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A Question of Reburial

Status Report on Reburial of Archaeological Sites in Norway
A Multiple Case Study

Master's thesis in Archaeology

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"Sites are not just pieces of dirt with artefacts in them. They are a product of human activities, which have been altered over the succeeding years by physical, biological, and chemical processes and human activity." (jones 2007:18)

Front page: Photomontage: Torbjørn Vasshaug

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Evelyn Johnsen, 14 May 2009, Trondheim.

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Notation

Askeladden:	Norwegian Cultural Heritage Database
CHM:	**C**ultural **H**eritage **M**anagement
ECCO:	**E**uropean **C**onfederation of **C**onservator-Restorers' **O**rganisations
GCI:	**G**etty **C**onservation **I**nstitute
ICCROM:	**I**nternational **C**entre for **C**onservation in **Rom**e. International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOM:	**I**nternational **Co**uncil of **M**useums
ICOM-CC:	**I**nternational **Co**uncil of **M**useums – **C**ommittee for **C**onservation
ICOMOS:	**I**nternational **Co**uncil on **Mo**numents and **S**ites
Kml:	Norwegian Cultural Heritage Act of 1978. **K**ultur**m**inne**l**oven
LECA®:	**L**ight **E**xpanded **C**lay **A**ggregate
MD:	Ministry of the Environment. **M**iljøvern**d**epartementet
MoLAS:	**M**useum **o**f **L**ondon **A**rchaeology **S**ervice
NIKU:	Norwegian Institute for Cultural Heritage Research. **N**orsk **I**nstitutt for **Ku**lturminneforskning
NOU:	Official Norwegian Report. **N**orges **O**ffentlige **U**tredninger
NPS:	**N**ational **P**ark **S**ervice
PARIS:	Conference on **P**reserving **A**rchaeological **R**emains ***I**n **S**itu*
PPG16:	**P**lanning **P**olicy **G**uidance **16**
RA:	Norwegian Directorate of Cultural Heritage. **R**iks**a**ntikvaren
St.meld:	Report to the Storting. **St**ortings**meld**ing
UNESCO:	**U**nited **N**ations **E**ducational, **S**cientific and **C**ultural **O**rganisation

1. INTRODUCTION

Archaeological remains are part of mankind's collective heritage and the importance of this legacy is commonly recognised today. To preserve this legacy has become the priority on the archaeological agenda. The loss of archaeological sites in the 19th and 20th centuries and the recognised importance of preserving what archaeological remains survive have led to the widespread adoption of a policy of preserving archaeological remains *in situ* (ICOMOS 1990; Demas 2004:137). In the last 25 years the theme of preservation of archaeological sites has been introduced to alternative approaches to preserving archaeological remains for the future. These approaches are based on the hypothesis that archaeological remains are best preserved in the original environment in which they have been situated prior to being uncovered and exposed to the elements. Methods that are being regarded as favourable alternatives to complete excavation include preservation of archaeological deposits *in situ* without excavation and reburial of archaeological artefacts in a marine environment. An additional method is reburial of archaeological sites. This latter method is regarded as one of the most viable and flexible intervention strategies for preserving archaeological sites which have been exposed (Demas 2004:137).

The present knowledge about reburial of archaeological sites as an established method for preservation *in situ* is based on European studies. However, national cultural heritage management in Norway has taken onboard the European directive that preservation of archaeological remains *in situ* is preferable to complete excavation (Miljøverndepartementet 2002:1). Is reburial - one measure for preservation *in situ* - taken into account? On the background of this question, this thesis investigates the topic *Reburial of archaeological sites in Norwegian archaeology.*

1.1. Aims and objective

The aim of this thesis is to establish the current status of reburial of archaeological sites as a method in Norwegian archaeology. Furthermore, the objective is to investigate different circumstances where the decision to rebury an archaeological site, or parts thereof, was made. Subsequently, many questions need to be investigated. The aims are to examine why reburial has been implemented in different cases, which method has been used, how the site has been/is monitored and what the outcome of the measure has been. The intention is not to arrive at a clearly defined answer to the question of whether to rebury or not, but to make a contribution to starting a discussion of reburial. Furthermore, the intention is to shed light on the many questions about reburial that need to be addressed in research on preservation of archaeological remains. Archaeological Science Advisor at English Heritage, Jim Williams and retired Chief Scientist at English Heritage, Mike Corfield (2003:276) state in an article on preservation of sites and artefacts *in situ* that before one can develop future research strategies one has to review the extent of our knowledge of conservation science. Research on this topic will be valuable in the future when managed reburial, as an alternative to temporary or long-term preservation of cultural heritage, will have been implemented to a larger extent than today. It is hoped that this thesis can provide recommendations for National Cultural Heritage Management in Norway with regard to the use of reburial of archaeological sites as a method to avoid irretrievable loss of archaeological remains.

1.2. Problem statement

What is the current status of reburial of archaeological sites in Norwegian archaeology?

This problem statement is complex. To answer the question about the current status of reburial as a method for preserving archaeological sites in Norwegian archaeology, further questions need to be investigated. The following questions have served as a connecting thread throughout this thesis;

1. *Which guidelines apply for the reburial of archaeological sites in Norway?*
2. *How is reburial implemented in county municipalities in Norway?*
3. *What can be learned about decision making, implementation and design, monitoring, and the short- and long-term outcomes of reburial of archaeological sites by investigating case studies?*

2. TERMINOLOGY AND DEFINITIONS

2.1. Preservation, conservation and preventive conservation

The terms preservation, conservation and preventive conservation will be used in this thesis and they need to be defined. The term preservation is here used as a goal and conservation as the means to accomplish preservation. Preservation seeks to prevent changes to archaeological remains. Archaeological excavation of archaeological sites is also preservation; excavation destroys the site and removes the prime source, but documentation of the remains and surviving artefacts are *preserved by record* (Lucas 2001:37). Conservation is a philosophy that emphasises dynamic intervention to prevent physical, chemical, or biological decay of archaeological remains when the environment changes, as opposed to preservation, which is a static term with the aim to prevent changes (Darvill 2003:97-98). However, Christopher Mathewson, Regents Professor in Engineering Geology at the Department of Geology and Geophysics, Texas A&M University and Geologist Tania Gonzalez (1991:2) state that preservation of an archaeological site cannot be defined as non-change because the site is located along a continuum of change over time. They define preservation as "*any action which reduces or eliminates detrimental changes resulting from site impacts"* (ibid). This definition of preservation will apply for this thesis. Conservation is defined by the International Council of Museums, Committee for Conservation (ICOM-CC):

> *"all measures and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations. Conservation embraces preventive conservation, remedial conservation and restoration. All measures and actions should respect the significance and the physical properties of the cultural heritage item."* (ICOM-CC 2008).

Conservator Eva Ernfridsson (2004) formerly at Studio Västsvensk Konservering in Sweden, defines conservation as every act that is performed directly or indirectly on an object or monument, with the intention to protect the integrity of the material and to guarantee respect of its cultural, historical, aesthetical or artistical meaning.

Conservation can affect archaeological remains indirectly without being interventive to the remains, but by altering their surrounding environment in such a way as to prevent damage. This is preventive conservation. E.C.C.O. is the European Confederation of Conservator-Restorers' Organisations. According to their web page, the confederation *"seeks to develop and promote, on a practical, scientific and cultural level, the profession of Conservator-*

Restorer of Cultural Property." According to E.C.C.O's professional guidelines the definition of preventive conservation is:

> *"Preventive Conservation consists of indirect action to retard deterioration and prevent damage by creating conditions optimal for the preservation of cultural heritage as far as is compatible with its social use. Preventive conservation also encompasses correct handling, transport, use, storage and display. It may also involve issues of the production of facsimiles for the purpose of preserving the original"* (ECCO 2007)

Eva Ernfridsson (2004) sees reburial of rock art sites as preventive conservation. Thomas Bergstrand, archaeologist at the Bohus County Museum, and Inger Nyström Godfrey, conservator at Studio Västsvensk Konservering (2006:145), state that preventive conservation, where the remains are preserved in a monitored environment, can sometimes be a better long-term method than recovery and conservation.

2.2. Reburial

The term reburial has several connotations. In Norway, as in The Americas and Oceania, the term reburial refers to the reburial of human remains. In these regions of the world the skeletons of indigenous people have previously become part of museum collections and later repatriated for re-burial. Another meaning of reburial, upon which this thesis is based, is the presumption that uncovered archaeological remains are better preserved for the future by reburial. Reburial is not a new phenomena, it has existed as an intuitive measure of putting back excavated soil mass after complete- or partial excavation, but this was done without evaluation and documentation (Demas 2004:137). This measure can be characterised by the term *backfilling*. Reburial in terms of preservation was addressed as early as in 1931; The Athens Charter[1] recommended that excavated sites which are not subject to immediate restoration should be reburied for protection (ICOMOS 1931). Reburial today seeks to re-establish the pre-excavation environment that has preserved archaeological remains for centuries (Hopkins and Shillam 2005:84; Bergstrand and Nyström Godfrey 2007:7). Reburial is regarded as a preventive measure that protects the archaeology from two types of threats: direct effects of water, wind, light, vegetation, animals and humans; and deterioration caused by continual fluctuations in temperature and moisture. It removes the zone of evaporation and

[1] see ICOMOS web site for full text of all charters and recommendations: http://www.international.icomos.org/charters.htm; Last visited: 07.03.09.

salt crystallization away from the underlying layer (Demas 2004:140). However, it does not protect the archaeology from the normal processes that take place in the soil (diagenesis). Diagenesis is not a term that is commonly used in reburial studies. The method of reburial does not interfere with the archaeological remains, but focuses on the surrounding environment. For such preservation purposes the term reburial became common in the Cultural Heritage Management (CHM) literature in the 1990s (Agnew et al. 2004:134). The Getty Conservation Institute (GCI) states that; *"Reburial, or backfilling, refers to the practice of returning an excavated site to a buried environment in order to re-establish a state of equilibrium that existed prior to excavation."* (The GCI Project Bibliographies SERIES 2003: 7)

The GCI and the National Park Service (NPS) in the USA together with the International Centre for the Study of the Preservation and Restoration of Cultural Property in Rome (ICCROM) arranged a colloquium in Santa Fe, New Mexico in 2003 on the topic *Reburial of Archaeological Sites*. Prior to this colloquium, the three organisers decided to use the term *reburial* instead of *backfilling*. This choice was made because the term reburial implies a broader range of conditions under which a site may be buried. It is also a more methodological, designed approach (Agnew et al. 2004:133). Likewise, this thesis applies the term *reburial* based upon the methodological description of reburying or covering exposed archaeological remains with the aim to assure further preservation of the condition, integrity and value of the remains for temporary purpose or for future generations. The term *backfilling* will still be used in this thesis, but only with the meaning of placing the already excavated soil back where it was previously situated. This means that if a reburial design involves using a type of soil or material different to that which was originally located on the site, the term backfilling is not applicable.

2.3. Conservation or preservation of archaeological remains in situ

When archaeological remains are threatened by natural processes or human activity, a decision about the remains' future has to be made. Either the remains are excavated and thereby preserved by record or they are left alone and preserved *in situ*. Preservation *in situ* and conservation *in situ* refer to the preservation of archaeological structures and remains in their original location (Demas 2004:150; Smits 2006:11). The CHM literature seldom differentiates between these two concepts and both are widely used and applied to similar situations. Preservation has been defined above as any action which reduces or eliminates detrimental changes resulting from site impacts. The preservation of archaeological sites *in situ* will subsequently be defined as maintaining the archaeological remains in their original location without introducing changes to the remains and minimising detrimental changes to the environment. The reburial intervention is a combination of preservation by record and preservation *in situ.* Reburial is passive to the archaeological remains but interventive to their environment, in contrast to excavation which is an intervention to the archaeological remains. Through reburial, changes will be made to the environment surrounding the remains. Reburial can therefore be defined as conservation. However, these alterations aim to minimise detrimental change and to re-establish the pre-excavation environment which had preserved the archaeological remains for centuries, prior to excavation; consequently, the term *preservation in situ* is used throughout this thesis.

2.3.1. Why preservation *in situ*?

When complete excavation is carried out and the remains are removed, the material has lost much of its research potential, because it is removed from its original context. Theoretically, future researchers have access to the primary source if the remains are left *in situ* and no unforeseen catastrophe has destroyed them. With the potential of new methods of excavation and analysis in the future, additional information can be extracted from the material. Mike Corfield (1996:33; 1998:304) argues for preservation *in situ* because improved techniques might be available for future generations to understand the archaeological remains better. One example of how new techniques can lead to new knowledge, was the introduction of mechanical topsoil stripping to Norway in the 1970-80s. This revolutionized the understanding of early agricultural settlements in Norway (Løken, Pilø and Hemdorff 1996). Once an archaeological excavation has been carried out the remains must be analysed, conserved and recorded and the costs involved are not inconsequential. Professor for International Archaeological Resource Management at Leiden University, Willem Willems (2008:289) states that archaeological heritage management today has established a conservation ethic that says that we should try to preserve sites, and not just because they are our primary sources but also because they are such a fragile and non-renewable resource. With successful reburial, archaeological sites can be preserved for future generations by not carrying out a full excavation and removal of the uncovered structural remains, but by reburying the site *in situ*.

3. METHODOLOGY

In order to approach the problem statements about the practice of reburial in Norwegian archaeology, two categories of source materials have been used. Firstly, CHM literature, such as guidelines, conventions, charters, treaties, legislation, and research on the topics of preservation *in situ* and reburial have been studied. It has already been mentioned that reburial is fairly new as a defined method in archaeology; this means that there are few published research results both in Norway and abroad. In order to gain insight into the questions put forth in Section 1.2., a second method for information gathering was required. The method selected was to personally consult the national and regional cultural heritage management authorities in Norway, such as the Norwegian Directorate of Cultural Heritage (Riksantikvaren), the Norwegian Institute for Cultural Heritage Research (NIKU), county municipalities and the five national archaeological museums. This contact was a general inquiry about reburial as a subject in Norway. During field work in Buskerud County Municipality, personal experience with reburial of archaeological remains following mechanical topsoil stripping was regarded as relevant to the problem statement of this thesis. It was necessary to engage in a dialogue with archaeologists and other professionals who had experience with the practise of reburial of archaeological remains in county municipalities in Norway. This was undertaken in the form of a questionnaire answered in writing or orally by the respondents. These contacts have provided insight into the current status of reburial in Norwegian archaeology.

The contacts mentioned above have provided data and valuable insight into different cases where reburial has been used as a method for preserving uncovered archaeological remains *in situ*. By investigating these case studies, where archaeological sites have been partly excavated and then reburied, the question about what can be learned about decision making, design and implementation, monitoring, and the short- and long-term outcomes of reburial of archaeological sites has been approached.

The framework is as follows: First, the CHM literature consulted in this thesis is presented (Chapter 4). Second, the responses from the county municipalities are summarised and discussed (Chapter 5). Finally, the case studies are presented (Chapter 6), analysed and discussed (Chapter 7). The methods used are further described in Chapters 5 and 6. The CHM literature provides a framework for the analysis and will be referred to in Chapter 7.

4. CULTURAL HERITAGE MANAGEMENT LITERATURE

Cultural heritage management in Norway has no laws or guidelines covering reburial of archaeological sites (S.R. Skoglund pers.com.[2] 19.03.2009). However, the Norwegian Government wishes to support the current international practice by following international conventions, agreements and processes (Miljøverndepartementet 2004-2005:10, 12, 87-88) and these emphasise preservation of archaeological remains *in situ* and the proper conservation of exposed archaeological sites. The following sections include guidelines, treaties, conventions, and legislation, in addition to research and literature regarding preservation *in situ* and reburial.

4.1. International guidelines

The first time the concept of reburial was proposed was in the General Conclusions of the Athens Conference (ICOMOS 1931: conclusion VI; Agnew et al 2004:133-134), where it is specified that ruins, of which preservation was found impossible, should be buried. This proposal was ahead of its time and until the term reburial became common in literature, other charters and recommendations proposed preservation *in situ* as a favourable option for archaeological remains. UNESCO's recommendation on international principles applicable to archaeological excavations (UNESCO 1956: II.9) promotes *in situ* preservation of unexcavated archaeological sites in the belief that they will benefit from future improved techniques and more advanced archaeological knowledge. This recommendation is not legally binding, but has influenced national legislations concerning excavation (GCI 2009). The Charter for the Protection and Management of the Archaeological Heritage (ICOMOS 1990: Article 6) promotes *in situ* preservation of monuments and sites as the overall objective of archaeological heritage management. Senior Project Specialist at the GCI, Martha Demas (2004:143) excludes reference to reburial in the 1990 charter. However, Article 6 states that *"[…] It also asserts the principle that the archaeological heritage should not be exposed by excavation or left exposed after excavation if provision for its proper maintenance and management after excavation cannot be guaranteed"* (ICOMOS 1990: Article 6). This does not directly refer to reburial, but it implies that some measures have to be carried out after excavation to assure that the cultural heritage is properly maintained and not left exposed.

[2] Sissel Ramstad Skoglund, Section of Archaeology, Department for Buildings, Monuments and Sites, Riksantikvaren. Email correspondence.

4.1.1. The Valletta Treaty

The European Convention on the Protection of the Archaeological Heritage (Valletta Treaty 1992) was signed in Valetta, Malta, on January 16th 1992. Norway ratified the convention in 1995 and implemented it on Mars 20th 1996 (Miljøverndepartementet 2000-2001). The Valletta Treaty recognises the threat to the European archaeological heritage, in the form of deterioration due to the increasing number of major planning schemes, natural risks, clandestine or unscientific excavations and insufficient public awareness. Article 4ii in the Valetta Treaty promotes preservation of the archaeological heritage *in situ* as the most preferable solution. The point of the Valletta Treaty is that permits to remove the archaeological remains should preferably not be given (Willems 2008:286). The Treaty stresses a European fellowship for protection of archaeological heritage in order to reduce the risk of deterioration. By encouraging exchanges of expertise and the comparison of experiences, conservation of the archaeological heritage is promoted. Furthermore, it states that the protection and management of archaeological heritage should be taken into account in town and country planning;

> *"Affirming that it is important to institute, where they do not yet exist, appropriate administrative and scientific supervision procedures, and that the need to protect the archaeological heritage should be reflected in town and country planning and cultural development policies."* (Valetta Treaty 1992: Preamble).

Article 3 in the Valletta Treaty states that the parties undertake to preserve the archaeological heritage and guarantee the scientific significance of archaeological research work. Hereunder the parties undertake to ensure that the archaeological remains are not uncovered or left exposed during or after excavation without arrangements being made for their proper preservation, conservation and management. The Valletta Treaty does not define archaeological heritage according to a date, such as the Norwegian Cultural Heritage Act (kml) from 1978 which sets it to the year 1537 (Kml 1978:§4). Rather it has a loose definition of what archaeological remains include: *"[...] considered to be elements of the archaeological heritage all remains and objects and any other traces of mankind from past epochs."* (Valletta Treaty 1992: Article 1.2.); *"The archaeological heritage shall include structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water"* (Article 1.3.). Norway is a signatory of the Valetta Treaty and is therefore bound to preserve the archaeological heritage as much as possible *in situ* and assure that exposed archaeology is properly preserved, conserved and managed.

4.2. Norwegian Guidelines

The international pressure on *in situ* preservation led to a new Official Norwegian Report (NOU) in 2002 (Miljøverndepartementet 2002:1) about Norwegian cultural heritage. This NOU 2002:1 *Fortid former framtid* states that *in situ* preservation is the most preferable solution. On the background of this NOU came the Report to the Storting (st.meld) No. 16 (2004-2005) *Living with Our Cultural Heritage*. This report for cultural heritage has the objective to reduce the decay and loss of cultural heritage towards the year 2020 (Miljøverndepartementet 2004-2005:16). Riksantikvaren is fostering *in situ* preservation as a fixed rule by refusing applications for exemption from the Norwegian Cultural Heritage Act. The Report to the Storting No. 16 states that methods of development on top of cultural deposits without excavation should be promoted to preserve the *underground archives* (Miljøverndepartementet 2004-2005:29). NIKU Archaeologists Ian Reed and Vibeke Vandrup Martens (2008:265) say that permission to remove automatically protected archaeological deposits can be regarded as the exception rather than the rule. Kristian Pettersen (pers.com.[3] 17.09.2007) says that the archaeological sites in Norway that are granted permits for excavation are often estimated to be poorly preserved and to give little information leading to new knowledge. Consequently, perhaps reburial is considered as less favourable in these situations than when the site is better preserved. He says that this may be one reason why reburial as an established method is not very common in Norway.

A question then arises: what is the value of buried cultural remains? Are the remains which by permission can be removed less deserving of preservation? When cultural heritage managers select remains for preservation, they have to state the reasons for preserving the selected remains. The values of the remains are three fold – as a source for knowledge, as a basis for experiences and as non-renewable resources. These values are weighed against the need for development within the community. The three values are further divided into criteria. The criterion for value as a source for knowledge is that the remains are representative, have a connection to the surroundings, are authentic and in a good physical state. The criterion for value as a basis for experience is connection and surroundings, identity, and symbolic,

[3] Kristian Pettersen, Archaeologist in Sør Trøndelag County Municipality. Email correspondence.

architectural and artistic quality. Cultural remains as non-renewable resources are a contribution to sustainable development (Miljøverndepartementet 2002:1:20-23). If the decision is made to exempt them from the kml, it is usually done with a requirement for an archaeological rescue excavation. This is done in order to *rescue* the archaeological remains and the knowledge they can provide before construction starts and the remains are lost for the future, and to preserve the remains by record. The excavations carried out by the Norwegian Institute for Cultural Heritage Research (NIKU) in the urban areas of Norway, date to the Middle Ages and are almost always rescue excavations. When NIKU excavates a property, they excavate a clearly defined area until there is nothing left to rebury (A.R. Dunlop pers.com. [4] 06.11.2007).

4.3. Research on preservation of archaeological sites in situ

In Norway, research on the results of preservation *in situ* are few, but increasing. In Tønsberg, archaeological deposits have been preserved *in situ* underneath a hotel. Monitoring equipment has been installed and data is frequently logged (Reed and Edvardsen 2005). This has become one of the longest running monitoring projects in Europe and will continue as a self financed project as long as the equipment continues to function (Reed and Martens 2008:267). Archaeological deposits have also been monitored *in situ* in Schultzgt in Trondheim (Peacock 2002). Thick archaeological deposits beneath the World Heritage Site of Bryggen in Bergen have been monitored since 2001. This monitoring programme is the basis for a monitoring manual for procedures and guidelines for the monitoring, recording and preservation/management of urban archaeological deposits which The Norwegian Directorate for Cultural Heritage and NIKU have published in collaboration with the National Museum of Denmark and Multiconsult AS (Dunlop et al. 2007). Willems (2008:288) says that research into the preservation of buried remains is being developed mostly in Northwest Europe and the US. There are more research results about preservation *in situ* and reburial abroad, but these are few in the overall context of archaeology and conservation research. This thesis will utilise cultural heritage research literature about preservation *in situ* and reburial from abroad.

In England, the generally accepted norm is to allow a 5% loss of archaeological evidence to allow for piling and other construction activities (Williams and Corfield 2003:277). Private archaeological contractors in the UK have standards for archaeological work, but they are not

[4] Alexander Rory Dunlop, Head (administrative) of districts office NIKU Bergen. Email correspondence.

backed by legal demands. Much depends on the contract between developer and archaeological contractor (Willems 2008:287). However, The introduction in England of PPG16 (the Department of Environment`s Planning Policy Guidance note, *Archaeology and Planning*, 1990), positively encouraged the preservation of nationally important archaeology remains *in situ* (DoE 1990). This planning guidance introduced the requirement to obtain an evaluation of the effects a proposed development will have on archaeologically important deposits. This should be obtained prior to development for the purposes of facilitating decisions by the planning authority (Woodiwiss 1998:33).

The lack of understanding of the physical, chemical and biological processes that influence the preservation of buried archaeological materials led to the first conference in Preserving Archaeological Remains *in Situ* (PARIS1) in London in 1996 (Corfield et al. 1998). The fact that archaeological sites in the UK were reburied without any consideration for what happens to the buried archaeological data during subsequent construction was addressed at PARIS1. The frustration of PARIS1 not producing any clarified results and guidelines led to a second conference (PARIS2) on the subject in 2001 (Corfield and Nixon 2004; Nixon 2004). The third conference in Preservation of Archaeological Remains *In Situ* came as a natural successor to the first two conferences. This third conference was held in Amsterdam in 2006 and concentrated on the two decades of *in situ* preservation of archaeological remains and subsequent measures (Kars and van Heeringen 2008). A forth conference is planned in 2010 in Copenhagen.

Jim Williams and Mike Corfield (2003:278), state that we know little about what happen to *in situ* preservation schemes because this is a relatively new approach, and few sites where *in situ* preservation has been part of the development strategy have been excavated. An important element to consider in the research of preservation *in situ*, is the climatic differences between Norway and other countries. In Norway the climate is extreme, and this makes preservation *in situ* more complicated. Even though research results from abroad are used in this thesis, adaptation to the Norwegian climate has to be considered.

4.4. Research on reburial methods

In the history of archaeological excavations there has always been simple intuitive burial of excavated or partly excavated archaeological sites. In Norway there have been examples where ruins have been buried by intuitive backfilling. One example of this happened in 1877-78, when parts of the Olavkloster ruins in Tønsberg were backfilled with excavated materials. Some parts of these ruins were removed due to construction work and the remaining parts of the ruins were buried by backfilling without any documentation or measures to assure further preservation of the ruins (Riksantikvarens ruinprosjekt 2006). Archaeological research has changed its focus over the last 150 years, from focusing on the artefacts to focusing on the context in which the artefacts are found. It is now regarded as very important to see the remains in context with their surroundings and this is an important element when outlining a strategy for preservation of archaeological remains *in situ*. Despite the term reburial being introduced in 1931, with the Athens Charter, it has not been used in Norwegian archaeology.

Rock art sites are a group of archaeological remains that in Norway have gained much national attention with regard to their future preservation as a result of the ten year project *Protection of Rock Art* -The Rock Art Project- from 1996 to 2005 (Hygen 2006). The Rock Art Project focused on, among other things, reducing the loss of rock carvings due to the annual freeze-thaw cycling in the winter and erosion of the rock surface. As a result, much of the rock art across Norway is covered by means of four different methods: cover with plastic to remove lichens; cover during the winter period with winter sheeting and uncovering in the spring for display for tourists; long-term covering because of the poor condition of the rock surface; and, permanent covering (ibid:39-41). Because of the poor conditions of preservation of rock art across Norway, measures had to be taken to prevent dissolution of weak mineral components, and complete erosion and weathering of the rock surface, which would result in the destruction of the rock art itself (Bjelland and Helberg 2006; Hygen 2006). Botanist Torbjørg Bjelland and Archaeologist Bjørn Hebba Helberg (2006:78), state in their *National Guidelines for Rock Art Preservation*, that the Rock Art Project did not investigate methods of long-term or permanent reburial with natural materials. Consequently, they give no recommendations for rock art reburial. However, permanent reburial of rock art was undertaken in the E6-Project (Ernfridsson 2004; Hygen 2006:41; Bårdseth 2007), which had consulted the Rock Art Project. This case is presented in Section 6.2 and described throughout Chapter 7.

Archaeologist Kristine Reiersen is at the time of writing conducting a research project on protective covers for archaeological features in agricultural landscapes in Norway. The aim is to minimise and distribute the load over the cultural remains, for a planned road construction and use. The project is temporary and after approximately two years, the site is planned to be re-opened to assess the state of the remains (K. Reiersen pers.com. [5] 16.04.2008).

The project *Reburial and Analyses of Archaeological Remains* (RAAR) started in 2001. The purpose was to evaluate reburial as a method for long-term storage and preservation of waterlogged marine archaeological artefacts. This was done by investigating the effects that the burial environment in Marstrand Harbour north of Gothenburg in Sweden had on different types of material. The research results give guidelines for the types of material that could be reburied in a marine environment (Bergstrand and Nyström Godfrey 2007). Bergstrand and Nyström Godfrey (2007:7-8) report that the results show that reburial could be a valid tool for heritage management, but its usefulness might be less general than previously assumed. Because of the ongoing research into the maritime burial environment and its effect on different materials, the subject of reburial in the marine environment will be excluded from this thesis.

In the literature from the USA, reburial is referred to as site protection through burial, site burial or burial-in-place (Mathewson 1988; Mathewson and Gonzalez 1991; U.S. Department of the Army, Corps of Engineers 1992; Bilsbarrow 2004). In 1989 the National Park Service published an article about intentional site burial; as a technique to protect archaeological remains against natural and mechanical loss (Thorne 1991 revised). Christopher Mathewson has conducted research on decay of archaeological sites buried for site protection (Mathewson 1987; Mathewson 1988; Mathewson and Gonzalez 1988; Mathewson and Gonzalez 1991). His work seeks to approach a site decay model (Appendix III), estimating how the site is going to be affected by the environment. In such a model, Mathewson (1987:225) points out four factors: site component variability; physical variability; biological variability; and chemical variability. Moreover, he says that it is more reasonable to develop an individual qualitative model for a specific site which is threatened by an engineering project because a quantitative model is complex and economically unrealistic (ibid:228).

Conservation and Management of Archaeological Sites (2004 vol.6 nr ¾) presents a number of papers on the topic *Reburial of archaeological sites* from the colloquium in March 2003 in

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Santa Fe, New Mexico, USA (mentioned in Section 2.2.) where forty professionals from different backgrounds gathered to discuss and share experiences with reburial as a method of protecting exposed archaeological remains. At the end of the colloquium, the conclusion was that further testing and research is still required to fully understand reburial as a technique to protect our archaeological heritage for future generations (LeBlanc 2003:7). Articles from this colloquium will be addressed throughout this thesis.

4.4.1. Geotextiles and fill materials

Reburial is dependent on proper use of materials suitable for the selected reburial design. The use of geotextiles has become more and more common when reburial is implemented, for protection, drainage, filtration and separation (Horrocks 1992:1-11; Demas 2004:150; Hopkins and Shillam 2005:83). Geotextiles contain fibres that are microbiologically resistant, such as polyamide, polyester and polypropylene. These qualities make the geotextile suitable for layer separation because it creates a stable, flexible and porous barrier between layers of soil of differing grain size and soil structure (Horrocks 1992:1-18). Both woven and nonwoven geotextiles are available in varying weights and porosities and often have suitable elasticity to allow them to be formed to fit the irregular surface of archaeological structures and sites (Thorne 1988:1). Geotextile aids drainage because it often has a higher permeability than the surrounding soil; thus, transporting water easily. The degree of permeability can be controlled by fabric selection (Thorne 1988:1; Horrocks 1992:11).

Another characteristic of geotextiles is filtration because they allow water and finer particles to pass from one soil layer to another but retain those particles of a coarser character (Horrocks 1992:11). Growth of surface vegetation can be influenced by choosing a geotextile with the specific weave, weight and porosity that favours the desired outcome (Thorne 1988:1). Because geotextiles have both a high tensile strength and the ability to adhere to soil layers in the immediate vicinity, they stabilise and reinforce both surface and sub-surface, because they enhance the strength of the soil mass (Horrocks 1992:1-18). This strength enhances the soil stability under heavy loads and this was the original recognition of geotextiles as novel geotechnical materials (ibid), and they are used most frequently in road construction (Thorne 1988:1). The physical properties of the soil may be altered by the trapping of oxygen, gas diffusion or water movement as an effect of introducing geotextiles to the buried environment. All of these three conditions are likely to increase microbiological activity (Hopkins and Shillam 2005:84).

Professor of Environmental Biogeochemistry at the University of Stirling, David Hopkins and PhD research fellow Laura-Lee Shillam (2005:85) have tested five different geotextiles for how they affect soil biological activity in the reburial environment. Among the five test textiles was Terram® 500. This is a thermally bonded and non-woven textile with 30% polyethylene and 70% polypropylene. The test showed that this geotextile is resistant to naturally occurring acids and alkalis and microbial attack, but on heating it lost tensile strength (ibid). Two of the geotextiles tested, named Landlok®, were originally designed for erosion control and have a coarse weave. Because of the coarse weave, this type of geotextile is not suitable as a barrier between different soil layers or between archaeological structures and overlaying soil. The additional two materials tested were Geotex®NW401 and Geotex®WM104F. These two are also resistant to naturally occurring acids and alkalis and microbial attack; in addition, they are resistant to UV radiation (ibid). Most non-woven geotextiles are made of polypropylene, which degrades rapidly when exposed to sunlight. The only test material that had any effect on microbial activity by altering the distribution of water and gas, was one of the Landlok® textiles, which had a biodegradable core. On a short-time scale, the decomposition of organic materials was not significantly effected by the other four geotextiles in an aerobic environment (ibid:86).

Common practice in the UK is to cover archaeological surfaces with the geotextile Terram®. This is used because of its long life (100 years). Then the remains are covered with washed sand, followed on top by soil from the site (Goodburn-Brown and Hughes 1996:65). Silica sand and washed sand provide good physical and thermal protection and introduce little direct contamination; silica sand is considered chemically inert (Canti and Davis 1999:776; Caple 2004:162).

Hydraulic conductivity refers to the soils ability to carry water through it. According to Corfield (1996:33-34; 1998:306) this ability depends on the geometry and distribution of the soil's pores. An open structured soil has high hydraulic conductivity compared to a compact soil, like blue clay, that will have a low hydraulic conductivity. The more compact the soil is the lower the hydraulic conductivity it has. Shilston and Fletcher (1998:9) report that cohesive soils are wetter and more plastic, and therefore weaker and more compressible than granular soils. Granular soils are also more permeable than cohesive soils and cohesive soils deform much more than granular soils. Because of the high permeability of granular soils, which defines the rate of compression, granular soils settle very quickly in highly saturated environments, while cohesive soils take months to consolidate (ibid). This consolidation time is relevant when a site is reburied, and the area is subject to continuing land use or development.

5. DIALOGUE WITH COUNTY CULTURAL HERITAGE OFFICES

This chapter will approach the second part of the problem statement about *How is reburial implemented in county municipalities in Norway?* According to the Norwegian Cultural Heritage act of 1978, the nineteen county municipalities in Norway are responsible for investigating whether or not a development plan is in conflict with the automatically protected cultural heritage within their county (Kml 1978:§9). The method of mechanical topsoil stripping reveals an extensive amount of archaeological remains preserved beneath topsoil. This method is heavily used in the archaeological surveys carried out by county municipalities in Norway. The method is based on the phenomenon that structures and evidence of previous cultural activity not yet destroyed by modern activity, such as by ploughing, can be found just beneath either topsoil in fields or turf in non-agricultural areas. In May 2008, cooking pits were found in Hole Municipality in Buskerud County. They were covered with geotextile, and stones and some of the topsoil to hold the textile in place. The topsoil was supposed to be replaced by mechanical backfilling after documentation had finished, but this was not done due to communication problems between the County Heritage Management Office and the stakeholder. In August the same year a visit to the site showed open, weed-infested trenches. Figure 1 illustrates the open trench and Figure 2 illustrates rapid growth of fireweed in the trench after only three months. Colonies of ants were found underneath the geotextile. This raised questions about the practice of reburial following mechanical topsoil stripping.

Figure 1: Cooking pits revealed during topsoil stripping covered with geotextile. Photo: Buskerud County Municipality. Date 14.05.2008.

Figure 2: The open trench containing the remains of the cooking pits after a hot summer. The geotextile is slightly visible amongst the fireweed. Photo: Evelyn Johnsen. Date 22.08.2008.

Information about procedures associated with topsoil stripping was gathered by entering into a dialogue with archaeologists in the county cultural heritage management offices in Norway. An email that included a questionnaire (in Norwegian) was sent to thirty-five individuals. Ten of the questionnaires were answered. Two of the respondents work as field archaeologists, four work as both desk and field archaeologists, and four respondents work as consultant archaeologists. A choice of responding to the questions either in writing or orally, was given in an attempt to elicit more replies. Five of the informants answered the questions by telephone (example in Appendix I); while five replied by filling out the questionnaire and returning it (example in Appendix II). The replies were double checked with each of the respondents.

There are nineteen counties in Norway and responses were received from eight, distributed over most of Norway (Fig. 3). These counties are Troms, Nordland, Hedmark, Sogn and Fjordane, Telemark, Vestfold, Østfold and Vest Agder.

Figure 3: Distribution of participating counties. Map after caplex.no. Graphics: Evelyn Johnsen.

For the eight counties, there was one respondent with the exception of Telemark and Sogn and Fjorane, where two respondents replied. The respondents answered according to their personal experience as well as their current county's routine. Archaeologists in Norway often depend on short-term employment spread between different county municipalities and museums. This means that; their experiences may reflect routines in other regions in Norway as well as in the heritage office in the county municipality were they worked at the time of the study. Therefore, the responses may reflect routines from more than the eight counties. Since a study of the practice in the county offices was considered to be a minor part of this thesis, priority was not given to visiting all the county offices in order to carry out and record interviews in person. However, personal interview may be a better and more controlled method for obtaining information if the primary focus of a thesis is the routines of processing and attitudes inside county municipalities. This was the case in the unpublished Master's thesis *Organisering av arkeologisk kulturminneforvaltning på fylkeskommunalt nivå. En* *kvalitativ studie av kulturminneforvaltningen i Nordland og Sør-Trøndelag fylkeskommune.* (Organization of Archaeological Cultural Heritage Management. A Qualitative Study of the Cultural Heritage Management in Nordland and Sør-Trøndelag County Municipalities) by Ruth Tove Trang (2008).

5.1. Responses from archaeologists in county municipalities

The responses from archaeologists to the questionnaire are summarised in the following subsections. The answers to a number of questions were similar amongst some of the archaeologists; so these answers can therefore be summarised. The answers that deviate from this are presented as well. The overall aim of the questionnaire was to gain insight into the practice of reburial following mechanical topsoil stripping. This insight will be used as a step towards evaluating the current status of reburial practice in Norway. The identities of the archaeologists are not revealed, but reference will be made to the different county municipalities. This means that no distinction has been made between the answers from archaeologists working in the office and archaeologists working in the field.

5.1.1. Trench size and procedures once archaeological remains are discovered

To gain insight into county municipalities' practice, four general questions were asked:

1. Do they use mechanical topsoil stripping as a method in the survey?
2. Which trench size do they use?
3. What is the procedure when archaeological structures are discovered?
4. Are archaeological structures sectioned?

All responding county municipalities use mechanical top soil stripping in their surveys. Their answers concerning the width ranged between two and four meters and the length varies depending on survey area. Three of the respondents who answered between three and four meters width also commented that the trench width is selected with the distance between the posts in three-shipped long houses in mind, to be sure not to miss post holes by trenching between two posts. One of the respondents from Telemark County stressed the importance of remembering that the county municipality's job is only to investigate whether there are any archaeological remains present; it is not to uncover all of them.

When asked about the procedure when archaeological remains are discovered, nine of the respondents answered documentation with drawings, photographs, measurement and mapping with GPS. One respondent answered that the structures are marked with nails and plastic find bags to be more visible and that they are numbered in the order in which they are found. Four respondents also mentioned charcoal sampling as a part of the documentation process. Regarding the question on procedure, the two respondents from Telemark County mentioned covering or reburial of the remains as part of the process. One said that the procedure depends on the weather, snow or rain. Maybe one must record the remains and then cover them right away. If the weather is nice and without precipitation, one can postpone the recording until the topsoil stripping is completed. The other said that after documentation, fibre cloth is laid on top of the structures and the topsoil is backfilled. The same mass removed during topsoil stripping is used. The question about sectioning of structures was asked because of the suspicion that structures that have been sectioned are not being covered because when sectioned, they have the status as excavated. All the respondents answered that discovered structures are being sectioned if there are any uncertainties about them being archaeological in origin. Three also mentioned simplified exemption, when the county gets responsibility for carrying out minor excavations, as a situation where structures are sectioned. The respondents from Østfold and Vest Agder added charcoal sampling as a reason for sectioning archaeological structures.

5.1.2. Covering of archaeological structures

To the question of if and how archaeological structures are being covered all the respondents reported some degree of covering. In Vestfold the structures are covered if there was no sectioning. Structures are covered with geotextile or plastic, depending on the material available, but geotextile is preferable. Last year (2008) Vestfold County started to put clay on top of the geotextile for further protection, and to alert the farmer when topsoil gets mixed with clay providing a warning of the plough going too deep. The respondent from Østfold answered that archaeological remains are usually covered. If there are many finds they try to cover them up, but not necessarily everything is being covered. One of the respondents from Telemark said that the trenches are open until the documentation has finished. *Cloth* is laid over the structure(s) in case of frost. After documentation the geotextile is retained and the trenches backfilled with the stripped topsoil. In some situations geotextile is not used because it is not available at the time, but respondents report that they often try to cover with geotextile. The second respondent from Telemark answered that remains are covered with fiber cloth followed by refilling of the trench. This respondent also mentioned an exception to the use of geotextile. If there are large areas with charcoal that are being interpreted as archaeological structures, then they do not use hundreds of square meters of geotextile to cover them up, but most of the structures are covered. The main reason for using fiber cloth is to make retrieval of the structure easier. Troms County Municipality answered that the finds are covered with fiber cloth. Nordland answered that the remains are covered occasionally using plastic or *cloth.* Vest Agder also answered that remains are covered occasionally with fiber cloth or road cloth. The two respondents from Sogn and Fjordane answered that the remains are covered with road cloth. Hedemark reported that if the trench is left open over a longer period of time or the weather is bad, the remains are covered with felt cloth which is then removed before backfilling.

5.1.3. Use of geotextiles

Questions number six to eleven referred to use of geotextiles or other materials. The questions asked were:

1. Is geotextile (felt cloth) used?
2. Why is geotextile used?
3. What type of geotextile is used?
4. How structures are covered if geotextile is not used?
5. If other materials are used for covering?

To the previous question about covering of archaeological remains, most of the respondents answered that they used some kind of fabric as cover. To the following questions they had the opportunity to expand on their use of geotextile. Everyone said that they used some kind of cloth. Terms like cloth (duk), fiber cloth (fiberduk), felt cloth (filtduk), geotextile, cloth usually for use underneath bark (barkduk) and road cloth (veiduk) were mentioned. One of the respondents from Telemark said that they do not have a lot of experience with using geotextile; it is in the recent years that this has become common. Troms answered that black fibre cloth has been used, but the respondent was not sure if this was a felt cloth. Nordland answered that geotextile is used when available from the contractor; the field archaeologist does not travel around with a supply of geotextile. Sogn and Fjordane answered that they are uncertain if road cloth is the same as felt cloth.

The answers to why geotextile is used were grouped in two reasons; favourable for the remains and that relocating the remains is easier when using geotextile. Nordland answered; *"Good question, I have always been trained to do so. I have the impression that it breathes better and will not seal the structure like plastic does. It feels like a healthier way to treat the cultural heritage"* (author's translation). Vestfold mentioned that geotextile allows moisture to permeate from both sides and experiences show that the growth of moss, lichen and fungi is reduced. Geotextile breathes better and there is a natural flow through the textile. Østfold said they use fibre cloth because it is not air- and watertight; the remains stay moist. It is also a protection for the structure. If it is uncovered on a later occasion the felt cloth prevents unnecessary cleaning of the structure. Troms is using fibre cloth to protect structures which are going to be excavated in the following field season. One of the respondents from Telemark said that the contamination of the structure from overlaying topsoil is reduced, and when geotextile is discovered the archaeologist is alerted to the previous excavated level and can stop the mechanical excavation before too much is removed.

Hedmark answered that geotextile is a better alternative than plastic which retains water. Preventing water pools is preferable when the textile is being removed. The breathing textile provides an environment similar to that prior to exposure. The cloth is slightly heavy and stays in place; this prevents contamination of the structures. Hedmark further points out that the main advantage with covering is that it prevents the remains from drying out. The two respondents from Telemark both answered that future retrieval of the remains was the main reason for covering with geotextile. Sometimes the digitalised mapping is inaccurate, and the sight of the geotextile makes recognition easier for the museum. Vest Agder and Østfold also mentioned retrieval when excavating as the reason for covering with geotextile. If topsoil is backfilled without geotextile as horizon marker, the relocation of the structure becomes difficult. If there is need for more documentation, a lot of extra work is necessary to retrieve the structure (Fig. 4). Sogn and Fjordane, who answered that they were not sure if road cloth is the same as felt cloth did not answer the question why geotextile (felt cloth) is used.

Figure 4: Frustrated field archaeologist can not recover structures after the topsoil has been backfilled. Photo: Telemark County Municipality.

All the counties did use local materials. Vestfold answered that sometimes geotextile is bought in small rolls at the gardening store and other times in larger rolls from the highway department. The geotextile from the gardening store is a little thinner than the one from the high way authorities. Østfold used to buy a specific type but the respondent did not remember the product name or number. They buy it from a construction firm. One of the respondents from Telemark answered that most often *bark cloth* is used because it is inexpensive and comes in different size, but that they use the one available. The other respondent from Telemark also answered that generally they use the one available, and at the shop where they usually buy it, there is only one type to be had. The respondent also mentioned that a difference in use of geotextiles had never been considered. Troms, Nordland, Vest Agder and Hedmark all answered that they use the type available at the nearest store. Hedmark also mentioned that they normally use the least expensive one. When asked about other materials used for covering, Nordland, Vestfold and Hedmark mentioned plastic. The rest mentioned soil. Nordland said that plastic could be used to protect the remains against overlying masses and help retrieve the structure. Telemark reported that plastic may be used temporarily as protection against weathering while recording, but not for preserving structures when backfilling trenches.

5.1.4. Backfilling and lack of backfilling

All the respondents answered that the trenches are backfilled with topsoil. Øsfold mentioned that earlier it was more frequent that this was not done. Telemark answered that the stripped topsoil is backfilled. Very seldom it happens that the farmer collects the soil and replaces it with sand. Vestfold and Telemark answered that they chose to backfill mostly because of the time it takes for the heritage management authorities to decide what to do with the site. Vestfold, Telemark, Nordland and Vest Agder said that the landowner probably has a desire to continue the productive use of the land since it is most often cultivated areas that have been examined. Østfold and Telemark also mentioned aesthetics as a reason; many surveys are implemented in urban areas and open trenches are an eyesore. The trenches are refilled because it also protects the remains. Telemark answered that there is bad drainage in open trenches and water accumulates, and this can damage the cultural heritage. Trenches are backfilled to provide mass above the structures to prevent erosion, and also to prevent animals or people, some with metal detectors, disturbing the remains. Troms mentioned that because the field season in northern Norway is so short, it is seldom that excavation is carried out the same season as the survey, and if trenches are not backfilled they will be damaged by rainfall, especially in sloping landscapes. Vest Agder also site accumulation of water, visiting people and animals, and damage by plant growth as reasons for backfilling. Furthermore, Hedmark and Sogn and Fjordane answered protection against weathering and human activity as reasons for backfilling trenches. All of the respondents agreed that the remains are covered with geotextile and the trenches backfilled irrespective of the need for short- or long-term preservation. They never know whether or not an excavation of the site will be carried out or how long the processing may take. The reburial is implemented in the same manner every time.

On the question of when the trenches are backfilled, all the respondents said the trenches are supposed to be backfilled when the documentation of the remains has finished. However, Vestfold mentioned that this is not always convenient and they sometimes stay open for a year. Østfold answered that in nine out of ten situations the trenches are backfilled before the project concludes - one or two weeks after at the latest. Telemark said they are backfilled after documentation has finished and when they are carrying out simplified exemption, they are being backfilled after that. Hedmark mentioned the need for other archaeologists from Riksantikvaren or one of the national archaeological museums to visit the site and assess the remains, on these occasions it can take one-to-two weeks before the trenches are backfilled. Telemark reported that before the survey, stakeholders sign an agreement that the trenches shall be backfilled after the survey has finished.

According to most of the respondents, the landowners are notified on the presence of archaeological remains. When asked if any restrictions are given to the landowner, Vestfold, Østfold, Vest Agder, Nordland, Sogn and Fjordane and Telemark answered that they are usually restricted to plow no deeper than before, and to use the land in the same manner as prior to the survey. Vestfold said that they may be restricted not to cultivate potatoes. They are told to report if they see any geotextile on the topsoil surface or caught up in the plowing machinery. Hedmark answered that if the remains are threatened because the topsoil is not deep enough for plowing, the alternative can be to add more soil.

The respondents were asked in which situations the trenches with uncovered archaeological remains are not backfilled with topsoil. Vestfold and Hedmark answered that this may happen when there is going to be an excavation shortly after the survey. Vestfold also added that it does happen that trenches stay open for a year in expectation of a later archaeological excavation, but they try to avoid this. Telemark answered that it may happen if Riksantikvaren or the museum wishes to see the remains before backfilling or if a simplified exemption is going to be carried out. Vest Agder and Sogn and Fjordane answered that this does not happen.

5.2. Discussion of the practice of reburial within the counties

All of the responding county municipalities use mechanical topsoil stripping in their surveys. However, responses were received from only eight out of nineteen counties. The reason for lack of replies from the remaining county municipalities is unknown.

Only two of the respondents mentioned covering or reburial as a part of the procedure when archaeological remains are discovered during topsoil stripping. However, later in the questionnaire, when asked if the remains are being covered, all of the respondents answered that they did use some kind of cloth. More often than not, materials are used as separation layers or horizon markers. These materials are usually geotextiles or plastic. However, the CHM authorities in Norway are trying to use permeable geotextiles as a fixed rule in the archaeological surveys, because it is commonly understood that geotextiles are a better alternative for reburial than plastic. The background for using geotextile in reburial schemes is often because of its qualities compared to plastic and other non-permeable materials. The respondents used terms such as; geotextile, cloth, fibre cloth, felt cloth, *bark cloth*, road cloth. All of these textiles are geotextiles. The questionnaire used the terms geotextile and felt cloth and some of the respondents expressed uncertainty about different types of geotextile and if the textile they use is a felt cloth or a geotextile. This may be the reason Sogn and Fjordane did not answer the question of why geotextile (felt cloth) is used.

All the replying counties backfill trenches after documentation of the remains have concluded. Backfilling topsoil in trenches on top of structures which have been uncovered by mechanical topsoil stripping is preferable in such a way that the overall impression of the area is the same as before the topsoil stripping of the site, and because the area should have the opportunity for continued use in the same manner as before. If reburial is implemented in rural areas where the land goes back to agricultural use, the reburial fill should be to the same height as the surrounding area. The farmers should be informed that they can use their land in the same way as before the exposure of the remains, to prevent, for example, the plough blades penetrating the underlying remains. The topsoil and fill materials protect the archaeological remains from surface weathering and biological processes. The topsoil therefore provides a protective layer for all structures lying directly beneath it (Jones 2007:22). Vestfold County introduced a new element to reburial of archaeological structures following mechanical topsoil stripping. In addition to covering the remains with geotextile, a layer of clay is put on top of the geotextile before backfilling with the removed topsoil. This is to further protect the remains. If a plough blade penetrates to the geotxtile, the clay will come up to the surface first alerting the farmer about the presence of underlying archaeological remains. This is dependent on the absence of clay in the topsoil in the field, and on the farmer actually noticing the clay when it is brought up to the surface. However, the plough could go deep into the ground immediately, penetrating the remains before the clay is discovered. When the plough blade penetrates the geotextile the damage is done, and the loss of integrity of the archaeological resource is irreversible.

The use of clay can be seen as a preventive conservation measure because it indirectly prevents the remains from being damaged from human activity, and not for protection from direct natural processes, although clay does have an encapsulating quality. Often remains discovered during mechanical topsoil stripping contain charcoal, an important feature for dating the structure. According to Mathewson's component model (Appendix III) charcoal is best preserved in dry conditions without micro- or macro-organisms, but it is also preserved in wet environments. In the example from the author's experience in a county municipality, cooking pits were covered with geotextile and some of the topsoil that was stripped off the remains was placed on top of the geotextile to hold it in place. This did not prevent colonies of ants laying eggs and making pores and passages in the remains after a short period of time. The geotextile is in this case a better alternative than other non-permeable materials. The accumulation of water would result in a freeze-thaw situation, which according to Mathewson's model accelerates decay for most of the site components except for metals, which remain unaffected. Geotextile in open trenches creates a favourable environment for ants to breed underneath the textile and when exposed to sunlight geotextiles made of polypropylene rapidly lose their tensile strenght. The remains are protected against plant growth in the trench if reburied with the same amount of soil mass that was stripped off. The trench in Figure 2 was overgrown with fireweed and the remains colonised by ants after only three months in the summer season. However, it was observed that the fireweed was not established in areas where the geotextile was installed to the same extent as elsewhere in the trench, i.e., the geotextile reduced plant growth.

5.3. Summary

The main impression the results from the questionnaire gave, was that geotextiles are frequently used because of the common understanding about permeable geotextiles being more favorable for archaeological remains than plastic sheeting. However, lack of knowledge about different types of geotextile and their qualities results in use of the geotextile available at the time of reburial and often the least expensive one. If the permeable quality is the most important characteristic of geotextiles, it is important that archaeologists are aware of the existence of geosynthetics with low permeability, such as the geomembrane Visqueen®. Archaeologists working for the cultural heritage management could benefit from guidelines about geotextiles suitable for the reburial of archaeological sites. The respondents reported that the remains are very often covered with geotextiles and reburied shortly after documentation to prevent the remains from being damaged by weathering or physically damaged by rain, invertebrates, animals, humans or plant growth. However, some of the respondents reported that this may take some time, up to a year after exposure of the remains. To prevent this damage, the trench should be backfilled shortly after documentation has concluded, and maintenance should be carried out during any prolonged period of exposure.

6. USE OF CASE STUDIES

In order to answer the third part of the problem statement, *What can be learned about decision making, design and implementation, monitoring, and the short- and long-term outcomes of reburial of archaeological sites by investigating case studies?,* analysis of instances of reburial has been selected to gain insight into the reburial process. Relevant questions are:

- How is the decision to rebury made?
- How is reburial designed and implemented?
- How is monitoring carried out?
- What do case studies tell about the outcome of reburial?

To answer these questions, the different phases of reburial in each case have to be defined and analysed. The phases include: decision making, design and implementation, monitoring, and outcome. The last phase does not exist in most long-term cases because of the short time of experience with reburial. However, where temporary reburial has been implemented, the outcome can be controlled and assessed when the timeframe has ended. Schramm 1971 quoted in Yin (1994:12) says that *"The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: Why they were taken, how they were implemented, and with what result"*. This definition is set forth by an observer in the work of Dr. Robert K. Yin (1994), and it promotes the decisions made in each case to be the major focus of the case studies. The decision making process will also be the main focus in this thesis: the decision to rebury; deciding reburial design and how to implement it; the decision to monitor or not; and what outcome these decisions led to.

Yin (1994:15) sets out five applications for case study, three of which are given here. First, to explain the causal links in real-life interventions which are too complex for survey or experimental strategies. Secondly, to describe an intervention and the real-life context in which it occurred. The third application is to explore those situations in which the intervention being evaluated had no clear, single set of outcomes. In order to learn about the different phases of reburial, contextual factors in the different cases are relevant, factors such as: stakeholders; guidelines; value of the archaeological remains; threats against the protection of remains; how the groundwater level on the site and in nearby deposits will be effected by any construction and alteration of the site; how the reburial is designed to mitigate the stress on the remains due to overlying construction; and, how the chemical and biological composition of the soil affect the remains. According to Yin (1994:13), the case study method can be used when the contextual conditions of the case studies are viewed as highly relevant to the phenomenon of study.

Case study research should not be confused with the qualitative approach. Case studies can be based on any composition of quantitative and qualitative data and there is no need for direct, detailed observations as a source of evidence in every case (Yin 1994:14). The method for approaching the questions put forth above requires thorough study of the different cases. As the topic of reburial is fairly new in archaeology and research reports on the specific topic of reburial are absent in Norwegian archaeology, the research method most suitable for obtaining a viable result has been to seek out specific cases of reburial of archaeological sites, and to define and analyse the different phases of the reburial process. The analysis in this thesis has been based on different forms of source material, both written and oral. The information gathering has been done by collecting information from archaeologists involved in the different reburial cases to obtain information from them. Field reports have also been used. People contacted include employees of the Norwegian Directorate of Cultural Heritage, Norwegian Institute for Cultural Heritage Research and the national archaeological museums in Norway, as well as presenters in the third conference of Preserving Archaeological Remains *In Situ* (PARIS3). When analysing this data one examines, categorises, tabulates, or otherwise recombines the evidence to address the initial propositions of the research (Yin1994:102). The greatest problem in the data collection phase has been finding relevant cases, and the uncertainty of not being able to identify all suitable cases.

6.1. Critique against the case study strategy

There are some concerns about using case study as a form of inquiry. Case studies can be seen to lack rigour and investigators may be sloppy and allow their conclusions to be influenced by equivocal evidence or biased views. The use of case studies in teaching, where materials may be deliberately altered to demonstrate a particular point more effectively, can be confused with case study research, where this alteration is strictly forbidden. Additional concerns about case studies are that they provide little basis for scientific generalisation (Yin 1994:9-10). Yin's (1994:10) answer to this is that *"case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes"*.

6.2. Presentation of case studies

Case studies have been chosen based upon different criteria. Projects which have investigated site formation processes, such as the Overton Down and Wareham experimental earthworks projects initiated in the 1960s in the UK (Jewell 1963; Evans and Limbrey 1974) will not be included in this study. It was also decided that case studies involving marine, estuarine or lacustrine environments would not be included. The marine environment and its components for preservation of archaeological remains is the subject for research in the Marstrand Project on the coast of western Sweden. Some selected cases have involved waterlogged land sites containing shipwrecks or terrestrial areas that have been lacustrine. Furthermore, the cases involve whole or parts of archaeological sites, and not single artefacts, isolated finds or casual finds without context. There are few cases of reburial of archaeological sites in Norway, so the cases have not been delimited due to geographical criteria.

Five Norwegian reburial cases have been analysed. The first of these involves a case from Skjærvika in Hammerfest (case 3) which refers to temporary reburial of traces of settlement exposed during topsoil stripping carried out by Tromsø University Museum. One case is from Bergen and involves temporary reburial of the ruins of the Katarina Hospital (case 4). Two cases from Trondheim are included; one involves long-term reburial of timber structures from a shipwreck (case 6) and the other is long-term reburial of medieval ruins (case 7). The last Norwegian case (case 8) involves reburial of rock art which received recommendations from the Norwegian Rock Art Project (1996-2006) by Riksantikvaren, where the objective was to preserve 300 of the most vulnerable rock art sites in Norway (Hygen 2006). However, this particular case involves stabilisation and long-term reburial due to road construction and not temporary winter covering of rock art. Three cases from the UK have also been analysed; two of which were temporary reburial projects. One of these includes Englands first managed and monitored reburial: The Elizabethan Rose Theatre in London (case 1). The other is a temporary reburial project of a wooden track way in Bramcote Grove, south-east London (case 2). The third English case involves long-term reburial of a Bronze Age boat in Derbyshire (case 5). These have been included because they are good examples of different reburial implementations and outcomes. The case studies for analysis are illustrated in Table 1.

Table 1: List of case studies included in the analysis.

Case	Remains	Dating	Duration
1. The Rose Theatre	Theatre, mud brick and timber	AD 1587	Temporary
2. Bramcote Grove	Track way of oak, alder, brushwood	Bronze Age	Temporary
3. Skjærvika	Traces of settlement, stone, charcoal	Stone Age - modern period	Temporary
4. The Katarina Hospital	Stone ruins	AD 1250	Temporary
5. The second Shardlow Boat	Log boat	BC 1600-1420	Long-term
6. Nedre Bakklandet 56	Shipwreck, pine	AD 1792±2	Long-term
7. Bristolkvartalet	Stone ruins	AD 1280-1295 – MT	Long-term
8. E6-Project	Rock art	Stone-Bronze Age	Long-term

7. ANALYSIS

The four phases of decision making, design and implementation, monitoring and outcome are presented in this chapter, and the selected case histories will be examined with these issues in mind. CHM literature regarding reburial and preservation of archaeological sites *in situ* identified in Chapter 4 will form the framework for the analysis. The format of the analysis is one of Yin's (1994:135) types of multiple case study report. This involves no narratives devoted to the single cases alone, but a cross-case analysis where each section is devoted to one of the phases and information from each case is sorted across these issues. Each of the mentioned phases is further divided into temporary and long-term strategy.

7.1. Decision making

When archaeological remains are threatened by natural processes or human activity a decision about the remains' future has to be made. Martha Demas (2004:141-142) states that the most important aspects of the decision-making phase are the assessments. In this phase one assesses why the site is important, who values it, and what benefits accrue from it. Furthermore, one considers: what the condition of the site or structure is, what the threats and causes of deterioration are; what legal, administrative and financial conditions are relevant; and what social, political and economic factors may affect the conservation and management of the site. These assessments are referred to in the following subsections. In each case selected for analysis, the archaeological remains have been threatened by either natural processes or human activity. Furthermore, they have been subject not only to partial excavation and preservation by record, but also preservation *in situ* where some remains have been left in place and reburied. Deciding between temporary and long-term reburial strategies is one assessment to make when reburial as an alternative is considered. The assessment of these two time-related strategies depends on the purpose of the reburial. If the purpose is to protect the remains from physical damage during construction work, then a temporary reburial strategy is sufficient. If the purpose is to protect the remains against natural decomposition mechanisms and to ensure the long-term survival of the archaeological resource for its intrinsic value in itself, rather than for display to the public, then reburial on a long-term basis is required.

7.1.1. Temporary reburial

Case 1. In Southwark, London; remains of the Elizabethan Rose Theatre from 1587 (Scheduled Monument No: 20851) were found during excavation in 1989 (Fig. 5). They are located beneath what today is the Rose Court building in Park Street. The remains were originally threatened by the construction of a new office building. The Secretary of State accepted that The Rose was of national importance (Wainwright 1989:434) but the English government could not give the site statutory protection because this would have cost the taxpayer millions of pounds in compensation to the stakeholder if the development was to be restricted (Wainwright 1989:434; Corfield 2004:307). Public and media interest in the site was substantial, and there were intense protests against the plan to fill in gravel over the remains so that construction could continue. Further construction at this time would have required piles to be driven through the remains and piling rigs would have caused damage to the site by compressing the remains (Biddle 1989:753).

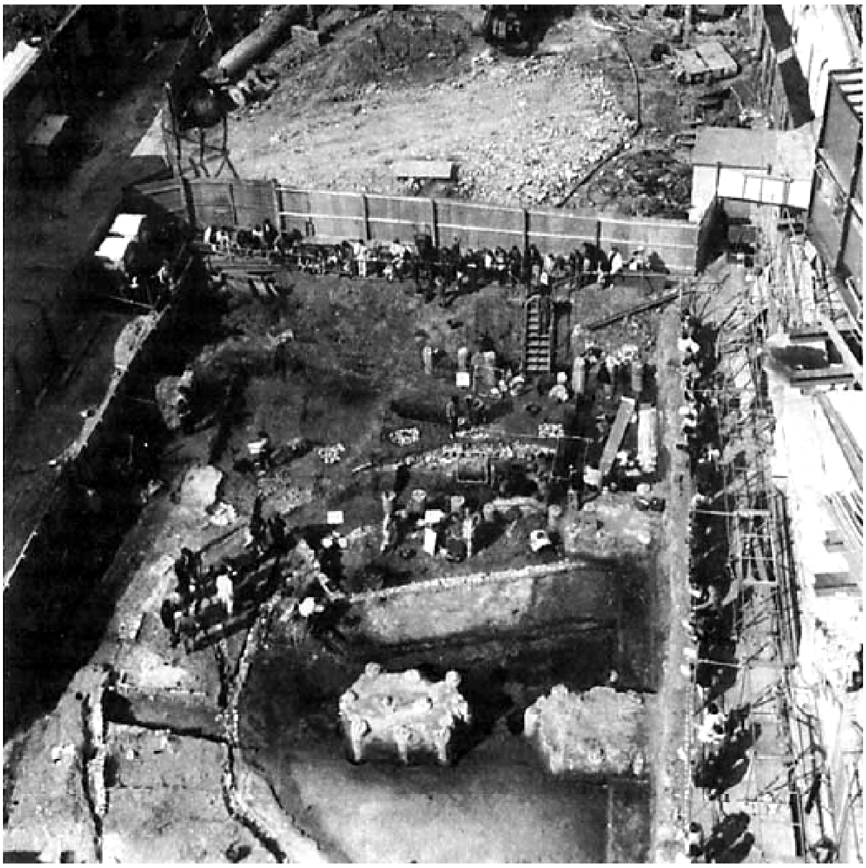


Figure 5: The site of The Rose in London during Excavation. Photo: Sean Smith (Biddle 1989:754).

The Rose Theatre is very important as an Elizabethan theatre because both detailed sketches of the theatre structure and the archaeological remains have survived. Together they make up what is known about the theatre (Orrell and Gurr 1989:421-423; Corfield 2004:305). Consequently, the government decided the site should be preserved *in situ* and instructed English Heritage to ensure the site's further protection. The stakeholder agreed to preserve the remains in the basement of the building, and they instructed the architect to redesign the basement – which had been designed to house a carpark - to give the remains better protection. The remains were intended to be preserved *in situ* for future public display, but the remains had to be protected during development of the building. Consequently, the decision was made to rebury the remains on a temporary basis. The idea of the design was that the remains should be protected during the construction of the building and that the integrity of the site should be preserved until future excavation of the site is carried out (Corfield 2004: 305-307).

Case 2. In Bramcote Grove in Southwark, south-east London, another temporary reburial project was carried out on a modern building development site in March 1992 (Goodburn-Brown and Hughes 1996:67, Nixon 1998:43). An evaluation trench uncovered a large oak log and several alder stakes originating from a Bronze Age track way. Brushwood, which extended beyond the section, was also present in the evaluation trench. Anoxic ground conditions had contributed to the preservation of these waterlogged timbers. The plan was for the site to be preserved *in situ* and the aim for the reburial was to prevent or slow the deterioration process by temporary reburial while a plan for *in situ* preservation was prepared (Nixon 1998:43).

Case 3. At Skjærvika in Hammerfest, Norway, archaeological settlement traces (Askeladden ID104112-1-46) were discovered in 2005 in association with the expansion of the Snow White LNG (Liguified Natural Gas) plant at Melkøya. Tromsø University Museum carried out an archaeological survey and test excavation on behalf of Finnmark County Municipality (Gil 2005:7). Trenches were opened and some surface areas were uncovered mechanically. The uncovered remains (house-sites, hearths, cultural layers, etc.) were documented and then reburied until possible later excavation. It was decided to rebury the exposed remains so they would be affected as little as possible by having been exposed to the elements (M. Ramstad pers.com. [6] 22.02.2008).

Case 4. In 1972-73 the remains of The Katarina Hospital (Askeladden ID95166) were found during development of the site Øvre Dreggsallmenning 2-4 in Bergen, Norway. The section of the ruins that was exposed was documented and then backfilled. Thirteen years later, in 1986, the site was excavated and the remains documented. The ruins were tentatively identified as the remains of the Katarina Hospital for women, founded by King Håkon Håkonsen in ca. 1250. After the excavation had finished, the ruins were reburied to protect the remains from accidental damage during the construction of the building (Hommedal 2003:17-22; Hommedal 2007:4). During fieldwork in 2002-2005 the ruins were re-excavated, conserved and a glass roof was constructed over parts of the ruins for *in situ* display. Furthermore, a part of the ruins' wall in the west was reburied during this fieldwork. This decision was made because this part of the ruins was exposed to rain. Later, a glass roof was constructed over the west part of the ruins as well (Hommedal 2007:7).

7.1.2. Permanent reburial

Case 5. In Derbyshire, UK, two Bronze Age log boats were discovered at the Hanson Aggregates Shardlow sand and gravel quarry. The first, found in 1998, was excavated and conserved. The second Shardlow Boat was found a few years later during a watching brief. Based on the archaeological surveys carried out in conjunction with the discovery of the first boat in 1998 and aerial photos that confirmed that the quarry area was rich in archaeological remains, the decision was taken to carry out a two-day-a-week watching brief of further removal of the aggregate from the paleochannels (Williams 2008:317). This second boat is 8 m long and consists of a 1-m beam. Partial excavation revealed that other than two small breaks, the boat was intact. A narrow trench was excavated across the centre of the boat to reveal the shape of the boat. Most of the boat was left *in situ* in the wet organic deposit. In addition to the exploration trench, only 5 cm of the boat's upper area, illustrated in Figure 6, was uncovered (ibid:318-319).

[6] Morten Ramstad. Researcher, Section for Cultural Science, Tromsø University Museum. Email Correspondence.

Figure 6: The 5-cm deep excavation of the second Shardlow Boat in Derbyshire. Photo: Birmingham Archaeology (Williams 2008:319).

Further excavation was considered to be detrimental to the long-term survival of the boat. The boat is located in the edge of the quarry; so, it was not difficult to change the proposed route for an access road. This gave more time to decide about the future of the boat. The boat could not be left exposed, and because of the change in the level of the water table as the work at the quarry progressed, the boat could not simply be left in-situ (Williams 2008:319). The decision was to preserve the boat *in situ* by reburial and monitoring. This was the idea from Hanson and their archaeological consultant, because excavation and conservation of the boat would cost more than preserving it *in situ* (ibid:325). The decision was made to construct a clay bund so that the boat would remain below the water table. This was to ensure the boat would stay waterlogged and not deteriorate, and not be affected by changes in the quarry due to continued extraction (ibid:320).

Case 6. The remains of a larger late 18th century cargo ship (Askeladden ID111313) were discovered during excavation of a building site at Nedre Bakklandet in Trondheim in 2007. Because there were buildings on the property, it was not possible to investigate if the proposed development plan was in conflict with the automatically protected cultural heritage in accordance with the kml from 1978, prior to the site development plan of June 2006. Accordingly, development of the site in the second half of 2007 was monitored by archaeologists from the Museum of Natural History and Archaeology in Trondheim, as a secondary solution evaluated by the museum refering to the kml §9. During development, a steel sheet pile wall was installed along the boundary of the site to prevent flooding by groundwater. While working on this wall in the northwest corner, archaeologists discovered wooden remains where the pile wall was to be installed (Fig. 7). The area where the wooden material was discovered was then excavated by archaeologists and it was established that these were the remains of a larger cargo ship (F. Skoglund pers.com. [7] 28.11.2007).

Figure 7: The exposed timber from the ship at Nedre Bakklandet in Trondheim. Shows the steel sheet pile wall. Photo: Fredrik Skoglund.

The project manager Fredrik Skoglund reported (pers.com. 28.11.2007) that following documentation the remains were reburied. The ship was found in the northwest corner of the site scheduled for development, but only a small section of the ship was affected by the construction. It is probable that additional remains still lie underneath the road to the north of

[7] Fredrik Skoglund. Researcher. The Museum of Natural History and Archaeology. Personal dialogue 28.11.07 and email correspondence 03.04.09.

the site, but this has not been verified. The ship has probably been used as a slipway and if so, much of the curved parts of the ship were already gone during this use, to form a levelled base (F. Skoglund pers.com. 03.04.2009).

From the exposed section it was possible to estimate the ship to be approximately 10-12 m. wide and possibly 40 m. in length, but due to its usage as a slipway the remains may be heavily reduced. The length was estimated according to the presumption that the width is proporsional to the boat's length by a factor of 1:4. Creosote was discovered on the site and on the uncovered wooden remains. Creosote is a type of tar that was used to impregnate telegraph poles, railway sleepers and other wooden poles for outdoor use. This tar contains benzene and phenols, and it may be speculated that these may have contributed to the preservation of the timbers (F. Skoglund pers.com. 28.11.2007).

The uncovered parts of the ship had been damaged by an earlier encroachment where piles for a building foundation had been driven into the subsoil. As a result, some of the ship's structure had been sawn off to accomodate the foundation. It is not known when this was done, but it influenced the subsequent decision taken by the Norwegian Directorate of Cultural Heritage (Riksantikvaren). The earlier encroachment that damaged the ship has also disturbed the original preservation conditions for this section of the ship. Because of the previous damage, Riksantikvaren granted permission to remove those parts of the ribs that obstructed the pile wall. These parts were photographed and five samples were taken for dendrochronological dating. These have been dated to 1797 ± 2 years (F. Skoglund pers.com. 28.11.2007). The Norwegian government owns all ship remains older than one hundred years according to the kml § 14 (kml 1978). The decision to rebury the visible parts of the ship was taken in accordance with the permission granted by Riksantikvaren to remove the affected parts of the ship, but leave the rest *in situ*. If the situation had been that the visible parts of the ship were intact, the developer would have had to decide between moving the wall further inside the construction site to avoid the ship, or applying for dispensation from the kml § 14, which would require an archaeological excavation of the remaining ship structure (F. Skoglund pers.com. 28.11.2007).

Case 7. In 2006-2007 the demolition of the building on the corner of Olav Trygvassongt 2 and Krambugt 3 and 5 (Bristolkvartalet) in Trondheim, resulted in the discovery of medieval ruins

(Askeladden ID96373). The ruins (Fig. 8) were radiocarbon dated to AD1280-1295 and ceramics dated to the 17th -19th centuries and early 20th century indicate re-use of the ruins (McLees 2008:16). These ruins represent the remains of a building and are protected according to the Norwegian Cultural Heritage Act from 1978 (Kml 1978:§4a). The stone floor is interpreted to be remains of a vaulted room at basement level (McLees 2008:5). Riksantikvaren wanted the ruins to be integrated into the new building – a hotel - and to be on display to the public, but the developer did not desire this solution for economic reasons. To ensure survival of the ruins and their integrity, during development and for the future under the building, the decision to rebury was made. The Norwegian Institute for Cultural Heritage Research (NIKU) undertook archaeological excavations of both a well found on the site and the cultural deposits above the ruins. The excavated depth of the well was limited due to the risk of the walls of the well collapsing. When the deposits over the ruins were fully excavated, the remains were reburied (ibid:19).

Figure 8: Wall and pillar foundation of the medieval ruin at Bristolkvartalet in Trondheim (McLees 2008:14).

Case 8. In connection with construction of the E6 highway in the county of Østfold, Norway, five rock art sites have been reburied to prevent damage to their carved rock surfaces. The road's vicinity to the rock art resulted in the decision to rebury the localities 17 (Askeladden ID100071), 27 (ID58539), 34 (ID100241), 41 (ID39652) and 55 (ID100564) (Bårdseth 2006). One additional rock art site was affected, but the decision was taken to remove this

(Vikshåland 2005). The localities are recorded in Askeladden, the Norwegian National Cultural Heritage Database, and the reburial materials are described. The aim of the reburial was to prevent damage during construction of the road (Bårdseth 2007:35) and to prevent damage to the carved rock surface by fluctuations in temperature, road-salt and other degradation processes that might cause the rock, and thereby the carvings, to rapidly deteriorate (Ernfridsson 2004). Eva Ernfridsson (2004) differentiates between chemical and physical deterioration. Chemical deterioration is characterised by dissolution or changes in mineral composition. Physical deterioration is when the stone actually crumbles or large parts of the stone are loosened by people walking on the rock, cleaning, roots and plants, or freeze-thaw cycling (ibid). These risks of damage and deterioration were the main reasons why the regional cultural heritage management proposed the idea of permanent reburial of the sites (Bårdseth 2007:35). The intention of the reburial structure was that it should be stable and prevent the flow of water and soil water over the site surface making the rock surface environment acidic. The sites are located in agricultural landscapes, so the aim was to integrate the construction as much as possible into the surroundings. In one case grass was planted over the clay because the area was going to be used for grazing horses (Bårdseth 2006).

7.1.3. How the decision to rebury is made

So why was the decision to rebury made in these cases? Jim Williams (pers.com.[8] 19.12.2007) says that reburial is not common in the UK but that planning guidance puts emphasis on the preservation *in situ* of nationally significant sites encountered during development, so reburial is not rare. Willems (2008:289) states that the decision to select sites for alternatively: protection, excavation, to be monitored during destruction (watching brief) or to be given up completely is completely political. The government decides this, but authorities depend on research to underpin this decision. Archaeologists should be consulted about the need for research and documentation prior to the reburial of a site (Demas 2004:148). The decision to rebury the Rose Theatre involved many different kinds of assessments. The site is important because the remains extend our knowledge of the theatre and together with the sketches of the theatre it makes up the body of information we have about it. The public valued the remains which showed the octagonal structure of *The O*, but

[8] Dr. Jim Williams. Archaeological Science Advisor for the East Midlands. English Heritage. Email correspondence.

the financial conditions meant that the government could not afford to stop the planned construction. The reburial was designed to protect the remains during construction until future display *in situ* could be implemented. In the Bramcote Grove case, the temporary reburial was also in order to protect the remains until proper preservation of the track way *in situ* was planned. In Norway, the Cultural Heritage Act sets premises for the protection of archaeological heritage, but in what manner this protection is going to be implemented is decided by Riksantikvaren. The cultural heritage management in Norway wishes to preserve as much archaeological remains as possible *in situ*, but often exemptions are made with the terms of an archaeological excavation and preservation by record. The remains' value is assessed and sometimes decision to implement temporary or long-term reburial of exposed sites is made for the further *in situ* protection of the remains. Demas (2004:142) sees temporary reburial as an important method to use in between excavations, outside the field season where the whole or parts of the site are going to be excavated, or while waiting on a better preservation alternative. At Skjærvika the archaeological features were reburied in order to stabilise the remains until a future excavation is carried out. The decision to rebury the Katarina Hospital was also due to planned later excavation, but in this case the reburial was going to protect the ruins during construction of a building in the interim until future *in situ* display was possible. Sometimes the stakeholder does not desire *in situ* display of the remains in the construction plan; this was the mains reason for the long term reburial of the ruins at Bristolkvartalet.

The main reason to rebury archaeological sites is protection and preservation from factors that can damage or alter the integrity of the archaeological remains. To accomplish this, Martha Demas (2004:142) states that only long-term, total reburial is the optimal conservation measure. The expectation that the destructive effects on the remains are reduced in the case of reburial and the loss of cultural remains is minimised is a motivating factor for reburial. This expectation follows from Mathewson`s model (Appendix III) on how changes in the physical, chemical or biological environment may affect heritage site components. The decision to rebury the rock art in the E6-Project was to reduce weathering of the rock surface and damage caused by the vicinity of the high way. In the case of the second Shardlow boat, the reasons for reburial and preservation *in situ* were the fact that further excavation would have been detrimental for the remains and the stakeholder preferred this solution compared with the cost for full excavation.

In some cases the decision to rebury is made due to personnel safety issues and not first- and-foremost for the *safety* of the archaeological remains. Fredrik Skoglund (pers.com. 03.04.2009) emphasizes the presence of creosote (a suspect carcinogen) as one of the main reasons the remains were reburied as quickly as possible. The stakeholder's guidelines for HMS (Health Environment and Safety) said that further investigation and documentation of the remains would cause a risk for inhalation and contact with the creosote.

According to Martha Demas (2004:137,144-145), reburial is often favoured for conservation, but many of those who have legal authority over a site are sceptical and are of the opinion that reburied sites represents land use constraint and many perceive it as an abdication of duty by cultural heritage authorities. Furthermore, others who want access to the site for study argue that reburial deprives the scholar of access to primary evidence, and are often sceptical and disfavour this solution. In addition to these two objections, Demas (2004:145) also stresses logistical objections to reburial, especially considering the necessity of reintroduction of soil mass, time and labour demands and re-excavation (in the case of temporary reburial), which means it is easier for the archaeologists and the government authority to leave the site exposed than to rebury it. Tilly (1998:7) argues that small sites can be a challenge for the *in situ* preservation of archaeological remains. These sites run on low budgets, and fewer resources are available in cases of unplanned-for costs. There is also more likelihood of accidental damage because, to construction workers, the remains are less evident or significant on smaller sites. If a site has been an object of access and tourism for a long time, any decision about reburial should be communicated and publicased in order for the public to have an opportunity to visit the site prior to reburial (Demas 2004:148). This is relevant especially regarding decisions to permanently rebury rock art, but it is an element that should be considered irrespective of archaeological site category.

7.2. Design and implementation

Archaeologist for Somerset County Council, Steven Membery (2008:311) argues that *"All preservation schemes require active and in many cases interventional management to create relatively stable environments."* To create such an environment, the physical, chemical, and biological conditions that will develop upon burial must be known (Mathewson and Gonzalez 1991:7). Mathewson and Gonzalez (1991:7) have listed the general decay effects, in descending order of their significance where the most severe are: wet-dry and freeze-thaw, wet aerobic, compression, macroorganisms, freeze, wet anaerobic, acidic conditions, microorganisms, movement, basic conditions, thaw, and the least severe: dry. Lecturer in Marine Archaeology at Bournemouth University, Paola Palma (2008:37) says that when the impact of environmental threats on shipwrecks is known, then an *in situ* protection/preservation strategy can be implemented. Although this statement was with reference to underwater finds, it is applicable to archaeological sites in general (E.E.Peacock pers.com. [9] 15.04.2009). In addition to the threats to the site, the decision about how to design a reburial intervention should be based on what kind of underground environment the site consists of and post-reburial use of the land (Demas 2004:150).

When the site goes back to building development after reburial, the reburial design has to involve assessments of different ways of mitigating pressure by the planned overlaying building (Williams and Corfield 2003:276). Mathewson and Gonzalez (1991:1) recommend that the design of a burial project must be carried out as a cooperative effort between the archaeologist and engineering geologist; the geologist must specify the burial to produce the desired environmental conditions to those components to be protected as identified by the archaeologist. An archaeological site can contain different archaeological materials which require different environments in order to survive. Mathewson and Gonzales (1991:11) say that if an environment that enhances the preservation of non-compatible site components cannot be created, a decision of which component to protect and which to not protect has to be made. To find an environment for non-compatible site components, the site components decay matrix (Appendix III) can be used. Furthermore, Mathewson and Gonzales (1991:11) reason that if this decision cannot be made for some reason, then site burial is not the best route to preservation.

7.2.1. Temporary reburial

Case 1. The Rose Theatre was designed to be a temporary reburial and the design (Fig. 9) had to be reversible when re-excavated (Wainwright 1989:434). During the excavation in 1989 the foundation, part of the 1587 construction, was recorded and removed for conservation (Biddle 1989:757). The remaining archaeological structures were covered with Terram® 1500, a

[9] Elizabeth E. Peacock. Professor, The Museum of Natural History and Archaeology. Personal dialogue.

nonwoven polypropylene/ polyethylene geotextile. The geotextile was applied directly on to the structures and divided into smaller pieces where necessary to fit all the upstanding (wooden) features of the theatre. Holes were filled with sand to make a levelled surface. The different pieces of geotextile were attached with a weak lime:sand mortar (1:6). The geotextile was then covered with iron and salt-free Buckland sand to a minimum height of 30 cm over the archaeological structures (Wainwright 1989:433; Corfield 2004:307-309).

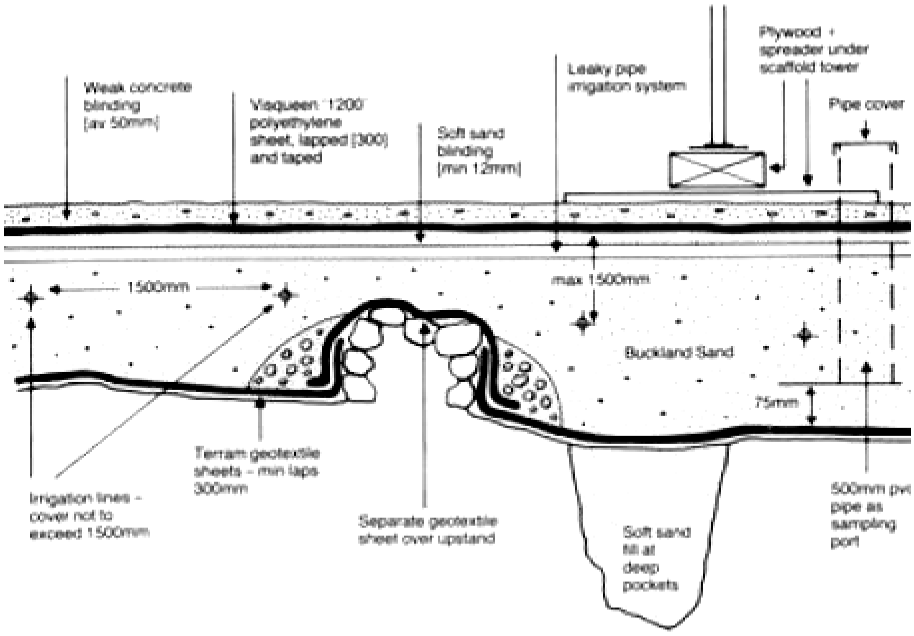


Figure 9: Sketch section of the measures taken to preserve the Rose Theatre (Ashurst, Balaam and Foley 1989:9).

The clay on the site started to dry out as a result of excavation and uncovering of the remains. This in turn made the ground shrink and form cracks. The principle of the design was that the site should be kept moist to prevent drying out and cracking of the clay ground. If the wooden structures dried out, they would shrink and break. (Corfield 2004:305-307). Frequently watering of the sand made it more compact and minimised the oxygen level. Pipes were laid in a system over the sand and then covered with an additional 12 mm of sand. These pipes provided moisture to the sand at all times. Visqueen® 1200 polyethylene cover was laid over the sand and further covered with 5 cm of weak concrete. In order to saturate the periphery of the remains, additional water was pumped over the concrete to form a pool of water in the center where the remains were situated lower than the surroundings (ibid:307-309). The use of peat was rejected because this would raise the acidity of the soil water and contribute to the deterioration of organic materials (Ashurst,Balaam and Foley 1989:9-10).

Case 2. In Bramcote Grove in Southwark, the wooden track way was covered with geotextile. Polythene sheeting was used and overlaid with damp peat in an attempt to avoid air pockets (Nixon 1998:43).

Case 3. The project manager at Skjærvika Morten Ramstad, reports (pers.com 22.02.2008) that the remains were covered (Fig. 10) with permeable geotextile (veiduk). Stones were placed on top of the textile for further stabilisation and then layers of turf were placed on top. Special structures and deep trenches were carefully packed to obtain as much physical support as possible. The aim was for the exposed remains be affected as little as possible by the fact that they had been exposed to the elements. The advantage with permeable geotextiles is that they allow water to pass through, and therefore prevent detrimental accumulations of water which can be damaging by freeze-thaw cycling in the winter. The remains are physically stabilised and the burial environment is similar to the original environment prior to excavation. The situation is of course not 100% similar to the original environment because the remains have been exposed to increased levels of oxygen, sunlight and microorganisms, thus changing the soil chemistry (ibid).

Figure 10: The remains at Skjærvika are covered with black road cloth (Gil 2005:17).

Case 4. After the excavation of the Katarina Hospital had finished in 1986, the ruins were covered with a compact layer of sand in conjunction with the construction of a building in Øvre Dreggsallmenning 2-4. It was important to protect the remains during the construction of the building (Hommedal, 2003:17-22; Hommedal, 2007:4). The temporary reburial design of the western part of the ruin (Fig. 11) implemented during fieldwork in 2002-2005 included geotextile (felt cloth) in addition to sand (Hommedal 2007:7). The reburial in 1986 is documented in Askeladden.

Figure 11: The western part of the Katarina Hospital in Bergen covered with geotextile and sand. The glass roof now protects the remains from rain. Hommedal is of the opinion that the ruins should be uncovered and displayed like the rest of the ruins (Hommedal 2007:11).

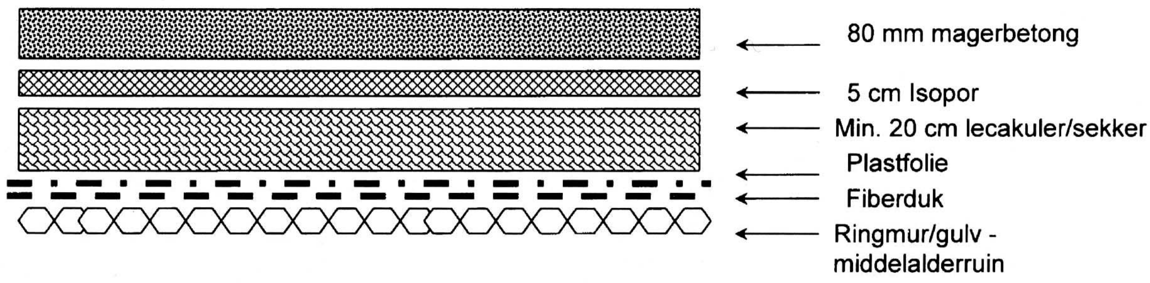
7.2.2. Permanent reburial

Case 5. In the case of the second Shardlow Boat, a senior engineering geologist for Hanson Aggregates designed a reburial solution that involved a clay bund cutting down in the underlying clay soils, forming a chamber for the boat to be unaffected by the changes in the quarry (Williams 2008:320). Furthermore, the boat was reburied by backfilling with the newly excavated mass from the nearby paleochannels. This would help re-create the original preserving surrounding soil environment that existed before the excavation (Ibid). Although the decision to rebury the find was taken in 2003, the actual work with backfilling did not begin until 2004. The positioning of the clay bund was delayed because the site was too wet. The water put the site at risk of collapse and damaging the boat. The work continued in 2005 when the site was considered to be dry enough. After a silt mound was built over the boat, a demarcation layer of netlon® (Fig. 12) was placed over the site to alert in the future of the presence of the boat (ibid:320.321).

Figur 12: The netlon® demarcation layer placed over the silt mound over the second Shardlow Boat. Photo: Birmingham Archaeology (Williams 2008:321).

Case 6. At Nedre Bakklandet 56, the ship's timbers affected by the pile wall, which were removed and sampled for dendrochronological dating proved to be well preserved and it was not difficult to get a date from the rings. The timbers were then documented and redeposited outside of the pile wall nearby their original location for reburial. Those remains not affected by the pile wall, were not removed because of the desire to preserve as much of the structure as possible *in situ* (F. Skoglund pers.com. 28.11.2007). These remains were covered with a geotextile that was available on the construction site. Which type of geotextile material would be most suitable was not considered; the one available on site was chosen by default. The returned parts, which were now situated on top of the *in situ* remains separated by geotextile, were then in turn covered with geotextile. The separation by means of geotextile will make it possible at a later date to identify which parts were removed and which parts are *in situ*. The geotextile also works simply as a marker for future excavators. After the covering with geotextiles, the area outside the pile wall was backfilled with soil that had been removed during excavation of the construction site (ibid).

Case 7. In the case of Bristolkvartalet, the reburial scheme (Fig. 13) used was recommended from The Rock Art Project initiated by Riksantikvaren. After the deposits overlying the ruins were excavated, the ruins were reburied. The ruins were first covered with geotextile, following by plastic sheeting to keep the ruins moist, a 20- cm thick layer of expanded clay pellets (LECA®) (not bags of pellets), a 5-cm layer of expanded polystyrene (EPS) foam, and finally an 8-cm thick layer of thin concrete was laid on the top (McLees 2008:19). It is most important that this reburial can distribute the weight of the building across the ruin. The stakeholder agreed to not make use of the basement in the new hotel, so the reburial strategy was designed partly in order to mitigate pressure on the underlying ruins. LECA® pellets were placed under the concrete to distribute the weight of the overlying building (ibid).



Figur 13: The reburial scheme used at Bristolkvartalet (McLees 2008:19).

Case 8. In association with the reburial of rock art in the E6-Highway Project in Østfold, the reburial design (Fig. 14) was drawn up by conservator Eva Ernfridsson, formerly of Studio Västsvensk Konservering (SVK) in Gothenburg. This reburial method has not been used before in Norway, and it was therefore important to benefit from experience with this method with similar projects in Sweden. Additional analysis of the soil and geology by the highway authority was considered in determining which material the project was going to use (Vikshåland 2005). The reburial has been carried out in consultation with the Rock Art Project which consists of archaeology, geology, and vegetation- and geotechnical studies professionals. The work on permanent reburial of rock art using clay is increasing, and Norwegian national guidelines are being developed (Ernfridsson 2004). The E6-Project was coordinated by the Norwegian Highway Authority, East Region. The reburial was assisted by mechanical excavators. Different soil material was considered as cover for the rock art site, moraine among others. Plastic clay from Borge, the municipality of Sarpsborg, was chosen because of its quality. This clay has a favourable pH, is easy to shape and can tolerate being on a slope up to 1:3 (Bardseth 2007:44-46).

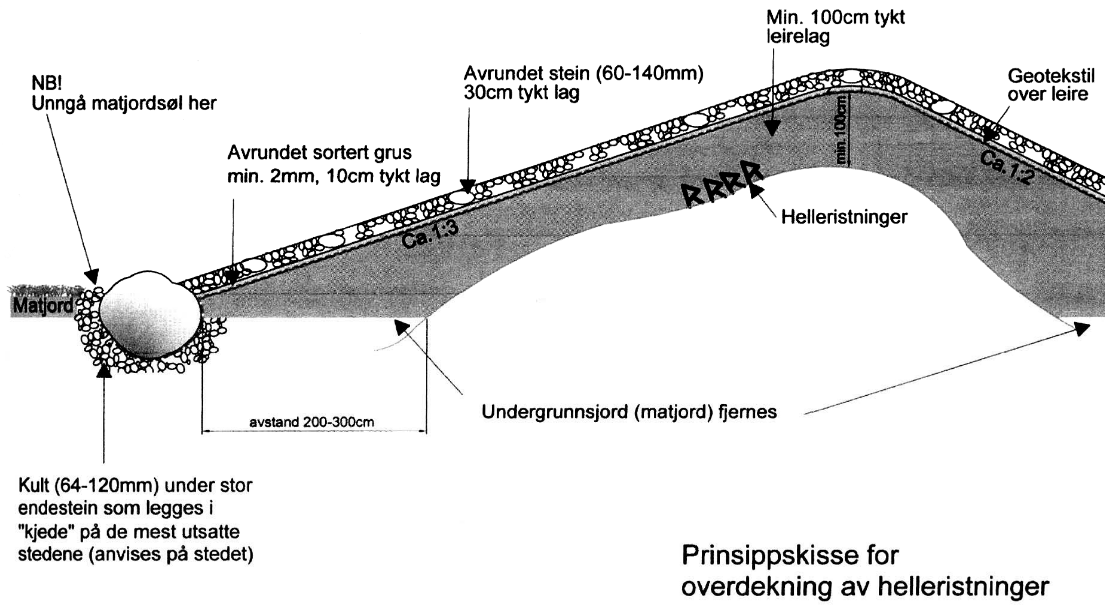


Figure 14: Principle plan illustrating the covering construction of the rock art in the E6-Project as it was planned in the planning phase. Illustration: Kristin Marie Berg (Bårdseth 2007:59).

Accessibility was another factor. It was easy to transport this clay to the site. Research on use of clay for the purpose of preservation, indicates that clay should not be stored between the time of extraction from the quarry and when it is deposited on the site, and that it should not be exposed to extensive vibration. In addition, it is important to complete the reburial process before a weekend which would otherwise expose a half-done construction to weathering (Bårdseth 2007:50-58). The planned method involved establishing a 1m thick layer of clay in direct contact with the rock surface, but only a 70cm thick layer was implemented due to the slope. Further, the clay is covered with permeable geotextile, topped with a layer of sand/ gravel and finally, stones. Larger stones are used to delineate the boundary of the covering and to maximise stabilisation (ibid:58-63). It was decided that the clay layer should be at least 60cm thick to reduce temperature fluctuations on the rock surface, especially in the winter. This was decided according to freezing extending to a depth of one meter deep (Ernfridsson 2004). The clay covering was placed by construction vehicles (Fig. 15) and was lightly compressed to exclude large pores and air pockets, so that plant roots would not become established (Bårdseth 2006).

Figure 15: The first load of plastic clay is distributed at Solberg nordre (site 27) in Østfold. Photo: Kristin Marie Berg (Bårdseth 2007:59).

7.2.3. How reburial is designed and implemented

More often than not some kinds of materials are used as separation layers or horizon markers. These materials are usually geotextiles or plastic. The duration of reburial may be an important element when materials are chosen because of their characteristics. When plastic sheeting is used as a layer identifier in reburial while awaiting excavation, it is for a temporary duration. The plastic sheeting, if not permeable, will accumulate water in the immediate vicinity of the archaeological remains. If the intended temporary reburial becomes long-term, the winter season will result in the accumulated water freezing and then thawing in the spring. According to Mathewson's model (Appendix III) this freeze-thaw cycling accelerates decay of all site components, except metals. Many geotextiles are permeable and if used, the freeze-thaw problem can be avoided (Thorne 1988:1).

It has been four years since the test excavation at Skjærvika. At the time of the reburial, the time frame for the reburial was not known. Consequently, time had no influence on the reburial strategy. The remains that consist of house sites, hearths, cultural layers, etc. were covered with geotextile and then stones were placed on top of the fabric before it was reburied with the turf that had been removed from the site during the stripping of the topsoil. Demas (2004:148) puts forward a warning about the tendency of temporary reburial becoming long-term. The reburial at Skjærvika was implemented irrespective of the need for short- or long-term preservation. This lack of a time frame is the same as when reburying archaeological structures discovered during mechanical topsoil stripping by the county municipalities. At the time of documentation and mapping, the archaeologist does not know whether or not there is going to be a later archaeological excavation of the discovered remains. The reburial strategy is therefore implemented in the same way, every time archaeological structures are found, irrespective of the need for short- or long term preservation.

For the purpose of later display of the remains, a method to effectively protect the remains is necessary, either while the rest of the site is excavated, while the overlaying building is constructed or while other measures are carried out in conjunction with preparation for the display. The use of a geotextile, with advantages such as being a marker layer or subsequent easier cleaning and preservation maintenance, is recommended by Hopkins and Shillam (2005:86). At the Katarina Hospital, compact sand was filled over the ruins in 1986. No geotextile was laid down between the ruins and the sand as a marker layer or to make cleaning easier; although, the second reburial of the western part of the ruins in 2002-2005 included geotextile over the site before sand was spread over. Senior Project Specialist with the GCI, Thomas Roby (2004:235) argues that some reburial interventions can have negative consequences because availability and costs of the materials in practice - and not their other characteristics - are the determining factors when implementing a reburial scheme. In the case of the reburial of the ship at Nedre Bakklandet in Trondheim, the geotextile available at the time was used without any assessment of its characteristics for reburial use. The presence of creosote forced the archaeologists to rebury the ship as soon as possible to ensure the safety of the employees on the site. There was no time to consider use of other materials.

The materials most commonly used in reburial of mosaics - soil, sand, gravel and specialized materials - are also used when reburying other archaeological structures and materials such as earthen materials, ruins, wood, charcoal and rock art. In addition to these materials, peat and clay are also used. Senior Lecturer in Archaeological Conservation at Durham University, Chris Caple (2004:162) states that physical damage to archaeological remains, such as damage by people, animals and plants, ice or the stress of temperature and hydration cycling, can be prevented by covering the remains with soil. The duration of the reburial and the climate will be decisive for deciding the depth of reburial, the type of horizon marker used or the need for a capping (Demas 2004:148). Tests carried out into depth of soil over buried archaeological remains in the US showed that the amount of breakage decreases with increasing dept of burial and artefacts that become ductile when wet, such as charcoal, tend to deform, or bend, without breaking (Mathewson, Gonzalez and Eblen 1991:96). In the case of reburial of ruins at Bristolkvartalet, the reburial was a long-term design to mitigate the loading of the building. The light expanded clay pellets were used to disperse the pressure from the overlying building, and geotextile and plastic sheeting to prevent the ruins from drying out and forming cracks in the subsoil. Demas (2004:148) argues that use of specialized fills may benefit earthen materials such as mud brick and adobe, wood or other organic materials. Consequently, these archaeological materials will be adversely affected by improper use of such fill material. Common practice in the UK is covering archaeological surfaces with geotextiles, e.g. Terram®. This is used because of its long life. The remains are then covered with washed sand, followed by soil from the site on top (Goodburn-Brown and Hughes 1996:65). This was the case at the Rose Theatre. Here the clay subsoil had dried out and cracks were visible. Use of Terram® minimised this problem. Head of Department of Anthropology at Texas A&M University, Donny L. Hamilton (1987:57) emphasizes the importance of eliminating the fluctuations as much as possible. With no regard to temporary or long-term reburial, the fluctuations in temperature and water content are the most detrimental effects of reburial. In the case of the second Shardlow boat, the archaeologists did not have the results of the analysis of the wood samples until the reburial had been implemented, but the need for minimising the changes in water level in the immediate vicinity of the boat led to the design of the clay bund.

An important element to consider when reburying archaeological sites *in situ* is the climatic differences between Norway and other countries. In Norway the climate is extreme, and this makes preservation *in situ* more complicated. The reburial of rock art in Østfold involved a layer of clay, geotextile and sand/gravel thick enough to minimise the freeze-thaw fluctuations on the rock surface. Christopher Mathewson (pers.com[10] 30.04.2009) says that this is one benefit of protection burial in the Norwegian environment; possibility to place the site materials below the frost line.

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7.3. Monitoring

When reburial is implemented, it is easy to think that the site no longer requires attention. However, monitoring and maintenance are highly important to obtain a successful reburial. The disadvantage with burying archaeological remains refers to the difficulty of predicting the compression of the archaeological remains, changes in groundwater conditions and soil chemistry and damage due to backfilling by construction vehicles (Hamilton 1987:58; Shilston and Fletcher 1998:8). Mathewson and Gonzales (1991:11) emphasize that when possible, reburied sites should be monitored to determine whether the desired environment changes have taken place. Where access to the water table is possible, a monitoring strategy frequently involves installation of piezometers. These devices are used to record pore pressure in the ground. The simplest form of piezometer is the standpipe or dipwell (Davis 1998:22). Piezometers respond quickly to changes in groundwater conditions, they cause little interference to the deposit, they can be left in place for long periods, they can be simply protected from vandalism, and they can be set up to read intermittently by hand, or continuously using a datalogger system. Where access to the water table is not possible, moisture can be measured with electrical moisture cells and the neutron probe (ibid:22-23).

This monitoring mentioned above is instrumental, in the ground. Another type of monitoring is the maintenance of the site's status and integrity by observations. Growth of vegetation that gets out of control and not dealt with is the principal cause of loss and destruction of reburied sites (Demas 2004:145-146).

7.3.1. Temporary reburial

Case 1. The Rose Theatre is England's first monitored reburial. Moisture content and water table level were measured by gypsum resistance cells and dipwells. Water samples were removed for analysis of pH, redox potential (which may indicate chemical or biological activity), dissolved oxygen, conductivity (which indicates dissolved salt content) and temperature. Until 2004 the monitoring was carried out once a month and complete water analyses twice since the implementation of the design. A reducing environment had to be established to prevent colonies of bacteria, fungi and insects from developing (Corfield 2004:307-309). The initial measures after implementation showed that the required reducing conditions were met. The reburial also had to protect against extreme temperatures: high temperatures lead to more biological and chemical activity; low temperature leads to the possibility of freezing. Frequent changes in temperature lead to cycles of contraction and expansion. The method had to protect against physical damage or contamination and monitoring of water level and water chemistry should be made possible (ibid). Measures showed that the water level rose quickly to a preferred level, the soil moisture content showed that the clay was fully saturated and the conductivity showed that there was very little input of soluble salts to the site (ibid:309-310). Peat and clay were not used because the peat would increase the acidity of the water and the clay would probably leave air pockets which would lead to oxidation. Furthermore, the clay would be difficult to remove from the archaeological remains when re-excavated (ibid:307). The reburial design was designed to last only for a few years, but in 2004 it had already been in place for 14 years, and with satisfactorily performance (ibid:305). The soil moisture cells have been replaced three times before they were replaced in 2000 by a time domain reflectometry system - probes that send electromagnetic pulses from the depth at which the moisture content is to be measured (ibid:310).

Case 2. The wooden track way in Bramcote Grove in Southwark was re-excavated 8 months after reburial, with no in-ground monitoring before this.

Case 3. In Skjærvika the re-established burial environment has no in-ground monitoring. This reburial is temporary and excavation is planned in the 2009 season, at which time the remains will have been reburied for four years and the condition of the remains can be assessed when excavation is carried out.

Case 4. During the 15 years that the ruins of the Katarina Hospital were buried, no in-ground monitoring was established. However, observations were made during the time of reburial. Vegetation had overgrown, and cigarettes and garbage that people had thrown away in the street littered the mounds of sand under which the ruins laid (Hommedal, 2003:18).

7.3.2. Permanent reburial

Case 5. Regarding the second Shardlow boat, project archaeologist Jim Williams recommended monitoring both water level and redox potential. Wood samples were taken from the section of the boat that was reasoned to have been above water during the active lifetime of the boat. The results of analysis of these samples came after the boat's reburial had already been carried out. Results showed that the wood cell structures contained some cellulose and a maximum water content (Umax) of 410%, which indicated that the upper part of the boat was heavily degraded. It is possible that other parts of the boat are better preserved but much depends upon the nature and history of the burial environment (Williams 2008:320-322). Equipment for monitoring was installed at three locations on the boat: at the stern, prow and middle of the boat. Vibrating wire piezometers were installed to monitor the water level, and three sets of three platinum-tipped electrodes were installed to monitor redox potential. Bags of pure gravel were placed on top of the boat to provide soil water reservoirs so that water samples could be taken out in plastic tubes for chemical analyses (ibid:321).

Case 6. At Nedre Bakklandet 56, there is no form of monitoring programme established in connection with the reburial of the ship remains (F. Skoglund pers.com. 28.11.2007), but Skoglund (pers.com. 03.04.09.) reports that the visible parts of the ship's timber were very well preserved when discovered.

Case 7. Representatives from the Directorate were present when the reburial of the ruins at Bristolkvartalet in Trondheim was undertaken to ensure quality control, but no monitoring after this was incorporated.

Case 8. The rock art sites reburied in the E6-Project are located in agricultural landscapes, so the aim was to integrate the construction as much as possible into the surroundings. In one case grass was planted over the clay because the area was going to be used for grazing horses. The intention of the reburial structure is that it should be stable and prevent the flow of water and soil water over the site surface making the rock surface environment acidic. This type of reburial is intended to require as little maintenance as possible in the future (Bårdseth 2006). According to Askeladden, the County Municipality of Østfold is responsible for carrying out maintenance every year at the sites. The reburial was implemented with the possibility for future inspection (Bårdseth 2007 foreword). Some parts of the mountain, without rock art, were covered in the same manner as the sites with rock art. This was done in order to have a reference area from which one can collect samples for measuring pH and the dryness of the clay (ibid:71).

7.3.3. How monitoring is carried out

In-ground monitoring of reburied archaeological sites has not been conducted in the Norwegian cases. However, the research on monitoring of archaeological deposits *in situ* has come a long way with results from Tønsberg, Trondheim and Bergen. Although no in-ground monitoring is installed at the rock art sites in Østfold, it is prepared an area with the possibility for collecting samples for pH measures without disturbing the rock art.

In the temporary reburial cases, the condition of the remains will be re-evaluated when re-excavated, but the long-term reburial projects will not have any insight into how the environments affect the remains during reburial until the remains are re-excavated sometime in the uncertain future, or buildings are demolished or a catastrophe occurs resulting in re-excavation of reburied sites. If monitoring equipment is to be installed, however, there are some factors to consider. Before excavation, one never knows what will be excavated, and there is no monitoring data on the original burial environment of excavated sites. Consequently, any attempt to re-establish the conditions that have preserved the remains prior to excavation is an estimation process (Caple 2004:162). But what if the remains are poorly preserved when excavated? Are the remains being totally excavated then to *rescue* what is left of the information or is the original environment to be established? The second Shardlow Boat was not well preserved when discovered. However, it was decided to rebury it, though this decision was made before the results of the analysis of the wood were known. The archaeologists however did know that the drying of the quarry would have detrimental effects on the future preservation of the boat. Complete loss of organic material rarely occurs in anoxic environments and decomposition is usually much slower. However, anoxic environments do not always guarantee that there will be no decomposition because some bacteria require an environment without oxygen (Hopkins 2004:169).

In the case of the ship at Nedre Bakklandet in Trondheim, the reburied environment is unknown since there is no monitoring, but the continuous saturation of the wood is favourable since drying accelerates decay when the wood has been wet. However, the ship can be subjected to wet-dry conditions due to the development of a building in the immediate vicinity, which according to Mathewson is the most severe site decay process. However, when exposed, the timber showed evidence of an earlier encroachment by a building and despite this the project manager reported that the exposed timber was very well preserved. Reburial has been implemented in many situations, but documentation and monitoring are missing. Documentation of the state of the remains before reburial can be compared with the outcome when re-excavated in temporary reburial cases.

In the case of the Rose Theatre the surrounding sand did not retain water next to the wooden foundation and there was no reservoir of minerals to maintain an anoxic environment, so active control measures were required to control water levels (Caple 2004:162). When using geotextile, one has to choose material according to the time frame of the reburial. Geotextiles have a certain lifespan and will eventually degrade. Regular inspection and maintenance are therefore needed to ensure high quality protection (Thorne 1988:1). Jim Williams (pers.com. 19.12.07) says that it is unusual for the site to be instrumented by in-ground monitoring and its long-term preservation to be considered in detail. Furthermore, he says that preservation often means putting a building over a site, and hoping the site will still be there in years to come. The reburied ruins under the building at Bristolkvartalet have no monitoring, but measures have been taken to mitigate the pressure from the weight of the building by incorporating clay pellets, expanded polystyrene (EPS) foam, and a layer of thin concrete into the reburial design. Williams (pers.com. 19.12.07) has been campaigning to get more people to think about issues such as monitoring and better assessment.

7.4. Outcome

The desirable outcome of reburial is always to preserve the archaeological remains for the future, either temporary or long-term. The search for the best preservation is the search for the specific environment that enhances preservation of different archaeological components. To achieve this, one needs to be familiar with how changes in the physical, chemical or biological environment affect the materials to be reburied.

7.4.1. Temporary reburial

Case 1. The temporary reburial designed for protecting the remains of the Rose Theatre has become long-term. Architect Jon Greenfield and scholar Andrew John Gurr reported (2004:332) in 2004 that since the excavation in 1989 the site has been kept in a reasonable state of preservation; covered in sand, concrete and water. Corfield (pers.com.[11] 27.04.09.) reports that, to date, the remains still lie beneath the original cover of geotextile, Buckland sand, a system of pipelines, polyethylene, concrete and water. Over the remains a system of red rope lights[12] are lined up showing the public how the original structures are interpreted and where the stage was located (Corfield 2004:310; Corfield pers.com. 27.04.2009). The

[11] Mike Corfield, email correspondence with Elizabeth Peacock.
[12] For pictures see the website of Rose Theatre Trust at http://www.rosetheatre.org.uk/about/gallery.php

installation of the new measurement probes in 1994, 1996 and 2000 made it possible to examine the surface of the remains by digging one meter squares down in the reburial material. This revealed cracks in the clay at the first opening, but at the second opening these had closed. In addition, a timber post was viewed in the same condition as when excavated in 1989 (Corfield 2004:310). Corfield (pers.com. 27.04.2009) reports that even though the reburial scheme was designed to last for a few years only, it has performed satisfactorily up to date. Furthermore, he extends on the plans for The Rose. The plan is to raise money to excavate the remaining 1/3 of the theatre left unexcavated in 1989. The cover over the previously excavated remains is to be replaced with a thinner, more permanent, cover. This new design will also include the suspected structural remains uncovered in the proposed excavation. The new cover will include a sheet of geotextile to separate the archaeology from the covering materials. Next, a layer of sand about 30 cm thick will be filled over the geotextile, and this will be overlaid by a geogrid to spread any load placed on the site, and finally, the site will be sealed by a sheet of polyethylene.

Case 2. In Bramcote Grove in Southwark, the re-opening of the buried site (Fig. 16) revealed a rapid deterioration of the Bronze Age trackway (Goodburn-Brown and Hughes 1996, Nixon 1998:43). Eight months after reburial the uncovering revealed decay processes on the surface of the timber. Fungal blooms and growths were visible on the surface, wood louse were also present. The temporary exposure of the timber prior to reburial had caused further decay during temporary reburial. The brushwood that had been near to the edge of the evaluation trench had degraded completely. The track way was excavated and the trench backfilled, leaving the nearby unexposed parts of the track way *in situ.* To protect these remains, the proposed housing development for the area was redesigned (Nixon 1998:43).

Figure 16: The polyethylene is being removed from the Bramcote Grove site (Goodburn-Brown and Hughes 1996:67).

Case 3. Excavation of the archaeological remains discovered in Skjærvika is scheduled for the 2009 season.

Case 4. The ruins after the Katarina Hospital (Fig. 17) were buried under a covering layer of sand with the top of the ruins slightly visible for fifteen years before the Norwegian Institute for Cultural Heritage Research (NIKU) formulated a management plan in 2001 to remove the sand and conserve the remains in accordance with The Norwegian Directorate for Cultural Heritage (Riksantikvaren). They were uncovered with help from Sørheim Riveservice A/S and conserved in cooperation with Byantikvaren in Bergen, Riksantikvaren, NIKU and Bergen Municipality City Planning Bureau during fieldwork in 2002-2005. After the uncovering, it was observed that some of the flat stones from the floor had been removed after the excavation in 1986, probably in association with the building construction (Hommedal 2003:20). Only minor conservation measures were needed, thus, the ruins have great authentic value. The ruins were incorporated into the building for public display through a glass window (Hommedal, 2003:17-22; Hommedal, 2007:8-11). Hommedal (2007:12) emphasizes that the sand and geotextile over the western part of the ruins should be removed for display of this part of the ruins as well.

Figure 17: Parts of the ruins of the Katarina Hospital on display (Hommedal 2007:1).

7.4.2. Permanent reburial

Case 5. Following three years of monitoring on the site of the second Shardlow boat, the data was analysed and an evaluation made as to whether the decisions taken have benefited the preservation of the Bronze Age boat. The preferred outcome of this reburial method is that the site remains waterlogged and with a preserving reducing environment. This reburial exercise for preservation *in situ* of the second Shardlow boat was estimated to cost between £50,000 – 70,000. It was a more economical alternative to complete excavation, analysis, conservation and display, which was estimated to cost approximately £150,000. Though this reburial project is a more cost-effective solution, the project implied some risk. If the reducing environment had not been established early on after the reburial, other measures would have been necessary to ensure the survival of the boat, including full excavation to save information. This would result in a far more expensive undertaking than if full excavation had been carried out to begin with. The long-term survival of the boat is also uncertain due to the heavily degraded state of its wood. Jim Williams says that if this case had occurred in a city centre or other urban environment, the decision of what to do with the boat may have been different because of concerns of time and space (Williams 2008:323-325).

Case 6. In the case of the buried timbers from an 18th century cargo ship at Nedre Bakklandet 56, the visible parts of the ship's timber were very well preserved when discovered. This is because the underground is moist; the water from the river seeps into the deposits and the site is affected by the tide. This gives the area relative good conditions for preservation of wooden structures, but the actual outcome of the reburial will not be able to be controlled before re-excavation of the site is carried out. The ship's remains are automatically protected according to kml §14, and Fredrik Skoglund (pers.com. 03.04.09) emphasises the importance that all further development in the area has to take this into consideration.

Case 7. At Bristolkvartalet, reburial of the medieval ruins is designed to be long-term and subsequently gives no insight into how the design and implementation have affected the ruins until the building is demolished or a catastrophe occurs that, in turn, leads to a new excavation. Because no monitoring is installed, there is no possibility to gain insight into the physical state of the ruins.

Case 8. Documentation and securing the rock art in the E6-Project in Østfold required knowledge from experts in science and technology. The final scheme for the permanent reburial, method and materials, was not clear at the beginning of the E6-project. This led to unknown expenses before the reburial was complete. The total cost was 24% higher than expected, partly because of unknown factors due to use of materials and quantity, and also because this was a pioneer project for such method and implementation (Bårdseth 2008:13-15). The maintenance once a year and the planned tests of pH and moisture of the clay will hopefully give some indicators on the sucsess of the reburial.

7.4.3. The outcome of temporary and long-term reburial

The intuitive measure of backfilling excavated soil into the excavated trench, whether or not there are any remains left, has been practised ever since the beginning of archaeology. Not often have backfilled sites, containing archaeological remains, been re-excavated and the result of the backfilling recorded and reported in detail (Caple 2004:162). The outcome of a temporary reburial can be seen when the reburial period is complete. However, the outcome of long-term and permanent reburial can not be known without excavating the site and investigating the buried remains. But if this is done, the current state is no longer a permanent or long-term reburial. The reburial of the Rose Theatre has become long-term and as Martha Demas warned about temporary reburial becoming long-term, the materials chosen for temporary reburial may require replacing after a period of time according to the lifespan of the materials used. As Thorne state, the geotextile has a limited lifespan and should be regularly inspected. Corfield reports that the cover over the Rose is going to be replaced with a much thinner, long-term cover.

Stone and mortar erosion is accelerated by the infiltration of water in combination with freeze-thaw cycling and salt crystallisation (Ford et al. 2004:179). Drying of deposits leads to cracks that can transport oxygen via air or rain water (Martens 2008). The stone ruins of Bristolkvartalet were reburied with geotextile and plastic to retain moisture to prevent the site from drying out, but the outcome of this can not be assessed due to the building raised on the site and no in-ground monitoring programme. The Katarina Hospital appeared well-preserved and had undergone only minor conservation measures, so this was kept to a minimum to maintain the authenticity of the ruins, including not replacing the missing flat stones with replicas (Hommedal 2003:20).

One of the conclusions of Mathewson, Gonzalez and Eblen's (1991:104) research was that burial of a site will reduce the impact of microorganisms and burrowing macro organisms. Hopkins (2004:169) states that the rate of decay of materials in soils is determined by the characteristics of the material itself, the presence of organisms capable of decomposing a particular material and the environmental conditions. Environmental conditions have the most influence on the decay of organic materials. Hopkins (2004:169) further proposes that this is the main reason parts of the Bronze Age timber structures in Bramcote Grove were lost rather than preserved. Colonization by a biological community and increased decomposer activity due to the changed environmental conditions caused the decomposition of parts of the wooden trackway.

Waterlogged deposits are found in urban cities that grew up at river crossings (Corfield 1998:303), such as London and Trondheim. Waterlogged deposits are an important repository of perishable archaeological and biological materials (Corfield 1998:302; Caple 2004:156). These favourable conditions require an anoxic and reducing environment, neutral pH and absence of aerobic bacteria. Such environments set the foundation for good timber preservation. Dewatering of such environments may irreparably damage these waterlogged deposits (Corfield 1998:302; Welch and Thomas 1998:16). It can lead to cultural layers drying out and cracking, allowing oxygen to enter, and stimulating biodegradation. In the case of the second Shardlow Boat and Nedre Bakklandet 56, the level of water has been taken into account. In the case of Nedre Bakklandet, only a part of the ship remains were exposed during development. Because of the presence of creosote, there was no time for a thorough investigation of the remains. The main focus of the reburial strategy was to cover the remains of the ship timbers with geotextiles that were available on the site in order to create a demarcation layer for later excavations. The ship was not waterlogged but saturated by the river when found: therefore, waterlogging was not a main priority when reburying. The river conditions have not changed, but the immediate vicinity of the new building may change the deposits' ability to retain water. Even though the remains were not waterlogged, the construction and the building close to the remains may contribute to the dewatering of the surroundings of the boat, or at least the portion of the remains that were exposed during excavation. Mathewson and Gonzales (1991:8) believe that if sites within the shoreline zone are exposed to cycles of wetting and drying, they should be excavated and documented rather than buried. In the case at Nedre Bakklandet, the tide contributes in keeping the site continuously saturated. There was only a part of a site that was exposed during the construction work and if the ship timbers were going to be excavated, the additional remains to the north of the construction site also had to be excavated.

The analysis of the wood in the Bronze Age boat in the case of the second Shardlow Boat indicated that the water content in the wood was over 400%. This means that the wood is seriously decayed. This leads to the question of whether the boat should have been excavated rather than reburied. Even though the analysis showed that the wood was seriously decayed, it has survived from the Bronze Age until now. In other conditions there would probably be nothing left of the boat. Williams points out that if the condition of the wood had been known before reburial, the decision to rebury might have been different. The quarry wanted preservation *in situ* due to a desire to fulfil the planning guidance on archaeology (Williams 2008:323). Willem Willems (2008:289) argues that in some cases, preservation should not be a goal in itself, but a means to an end. His view is that politicians want to save face and money. Even if the long-term preservation prospects for a site are not so good, the decision for preservation is taken in order to fulfil the planning guidance. He further states that small parts of sites are often excavated to reduce the cost and to limit the exposure, resulting in little research value and the rest of the site is left for excavation in an uncertain future (ibid:289).

7.5. What can be learned from case studies?

Few reburial cases in Norway are managed and documented. Often field reports include only a brief comment about the fact that the remains are covered up after surveys have concluded. However, one exception is the long-term reburial in the E6-Project. It is conducted detailed documentation of the reburial of Rock Art in Varia 68 *Dokumentasjon og sikring av helleristningar* (Bårdseth 2007). Here the decision making process and the reburial design are well-documented. The reburial of ruins at Bristolkvartalet in Trondheim was documented in a report from NIKU, although given little space. All of the cases in this analysis are recorded in The National Cultural Heritage Database, Askeladden, but only in two of the cases is the reburial mentioned in the database.

The decision-making process should include interdisciplinary cooperation in order to cover all relevant aspects of the reburial design and implementation, and when assessing the need for monitoring, whether visual inspection or in-ground. This can be done by drawing up a risk assessment which could include:

- What the threats to the remains are
- Probability of these threats occuring
- What can be done to reduce these threats
- Protective designs
- Implementing the design
- Measures to monitor
- Assessments of the outcome

Work regarding permanent reburial of rock art has gained more attention than other categories of archaeological heritage, but the need for drawing up guidelines must be emphasised. The case studies have shown that the decision to rebury depends much on the assessments made by the Norwegian Directorate of Cultural Heritage regarding a site's value. In addition, the stakeholder's desire to go through with the project and if *in situ* display is to be incorporated into the plan, decides the need for temporary or long-term reburial.

When the decision to rebury a site is made due to construction of an overlying building, there has to be designed a long-term reburial plan which assures the further preservation of the remains and mitigates the load of the planned overlaying building. However, if the remains are to be displayed *in situ* after the construction has finished, the main importance of reburial is to assure protection for the remains during the construction phase. In these cases, a temporary reburial design that prevents accidental physical damage caused by falling objects, construction machinery, etc. at the construction site is sufficient. However, there is a possibility for temporary reburial becoming long-term. Consequently, the materials chosen for temporary duration should be replaced with materials for long term reburial.

8. SUMMARY OF THE CURRENT STATUS OF REBURIAL OF ARCHAEOLOGICAL SITES IN NORWEGIAN ARCHAEOLOGY

Through international legislation, Norwegian Cultural Heritage Management has become increasingly engaged in the *in situ* preservation of archaeological deposits and sites. However, Norway still seems inexperienced in reburial as a method for preserving excavated archaeological sites *in situ*. To date, Norwegian Cultural Heritage Management has no common guidelines on reburial strategies involving archaeological sites. However, the research on reburial of rock art has come a long way. A vast number of the archaeological surveys carried out are executed by mechanical topsoil stripping. In order to find the archaeological remains hidden beneath the topsoil, the soil is stripped away mechanically with the result that any remains present are being partly excavated. There is a collective agreement amongst archaeologists in county municipalities that the remains are best preserved when the topsoil is backfilled promptly, but how important a separation layer is and what material this should be varies. Field archaeologists may benefit from guidelines regarding geotextiles for use in reburial. When mechanical topsoil stripping is used in archaeological surveys, this is often in agricultural landscapes. The threats of the plough penetrating the remains are considerable and thorough briefing of the landowner about the archaeology present is necessary to assure adequate further protection of the reburied remains.

Cases of reburial from the UK are managed and better documented than in Norway, but reburial is practised on more basic levels without extensive documentation on the intervention. In-ground monitoring of burial environment has not been incorporated in Norwegian reburial cases; however, visual inspection is often implemented. In some cases, the archaeologists have consulted specialists from other sciences in order to design suitable reburial schemes. An interdisciplinary approach is beneficial for implementing successful reburial. Archaeologists need to engage more with archaeological scientists and soil chemists and more involvement in the science and literature of the burial environment and conservation is desirable.

The future of reburial depends on the results and outcomes of different reburial intervention. Consequently, documentation on the physical state of the remains before reburial is needed for comparison with the outcome of reburial and to measure the deterioration before and after reburial. Documentation of the design of different reburial interventions is also needed in order to compare with the result of reburial and create guidelines for suitable technical designs for reburial of archaeological remains. It is recommended that standard tests for preservation are developed that archaeologists and other professionals who deal with the reburial question in archaeological field practice can implement for a site reburial. Managing Director of Museum of London Archaeology, Taryn Nixon (1998:43) states that more experimentation and experience with reburial in different circumstances is needed to derive sufficient knowledge of how well archaeological deposits will survive in reburied conditions. Very often reburial is not possible or preferable, but reburial as a method should be established as a viable alternative for those cases where this alternative is the best for the preservation of the cultural heritage and for sustainable development. In conclusion, a reference to a statement from Willems (2008:289): *"We simply lack the information to make a well-founded recommendation or decision."*

8.1. Thoughts about future approaches to reburial of archaeological sites

This thesis does not contribute a clear defined answer to the question of whether to rebury a site or not; but, it contributes to starting a discussion about reburial in Norway and sheds light on some of the many questions about reburial which need to be addressed and stressed in research on the preservation of archaeological sites. More research will be needed on the matter of reburial, and case studies of reburial are valuable in the process of evaluating the effects of reburial. Results of different reburial projects have to be viewed and analysed and further research concerning variables of the burial environment has to be carried out before we can tell anything about how to conduct successful reburial. Two relevant questions that are beyond the scope of this thesis are: 1) covering of profiles containing cultural remains - when surveys are conducted the profiles are exposed, with the effect this exposure causes due to change in soil oxygen and water; and 2) how the county municipalities' practice for reburial following archaeological surveys is in comparison to relocation and excavation by the museums. Research on reburial will be very valuable in the future, when these alternatives for temporary and long-term preservation of cultural heritage will be implemented to a much wider extent than today. However, the research on reburial needs to account for changes in the global climate. Techniques and terms of preservation may need modification due to climatic changes.

Abstract

Reburial as a method for preserving archaeological remains *in situ* is regarded as one of the most viable and flexible intervention strategies for preserving archaeological sites which have been exposed. Reburial has been defined as a preventive measure that protects the archaeology by re-establishing the pre-excavation environment which has preserved archaeological remains for centuries.

The aim of this thesis was to establish the current status of reburial of archaeological sites as a method in Norwegian archaeology. Relevant questions such as: *Which guidelines apply for the reburial of archaeological sites in Norway?; How is reburial implemented in county municipalities?; and What can be learned about decision making, implementation and design, monitoring, and the short- and long-term outcomes of reburial of archaeological sites by investigating case studies,* have been approached by studying Cultural Heritage Management literature, engaging in dialogues with archaeologists in county municipalities in Norway, and by analysing case studies where reburial has been implemented.

Through international legislation, Norwegian Cultural Heritage Management has become increasingly engaged in the *in situ* preservation of archaeological deposits and sites. However, Norwegian Cultural Heritage Management has no common guidelines on reburial strategies involving archaeological sites. A vast part of the archaeological remains are exposed during mechanical topsoil stripping. Geotextiles are frequently used in reburying these exposed remains. There is a collective agreement amongst archaeologists that the remains are best preserved when the topsoil is backfilled promptly. Field archaeologists may benefit from guidelines regarding geotextiles suitable for the reburial of archaeological sites. Few reburial cases in Norway are managed and documented. The decision-making process should include interdisciplinary cooperation in order to cover all relevant aspects of the reburial design, implementation and monitoring. This may be in form of a risk assessment. The future of reburial depends on results of different reburial projects. Consequently, documentation on the physical state of the remains before reburial is needed for comparison with the outcome, to measure and evaluate the deterioration. Documentation of the design of different reburial interventions is also needed in order to create guidelines for suitable technical designs for reburial of archaeological remains. It is recommended that standard tests for preservation are developed which archaeologists and other professionals, who deal with the reburial question in archaeological field practice can implement for a site reburial.

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Appendix I - Example of questionnaire replied orally (in Norwegian)

Spørsmål om behandling av funn av strukturer ved maskinell søkesjakting.

Hvilket fylke? Telemark Stilling? Saksbehandler. Saksbehandlere er også i felt for å ha kontakt med praksisen og også på grunn av budsjett for prosjektene, men er ikke like mye i felt som feltarkeologene.

1.Brukes maskinell søkesjakting som en metode for arkeologisk registrering i fylket der du jobber? Ja
Hvis nei, kan du gå direkte til spørsmål nr. 18.

2.Hvilken sjaktstørrelse opererer fylket med?
Ca 4 meter bred, lengden kommer an på planområdet. Sjaktene blir lagt parallelt med 10 meters mellomrom. Bredde på 4 meter for å ha større sjanse for å fange opp strukturer for eksempel stolpehull.

3.Hva er prosedyre ved funn av arkeologiske strukturer i sjaktene?
Først må man finne ut om det er arkeologiske strukturer. Dersom det er tvil blir usikre strukturer snittet. De fineste, mest sikre av de usikre strukturene blir snittet først, de som det er størst sjanse for at er arkeologiske strukturer. Dersom det blir bekreftet arkeologiske strukturer blir det lagd profiltegning, tatt kullprøve både i profil og plan. Strukturene blir nummerert og fotografert. Strukturene og sjaktene blir målt inn med DPOS. Fiberduk legges på og matjorda fylles tilbake. De samme massene som er tatt bort under sjakting blir fylt tilbake.

4.Blir påviste strukturer snittet under registrering?
Hvis det er usikre strukturer så blir de snittet. Starter med å snitte de fineste først fordi det er størst sjanse for at de er arkeologiske strukturer. Dersom man finner sikre strukturer blir det ikke snittet.

5.Blir funn av strukturer tildekt? Hvordan?
Med fiberduk og så fylles sjakten igjen. Bruk av geotekstil kommer an på. Hvis det er store kullflak som blir tolket som struktur så brukes ikke flere hundre kvadratmeter med fiberduk til å dekke strukturen. Det som er hovedmålet med bruk av fiberduk er at det skal bli lettere å finne igjen strukturen. Små strukturer blir som regel tildekt.

6.Blir det brukt geotekstil (filtduk)?
Ja, men har ikke så lang erfaring med bruk av geotekstil. Det er en ny praksis, først de senere årene at dette er blitt vanlig.

7.Hvis det brukes geotekstil, hvorfor?
Først og fremst for å lette gjenfinningen for museet, noen ganger blir innmålinger av strukturene unøyaktig. Filtduk brukes også for å dempe forurensningen og også for å unngå omroting på grunn av plog. Det er lettere å stoppe dersom geotekstil kommer til synet.

8.Hvis det brukes geotekstil, hvilken type brukes?
Den som er å få kjøpt, der vi kjøper den bruker de bare å ha en type. Den som er tilgjengelig. Har ikke tenkt over at det er noe forskjell.

9.Hvis geotekstil ikke benyttes, hvordan blir strukturer tildekt?

10.Brukes annet materiale til tildekking?
Nei

11.Blir sjakter med funn fylt igjen med matjord?
Ja

12.Hvis sjaktene blir fylt igjen, hvorfor?
For å unngå forvitring og forurensning, strukturene blir utydelige hvis de blir utsatt for regn og flom. Når det gjelder funn så er det for å ta vare på dem. Ellers estetisk, noen liker ikke at sjaktene står åpen, ikke fint å se på. Ønsker ikke å legge til rette for at nysgjerrige person skal kunne gå i sjaktene å forstyrre funnene.

13.Når blir sjaktene med funn eventuelt fylt igjen?
Umiddelbart etter dokumentering er helt ferdig. Sjakter med funn blir liggende åpen helt til all dokumentering er ferdig. Har ikke så veldig lange prosjekt. De funntomme sjaktene blir fylt igjen først. Bruk av geotekstil mens prosjektet pågår kommer an på været, er det fint vær så brukes ikke filtduk.

14.I tilfeller der sjakter med funn er fylt igjen og tilbakeført til dyrket mark, blir det gitt noen restriksjoner eller anbefalinger til grunneier? Hvilke?
Reguleringsbestemmelsene sier at sjaktene skal fylles igjen etterpå, tiltakshaver må underskrive på dette. Dersom området fortsatt brukes til dyrking kan det drives som før, det blir gitt beskjed om at det ikke må pløyes dypere enn det er gjort før. Dersom det skal gjøres endringer i bruken av området må grunneier informere om dette. Har fått inntrykk av at den jorda som legges tilbake ikke er like bra som den urørte jorda. Vi er ikke nå flink på å oppsøke grunneierne i ettertid og informere om dette, det står i bestemmelsene som sendes ut.

15.Fra registreringen er ferdig til en eventuell utgravning skjer kan det gå lang tid, hvilken innvirkning har dette på avgjørelsen om tildekkingen eller gjenfyllingen av sjaktene?
Det er akkurat derfor sjaktene fylles igjen. Det er bare å fylle igjen sjaktene uansett, det blir ikke utgravning uken etter likevel.

16.Noen registrerte felt blir aldri fullstendig utgravd, hvordan blir dette tatt med i avgjørelsen om sjaktene skal fylles igjen eller om strukturene skal tildekkes?
Nei. Filtduk blir lagt på for at det skal bli lettere å finne igjen strukturen. Umulig å vite hva som blir utgravd så det skal alltid fylles igjen.

17.Hvis sjakter med funn ikke blir fylt igjen, hvorfor?
Forenklet utgravning, dersom det er snakk om en enkelt kokegrop, så undersøkes den med en gang, men da er den ferdig undersøkt etter det. Alle sjakter med funn blir fylt igjen.

18.Kan du tenke deg noen problemer med at sjakter med funn ikke fylles igjen med matjord? Gjerne eksempel.
Naturskade, regn, frost. Det er ofte dårlig drenering nede i sjakta. Nysgjerrige personer kan gå på feltet og gjøre skade og til og med ta egne kullprøver. Materialet blir forringet. Det har

også noe å gjøre med imaget, folk kan miste respekten for oss hvis vi gir inntrykk av at det ikke er så viktig å ta vare på det.

19.Kan du tenke deg noen problemer med at sjakter med funn blir fylt igjen ved at matjord blir fylt direkte oppå strukturene?

Problemer å finne igjen strukturene. Tror også at det er et problem når det skal renses fram på nytt. Når det er sjaktet er allerede toppen tatt av og når det er renset fram er det gått ytterligere noen cm ned. Dersom jorda blir fylt direkte oppå blir det mer å rense fram neste gang og da forsvinner mer av strukturen, da fremskyndes prosessen med at strukturen forsvinner.

20.Kan du tenke deg noen problemer ved bruk av geotekstil (filtduk) ved tildekking av strukturer i sjakter?

Nei, det måtte jo ha vært hvis geotekstilet inneholder noen kjemiske egenskaper som foringer strukturen på noen måte. Dersom sjaktene er grunne og geotekstilen kommer i plogen blir strukturen omrotet, det er et problem. Vi har ikke fått noen tilbakemelding på problemer med bruk av geotekstil og har heller ikke tenkt noe særlig over det.

21.Hva er dine tidligere erfaringer med tildekking av strukturer eller gjenfylling av sjakter med funn?

Jeg har hatt erfaring med at sjakter har blitt liggende åpen og at dette ikke er bra. Det har da kommet muntlige beskjeder fra museet om at utgravning skal skje snart og derfor er det ikke nødvendig å fylle igjen. Det har da ikke blitt gjort utgravning umiddelbart etter registrering og sjakten har blitt stående åpen over en lengre periode. Formelt er det en regel at alle sjaktene skal fylles igjen. Den tidligere negative erfaringen med at sjaktene blir stående åpne er grunnen til at det nå blir gitt beskjed om at sjaktene skal fylles igjen. Området er ofte jordbruksland og skal derfor fortsettes å dyrkes på.

22.Har du noe å tilføye?

Det som bør være felles er gjenfylling, fordi det er det bestemmelser for.

Appendix II – Example of questionnaire replied in writing (in Norwegian)

Spørsmål om behandling av funn av strukturer ved maskinell søkesjakting.

Hvilket fylke? Hedmark Stilling? Feltarkeolog

1. Brukes maskinell søkesjakting som en metode for arkeologisk registrering i fylket der du jobber?
Hvis nei, kan du gå direkte til spørsmål nr. 18.
Ja

2. Hvilken sjaktstørrelse opererer fylket med?
3,5 – 4 meter, i spesielle tilfeller bredere/ smalere. Det vil alltid være en vurderingssak i forhold til hva man forventer å finne. Tiden en har til rådighet etc. Bredden som vanligvis benyttes skyldes at det ved smalere sjakter vil være risiko for at feks en treffer på mellom to stolpehull. Videre vanskeliggjør smale sjakter en helhetlig forståelse av eventuelle funn – og dermed vanskeligere å avgjøre hva funnet er / om det dreier seg om aut fredete strukturer.

3. Hva er prosedyre ved funn av arkeologiske strukturer i sjaktene?
Opprens, innmåling, foto, beskrivelse, (tegning i målestokk).

4. Blir påviste strukturer snittet under registrering?
Usikre strukturer / dokumentasjon ved forenklet saksbehandling

5. Blir funn av strukturer tildekt? Hvordan?
Hvis sjakta blir stående åpen over lenger tid / dårlig vær. Filtduk som fjernes før
Gjenfylling

6. Blir det brukt geotekstil (filtduk)?
Ja

7. Hvis det brukes geotekstil, hvorfor?
Alternativet plast samler vann. Tekstil slipper denne igjennom noe som er en fordel for å unngå vannansamling når duken fjernes. Videre gir den ”pustene” effekten til filtduk forhold som ligner mer det funnene har når de ikke er avdekket. Duken er
Videre relativt tung slik at den ligger godt på plass og dermed beskytter kulturminnene mot omroting. Fordelen med tildekking er generelt at det motvirker
Uttørking.

8. Hvis det brukes geotekstil, hvilken type brukes?
Ikke noen spesifikk, fortrinnsvis den som er rimeligst.

9. Hvis geotekstil ikke benyttes, hvordan blir strukturer tildekt?
Plast / plastpose / jakke / regnjakke hvis det er nødvendig å tildekke (noe som er en avveiingssak) så benyttes det som er
Tilgjengelig (man er jo gjerne langt unna allfarveg). Men primært brukes filtduk.

10. Brukes annet materiale til tildekking?

Plast / plastpose / jakke / regnjakke hvis det er nødvendig å tildekke (noe som er en avveiingssak) så benyttes det som er
Tilgjengelig (man er jo gjerne langt unna allfarveg). Men primært brukes filtduk.

11. Blir sjakter med funn fylt igjen med matjord?
Ja, raskest mulig.

12. Hvis sjaktene blir fylt igjen, hvorfor?
Erfaringsmessig medfører den eksponeringa avdekkingen medfører mye slitasje på kulturminnene – regn / sol / føtter med mer.

13. Når blir sjaktene med funn eventuelt fylt igjen?
Raskest mulig etter dokumentasjon. Av og til kan det være viktig at andre arkeologer / riksantikvaren / landsdelsmuseet kommer ut for å se på kulturminnet i slike
Tilfeller kan det gå lenger tid (1-2 uker)

14. I tilfeller der sjakter med funn er fylt igjen og tilbakeført til dyrket mark, blir det gitt Noen restriksjoner eller anbefalinger til grunneier? Hvilke?
Er avhengig av type funn. Om funnene ligger utsatt til pga feks tynt pløyelag kan det være aktuelt å fylle på ekstra masser.
Restriksjoner kan være kun harving (noe som uansett i landbruket mange steder helt har erstattet pløying uavhengig av arkeologien). Siden det er vanskelig å kontrollere restriksjoner mht. Pløyedybde er det lite aktuelt, i tilfelle en oppfordring til grunneier (men dette er jo komplett umulig å etterprøve). Alternativet kan eventuelt være å ta ut området slik at det ikke blir dyrket lenger. Men siden det tidligere nær alltid vil ha vært pløyd på stedet vil kun harving redusere
Dybden vesentlig – og dermed være tilstrekkelig.

15. Fra registreringen er ferdig til en eventuell utgravning skjer kan det gå lang tid, Hvilken innvirkning har dette på avgjørelsen om tildekkingen eller gjenfyllingen av Sjaktene?
Det er svært sjelden at utgraving kan følge umiddelbart. I de aller fleste tilfellene kan ikke utgraving skje før etter en påfølgende vinter. Det vil dermed bli fylt igjen. I de få tilfellene hvor utgraving følger i løpet av 1-2 måneder kan det være aktuelt å dekke til med duk.

16. Noen registrerte felt blir aldri fullstendig utgravd, hvordan blir dette tatt med i Avgjørelsen om sjaktene skal fylles igjen eller om strukturene skal tildekkes?
Erfaringsmessig medfører filtduk under pløyelag en risiko for at filtduken henger seg fast i plogen og blir dratt opp – noe som kan gi vesentlige skader på kulturminnet. Duk under pløying brukes derfor ikke. Mao. Funn som ikke skal graves ut fylles alltid igjen med matjord.

17. Hvis sjakter med funn ikke blir fylt igjen, hvorfor?
Umiddelbar utgraving.

18. Kan du tenke deg noen problemer med at sjakter med funn ikke fylles igjen med Matjord? Gjerne eksempel.
Erfaringsmessig medfører den eksponeringa avdekkingen medfører mye slitasje på kulturminnene – regn / sol / føtter med mer.

19. Kan du tenke deg noen problemer med at sjakter med funn blir fylt igjen ved at Matjord blir fylt direkte oppå strukturene?

Vanskeligere å finne igjen, enn om de dekkes med duk. En registreringssjakting er uansett en mild form for kontrollert ødeleggelse – de bevares best om en ikke sjakter / funn dokumenteres best om det graves umiddelbart. Men totalt sett er likevel registreringssjakting å foretrekke da alternativet er at funn ikke blir påvist.

20. Kan du tenke deg noen problemer ved bruk av geotekstil (filtduk) ved tildekking av Strukturer i sjakter?

Det vil alltid være en viss risiko for at valget man tar medfører større skader en fordeler. Vanskelig å gi noen spesifikke eksempler.

21. Hva er dine tidligere erfaringer med tildekking av strukturer eller gjenfylling av sjakter Med funn?

Tildekker aldri funn i sjakter i forbindelse med gjenfylling. Tildekker når det er sol som medfører rask opptørking – og dermed vanskeliggjør dokumentasjonen fordi strukturene blir vanskelige å se. Videre tildekkes funn om det kommer regn i påvente av bedre dokumentasjonsforhold. Midlertidig tildekking fungerer bra – i forhold til alternativet opptørking / vannoppsamling er midlertidig tildekking bra selv om det gjerne medfører behov for ytterligere opprensing pga at funnet til en viss grad blir hardpakket av å ligge under duk – dog langt mindre enn om det ikke dekkes til.

22. Har du noe å tilføye?

Generelt i forhold til restriksjoner ved pløying / tildekking før gjenfylling strukturene vil i de fleste tilfeller bevares best ved at stedet brukes på samme måte som frem til nå – selv om restriksjoner kan være aktuelt i enkelte tilfeller. Filtduk er et fremmedelement og dermed tilføring av en faktor som kan endre

Bevaringsforholdene i negativ regning ikke bare fordi duken blir dratt opp i forbindelse med pløying, men også på grunn av endret fuktighet med mer.

Appendix III - Mathewson's model.

SITE COMPONENTS

PROCESSES	Animal Bones	Shell	Plants	Charcoal	Crystaline Lithics	Granular Lithics	Ceramics	Archeo. Features	Soil Attributes	Metals	Context	Isotope Content	Topo-graphy
Acid Environment	A	A	E	N	N	A	N	N	A	A	N	A	N
Basic Environment	E	E	A	N	N	E	N	N	A	A	N	N	N
Dry (Cont.)	E	E	E	E	N	E	N	N	N	E	N	E	N
Wet Anaerobic (Cont.	E	E	E	A	A	A	A	A	A	A	N	A	A
Compression	A	A	A	A	N	N	A	A	A	N	A	N	A
Movement	N	N	N	A	N	N	N	A	A	N	A	N	A
Wet-Dry	A	A	A	A	A	A	A	A	A	A	N	A	A
Micro-organisms	A	N	A	A	N	N	N	N	N	A	A	A	N
Macro-organisms	A	A	A	A	N	A	N	A	A	N	A	N	N
Wet Aerobic	A	A	A	A	N	A	A	A	A	A	N	A	N
Freeze-Thaw	A	A	A	A	A	A	A	A	A	N	A	A	A
Freeze	A	A	A	A	N	A	A	N	E	N	A	E	N
Thaw	N	N	N	N	N	A	N	N	A	N	A	A	N

E=Enhances Preservation **A=Accelerates Decay** **N=Neutral or No Effect**

This model relates a change in the physical, chemical or biological environment of a site buried for preservation to the impact of that change on a specific site component or spatial relationship (After Mathewson 1987:225).