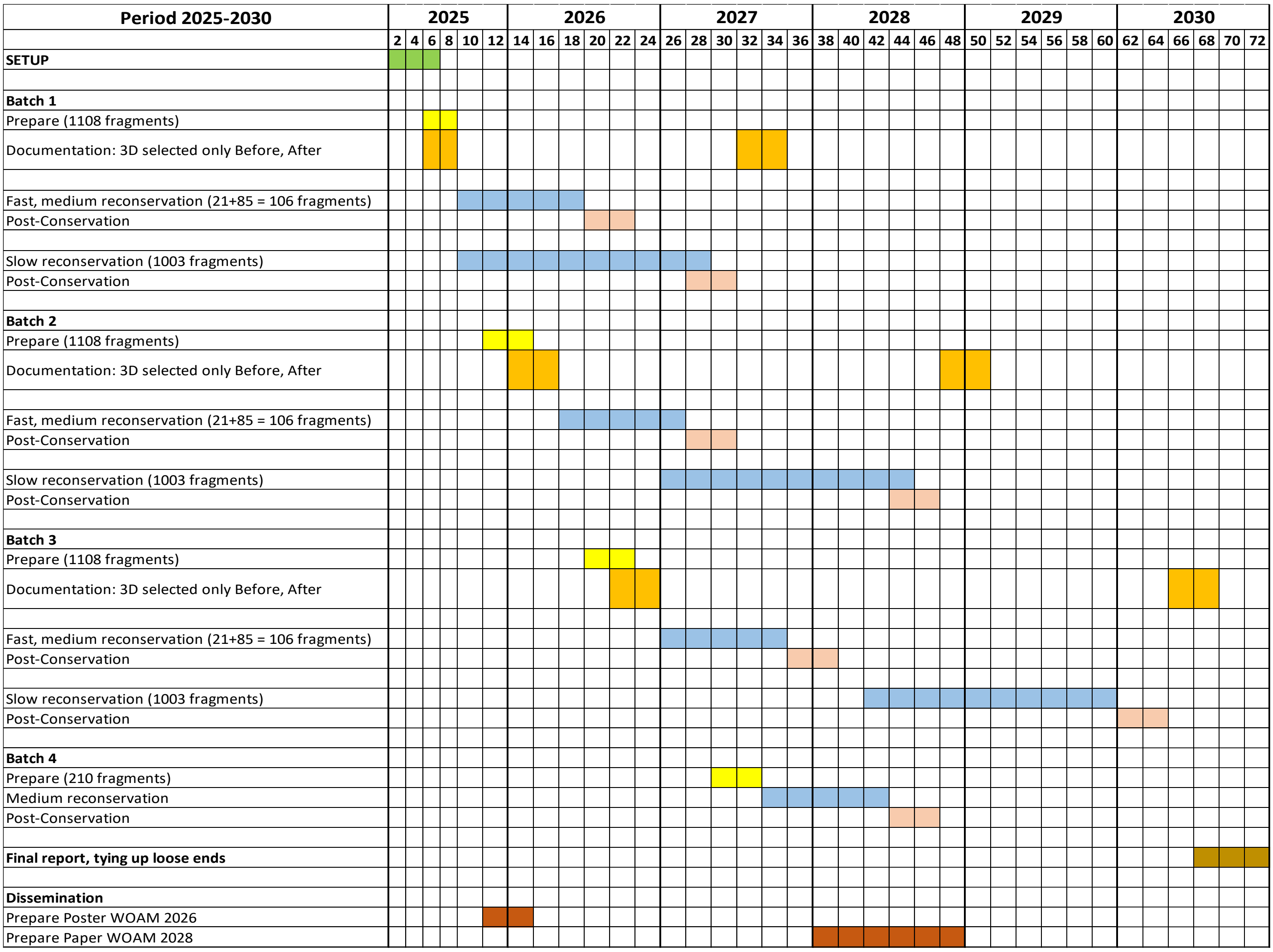

Figure 4. Suggestion for distribution for 4 Batches of objects over 6 years.

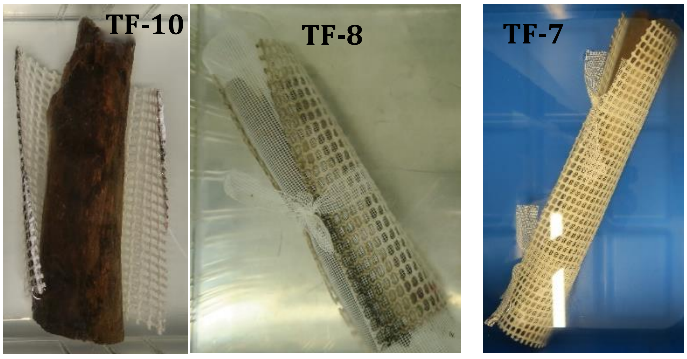

Figure 5. Examples of physical supports used during desalination of larger branches.

Figure 6. PEG retreatment in SO-II. For SO-III Reconservation, the large number of objects that will undergo reconservation at the same time (ca 20 objects per box) make it imperative to design a way to keep track of each one in the setup phase, so that it can be returned to its original storage box.

Below is a table showing the Reconservation milestones. The milestones are also briefly described in the text following the Milestone table.

Milestones for a 6-year project period, ex 2025-2030	Finish month
Project Setup	5
Batch 1	
Prepare (1108 fragments)	8
Documentation: 3D selected only Before, After	Before:8 After: 34
Fast, medium reconservation (21+85 = 106 fragments)	18
Post-Conservation	21
Slow reconservation (1003 fragments)	27
Post-Conservation	30
Batch 2	
Prepare (1108 fragments)	12
Documentation: 3D selected only Before, After	Before:15 After: 51
Fast, medium reconservation (21+85 = 106 fragments)	24
Post-Conservation	27
Slow reconservation (1003 fragments)	43
Post-Conservation	46
Batch 3	
Prepare (1108 fragments)	21
Documentation: 3D selected only Before, After	Before:24 After: 67
Fast, medium reconservation (21+85 = 106 fragments)	34
Post-Conservation	37
Slow reconservation (1003 fragments)	59
Post-Conservation	63
Batch 4	
Prepare (210 fragments)	31
Medium reconservation	42
Post-Conservation	45
Final report, tying up loose ends	72
Dissemination	
Prepare Poster WOAM 2026	during Year 1
Prepare Paper WOAM 2029	during Year 4

7.1 Project set up

We cannot use existing vats in the conservation lab, as they are used for other conservation projects. Equipment must be ordered and set up.

Start up meetings with collection managers and Head of Collections are required to clarify goals and procedures. For example, to establish strategies for labelling storage boxes, which objects should be 3D-documented, etc.

Early on, it will be necessary to coordinate the use of common resources (freezer, freeze dryer, etc) with other projects, and coordinate timeslots with 3D staff.

In this project description, the objects have been organized into 4 batches. Each 'Batch' of objects have the similar steps, described in the following:

7.2 Preparation before retreatment (ca. 1100 objects per Batch)

7.2.1 Organizing batches

From the start of reconservation to the end, we must establish a system that ensures that we do not mix objects from different boxes. This involves labelling, ways of grouping in impregnation tanks, etc.

7.2.2 Documentation: Photo, Xray, 3D and material ID

Before retreatment, all objects must be documented according to specified procedures (photo, Xray).

The project team should also decide the strategy for 3D documentation together with Prof. Jan Bill as well as with KHM's 3D experts. It is suggested that 3D documentation be undertaken only of objects of importance and of selected objects in the Medium-High risk group. We must also decide in which cases 3D documentation will be undertaken both before and after retreatment or only before. As 3D documentation can take time, it is important to create a schedule for such work so that it is compatible with the time required for reconservation.

Identification of eventual repair material used during reconstruction in the early 1900s should be analysed and recorded.

7.2.3 Evaluate need for physical supports and make them

Evaluate needs for physical supports, and design and construct them. For ex. for large objects, objects with simple repairs, branches, etc. Different types of materials must be ordered and methods will be developed.

7.3. Retreatment steps

7.3.1 Desalination, PEG impregnation

Weekly monitoring of conductivity, pH, taking photos where relevant.

7.3.2 Freeze dry

After removal of objects from final PEG bath, they are wiped or rinsed of excess surface PEG and then packed for freezing. Freeze in available space (-40C). Freeze dry in batches.

7.4. Post Retreatment processing

7.4.1 Post-reconservation

After freeze drying, excess PEG must be removed using gentle heating. Eventual repairs and aesthetic retouching must also be made where appropriate.

7.4.2 Documentation after retreatment

Photo all objects after treatment when returned to their place in their storage boxes. X-ray and 3D documentation of selected objects only (for example, those which have minor repairs).

7.4.3 Return to storage

Reconserved objects are returned to the same storage box.

If different objects in a box underwent different retreatments (for ex. using both PEG 2000 and Non-aqueous methods), we must find a way to label the individual fragments with each retreatment method. That is, devise a system.

7.5. Database work

Treatment reports, photos, X-rays must be labelled and archived into MUSIT. Analysis data (if used to ID materials) and 3D documentation must be archived according to Museum practice.

7.6 Dissemination

New knowledge generated during the project should be disseminated to the wider conservation community through publications and international conference presentations (ex. WOAM). Mentoring student employees is gives project conservators pedagogical experience.

8. Organization, roles and responsibilities

Project owner of SO-III Reconservation is KHM's Dept. Head of Collection Management. Project members will report to Group Leader, Brynjar Sandvoll.

SO-III Reconservation is linked with SO-III Research, but it is not necessary that the 2 projects run simultaneously. However, it would be an advantage if they could overlap, so as to exchange experiences and knowledge.

8.1 Personnel

Project conservators (100%): 2 archaeological conservators, at least one with extensive knowledge of wood conservation, also preferably about alum-treated wood. Ideally, in-house staff are best for this project, as new knowledge will remain in-house, such that it can be passed on to other conservators, and fed into SO-III Research.

Project coordinator (50%): will take on administrative duties and contribute where needed in the project, depending on expertise.

Additional expertise includes 3D staff, for which we have budgeted KHM staff hours. Hiring conservation students (either during the semester or summer) will assist the project conservators and provide valuable work experience.

8.2 Expertise as needed

A reference group with both in-house and external members will give feedback underway, as necessary.

Collection managers (archaeological finds) and Head of the Viking Ship collection are consulted as required.

9. Stakeholders/target groups

The main stakeholder is the project owner, the Museum of Cultural History, whose cares for the Oseberg collection.

Other stakeholders are the users of the Oseberg collection in either research or exhibition, and conservators at other institutions that have alum-treated wooden objects and more generally those interested in (re-) conservation of archaeological wood.

10. Budget

SO-III RECONSERVATION - Internal funding								
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Staff								
Project coordinator	lønn: 50%	485 000	509 250	534 713	561 448	589 521	618 997	3 298 928
Conservator-1, KHM	100 %	940 000	987 000	1 036 350	1 088 168	1 142 576	1 199 705	6 393 798
Conservator-2, KHM	100 %	940 000	987 000	1 036 350	1 088 168	1 142 576	1 199 705	6 393 798
Master student - ltr 45	8 weeks per year	115 000	120 750	126 788	133 127	139 783	146 772	782 220
3D expert, KHM	1.5 årsverk	275 000	288 750	303 188	318 347	334 264	350 977	1 870 526
Travel								
Ref group meetings, In-person meetings years 1, 4, 6, otherwise digital meetings	travel		100 000		100 000		100 000	300 000
Study tour Wasa, NatMus Denmark;	travel	180 000						180 000
Dissemination								
Publications 5 total	Drift			20 000	20 000	20 000	40 000	100 000
Conferences, ca. 1 per year per person	travel		60 000	120 000	60 000	120 000	120 000	480 000
Running costs								
Equipment, consumables	Drift	333 333	333 333	333 333	333 333	333 333	333 333	2000000
Use of existing conservation laboratory facilities (ex. Freeze dryer, freezer) and 3D equipment	Drift	224 000	224 000	224 000	224 000	224 000	224 000	1 344 000
							TOTAL NOK	**23 143 270**

11. References

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12. Overview of versions and edits

Versjon	Dato	Endring	Ansvar for å beskrive endringen	Ansvar for godkjenning av endring
	14.08.23			