THEME 4 - HERITAGE - MANAGEMENT
AGGREGATES EXTRACTION & MANAGEMENT OF THE HISTORIC ENVIRONMENT

Research funded through Defra’s Aggregates Levy Sustainability Fund
Sustainable Aggregates:
Aggregate resources produced from sand and gravel deposits, crushed rock or dredged from the sea contribute to the economic and social well being of the UK. Their production and supply has environmental effects.

The Aggregate Levy Sustainability Fund (ALSF) has provided funding to undertake work to minimise and mitigate these effects. This report is part of a portfolio of work that reviews ALSF and other work undertaken between 2002-2007 on ‘promoting environmentally-friendly extraction and transport’ of land-won and marine aggregates to provide a state of knowledge account and to highlight the gaps in our understanding and practices.

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EXECUTIVE SUMMARY

This report reviews the impact that ALSF projects aimed at developing new guidance, standards and best practice have had on the aggregates industry, archaeological curators and practitioners. The report provides a critique and summary of the suite of guidance to industry undertaken through the ALSF, placing such guidance in the context of wider research into the historic environment.

This report is derived from consultation with stakeholders, a dataset of available resources, and a literature review surveyed over September – November 2007. A ‘route map’ of ALSF products and related resources supports the report.

The report is part of the ALSF Dissemination Project 2002-07, one of three such benchmarks reports produced for the dissemination project as part of the overarching Heritage theme.

The key findings of this report are:

**Impact**
The impact of the ALSF has been extremely positive across all sectors. Industry and the planning sector have benefited from the acquisition of new datasets (especially in the marine zone), allowing for better pre-planning and risk-avoidance, allied to the provision of enhanced management guidance. Archaeology has benefited from new investment, supporting proactive management based research into archaeological sites as well as the development of analytical techniques. All sectors have benefited from the experience of collaborative projects that promote best practice in data acquisition, analysis and management.

The suite of the ALSF projects is recognised as being fundamental in providing a sounder knowledge base for the management of heritage resources; the ALSF is seen to be in the interests of industry, the development of this understanding increasing the confidence of all stakeholders.

The ALSF is recognised as being a major ‘driver’ of fundamental research into many aspects of archaeology, developing a robust evidence base for management with additional public relations benefit to be gained from industry supporting such work through public-facing, media friendly collaborative enterprises, data-sharing and the sponsorship of post-graduate students.

As a direct consequence of the ALSF, UK Plc is better able to proactively manage its strategic aggregates resource in England as well as reactively deal with unforeseeable archaeological discoveries.

**Recognition**
The recognition of the ALSF role by all sectors has been extremely good; it is rare for the role of ALSF not to be recognised in at least some format. Nonetheless, the general consensus is that the ALSF needs a still higher profile – there is a willingness to further acknowledge the ALSF contribution where possible.

The absence hitherto of an instantly recognisable ALSF ‘heritage’ logo has been a major barrier to greater recognition of the scheme, making it difficult to identify specific ALSF funded support whether...
on site entrance and display boards, or ‘hard’ media and websites; the absence of a single, dedicated web-presence for all products of ALSF projects was similarly felt to be a barrier to higher recognition.

On the world stage the ALSF is held up as a model of innovative heritage management providing proactive, collaborative research of benefit to all stakeholders. ALSF heritage investment represents an extremely cost-effective form of strategic investment, in marked comparison to the reactive threat-led management and funding commonly in use outside the UK, where under-investment in ALSF-style strategic planning remains the norm.

**Communication and dissemination**

Communication and engagement between the public and private sectors in the marine zone has been extremely thorough, and can be considered one of the great successes of the ALSF; this is sometimes in contrast to the terrestrial ALSF, where some improvement in approaches is still required, although great advances have been made in the terrestrial zone in this respect.

Communication is most effective at the local level, a result of the long-term work of individual researchers and curators being exposed to project fieldwork. Positive lessons can be learnt from researchers who have succeeded in establishing good communication with quarry managers.

Integrated involvement of industry representatives within the design, implementation and dissemination of projects provides essential reassurance to industry, saving money and time, improving the quality of advice, and reducing risk. Some of the most useful collaboration includes training across industry and the heritage sector designed to raise mutual understanding and cross working, presenting heritage data and guidance in a timely fashion, and in a way that reveals the benefits to industry.

Tight timescales and timetabling have been a problem for many ALSF projects; any future ALSF needs a longer commissioning run-in as well as longer funding periods, with an earlier start-time. The final size of the extensions to the original fund only being known so close to each new financial year has been a disincentive to proposing relatively high-risk, high-capital ALSF projects and/or those requiring major advance capital investments. Such a short window also makes it difficult to get projects together in time to take advantage of the best weather conditions for survey, a particular problem for marine and aerial surveys.

**Future**

The continuation of the ALSF should be encouraged; its unique place in heritage management policy should not be considered a barrier to continuation, given the levy’s demonstrable successes.

**Specific recommendations for future work include:**

1. Enhanced provision of mitigation funds in the event of further major unexpected archaeological discoveries that cannot be resourced via the normal planning system.

2. Provisions for specialists, in particular the negotiation of long-term licences for the academic use of surveys and survey data, GIS and maps.

3. Development of techniques, in particular models of fluvial systems in order to predict the archaeological resource need to be refined and tested.

4. Enhanced data-acquisition, particularly in the marine zone in regard to the nature and distribution of resources within the UK Exclusive Economic Zone (EEZ).
5. Guidelines (with appropriate dissemination) to industry, the heritage sector and especially planning authorities on all aspects of structure, priorities, and future agendas, highlighting shared interests.

6. Agreed protocols for reporting of all finds from the aggregates industry, including central government guidance and local government implementation.

7. The development of an accessible, online, non-technical ALSF glossary.

8. The expansion of the holistic management relationship of the historic and natural, terrestrial and marine, management and legislative environments at every level.

9. Maximisation of efficiency of capital costs (for example, mechanisms to facilitate transfer of high-cost survey instruments from one project to another), and/or the possibility of cross-sector investment (e.g. between English Heritage and Natural England, in order to make full use of existing equipment and survey time).

10. Ensuring clear and explicit links between ALSF priorities and objectives, and regional and national strategic goals and developments (e.g. with Heritage Protection (Draft) Bill, Planning Bill and the Marine Bill) wherever possible.
The Aggregates Levy Sustainability Fund (ALSF) was introduced in 2002, initially as a two-year pilot scheme, to provide funds to relieve the environmental impacts of aggregate extraction; past, present and future. Following a three-year second round of the Fund, a further one year extension to the scheme was announced by the Chancellor of the Exchequer in the pre-Budget Statement on 6th December 2006.

The ALSF is distributed on behalf of DEFRA (the Department for Environment, Food and Rural Affairs) by, amongst other bodies, English Heritage, who allocate funds against ALSF Objective 2 (Promoting environmentally-friendly extraction and transport) and Objective 3 (Addressing the environmental impacts of past extraction). From the very beginning, some of the levy was used to fund work on the historic environment in order that it could be better managed and understood and that the results of this increased understanding could be spread more widely.

Over the last six years, through English Heritage, the ALSF has funded over 250 projects involving archaeology and the historic environment to a total value of over £23.75m.

THE ALSF DISSEMINATION PROJECT 2002-2007

In 2007 DEFRA commissioned a project to bring together and disseminate the results of all research funded by the ALSF during the six years between 2002 and 2007. This is the ALSF Dissemination Project, focusing on four core themes, each of which has up to four distinctive sub-themes.

The Heritage theme has been subdivided into three linked projects, each with specific aims and target audiences.

Rich Deposits - Aggregates Extraction, Research and the Knowledge Pool. This is aimed at the ‘knowledge society’: academics within colleges and universities, the contractors involved in the excavation of sites, ‘curators’, not of museums but those who are often based in planning departments from where they look after the archaeology of a specific area, and the interested public.

The Sands of Time - Aggregates Extraction, Heritage and the Public. This report is aimed at the general public and at government, drawing from the ‘knowledge pool’ and engaging communities with the heritage associated with both current and past aggregate extraction.

And this report - Sustainable Heritage - Aggregates Extraction and Management of the Historic Environment.
THE REVIEW: SUSTAINABLE HERITAGE – AGGREGATES EXTRACTION AND THE HISTORIC ENVIRONMENT.

This report reviews the impact that ALSF projects aimed at developing new guidance, standards and best practice have had on the aggregates industry, archaeological curators and practitioners. The report provides a critique and summary of the suite of guidance to industry undertaken through the ALSF, placing such guidance in the context of wider research into the historic environment.

Methodology
The project underlying this benchmark report was managed in accordance with the English Heritage (EH) guidance Management of Research Projects in the Historic Environment (MoRPHE). The project involved five stages undertaken across September 2007 to January 2008:

Stage 1: Familiarisation and Project Initiation.
Stage 2: Data Collection, Phase 1 – Projects and Literature.
Stage 3: Data Collection, Phase 2 – Stakeholder Consultations.
Stage 4: Initial Reporting.
Stage 5: Editing and Presentations.

In particular, a rapid consultation exercise was undertaken in November 2007, capturing the perceived impact of the ALSF through the thoughts of a sample of practitioners, curators and quarry managers, including:

- Local Government Archaeology and Planning Officers (primarily consulted via the Association of Local Government Archaeological Officers, the Royal Town Planning Institute, and the Planning Officers Society).
- EH Experts and Inspectors.
- Professional Units or Organisations and Specialists.
- Archaeological Consultants.
- Industry Representatives (primarily consulted via the British Aggregates Association, the British Marine Aggregates Producing Association and the Quarry Products Association).

These consultations addressed a variety of issues, including the perceived benefits realised by the ALSF, the levels of recognition of these benefits across target audiences, the shortcomings evident in the current and previous approaches to heritage management and aggregates, and recommendations for the future. The result is a snapshot of the overall impact of the ALSF scheme on target audiences. A simultaneous internal EH review (conducted by E. Lee), focusing on any differences of opinion within EH as well as areas of agreement and consensus, is integrated into this wider survey.

Aggregates extraction and heritage management prior to the ALSF
The most significant problem relating to aggregates extraction and heritage management prior to the ALSF was one of sufficient, and appropriate, data and standards to guide medium- to long-term plans for aggregate extraction. Minerals planners and operatives sought consistency and predictability in baseline data and approaches but have been unable to obtain this for the historic environment. Archaeological sites and deposits were consequently increasingly viewed as a risk to projects, a barrier to long-term planning and investment. Despite the injection of investment by the ALSF, this remains a problem.
Underlying and exacerbating this issue was the very limited detailed knowledge of the nature and distribution of heritage resources in relation to suitable aggregate deposits. This situation was particularly acute in the marine zone within the UK Exclusive Economic Zone (EEZ) out to 200 nautical miles. There was, and remains, a need for significant, ongoing investment in the mapping of the marine historic environment to define the resources that government are attempting to manage; this becomes increasingly important in the context of proposed changes to marine legislation as of January 2008.

Lack of data and consistency manifested itself in a lack of holistic management of the natural and cultural environment as an integrated resource. The inter-relationship of heritage and biodiversity agendas was not considered in an integrated way negating opportunities to take advantage of synergy or to reconcile tensions. This situation is not helped by the structure of central government, which deals with these topics via very different organisations (English Heritage and Natural England) funded via different government departments (DCMS and Defra).

These issues were increasingly poorly served by out-of-date policy to guide decision-making; the last agreed guidance was the Confederation of British Industry (CBI) Code of Practice for Mineral Operators, first issued in 1982 and revised in 1991. Where later guidance did exist – for example on archaeological techniques – there was little specific to the particular circumstances of gravel/aggregates extraction, and until the ALSF was initiated there was no agreed protocol for reporting finds of historic and archaeological interest as applied to the aggregates industry. This situation was not helped by the tendency for Local Minerals Plans (LMPs) to include consultation of archaeological interests (i.e. with County Archaeologists, Association of Local Government Archaeology Officers) at too late a stage to ensure that competing interests could be appropriately balanced.

Unidentified wreck on the Goodwin Sands, surveyed as part of the Rapid Archaeological Site Survey and Evaluation project. © ADUS and the University of St Andrews
Overview of guidance and standards emerging from ALSF projects

This report assesses the products of those EH ALSF projects which were either specifically designed to focus on development and innovation of techniques, standards, and/or best practice guidance in delivering the following EH ALSF priorities:

- Research to enhance the understanding of the scale and character of the historic environment in current or likely future aggregate producing areas, in order to provide the baseline information necessary for effective future management.
- Strategic research on the character, scale and geographical distribution of the potential impacts of aggregate extraction (including secondary aggregate resources but excluding construction waste) on the historic environment.
- Techniques of prediction and evaluation, mitigation strategies, training, awareness and information exchange.
- Support for the development of management and conservation strategies for the historic environment in current or likely future areas of aggregate production.
- Methodological and technical research to improve predictive, evaluation and mitigation tools in order to promote and advance maximum information gain and cost effectiveness which will benefit both the extraction industry and the historic environment.

One of the key purposes of the ALSF has been to provide those working on planning, scoping, risk assessment, field investigation, analytical procedures and subsequent management of historic assets in aggregates extraction zones with appropriate, readily accessible toolkits to aid in decision-making, risk management and mitigation.

Research projects include those that focus on enhancing the baseline information available for managing the historic environment, through landscape characterisation (e.g. the five zone England’s Historic Seascapes project) (3783, 4728, 4729, 4730, 4731) and mapping (e.g. the Palaeolithic Rivers of SW Britain (3847), Submerged Palaeo-Arun & Solent Rivers (3277), and the 3D Seismics for Mitigation Mapping of the Southern North Sea (4613) projects), and the developing of methodologies for predicting and protecting the resource (e.g. the various LiDAR, geoarchaeological, GIS, and marine exclusion zone projects) (see below).

The need to establish chronologies to underpin these landscape models is recognised, and projects developing the scientific techniques used for dating terrestrial deposits are underway (Optically Stimulated Luminescence/Amino Acid Racemization) as well as the imminent issuing of guidance on their use (OSL Guidelines). Other guidance documents produced with ALSF support are intended to encourage a consistent approach to the sustainable management of the historic environment (such as Making Archaeology Matter; Planning for the Future; the British Marine Aggregate Producers Association (BMAPA) Protocol for Reporting Finds of Archaeological Interest).

ALSF technical and guidance projects can be assembled into three primary categories:

1. New Techniques
2. New Approaches to Historic Environments
3. Assessing Impacts
New Techniques: development of and guidance upon new methods of obtaining data about the historic environment:

A suite of projects have made major advances in dating, particularly in Amino Acid Racemization (AAR) and Biogenic Carbonate Optically Stimulated Luminescence (OSL) (3854, 5352), including guidance (5351). These have, among other advances, progressed the chronological modelling of archaeological sites located in aggregate areas (3379) and the radiocarbon (C14) dating of bone samples recovered from gravel sites (3513, 5431).

New Approaches to Historic Environments: guidance on developing new ways of characterising buried landscapes and the historic resources they contain:

There have been sustained advances in the field of geophysics for archaeological prospection, identification, modelling and management in relation to aggregates, both on land and under water, through the use of Airborne Light Detection and Ranging (LiDAR) on land in the prediction of organic preservation on aggregate landscapes (4782, 5261) (as in the example of the Forest of Dean Archaeological Survey (4798)) and both seisms and high resolution sonar at sea.

Terrestrial geophysical surveys have seen the development of predictive modelling and survey techniques for, among others, north-west England (3835), the sub-surface drift geology of Greater London gravel extraction areas around the Lea Valley (3282), and known mineral extraction sites in the Greater Thames region (3374). These have included thematic surveys modelling the stratigraphy and geoarchaeology of English valley systems (3329), and multi-spectral imaging and thermal-decay mapping on sands and gravel bearing sub-soils (3841), as well as predictive modelling of multi-period geo-archaeological resources at river confluences (3357, 3349).
Advances in marine seismics and high resolution sonar have resulted in a significant expansion of both the amount of data for submerged historic materials (both shipwrecks and inundated prehistoric landscapes) (3364, 3594) as well as the format of exclusion zones around such sites in relation to marine aggregates extraction (3365, 5382), models of regional sediment erosion for submerged archaeological sites (5224), and the format of rapid archaeological site surveying and evaluation in the marine environment and transitional zones (3837). This has included the production of guidance documents (4613, 5274) notably the joint BMAPA/EH Protocol for Reporting Finds of Archaeological Interest (3645), and links in to wider ALSF projects exploring marine biodiversity agendas (5402). The importance (3324, 3767, 3877) and general relative significance (3916, 5383) of shipwrecks have all been modelled for the first time, and areas of maritime archaeological potential (AMAPs) for shipwrecks (5083) are now being refined.

There has been a particular expansion of data on the terrestrial Palaeolithic resource of southern Britain thanks to the ALSF, leading to enhanced data and guidance in the Medway Valley (3836), the Sussex/Hampshire coastal corridor (3279) and South-West Britain (3847). In the marine zone these projects are mirrored by the series of ‘seabed prehistory’ projects mapping inundated prehistoric landscapes of the Palaeo-Arun and Solent Rivers in the English Channel (3277, 3543), and southern North Sea (4613), which have massively expanded the understanding of these prehistoric environments, and have included outreach in the form of seminars (5401) and guidance documents (3876). Work that enhances understanding of the link between landscapes and submerged ‘seascapes’ is an outstanding component of the ALSF programme.

There has also been site-specific work, for example in the Trent Valley, undertaking geoarchaeological surveys (3850, 3887), and the characterisation, modelling and managing the buried landscape in the Vale of Pickering (3409, 5288). Such surveys are complemented in the marine zone by the series of ‘England’s Historic Seascapes’ projects (Liverpool Bay (3783); Solent and Isle of Wight (4728); Southwold to Clacton (4729); Withernsea to Skegness (4730) and Scarborough to Hartlepool (4731), the overarching review (5254); and the digital dissemination element (3783). The ‘white zone’ transition between the sea and the land (so important to ongoing Integrated Coastal Zone Management agendas within the Marine Bill) has also undergone transition zone mapping for marine-terrestrial archaeological continuity (4632).
Assessing Impacts: guidance and advisory reports into risk assessment, management and mitigation:

Planning for the Future (5109) is an example of an ALSF guidance project designed to clarify archaeological considerations and evaluation procedures, and address inconsistencies in archaeological advice across the UK. The outcome of this project has been the issuing, in draft form, of a practice guide, Planning for Mineral Extraction and Archaeology, by the Minerals and Historic Environment Forum (MHEF), to aid planners, industry and archaeologists in the application of existing planning policies and guidance.

Overarching guidance such as Planning for the Mineral Extraction and Archaeology is joined by site- and/or region-specific ‘guidance’, such as that produced for the Trent Valley (3863) and the Till-Tweed Catchment (3325). Type-specific projects have also led to specialist guidance, including, soon to be published, draft documents on the archaeological potential of cave and fissure deposits in limestone (4996), water table dynamics in relation to aggregate extraction sites (3557 - jointly funded with MIRO), and Optically Stimulated Luminescence (OSL) (5351).

The Whole-site first Assessment Tool-kit for Assessment of Sand and Gravel Deposits (5366) is an example of the broader benefits of such ALSF work, this project being emblematic of the new type of ALSF-stimulated project that actively includes personnel from across a range of sectors and/or organizations, with universities of Leicester and Birmingham, British Geological Survey, EH and Lafarge all involved in developing methodological and technical developments which will benefit both industry and archaeology.
2 CASE STUDIES

TILL-TWEED CATCHMENT AGGREGATES & ARCHAEOLOGY PROJECT & PLANNING FOR THE FUTURE: NATIONAL GUIDANCE (3325 AND 5109)
(Archaeological Research Services)

Background and aggregate link
The Till-Tweed confluence is rich in archaeology of all periods, but is significant for its Neolithic and Anglian resources. Exploitation of the aggregate deposits is equally important, and a clear need exists for industry and minerals planners for coherent landscape-scape information on the historic environment resource.

The project
The Till-Tweed Aggregates and Archaeology Project (3325) examined the archaeology and geomorphology of the Till and Lower Tweed river valleys in Northumberland. The project integrates the known archaeological remains of the area, identified from archaeological reports, aerial photographs and fieldwalking, with geomorphological landform units, incorporating evidence from sediment cores and other observations. The resulting digital maps are intended to provide the base-line information to assist all stakeholders in the future management of the historic environment within aggregate areas (Hewitt and Johnson 2006).

Outcomes
A guidance document, Planning for the Future, was produced in conjunction with the Till-Tweed GIS, designed to clarify archaeological considerations and evaluation procedures and address inconsistencies identified in archaeological advice across the county. The document explains the link between landform types and certain archaeological or palaeoenvironmental remains, and the stages involved in assessing their resource potential (Waddington and Passmore 2006: tables 1 and 2). The range of assessment techniques are also described, including the use of geomorphological mapping, produced using high-resolution remote sensing techniques such as Light Detection and Ranging (LiDAR), as well as the more targeted, intrusive measures, such as evaluation trenching and excavation, to investigate the resource at specific locations. This guidance is the result of dialogue and collaboration between archaeological contractors (Archaeological Research Services Ltd), curators (Northumberland County Council and EH) and academics (University of Newcastle), and relates specifically to an area of the Northumberland landscape.

By providing industry, planners, archaeological curators and contractors with a common data set on which to base decision making (represented by the Till-Tweed GIS), it is hoped that the project will encourage dialogue, and a sense of openness amongst stakeholders that will benefit the interests of industry and the historic environment alike. Digitally mapping the relationship between geomorphology and archaeology will help to predict areas of potential sensitivity. This will potentially benefit industry by providing prior knowledge of where sensitive remains may be located as well as targeting time and costs in the most cost-effective way when evaluating the historic environment resource.

The principles and methodologies of Planning for the Future are widely applicable, and the project has been used as the basis for the national project Planning for the future: National guidance (5019), which involved the development of the Planning for Mineral Extraction and Archaeology: Practice Guide on behalf of the Minerals and Historic Environment Forum (MHEF) in response to the need for coherent and transparent heritage advice across England. This Guide is currently at development stage and it is hoped that it will be released in 2008.
WHERE RIVERS MEET: RITUAL, SETTLEMENT AND THE ARCHAEOLOGY OF RIVER GRAVELS (3349)
(University of Birmingham)

Background and aggregate link
The Where Rivers Meet project focuses on the confluence of the Trent and the Tame Rivers in Staffordshire. Extensive extraction occurs in this landscape – a landscape rich in archaeological remains, ranging from Late Pleistocene megafauna and Neolithic/Early Bronze Age ceremonial monuments, to Romano-British and Anglo-Saxon settlements.

The project
Between 2002 and 2004, the Where Rivers Meet project explored the use of a wide range of traditional and innovative techniques to examine the historic environment, resulting in a detailed, quasi-3D, record of the archaeological landscape. Several different approaches were used, including a palaeofluvial analysis; hydrogeological modelling; and a GIS-based digital landscape model, using Light Detection and Ranging (lidar) data for the base terrain model. This, and other ALSF funded projects (e.g. Airborne lidar Backscattered Laser Intensity Prediction of Organic Preservation (4782) and The Forest of Dean Archaeological Survey: LiDAR (4798)) demonstrate the practical use of lidar as an efficient tool for producing high precision terrain models, including the capacity to identify and model features as varied as small burial mounds, extensive palaeochannels and medieval agricultural landscapes.

Extensive surveys using a range of ground-based geophysical techniques, including magnetometry, resistivity and ground penetrating radar (GPR), were also conducted within a focus area (incorporating the important prehistoric Catholme Ceremonial Complex, the Catholme Saxon Settlement and the Wychnor Anglo-Saxon cemetery) to test the effectiveness of aerial photographic and geophysical survey techniques in the field. Subsequent fieldwork involved the ‘ground truthing’ of geophysical survey data through excavation, in order to assess the effectiveness of evaluation techniques.

Outcomes
Although the study concludes that ground-truthing remains essential for the final interpretation and recording of archaeological anomalies, the results provide valuable feedback on the effectiveness of geophysical techniques for resource management and project planning in aggregates area. The study highlights the potential of GPR to provide a three-dimensional subsurface
view of archaeological deposits, as well as an indication of the depth of features in relation to later activities, enabling predictions to be made about the likely impact of activities, such as agricultural cultivation, on the state of archaeological preservation.

The development of an integrated GIS provides a key tool for the future analysis and management of the historic environment, and provides a common information base accessible to all stakeholders. The study also resulted in a management discussion document for the study area, which should benefit future management decisions by encouraging open and healthy debate. Finally, and as a consequence of the multi-facetted nature of the research, the project has resulted in closer working relationships between archaeological curators and specialist researchers, which should help to ensure more informed and consistent archaeological advice.

Medieval deserted settlement remains, LiDAR overlain with OS Landline. © Dr. Simon Buteux, Field Archaeology Unit, University of Birmingham

SIR3000 ground penetrating radar unit with a 400 MHz antenna
© Dr. Simon Buteux, Field Archaeology Unit, University of Birmingham
THE PALAEOLITHIC RIVERS OF SOUTH-WEST BRITAIN (3847)
(Universities of Exeter and Reading)

Background and aggregate link
The Palaeolithic archaeology and Pleistocene environments of south western England have received relatively little research over recent decades, and much of the work that has taken place has focussed on the archaeology of cave and rock shelters, despite the fact that up to 80-90% of the country’s known resource relating to the Lower and Middle Palaeolithic periods (c. 500,000–40,000 years ago) is represented by stone tools from secondary contexts (that is, sediments transported and laid down by rivers during the Middle Pleistocene) (Hosfield and Young, 2007). The Palaeolithic Rivers of south west Britain forms part of the regional survey and mapping research theme, focusing on the reconstruction of fluvial palaeolandscapes and assessing the Lower and Middle Palaeolithic archaeological resource associated with those fluvial deposits, to improve the base-line information for management purposes.

The Project
The project provides a synthesis of existing evidence for Lower and Middle Palaeolithic occupation of the region (Cornwall, Devon, west Dorset and south Somerset), and assesses the archaeological, palaeo-environmental and geoarchaeological potential of its Pleistocene fluvial landscapes. The fieldwork, which focused principally on the Exe, Otter, and Axe river systems, undertook investigation of key deposits. Landforms were mapped and deposits characterised using remote sensing technology, including GPR and IFSAR, and lithostratigraphic recording, while samples were dated using OSL techniques (fig. 3), to address
the regional lack of robust geochronologies for fluvial deposits and landforms (Hosfield et al. 2007: 1).

Outcomes
The results not only indicate that the Pleistocene fluvial landscape resource within the south-west is more significant and variable than previously realised, but also identifies the existence of an extensive ‘invisible’ component within the Palaeolithic archaeological record (Hosfield et al. 2007: 1). The results suggest that although key deposits can be identified, the archaeological potential of aggregate units or terraces is not uniform (Hosfield et al. 2007: 2), and this enhanced understanding of the distribution of Palaeolithic archaeology and the varied formation of the deposits clearly has implications for the current and future management of the resource (Hosfield et al. 2007: 98). Critically, the project has produced the first partial chronology for the formation of river terraces in the region, helping to contextualise our understanding of the region’s Lower and Middle Palaeolithic archaeology, informing future management decisions for the region.

As part of its dissemination and outreach objective, to raise the profile of the region’s Palaeolithic archaeological heritage amongst all stakeholders, the project held a series of events for schools, societies, interested public and the academic community, and has produced a follow-on series of digital teaching and learning resources. The positive response received by the project’s outreach element has revealed a high degree of public interest within the region, with implications for future dissemination and training opportunities.
3D SEISMICS FOR MITIGATION MAPPING OF THE SOUTHERN NORTH SEA AND SUBMERGED PALAEO-ARUN (4613)

(University of Birmingham) (3277/3543) (Imperial College)

Background and aggregate link
During periods of exposure in the Late Quaternary glacial periods, much of the UK continental shelf became a terrestrial landmass, crossed by a network of river valleys. These fluvial systems, with their array of natural resources, would have provided attractive environments for humans to occupy and exploit, and this is demonstrated by the wealth of archaeological evidence derived from the onshore river terraces of England's South Coast (Gupta et al, 2007a: 94, citing Wymer, 1999).

The same sediment bodies of offshore fluvial systems are of considerable interest to the aggregate industry and are coming under increasing pressure from other offshore activities (extraction and construction). Despite a long-standing awareness of this submerged terrestrial landscape, its archaeological potential has only been realised in recent decades (e.g. Coles 1998, Flemming 2004 and Westley et al 2004), and the lack of detailed knowledge of this palaeo-environment soon became clear. It is in the long-term interests of both minerals operators and managers of the historic environment, to encourage a better understanding of submerged palaeo-landscapes so that informed decisions can be made about the future management of finite mineral and archaeological resources (Westley et al 2004: 1).

The projects
In response to this data imperative, and following recognition of the archaeological importance of the UK continental shelf (Westley et al 2004), the ALSF has funded several projects that considerably enhance our understanding of the offshore resource and our ability to predict potential areas of archaeological preservation. The following projects demonstrate the support given by the marine aggregate industry, which recognise the importance of developing a sound knowledge base as a way of reducing risk.

Using existing 3D seismic datasets donated by Petroleum Geo-Services, the University of Birmingham have mapped an extensive area of the southern North Sea (Gaffney and Thomson 2007: 115) as part of their 3D Seismics for Mitigation Mapping of the Southern North Sea Project (4613). The maps of buried landscapes produced from this data have revealed the location of former coastlines and a complex system of palaeochannels, with areas of potential wetland that may be conducive to the preservation of archaeological remains.

The River Arun belongs to another fluvial system that joins a substantial palaeo-valley located within the English Channel. Extensive seismic and core datasets were made available to Imperial College London by Hanson Aggregate Marine Ltd., United Marine Aggregates Ltd, and RMC Marine Ltd. for mapping the Arun’s present offshore component. These existing...
datasets, and new data acquired by the project, have demonstrated the exceptional value of multibeam swath bathymetry to mapping and visualising the seafloor. In addition, high-resolution seismics has been used to identify and characterise fluvial features, such as terraces and peat horizons, which have a potential for containing evidence of early prehistoric activity.

**Outcomes**

The landscape models produced by these projects provide an excellent framework on which future research can build: Recommendations arising from the consultation process include the application of high resolution seismics and targeted sampling strategies to further investigate areas of high and low preservation potential.

The integration of information derived from other sources (e.g. existing and new vibrocore and grab-sample data, and artefacts identified as a result of the Wessex Protocol reporting system) (3645) may help to establish the presence or absence of archaeological material as well as the chronology of associated marine deposits. The integrated use of geophysical, geotechnical and archaeological data has also been trialled at several study areas around the southern and eastern British coastline, as part of the Seabed Prehistory project (Leather et al 2007).

These projects demonstrate the innovative ways in which marine geophysics and geology can be used to enhance our understanding of the topography and morphology of submerged palaeo-landscapes, and it is widely acknowledged that large-scale and costly projects such as these would not have occurred without the support of the ALSF. However, the excellent results achieved by these surveys, only go part of the way towards understanding the chronological development of the landscape and its palaeo-environmental and archaeological potential, and further work, along the lines of the Seabed Prehistory project, is now required to build on these results.
**Background and aggregate link**

The origins of the *Protocol for Reporting Finds of Archaeological Interest* project lie in the recognition by the British Marine Aggregate Producers Association (BMAPA), that practical guidance and measures were required to ensure that heritage issues were taken into consideration by the marine aggregate sector. BMAPA took the initiative to engage with the heritage sector and in 2003, in partnership with EH, produced the *Marine Aggregate Dredging and the Historic Environment: Guidance Note* (BMAPA and EH, 2003). The guidance note is designed to give marine aggregate developers, archaeological consultants, curators and contractors a clear understanding of marine archaeological issues and procedures relating to the aggregate extraction process, and offers practical guidance to ensure that the appropriate measures are put in place to help protect the marine historic environment.

**The project**

This guidance was followed by BMAPA’s *Protocol for Reporting Finds of Archaeological Interest* (BMAPA and EH 2005), which was prepared by Wessex Archaeology, and is designed to promote a consistent approach to dealing with archaeological finds encountered in the course of the extraction process. The procedures involve the initial reporting of finds to an allocated Site Champion located on the vessel or at the wharf. The Site Champion reports the find to the Nominated Contact within the dredging company who is responsible for liaising with Wessex Archaeology for initial archaeological advice. Where the location of the find is sufficiently well known, the Nominated Contact also implements a Temporary Exclusion Zone, pending
further archaeological advice. The reports are then submitted to EH, who may then become directly involved, for instances in cases where multiple finds are recovered from an area and where peat or the remains of a wreck has been reported.

The introduction of the Protocol was accompanied by an Awareness Programme, implemented by Wessex Archaeology and funded by the ALSF, to raise awareness and provide guidance on how to identify and deal with artefacts retrieved during the extraction process. The programme included visits by archaeologists to wharves and vessels, regional workshops on finds recognition, a pilot newsletter and a DVD training package. Following the success of the initial 2005-06 Awareness Programme, an extension to the programme was granted in 2007/08.

**Outcomes**

A range of archaeological material has been reported so far, including organic remains, such as wood, peat, bone and antler; struck flint, and the remains of World War II aircraft. The reported finds represent a valuable source of information for understanding the nature, date and distribution of prehistoric settlements within the submerged prehistoric landscape, as well as representing a record of subsequent historic and cultural events, and have the potential to inform the results of other research projects. The importance of these artefacts for enhancing our knowledge of past environments is demonstrated by the discovery of a mammoth tusk by Purfleet Aggregates Ltd.; this is one of the most northerly dated examples of its kind and, as such, has ‘significant implications for understanding the distribution of this species during the last ice age’ (Dredged Up: Spring 2007: 5).

The introduction of the Protocol has been well received by the industry (Dredged Up: Spring 2007). The protocol’s principal achievements lie in an increased archaeological understanding and awareness within industry and the participation of everyone involved in the aggregate dredging process. The convenient reporting procedure encourages the use of the system, which in turn increases the potential for archaeological sites to be identified, which were previously unknown. The BMAPA Protocol project exemplifies the positive and mutual benefits of good collaboration between industry and archaeologists, and in doing so, helps to achieve a more informed and efficient regime for managing the historic environment.
MODELLING EXCLUSION ZONES
(3365) (Southampton University)

Background and aggregate link
The marine heritage resource is finite and diverse, as it is on land, and includes prehistoric sites and landscapes, which have been submerged by sea level rise, as well as artefact-based sites such as shipwrecks and 20th century aircraft. The Modelling Exclusion Zones project arises from the need to protect important archaeological remains within the marine environment, for our own and future generations (Roberts and Trow 2002: 3, citing DCMS 2001), and attempts to refine the existing design of exclusion zones for the more informed protection of artefact-based sites.

The project
Exclusion zones are drawn around sites of archaeological or historical significance, within which dredging is prohibited. Their purpose is to protect the site from direct damage or destruction by the dredge head, or from the indirect effects of dredging upstream, which may cause changes in seabed dynamics and sediment flow around the site itself. Exclusion zones are important to the industry in reducing the risk of damage to the dredging plant and by reducing the potential for sediment contamination. However, the radius of a current, circular exclusion zone can be in the region of 50m-200m from the site itself, and the extent is usually based on the professional judgement of archaeologists, and not necessarily on the results of quantitative research (Dix et al 2007: 172). Modelling Exclusion Zones (3365) aims to achieve a more ‘robust, methodical and practical’ approach to the design of exclusion zones (Dix et al 2007: 173) whilst achieving a balance between the requirements of heritage protection and the interests of the marine aggregate industry.

Through the analysis of large quantities of data, including the results of laboratory tests and field investigations on two wreck sites, the study has greatly enhanced understanding of the relationship between flow and sediment...
dynamics. Data derived from a series of Acoustic Doppler Current Profilers (ADCPs) were used to measure the flow field around each wreck, from which it was possible to reconstruct patterns of flow modification around the obstacle. The results can help to predict the rates and patterns of sediment accretion around a wreck site and also sediment erosion, with clear implications for predicting changes in a site's stability (Dix et al, 2007: 173).

On the basis of these results, the project proposes an alternative to the current circular exclusion zone: the suggested design consists of a tidally aligned ellipse. Surrounding the wreck and encompassing the seabed directly affected by its presence is an inner ‘dynamic buffer’; this is then surrounded by a ‘slope buffer’, the outer edge of which forms the perimeter of the exclusion zone. In combination, these attempt to ensure the long-term stability of in situ sediments and sediment input from upstream of the site, whilst also protecting the potential distribution of artefacts downstream.

**Outcomes**

The results of the project are of direct and practical use to the marine aggregate industry, as well as other marine industries, and demonstrate the positive outcome of regular, close communication between the dredging industry and other key stakeholders. Indeed the scientific results of this project are currently being edited to form a guidance note for both the industry and the regulators.

An investigation of the maximum safe angle of dredging slopes around the perimeter of an exclusion zone has been suggested as a possible area for future research. The angle of slope is determined by the stability of the sediment in the vicinity of the site, and further work could be carried out to establish the safe slope limits in relation to different materials. This would help maximise the aggregate area available for extraction whilst ensuring the stability of the protected wreck site.

Following on from Modelling Exclusion Zones a further project (EH no 5224) is developing models of sediment mobility at the regional scale, in order to predict rates of sediment transport and to identify areas likely to experience accumulation or erosion over time, with potential implications for the long term preservation of sites. A further extension of this project using Acoustic Doppler Current Profiler (ADCP) deployment to record current sediment transport pathways within the English Channel is also being considered.
3 PRINCIPAL ISSUES

Impact
It is recognised by industry that the sum of ALSF projects is fundamental in providing a sounder knowledge base for the management of heritage resources; the ALSF is seen to be in the interests of industry, the development of this understanding increasing confident decision making. Understanding the distribution of resources of historic and archaeological significance is extremely important to industry; studies on such ‘constraints’ provide direct in situ information of real value to management in relation to protection of resources of historic and archaeological significance. Put simply, more knowledge equals less threat – ‘the initial cost goes up but the overall risk goes down’.

The ALSF is recognised as being a major ‘driver’ of fundamental research into aspects of maritime heritage, with a PR benefit both for industry and the historic environment in the support of such work through collaborative enterprise, data sharing and sponsorship. Exchange of data, thoughts and initiatives has been excellent between marine companies and the heritage sector; the marine aggregates industry has firmly embraced not just the primary benefits of the ALSF in terms of data-collection, site identification and risk-assessment, but also the secondary benefits of PR, participation and engagement at every level.

ALSF investment has had an immediate and significant impact on professional practice, and much of the research undertaken since 2002 would not have been achieved without the injection of this investment, particularly in the case of specialist or large scale projects. The Middle Thames Northern Tributaries Project (3310) was, for example, first proposed in the late 1990s but did not take place until the ALSF was able to provide support.

Issues addressed by ALSF projects have the potential for delivering ‘added value’ for other areas of marine planning and development (such as wind farms, etc). A number of ALSF projects have generated potentially very beneficial outputs in the field of sustainable heritage. It is often very difficult to place a direct economic ‘value’ on the conservation of marine resources in particular, or on the importance of a greater public understanding of the maritime environment, but these offer genuine added value that would not have been achieved without the ALSF. This work can probably be best justified by the fact that the Government would not have sufficient information to manage the resources of the UK Exclusive Economic Zone as required under the forthcoming Marine Bill without devoting significant funds to identifying what those resources are and where these resources are located, something in which the ALSF has invested significant resource over the past six years. Work that enhances the understanding of the link between landscapes and submerged ‘seascapes’ is an especial strength of the ALSF programme. In the absence of significant funding from other sources the ALSF has proved to be a key delivery mechanism of fundamental research on maritime heritage.

Recognition
The recognition of the ALSF role by all sectors is generally very good; the Levy itself has a high profile, and it is rare for the role of ALSF not to be recognised in at least some format. For example, much interest has been shown in EH ALSF approaches and guidelines at the bi-annual International Quarrying and Recycling Show. Nonetheless, the general consensus is that the ALSF needs a still higher profile – there is a willingness to further acknowledge the ALSF contribution where possible.
Guidelines aimed at operators in the field should assist the continued growth of recognition of the ALSF among the terrestrial minerals industry; where terrestrial extractors are currently aware of ALSF schemes this is usually in relation to approaches to new information upon specific archaeological materials or landscapes – e.g. new data on Palaeolithic gravel terraces. In other cases, successful terrestrial awareness has come thanks to new and/or innovative techniques of use to industry – e.g. the Geophysical Exploration Equipment Platform (GEEP) project that places multiple geophysical sensors on a platform towed behind quad bikes, helping in speedy risk quantification, part of a MIRO-sponsored Knowledge Transfer Partnership (KTP) between Geomatrix Earth Science Ltd and the University of Leicester.

The relative lack of awareness of terrestrial ALSF within industry sits in contrast to that of the marine aggregate industry (e.g. United Marine Aggregates Ltd., Hanson Aggregate Marine Ltd.), which was heavily involved in the initiation of ALSF projects with not only EH but also particular universities (e.g. Southampton University) as well as archaeological contractors (e.g. Wessex Archaeology), an example of industry proactive involvement.

Neil Brundel (Dudmans Ltd) and Matthew Pope (UCL) celebrate the discovery of the Boxgrove palaeo-landsurface at Valdœ Quarry, West Sussex (from the EH ALSF Annual Review 2005-06: 11, courtesy of the Boxgrove project and Matt Pope, UCL Institute of Archaeology)
**Communication and Dissemination**

Communication and engagement between the public and private sectors in the marine zone has been extremely thorough, and can be considered one of the great successes of the ALSF. Marine industry consultees were usually aware of the whole suite of marine projects, unlike many of their terrestrial counterparts. This has included awareness of the interrelation of projects associated with the different themes of biodiversity, geodiversity and restoration, as well as heritage. There remains a need for further marine guidance and data, especially as regards specific issues such as the modelling of scaled taphonomy.

The profile of the ALSF is generally felt to be higher in the wider heritage sector than it is within EH; it is particularly well-recognised by specific sections of the archaeological community working on related research – e.g. the Palaeolithic (and prehistoric archaeologists in general), and maritime archaeology, and is much less visible to the archaeological community as a whole, particularly sectors which have limited contact with the aggregates industry or deposits – e.g. urban and medieval archaeologists. There is a marked variation of recognition between different sectors of the archaeological community, with generally much higher recognition from within the contract and local government sector, reflecting a primary aim of the ALSF to influence management practice, in comparison to the university and museums sector. Although there has been active and successful engagement with certain sectors, notably primary and secondary education, other sectors, particularly the university sector, often remain unaware of the products of the ALSF. As a consequence relatively little ALSF work is being actively integrated into the university teaching syllabus at either the undergraduate or postgraduate level.

The ALSF has opened up channels of dialogue with minerals planners, resulting in early consultations – literally ‘breaking the ice’ – in the production of draft minerals plans, with specific project outputs (e.g. The Trent Valley Survey (3307) and Where Rivers Meet (3349) projects) which are beginning to feed into local minerals policies, helping address problems with pre-PPG16 mineral permissions.

The uneven distribution of ALSF projects across England, together with the varied level of curatorial archaeological provision at the county and district levels, means that planning officer awareness of ALSF projects is extremely variable across England. In many cases, awareness of ALSF work may be restricted to one high-profile project within an officer’s district. Due to the pressure that all planning officers are under to meet response times of 21-28 days in the face of rapid development, many officers simply do not have the time to read outreach documents or respond to user-surveys. Outreach specifically to the planning sector has been slight in comparison to that aimed at other sectors; this is a gap that any future ALSF would do well to address.

The absence of an ALSF logo, together with the lack of a dedicated web-presence for products of ALSF heritage projects, has been a major barrier to higher recognition, especially by industry, making it difficult to identify specific ALSF funded support - e.g. on site entrance and display boards, ‘hard’ media (leaflets, press releases, etc.) and websites. While there is basic project information on the EH and DEFRA websites (http://hec.english-heritage.org.uk/admisremote/HEEPOnline/home.asp and http://alsf.defra.gov.uk/), these do not always provide direct links to individual project pages or archived research data held by the Archaeology Data Service (ADS) (http://ads.ahds.ac.uk/). In turn, the ADS does not yet provide full details of, or links to, secondary research products such as scientific papers and reports, nor links back to project pages. The problem of identifying ‘second-tier’ products of the ALSF – such as ‘piggyback’ research and publications that are derived from but not specifically a part of ALSF funded projects – is particularly acute in this regard.
There remains an urgent need for a single ALSF website dedicated to industry-related reporting and guidance, providing clear links to all ALSF products and outputs in the heritage sector and elsewhere. The Marine Environment Protection ALSF (MEPF) website (http://www.alsf-mepf.org.uk/default.asp) provides a good model for this, and benefits, as does all the marine ALSF sector, from its own, dedicated logo, unlike the EH component of the ALSF. Provision of dedicated web content should include industry-dedicated syntheses of project types: these need not be particularly involved, and could involve an outreach element, making specialist scientific or academic projects more accessible and providing the contact details of a ‘pool’ of specialists. A combined, central website and clearer ALSF ‘brand’ would reinforce the message of joined-up management and government of aggregates across the terrestrial and marine zones, natural and historic environment. This ‘holistic’ strategy would benefit joined-up thinking, encouraging new channels of dialogue between different groups and sectors. The new webpage www.sustainableaggregates.com will go a considerable way to addressing this issue.

A range of ALSF projects (both terrestrial and marine) have demonstrated that communication is far more effective at the local level, as a result of long-term work of individual researchers and curators being involved/ exposed to project fieldwork. Positive lessons can be learnt from researchers nationally who have succeeded in establishing good communication with quarry managers. There are lessons to be learnt in this respect from approaches that failed to foster good relations in the past; the National Ice Age Network (NIAN) (3790) is a case in point. Communications failures at a strategic level followed by the generally negative reaction of the Quarry Products Association (QPA) to NIAN’s overtures for broad-scale working policies/frameworks led to a break-down in communication at the local level, threatening, in some cases, long-established local
relationships between quarry operators and historic environment professionals.

A number of case-studies demonstrate that successful projects in terms of industry relations:

- Were from the outset partnerships between industry and archaeologists, with all partners being including in project development and design, data sharing and collection, and/or processing.
- Showed immediate functionality/use to industry, such as modelling locations of sites, or aggregate dynamics around particular locations.
- Showed efficiency, through the use of legacy data or industry platforms, and frequently involved industry provision of in-kind support via the loan of equipment.
- Undertook ‘industry-friendly’ outreach through internal industry media and conferences, including significant PR potential for extraction companies.
- Provided stand-alone, accessible, user-friendly web resources.
- Were timely and well-managed, responding to currently pressing needs in industry to identify, and help mitigate, risks.
- Frequently involved archaeologists or the analysis of archaeological data, but were often led or managed by non-archaeologists, such as geophysicists, geographers, oceanographers and others with a greater sensibility to the needs of industry.

Greater industry involvement could be encouraged through non-heritage ALSF funding organisations taking the lead on such projects. This would circumvent the problem of lack of awareness of current industry needs in terms of data requirements and the possible benefits of collaboration. Development of the Minerals and Historic Environment Forum (MHEF) should assist in this process, through enhanced information sharing with industry and planners on initiatives of mutual interest. Integrated involvement of industry representatives within the design, implementation and dissemination of projects would help avoid the out-of-hand rejection of recommendations and guidance from ALSF projects. As a range of ALSF projects demonstrate, collaboration can work to industry’s advantage in the mitigation process, for instance, when researchers are employed as consultants in the development control process because of the small pool of period or environment-specific specialists. Supporting archaeological projects ultimately saves money and time, improves the quality of advice, and reduces risk.

Given the evident need to increase ‘industry awareness’ amongst archaeologists in general, targeted training programmes for historic environment staff in the structure and operation of the minerals industry is something that the continued ALSF should fund. Training would show heritage sector ‘willing’, helping to improve communication with the terrestrial industry in particular. The heritage profession tends to expect a lot from industry staff in terms of understanding the ‘needs’ of the historic environment with very little in the way of reciprocation; such a programme could address the balance. Any collaborative training programmes should also highlight the connections between the terrestrial and marine natural and cultural environment, and include suggestions on how quarry or dredge sites can be managed to shared ends in a ‘sustainable’ fashion. Targeted training programmes are needed. For example, Palaeolithic research relies on the work of quaternary scientists to achieve coherent picture. Only a handful of experienced scientists exist, and many of these will retire soon, leaving a huge skills gap and loss of knowledge built up over many decades. There is an urgent need to establish apprenticeships as soon as possible – an estimated ten-year window exists to train people up before specialists retire. The ALSF would be the ideal platform for such a programme, and this could offer opportunities for industry collaboration and sponsorship. Such training would enhance
opportunities for to negotiate long-term licences for the academic use of industry survey data, GIS and maps (e.g. BGS); this would result in long-term cost savings as well as further improving collaborative relationships between industry and researchers. Such training would enhance opportunities to negotiate long-term licences for the academic use of industry survey data.

Time lag is a serious problem for dissemination; caused partly by the nature of ALSF funding and administration, and partly by the traditional failure of archaeology to deliver publications to short time-scales. The latter problem has begun to reduce in the last decade due to the pressure to publish from the university sector ‘Research Assessment Exercise’ (RAE) which judges university departments – and individual researchers – on the basis of their research output as assessed through the number and quality of their publications and funding awarded. It should be noted that ALSF publication/dissemination of results is generally quick in comparison to the general speed of production of publication in archaeology as a whole.

Tight timescales and timetabling have been a problem for many ALSF projects; the ALSF needs a longer commissioning ‘run-in’ as well as longer funding periods. The final size of the extensions to the original fund only being known so close to each new financial year has been a direct disincentive to proposing relatively high-risk, high-capital ALSF projects and/or those requiring major advance capital investments. Such a short ‘window’ has made it difficult to get projects together in time to take advantage of the best weather conditions for survey, a particular problem for marine and aerial surveys. The stop-start nature of the ALSF funding has increased the risks of involvement in ALSF projects: it is difficult to respond to unforeseen issues or adjust project plans. A longer ALSF commissioning window would secure sustainability of investment structures, helping to extend the life of projects beyond the end of the ALSF. The ALSF also needs to be better integrated with other available funding schemes. In the case of ‘external’ sources such as the research councils, industry funds, the funding frameworks/structures of both the ALSF and the research councils effectively discourage cross-funding of projects.

Although outreach is the subject of another thematic review paper, this industry consultation highlights the need for greater ALSF spend on outreach projects that disseminate the results of archaeological research at aggregate quarry sites to local communities. The challenge is to ensure that different target audiences are aware of the resources being made available to them, in particular the guidance and good practice information. There is an urgent need for better support and advice to quarry staff, reassuring them that archaeological finds and fieldwork need not be a problem, and can be of great assistance in risk-avoidance and mitigation. Any such programme needs to be a collaborative project with industry, strengthening existing connections wherever possible. Research results need to be explicitly stated, and presented in a way that reveals the benefits to industry. It is the responsibility of the heritage sector to explain the broader picture to industry, demonstrating how large projects relate to smaller, targeted ones. For instance, whilst palaeolandscapes can be extensive, and the potential for significant archaeological deposits does exist human occupation is not uniform, and targeted archaeological research can benefit industry by identifying areas of the landscape with lower archaeological potential. Data provided by ALSF projects can thus feed into broader resource assessments, further enabling joined-up strategic decision-making.
Key gaps in knowledge and output
The greatest ‘key gap’ in knowledge remains that of archaeological site locations – of mapping and risk prediction. This remains particularly acute in the marine zone, which has a much shorter history of mapping, management and mitigation in comparison to the terrestrial zone. Such data is of the highest value to industry and the heritage profession alike. Additional investment in such mapping will be necessary into the foreseeable future, and the ALSF remains the primary source of government investment in such surveys.

The range of projects that can be anticipated in the future broadly fall into the categories of ‘environmental characterisation’ and ‘resource protection’, such as: continued investment in the base mapping of the marine environment to help define the marine archaeological resource (this will become increasingly important if the Marine Bill comes into force), and an expanded suite of ‘practical’ guidance projects that steer away from an unnecessarily ‘academic’ approach.

The relationship between terrestrial and marine sites continues to require additional exploration, particularly in the light of Integrated Coastal Zone Management Strategy, itself partially a product of new strategies of coastal management in the face of climate change and other related coastal change, both ‘natural’ (e.g. ongoing erosion) and cultural (e.g. the strategy of ‘managed retreat’). This has links to mapping, data levels and legislative conditions, and much work is needed on the ‘white zone’ junction between sea and land in order to develop the types of contiguous palaeolandscape models and datasets of the type that will be needed in the coming century. ALSF certainly has a potential part to play in delivering this work. High-resolution seismic and other geophysical archaeological investigations of sites like Dogger Bank, matched with focused coring based on data/interpretation coming from existing projects, offers much potential new data on the range and density of prehistoric submerged landscapes of extremely high value to industry and interest to academia.

Reson multibeam bathymetric survey of the A1 submarine, surveyed as part of the Wrecks on the Seabed project. Courtesy of Wessex Archaeology
4 RECOMMENDATIONS

A revised ALSF research agenda is needed to build on the successes of past work and guide decision making on investment in future specific projects. Generally, this means that the ALSF needs to take pilot projects at a local level and apply these more widely – i.e. tracking the industries move towards a regional approach to tackling local sensitivities. This could include revisiting earlier Aggregates Resource Assessments (ARAs) to take these to a greater level of precision and detail, perhaps by recommending specific techniques that would be appropriate for the evaluation of proposals in specific areas.

Future work should focus on identifying the existing benefits of the ALSF, expanding upon these, making even clearer to industry and the general public alike how the input of investment via the ALSF feeds into:

- Direct benefits for industry in terms of guidance, risk prediction and avoidance, etc.
- Technological/methodological advances.
- Outreach/education and ‘value added’ in public engagement and understanding.

If the ALSF has had one impact above all others, it is the range of successful collaborations with industry, particularly in the marine zone as regards seabed mapping through data sharing. The ALSF is largely responsible for the expansion of such collaboration, and continued investment would ensure the long-term sustainability of this relationship. Such support would foster greater levels of collaboration between the marine historic and natural environment sectors through the development of holistic data-collection, management, and mitigation strategies.

The ALSF has highlighted the broader socio-economic benefits of aggregates extraction, including the overlap between the various ALSF historic environment dissemination themes, and the marine historic and natural environment sectors and of industry/academic collaboration. What is now needed, in order to continue this process, are specific, targeted developments:

- Draft and finalised guidelines (with appropriate dissemination) to industry and the heritage sector alike on all aspects of structure, priorities, and future agendas of both sectors, highlighting shared interests. These should particularly focus on the understanding of the nature and scale of ‘risks’ to the historic environment posed by aggregates extraction, and on ways of minimizing these risks by exclusion zones, etc.
- Agreed protocols for reporting of all finds from the aggregates industry – including central government guidance and local government implementation, even where materials come from non- AMAAA 1979 and PPG 16 sites.
- The development of an accessible (online?) non-technical ALSF glossary – especially of sophisticated fieldwork tools, techniques, and methods, including the clarification of the broader relationships between landscapes and submerged ‘seascapes’ explained. Such dissemination should include undertaking the types of targeted training programmes discussed above.
- The expansion of the management relationship of the historic and natural environment at every level of central and local government, the private and university sectors. This should include an holistic environmental characterisation and resource protection agenda.
Additional pilot projects and strategic plans are now needed – the ALSF needs to be far more strategic, providing larger funds over longer terms, with solid management frameworks used to ensure the long-term sustainability of projects. The ALSF has now been shown to be of great use and benefit to industry and academia alike, as well as of interest to the general public. Additional investment should capitalise on this advantage by focusing in on specific projects that meet the combined needs of industry, planners and archaeologists. This should be tied into ongoing processes of legislative reform, particularly as regards the Heritage Protection (Draft) Bill, the Planning Bill and the Marine Bill. Such strategic investment could include:

- Enhanced provision of mitigation fighting funds to further offset the costs to industry in the circumstances of the discovery of nationally significant and unforeseeable archaeological discoveries. This could be usefully tied-in to the possible management structures of the Heritage Protection (Draft) Bill as regards Local Area Agreements (LAAs) and local authority historic asset management and industry links.
- Testing and refinement of methods developed in previous ALSF rounds for modelling fluvial systems in order to predict the archaeological resource; results also need to be compared with data derived from subsequent quarrying, to provide verification. This will require additional resources for contractors, since obtaining this level of data will exceed the reasonable requirements of any archaeological condition. The testing is best done in active quarrying areas, where exposures are far greater than limited test trenching/pitting undertaken for research purposes. In the marine zone this could include testing seabed invasive sampling strategies such as vibrocoring and grab sampling, as well as sampling strategies of prospection for archaeological sites.
5 BIBLIOGRAPHY


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## EXISTING WEB RESOURCES

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<td>Mapping the sub-surface drift geology of Greater London gravel extraction areas (Lea Valley)</td>
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<td>3325</td>
<td>Till-Tweed catchment aggregates and archaeology project</td>
<td><a href="http://www.ncl.ac.uk/till-tweed/">http://www.ncl.ac.uk/till-tweed/</a></td>
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<td>3357</td>
<td>Predictive modelling of multi-period geoarchaeological resources at a river confluence</td>
<td><a href="http://www.tvg.bham.ac.uk/Trent_Soar/Archive.html">http://www.tvg.bham.ac.uk/Trent_Soar/Archive.html</a></td>
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<td>3362</td>
<td>A Re-assessment of the archaeological potential of Continental Shelves</td>
<td><a href="http://www.arch.soton.ac.uk/Research/Aggregates/shelve-intro.htm">http://www.arch.soton.ac.uk/Research/Aggregates/shelve-intro.htm</a></td>
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<td>3364</td>
<td>High resolution sonar for the archaeological investigation of marine aggregate deposits</td>
<td>Project summary: <a href="http://www.english-heritage.org.uk/server/show/ConWebDoc.5230">http://www.english-heritage.org.uk/server/show/ConWebDoc.5230</a></td>
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<td>3365</td>
<td>Modelling exclusion zones for marine aggregate dredging</td>
<td><a href="http://www.soes.soton.ac.uk/research/groups/geophysics/aggregates/Index.htm">http://www.soes.soton.ac.uk/research/groups/geophysics/aggregates/Index.htm</a></td>
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<td>3379</td>
<td>Modelling the chronology of archaeological sites on aggregates</td>
<td>Project summary: <a href="http://www.english-heritage.org.uk/server/show/ConWebDoc.5099">http://www.english-heritage.org.uk/server/show/ConWebDoc.5099</a></td>
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3409 Characterising, modelling and managing the buried landscape in the Vale of Pickering

3495 The Lower and Middle Palaeolithic occupation of the Middle and Lower Trent catchment
Project summary: http://www.english-heritage.org.uk/server/show/ConWebDoc.8748;

3513 Radiocarbon dating of bone samples recovered from gravel sites

3594 Multi-beam sonar on wrecks
Project summary: http://www.english-heritage.org.uk/server/show/ConWebDoc.5531

3645 BMAPA Protocol for Reporting Finds of Archaeological Interest
http://www.wessexarch.co.uk/projects/marine/bmapa/dredging-hist-env.html
http://ads.ahds.ac.uk/catalogue/archive/bmapa_eh_2006/

3767 On the Importance of Shipwrecks
http://ads.ahds.ac.uk/catalogue/archive/shipwrecks_eh_2006/

3835 Evaluating aggregate in NW England: the effectiveness of geophysical survey

3854 Chronology of British Aggregates using Amino-acid racemization and degradation
Summary: http://www.york.ac.uk/depts/arch/Projects/Racemization.htm

3876 Seabed prehistory - gauging the effects of marine aggregate dredging
http://www.wessexarch.co.uk/projects/marine/alsf/seabed_prehistory/index.html

3897 Beneath the Soil from Trent to Nene: An assessment of the performance of geophysical survey in the East Midlands
http://ads.ahds.ac.uk/catalogue/archive/tvgga_eh_2007/

3916 Enhancing our Understanding; Identifying shipwrecks of historic importance lying within deposits of marine aggregate
http://ads.ahds.ac.uk/catalogue/archive/understanding_eh_2007/

3917 Enhancing our understanding: mapping navigational hazards as areas of maritime archaeological potential
http://ads.ahds.ac.uk/catalogue/archive/navigation_eh_2007/downloads.cfm

4613 3D Seismics for mitigation mapping of Southern North Sea

4632 Transition zone mapping for marine-terrestrial archaeological continuity
Not yet available on-line.

4728 England's Historic Seascapes: Solent and Isle of Wight
http://ads.ahds.ac.uk/catalogue/archive/ehssolent_eh_2007/
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<td>5083</td>
<td>Refining areas of maritime archaeological potential (AMAPs) for shipwrecks</td>
<td><a href="http://www.bournemouth.ac.uk/conservation/abouttheschool/ahe/amap1.html">http://www.bournemouth.ac.uk/conservation/abouttheschool/ahe/amap1.html</a></td>
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<td>5109</td>
<td>Planning for the Future</td>
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<td>5224</td>
<td>Development of a regional sediment mobility model for submerged archaeological sites</td>
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<td>5254</td>
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<td>5261</td>
<td>Airborne remote sensing of aggregate landscapes</td>
<td>Project design: <a href="http://www.tvg.bham.ac.uk/ATM/Circulation_5261_PD_03_2007_Airborne%20RS%20of%20Aggregate%20Landscapes.pdf">http://www.tvg.bham.ac.uk/ATM/Circulation_5261_PD_03_2007_Airborne%20RS%20of%20Aggregate%20Landscapes.pdf</a></td>
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<td>5274</td>
<td>Data interpretation of marine geophysics: seminar and guidance</td>
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<td>Potential of aggregates, palaeoenvironment and archaeology of Vale of Pickering</td>
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<td>OSL Guidelines</td>
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<td>5366</td>
<td>Whole-site first assessment toolkit for assessment of sand and gravel deposits</td>
<td>Project overview: <a href="http://www.nottingham.ac.uk/tpau/New_projects/FASTRAC/index.htm">http://www.nottingham.ac.uk/tpau/New_projects/FASTRAC/index.htm</a></td>
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<td>5382</td>
<td>Marine geophysics data acquisition and exclusion zone guidance</td>
<td>Not yet available on-line.</td>
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