1 INTRODUCTION

1.1 The Archaeological Leather Group (ALG), whose members consist of leather specialists, scientists and conservators, aims to promote the study of leather and leather artefacts from archaeological contexts. At a meeting of the ALG held in December 1988 the need for a policy statement on the requirements for waterlogged archaeological leather and its study was raised. Consequently, through the co-operation of an independent leather specialist and conservators from the Ancient Monuments Laboratory, English Heritage, a draft set of guidelines were drawn up and circulated for comment; the comments received were subsequently incorporated. The implementation of the principles of the Management of Archaeological Projects (MAP2, 1991) has prompted the revised guidelines presented here which have been compiled with the assistance of the ALG which was revived in 1994.

1.2 These guidelines are aimed principally at excavators and finds processing staff who may require advice as to the best way of dealing with waterlogged archaeological leather when it occurs on site, and conservators and finds staff entrusted with its care after excavation before it is deposited in a museum. More detailed advice on the care and investigation of waterlogged archaeological leather can be obtained from the contacts given in 11 below.

1.3 It is expected that these guidelines may be revised in due course in the light of further work and any comments will be welcomed by the authors who can be contacted at the address given in 11 below.

2 PROJECT PLANNING (MAP2 Phase I)

2.1 A conservator will be a member of the core team of every project and on hand to give valuable advice at all stages of a project (MAP2, 4.6). Where the likelihood of leather recovery can be predicted it is good practice for the excavator to make initial contact with a leather specialist so that procedures for its immediate post-extraction treatment can be agreed with the conservator and excavation team at the outset. As decisions on retention of material may have to be taken early in the project contact with a museum professional from the designated museum should also be made at an early stage (MAP2, 4.10).
3.1 Site visits by the conservator and specialist can be arranged to advise on immediate post-excavation washing and storage. Providing the leather has been washed, see below 4.1, 4.2, the specialist will be able to spot date the material on subsequent site visits. The dating and comment on the nature of the waterlogged deposits which this provides while the excavation is in progress gives valuable additional information which may influence or revise policy decisions as fieldwork proceeds (MAP2.4.9).

3.2 In addition to leather artefacts it is useful for the specialist to be notified of any features thought to be connected with leather technology which may have been recognized on site. Tanning pits, dumps of horn cores, skulls, lower leg and foot bones, deposits of animal hair may be evidence of leather preparation. Such features are not usually found in close proximity to areas of domestic occupation because of the unpleasant smell associated with the processing of hides and skins. Dumps of offcuts may be evidence of leather working.

3.3 Material should not be discarded on site without reference to the relevant specialist. It is important for specialists to see all the leather recovered from a site as the presence or absence of certain categories of leather is significant to the interpretation of the assemblage. Seemingly undiagnostic fragments may provide valuable evidence, those which do not can provide samples for experimental work at a later stage.

3.4 Following excavation the leather should be bagged by context only. Individual components from the same composite object should be kept together and isolated from apparently unassociated items from the same context. It should be indicated on the bag whether the leather has been grouped according to close association or general context and details of the context (e.g. well, pit etc) should be provided. It is preferable not to allocate finds numbers at this stage but where circumstances dictate that the leather should be individually numbered it must be remembered that the increased work this will generate in the laboratory during treatment will be reflected in the overall conservation costs.

3.5 While awaiting treatment waterlogged leather should be stored in two sealed polythene bags in air tight polythene containers. As much air as possible must be removed from the bags by gentle pressure before sealing. The leather should be kept in cool, dark conditions. Storing the containers in or lining them with light-excluding, black plastic refuse sacks will help prevent fungal growth as will keeping the leather in cold storage wherever possible. A domestic style refrigerator is suitable for this purpose, clearly labelled for the storage of wet organic finds only. The deep freezing of leather to enable long term wet storage is no longer recommended as freezing has been found to have a detrimental effect on the cell structure of leather.
3.6 The addition of fungicide to the storage water is not generally advisable and dark cold storage is preferable, see 3.5. Fungicide interferes with C14 dating results and may accumulate on the leather in concentrated deposits after freeze-drying. It must be remembered that the growth of fungus may affect the analysis of dyes and tannins. Any decision on the use of fungicide must be made in conjunction with the conservator and specialist who will be dealing with the material and the appropriate safety measures taken (COSHII, 1989). If fungicide has been added precautions will have to be taken when handling the leather by both conservators and specialists as skin irritation may result. The material used and in what concentration must be clearly indicated on the packages; vinyl gloves should be worn while handling such leather and it may be necessary to prepare a COSHH assessment for this task which may require additional precautions (COSHII, 1989).

4. AFTER EXCAVATION

4.1 Thorough cleaning of the leather is essential as examination and conservation cannot proceed until the soil has been completely removed. Washing is often carried out by finds processing staff rather than conservators. The advantages of having the leather cleaned by professional conservation staff after excavation is completed must be weighed against the desirability of having information on dating and contamination/residuality of the waterlogged deposits available during the fieldwork stage when the leather is washed by on-site finds staff. The conservator and specialist will be able to advise on the suitability of the leather for washing on site. With complex Roman and post-Medieval shoe constructions comprising multi-layered bottom units, it may be more appropriate for only the surface soil to be removed initially, leaving the soil between the individual layers present; this will serve to keep the components together until they can be deconstructed in the laboratory where the relationship of the individual components can be fully recorded.

4.2 The leather should be washed by hand in a gentle stream of running water. Thin disposable gloves should be worn, the soil being removed using small sponges and soft brushes where appropriate. Whoever performs this task must be informed of the necessity for careful and thorough examination during washing to preserve any colouration (dyes, pigmentation), decoration, preserved thread, moss stuffing, grass/hay, textile or fur linings, cork soles or wooden pegs in soles. The removal of hard soil deposits may be facilitated by a period of soaking but a conservator should be consulted should the deposits prove intractable.

4.3 After washing the leather should be stored as 3.5 above. It is advisable to place the leather in clean polythene bags rather than reusing the original packaging which may harbour fungal spores. Cold storage is strongly recommended.

4.4 Any x-radiography should be carried out prior to assessment. This will mainly involve Roman nailed shoe bottoms as this technique produces a clear record of any nailing patterns. It may also be informative to x-radiograph other leather artefacts with
metal fittings.

5 ASSESSMENT (MAP2 Phase 3)

5.1 As soon as possible after excavation the washed leather should be scanned when wet by the conservator and specialist, in consultation with the appropriate contextual information for the site, and assessed for its immediate and long term conservation requirements and potential for analysis (MAP2 6.2, 6.11).

5.2 The assessment will make recommendations on the selection of the material for treatment. Leather with potential for residue analysis (looking for tannins, oils waxes, pigments etc) should not be freeze dried but kept damp but it must be remembered that any leather cannot be stored wet long term. In preference to dispersal leather can be air dried to permit long term storage without incurring more costly conservation treatments, see 7.3.5 below. The present state of knowledge of leather artefacts is such that the only categories of leather which should be considered for air-drying currently is scrap leather (i.e. fragments with all edges torn and which possess no diagnostic features) and waste from the manufacturing process.

5.3 Where appropriate in the assessment the specialist in conjunction with the conservator will make recommendations as to the necessity for measuring and/or drawing waterlogged leather prior to treatment. Should it be thought necessary to have a record of significant artefacts before treatment the wet leather can be traced onto mylar sheeting using a fine permanent marker pen; some conservation laboratories are able to undertake this as a matter of course. It is not necessary to either measure or draw the entire leather assemblage prior to conservation treatment, see 7.2 below.

6 THE NEED FOR CONSERVATION

6.1 Unconserved leather is potentially hazardous to health through fungal and bacterial infection, both of which can also cause damage to the leather itself. It is preferable to study leather which has been conserved and is dry rather than wet. Apart from the disadvantages of wet leather as stated, it is fragile and easily damaged with handling. The study and illustration of wet leather is messy and time consuming involving the unsealing of the bags and blotting to remove the excess water which can cause some physical damage. The shiny surface of wet leather can mask fine details such as stitching, surface decoration and grain pattern. The leather then has to be rewetted and the bags resealed. In addition, wet leather is inconvenient and heavy both to store and to transport.

6.2 In the interests of health and to minimise the damage to the material it is recommended that leather is conserved as soon as practicable following excavation. Whenever feasible the untreated leather should be conserved during the cooler months. Efficient project planning will ensure that the length of time that leather is held in wet storage prior to treatment is kept to a minimum. The period of wet storage should not
exceed two years duration.

7 CONSERVATION TREATMENTS

7.1 The batch processing of leather (i.e. leather grouped together according to context rather than items which have been given individual small find numbers) has been found to be the most cost efficient method of conservation. If the material has been individually numbered this will extend the treatment time as individual pieces have to be kept separate throughout the treatment.

7.2 Previously much time has been spent measuring leather before and after treatment to monitor the amount of shrinkage undergone during conservation. Recent work (Ibbs, 1997) has suggested that unless the leather is measured to a very high degree of accuracy this has been of limited value. Research on leather shrinkage is best conducted through individual specific projects, see 10 below and the routine measurement of all leather undergoing treatment is no longer recommended.

7.3 A number of leather conservation treatments are available ranging from PEG 400 or glycerol and freeze drying, PEG 600 without freeze drying, solvent drying and wax treatment. In addition, the controlled air drying of leather can be used to allow material to be stored long term which might otherwise have to be discarded.

7.3.1 Freeze drying

With the benefit of over a decade’s experience the use of freeze drying to conserve waterlogged leather has been found to produce satisfactory results. Freeze-dried leather is dry, light and flexible with a good colour, showing surface detail extremely well. It is sufficiently durable and supple to allow repeated handling necessary during study and illustration. Its light weight makes it easy to transport and store. Recently some doubts have been expressed as to the long term effects of freeze-drying on leather as some examples have been seen to be excessively dry and friable; currently research is being undertaken on the topic, see 10 below.

7.3.2 Solvent drying

The use of solvents in large quantities is hazardous as they are highly inflammable and suitable safety precautions will have to be taken (COSHH, 1989). The solvents remove dyes and in the presence of dilute acid removes tannins. The white spirit which is also used in the treatment may leave fumes which linger so that good ventilation is essential when studying such material. Leather treated by solvents hardens within a fairly short time so that frequent dressing of the leather is necessary and time consuming process which darkens the surface and can obscure detail. See 7.3.5.
7.3.3 Wax treatments:

The prolonged heating of leather necessary in wax treatment is known to cause structural
damage by irreversible shrinkage of the collagen fibres. The high molecular weight PEG
used also tends to darken the surface of the leather, obscures detail and also attracts dust.

7.3.4 Air-drying

Wet leather can be allowed by dry out under controlled conditions in order that it may be
safely stored. Leather is difficult to study and draw in this state, however, as it is rigid
and extremely easily damaged and so should be re-wetted before examination. It has been
found that on re-wetting the leather is slightly less flexible than when excavated and that
the dimensions are slightly reduced. The leather should be slowly air-dried under pressure
to ensure wherever possible that originally flat objects remain flat. Air drying is not
irreversible; techniques are currently being developed to allow air dried leather to be
rewetted, treated with glycerol to increase flexibility and subsequently freeze dried, see
10 future research below.

7.3.5 Leather dressing

In most cases leather dressings should not be applied after freeze drying as they can
obscure some fine detail but this could be carried out after specialist examination. The
correct application of dressing is a very time consuming process, small amounts being
applied at one time to ensure that it is taken up by the leather and does not just remain on
the surface.

8 POST-TREATMENT CARE

8.1 Packaging

After treatment care should be taken in the packaging of the leather. Groups of offcuts
and flat pieces of leather can be stored in pierced polythene bags. Support to the latter
can be given using polyethylene foam covered with acid free tissue paper or acid free
card padded with acid free tissue paper. More three dimensional items should be stored in
suitable sized acid free boxes supported by, but not wrapped with acid free tissue paper.

8.2. Storage

Leather is susceptible to changes in Relative Humidity and temperature and ideally should
be stored at 45-50% Relative Humidity with a temperature of 18° C. Acid free cardboard
boxes and tissue paper used in the packaging will help buffer changes in conditions but
ideally the leather should be removed to a suitable store as soon as possible.
8.3 Handling

Leather will have to be handled during the analysis phase by specialists and illustrators (MAP2 Phase 4) but this should be kept to a minimum. The use of cotton gloves will protect the leather from contamination from handling but care must also be taken to avoid physical damage.

8.4 Display

The specialist should have the opportunity to examine the material before any reconstructions are made for display. Details of construction, seams etc may be obscured when an item has been reassembled. The conditions of the display should also be suitable for the leather.

9 DISPERsal

Unlike other categories of material insufficient leather has been recovered from archaeological excavation on a national scale for the question of the advisability of total retention of all leather assemblages to be a serious problem at present. Given the spacial and financial constraints under which the recipient museums labour, however, the indiscriminate collection and retention of any material is now insupportable (see SMA Guidelines). Ultimately, the criteria by which leather objects are selected for retention or dispersal lies with the archaeological curator of the recipient museum, in consultation with a specialist where necessary, however, decisions made during the assessment process as to the suitability for conservation will influence decisions made later, see above 2.1. The questions this raises must be the subject for discussion in the near future. At present, leather not considered appropriate for conservation may be air-dried to allow for safe storage (see 5.2, 7.3.4 above) until a policy for retention and dispersal can be agreed.

10 FUTURE RESEARCH

10.1 Academic research topics

In order to further research into archaeological leather it is essential that those currently working in the field draw up a list of the most fruitful lines of academic enquiry. In this way it will be easier to gauge which assemblages are of local, regional, national or international significance and better target the resources available for their analysis. The ALG are currently engaged in compiling a list of research objectives for the guidance of those undertaking assessments and analysis of archaeological leather.
10.2 Conservation research

In order to eliminate costly duplication of research in conservation laboratories it will be
necessary to instigate specific research programmes. The ALG are also in the process of
compiling a list of conservation research topics. Projects at present underway include the
freeze drying of air dried leather and a pre-treatment condition assessment to determine
glycerol concentration to be used.

11 FURTHER ADVICE

Specialist advice can be obtained from the contacts named below.

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12 REFERENCES

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SMA 1992 Selection, Retention and Dispersal of Archaeological Collections, Society of
Museum Archaeologists Guidelines
ICCOM 1994 Guidelines for Costume.
COSH2, 1989 The Control of Substances Hazardous to Health Regulations