ENGLISH HERITAGE SCIENCE STRATEGY: SUMMARY ACTION PLAN

This is a live document. It is updated every six months - this version April 2015

This section presents tabulated plans for the actions outlined in the English Heritage Science Strategy. Where appropriate, short term actions are listed first to show the priorities for action up till 2015. The first four tables list new proposed work under this Strategy. Table 5 then lists for reference Heritage Science activities already approved under the National Heritage Protection Plan. Table 6 identifies topics to be covered by English Heritage written guidance for the sector, and Table 7 lists the English Heritage contribution to specific methodological improvements in Heritage Science.

For each activity on the tables, the following information is given:

- National Heritage Protection Plan alphanumeric Activity / Protection Result reference or internal English Heritage 4-digit project reference number is given to assist cross-reference to detailed plans and documentation.
- A specific outcome of the work, with dates for delivery where available.
- The owner of the activity within English Heritage responsible for seeing that the outcome is achieved. This will in most cases be an NHPP Activity Lead, as described in the NHPP Activity Plan, or a named English Heritage department or team. The Science Network owns several actions. In these cases, resources will be contributed by individual departments and agreed for each Action through Network discussion as it is planned in detail. Note that much English Heritage science work is undertaken by external partners working on commission. In these cases only the English Heritage department or team responsible for the commissioned project is listed.

These tables will be reviewed and updated annually by the Science Network during 2013 - 2015 to report progress and note any changed or additional activities. All reports on progress should be sent to the Science Network convenor.

TABLE 1 TOPIC 1 - UNDERSTANDING MATERIALS AND ENVIRONMENTS

Topic 1 Actions	NHPP Activity / Supporting action	Measurable / output	Owner
Short term Actions			
Continue with and complete existing NHPP research to understand material decay (including modern materials), and environments (See Table 5 below for more details).	Mainly Measure 2, (i.e. 2A2, 2C1, 2C2, 2D1 and 2D5)	See Table 5 for details. NHPP coordinator and Science Network convenor to review yearly.	NHPP Activity Leads; NHPP programme manager; Science Network convenor
Continue and complete existing NHPP research that identifies heritage assets, and assesses their significance including the risks and threats they face (see Table 5 for details.	3A5	See Table 5 for details. NHPP coordinator and Science Network convenor to review yearly.	NHPP Activity Leads; NHPP programme manager; Science Network convenor
Prioritise further material decay / environment research relating to heritage assets to feed into the next plan period of the NHPP.		Completed proposals (i.e. preservation *in situ* strategy) for next planning period. In progress with new projects proposed	NHPP Activity Lead
Assess whether our existing recording and monitoring systems are able to collect data that can assist in understanding climate change impacts.	Measure 1	Identify what information HE collects to assess direct and indirect impacts on the historic environment. New projects proposed	Historic Environment Intelligence Team; English Heritage Climate Change Network
Identify and compile baseline information on marine attritional threats to assets to help formulate plans for next plan period.	2C2	Compilation by date of plan update. HEI report completed	2C2 Activity Lead; EH marine network
Medium term Actions			
Identify collections, artefacts and sites within the National Heritage Collection that could be used by internal and external researchers to research material decay / environment topics.	Possible new Measure 7 and 8 projects	Produce a list of material and sites where there are specific material decay issues which would benefit from scientific input. This is being taken forward as part of the New Model	Science Network; Estates Department
Identify new material decay / environment research topics for inclusion within future NHPP period.	2A2, 2C1, 2C2, and 2D1	New projects integrated into next plan (March 2015). New projects proposed	Science Network; NHPP Activity Leads

Identify projects for maintenance / resilience of designed landscapes for next plan period of NHPP.	2C2	New projects identified and integrated into next plan New projects proposed	2C2 NHPP Activity Lead; Gardens and Landscapes Team

TABLE 2 TOPIC 2 – RAISING AWARENESS OF EXISTING TECHNIQUES, IMPROVING METHODS, ACCESS TO INFORMATION AND ADVICE.

See also Tables 6 and 7 for expanded guidance and methodological research.

Topic 2 Actions	NHPP activity / Supporting action	Measurable / output	Owner
Short term Actions			
Work with English Heritage Guidance Group to continue to provide guidance on heritage science topics that is relevant, up-to-date, co-ordinated with other guidance for the sector, and delivered through the most appropriate formats for its audience. Review existing heritage science guidelines to ensure they are up to date and relevant.	Largely Supporting actions (See Table 6)	Guidelines produced according to timetable and budget Heritage science guidelines reviewed regularly and proposals developed for updates or addenda where necessary. Completed.	Guidelines Development officer Science Network
Work with EH Training Group to develop and provide training to raise awareness of new / existing heritage science techniques and guidelines.	Supporting action	Identify through Science Network key priorities through to 2015 for heritage science training. Completed	Science Network; Training Delivery manager
Ensure scientific input is available to staff in the Development Management, Historic Places and Heritage at Risk teams of National Planning and Conservation Department, to provide strategic input to casework and to contribute to removing Heritage at Risk assets from the register.	Contributes to 8A1	Agreed protocol for accessing science advice within English Heritage, for development and statutory casework and Heritage At Risk purposes covering level of available resource and timescale for accessing services. Completed	Senior Science Advisor; Conservation Teams; National Planning Department Principals National Heritage At Risk programme manager

Ensure scientific input is available to underpin the maintenance and conservation programme to the EH estate.	Contributes to 7A1	Agreed protocol for accessing science advice within English Heritage for Estates maintenance and conservation purposes, covering level of available resources and procedure for accessing services. Completed but affected by New Model. Now covered by the service agreement	Senior Science Advisor; Conservation Teams; National Collections Estates Director
Contribute to national and international initiatives for setting and agreeing scientific standards.	Largely Supporting actions	Identify and agree within the Science Network the Standards to which EH should contribute (i.e. CEN 346 – Heritage and Conservation; IntCal group - radiocarbon)	Science Network members and convenor
Continue existing research to improve current methods of identification and investigation of heritage assets. (See Table 7 further details).	Largely Supporting actions, see below Table 7	See Table 7.	See Table 7
Raise awareness of scientific techniques and methods and engage the historic environment sector with heritage science.	7A2, 8A5, Supporting action	Carry out promotional events each year as resources allow. Report on promotional activities. Produce Horizon Scanning and/or Threat/ Opportunity Assessment reports as appropriate.	Science Network,

Disseminate the results of recent heritage science research. a) Practical building conservation series; b) Dating historic window glass; c) Radiocarbon date lists; d) London Regional Review of scientific dating (not dendro).	Supporting action	Produce research reports /journal articles and case studies for the EH website. Specifically: a) 10 e books produced along with online guidance. b) Make published article on historic glass in 'Historic Environment Policy and Practice' available under Open Access. Completed c) Publication of 4 volumes (2011-15). *2 volumes produced and 2 at proof stage* d) Publication of review. In next plan period.	a) Conservation Teams (Buildings Conservation Research Team); b) Archaeological Conservation and Technology Team; c and d) Scientific Dating Team
Contribute to the implementation of EH strategy for improving information access, including development of best practice in digital data collection, ordering and archiving practice.	New projects, Supporting actions	a.) Presentation of Information Access Strategy to Science Network during 2013. Development of the strategy is planned for HE action plan 2015-18 b) Produce an audit of existing practice for archiving of digital X-rays to look at which conservators and specialists use digital X-rays and how these are archived by the receiving museums by March 2017.	a.) Capacity Building Team b)Archaeological Conservation and Technology Team
Ensure English Heritage Science results contribute to further development of appropriate research frameworks, e.g. at regional or local level, or to the development of other research tools.	Supporting action	Contribute to User requirements survey for HERALD (Project 6752). Ensure English Heritage Science Advisors are aware of and involved in reviews of Regional Research Frameworks relevant to their Locality. Responded to HERALD as appropriate	Science Network Capacity Building Team;
Medium term Actions			

Work with the EH Guidance Group to identify topics and appropriate formats for heritage science guidance for the next plan period for the NHPP.	Supporting action	Science Network and Guidance Group to identify existing projects that will generate material for new guidance. New projects proposed	Science Network convenor; Guidance Group convenor
Identify new internal projects to improve practice and methodologies that will form the basis of Supporting action projects within the next plan period for the NHPP.	Supporting action	Science Network through represented teams to identify new projects to feed into next NHPP plan period. New projects proposed	Science Network
Work with the internal EH Training Group to highlight future areas for training in heritage science topics.	Supporting action	Science Network (through represented teams) and training deliver group to identify priority areas for future training. New programme developed and awarded to Leicester University	Science Network; Training Delivery manager

TABLE 3 – TOPIC 3 CAPACITY, CAPABILITY AND PUBLIC BENEFIT

Topic 3 Actions	NHPP activity / Supporting action	Measurable / output	Owner
Short term Actions			
Ensure that our staff are aware of the full potential of scientific techniques and how they can access advice and scientific support.	Supporting action, Contributes to Measure 6	Report prepared for NPCD management approval on priority areas for future training of EH staff in science techniques. Completed as part of staff development strategy Create an internal science portal to signpost science research outputs, guidance and standards, and a directory of EH expertise and clarification of lead roles for given topics Science Network to agree precise mechanisms. Sharepoint developed and in active use	Capacity Building Team Science Network;
Enhance sector capacity and capability through participation in research studentship funding programmes and other types of post-graduate training and professional CPD.	Supporting action	Collated data on number / results of studentships and other CPD activities issued annually. Interactive spread sheet set up	Science Network
Support specialist professional groups such as the Association of the History of Glass, Historic Metallurgy Society, Medieval Pottery Research Group, Association for Environmental Archaeology, Professional Zooarchaeology Group.	Supporting action	Report for Science Network on activities and initiatives within professional specialist groups issued annually. This is being undertaken through the NHSF Newsletter	Science Network
Improve public displays and interpretations of our properties and archives with the results from new heritage science research.	Supporting action, 7A2	Considerable success (e.g. Stonehenge). Will need to continue to promote this as part of New Model.	Science Network

Improve the presentation of Heritage Science on our websites to increase public awareness and appreciation.	Supporting action	New case studies are added each year, and existing case studies reviewed and removed if appropriate. All EH scientific reports accessible on our external website. Pages set up. New pages published on the new websites Model.	Science Network
Medium term Actions			
With the National Heritage Science Forum, consider ways of enhancing the role that heritage science can play in the teaching of science within secondary and tertiary education (i.e. through the use of case studies based on our work and the work of those that we fund).	Supporting action	Discuss options for progress in this area with National Heritage Science Forum Discussions held. Project proposed as part of the Historic England Action Plan.	Science Network convenor.

TABLE 4 OVERARCHING ACTIVITIES

Overarching Actions	NHPP activity / Supporting action/ Corporate Target (CT)	Measurable / output	Owner
Short term Actions			
Develop a science network within English Heritage to bring together EH Heritage scientists to discuss existing and future work and how this contributes to NHSS / NHPP priorities.	Supporting action, CT01	Science network set up and terms of reference produced and agreed by February 2013. Inaugural meeting held 6/02/2013 and every 6 months thereafter	Head of Strategic Planning and Management Division
Join and contribute to the National Heritage Science Forum (NHSF).	Supporting action; CT05	English Heritage membership of NHSF by Spring 2013. Regular attendance at forum meetings. English Heritage contributions to forum objectives recognised in NHSF minutes and reports. Convenor is a Trustee of the NHSF and regularly attends meetings and. is convenor of the working group on sharing equipment and skills	Science Network convenor
Contribute to an overall English Heritage response to the government supported Finch Report (July 2012) on open access academic publication routes, covering specialist EH staff scientific work and that funded by EH.	Supporting action, CT07, CT08	Science Network to produce discussion paper (threat/opportunity assessment) for consideration by end 2013 –this was delayed whilst awaiting information from DCMS. It will be taken forward under the s part of the research resource strategy.	Capacity Building Team

Raise awareness of our EH heritage science analytical facilities and services that could be shared, or performed for other internal departments.	Supporting action, CT07, CT08, CT14	Produce a list of existing equipment (laboratory / portable), and possible analytical services by July 2013. Kit list is available and on the Sharepoint. Kit promoted externally through NHSF kit catalogue Propose and investigate a memorandum of understanding for shared use of English Heritage equipment 1) internally and 2) with other NHSF members–in progress	Science Network
Increase access to English Heritage reference collections and promote their use by external researchers.	Supporting action, CT07, CT08	Make existing catalogues available on-line (ideally as searchable databases) by February 2014. Information on the main collections are available on our websites Further work is underway	Environmental Studies Team
Improve staff online access to key heritage science academic journals to enhance knowledge transfer, i.e. staff training and development.	Supporting action, CT14	Agreed priority subscription list by October 2013. Produce a business case with costs / discussion paper for online access to all priority journals by December 2013. A survey of use of Scientific journals was undertaken in conjunction with the library. Online subscriptions have been obtained for the more heavily used journals and other cancelled where use was limited. A subscription to Web of Science is being obtained following IT transformation.	Science Network

TABLE 5 – TOPIC 1 CURRENT AND PROPOSED WORK ALREADY PRIORITISED IN THE NATIONAL HERITAGE PROTECTION PLAN

Existing 'Understanding materials and environments' projects	NHPP activity	Progress / output	Owner
Thermal performance of traditional building elements.	2A2	Ongoing; to date research has focussed on windows (timber and metal) and solid brick walls with testing both in situ and in the laboratory.	NHPP Activity Lead
Whole-house thermal performance and impacts of interventions.	2A2	A programme of in-situ testing and monitoring was carried out in 2011-12 to understand the actual performance of a brick terraced house before and after energy-saving improvements were made. A report on the thermal performance of the house has been peer reviewed and will be published in 2015.	NHPP Activity Lead
Hygrothermal behaviour of traditional building and traditional building elements.	2A2	On-going project to understand the factors that affect behaviour of building fabric in response to heat and moisture in connection with measures to improve energy efficiency to better assess technical risks.	NHPP Activity Lead
Technical risks of insulation	2A2	Monitoring is on-going on existing test sites and an interim report looking at the practical problems of installation, the relative cost of the different insulation types as well as their effectiveness/performance will be published in 2013. Additional case study sites to understand the technical risk associated with insulating older buildings are being sought.	NHPP Activity Lead
Measuring moisture in walls - evaluation of timber dowel method.	2C2	Investigation of factors affecting accuracy and interpretation of moisture measurements in timber.	NHPP Activity Lead
Assessment of moisture content in Victorian lime and mortar	2C2	Plotting the distribution of moisture in bricks and mortar in a sample area of walling to assess the error magnitude in spot measurements	NHPP Activity Lead
Laboratory work to investigate moisture transport in walls	2C2	Lab work to understand the technical risks associated with insulating older buildings by assessing the condensation risk at the interface of the insulation and the fabric and moisture accumulation within the masonry.	NHPP Activity Lead
Lab-based inter-comparisons of methods to monitor moisture in masonry materials	2C2	Inter-comparison of moisture measurement/monitoring methods in porous materials. Assessing the accuracy, practicability and consistency of measurements obtained using a range of techniques/devices to understand their potential and limitations.	NHPP Activity Lead

Ditherington Flax Mill - Hygrothermal performance study of solid brick walls before and after installation of IWI	2C2	Site-based monitoring to examine the heat and moisture behaviour of insulated and un-insulated brickwork in response to internal and external and external environmental loads, including wind driven rain.	NHPP Activity Lead
WUFI modelling: evaluation of modelled hygrothermal behaviour	2C2	Comparison of heat and moisture behaviour in brick walls predicted by numerical modelling and measured on-site data. Investigation of factors affecting accuracy of modelling and assessment of input data sensitivity. Development of protocols for modelling traditional buildings.	NHPP Activity Lead
Hygrothermal performance of roof voids	2C2	Site-based monitoring of eight roof voids to examine the effects of ventilation and insulation on the behaviour heat and moisture.	NHPP Activity Lead
Hygrothermal performance of underfloor voids	2C2	Site-based monitoring of six sub-floor voids to examine the effects of ventilation and insulation on the behaviour heat and moisture.	NHPP Activity Lead
Assessing models of wetland resilience and vulnerability to climate change.	2C1	Project completed and an online toolkit published. Follow-on stage proposed to scope project for using the toolkit to run risk assessments for significant wetland heritage sites by 2015.	NHPP Activity Lead
Ivy on walls, phase II.	2C2	Project to complete FY 2015/16. Output – publication / report	Gardens and Landscape Team
Developing protection for exposed (ruined) walls: Soft wall capping.	2C2	Research has tested benefits of using soft capping to reduce decay to wall-tops and faces caused by harmful effects of weathering and exposure. Also aims to reduce amount of intrusive repairs and maintenance. Testing completed and site monitoring ends in autumn 2015. Results indicate effectiveness of soft capping. Research results and Technical Advice Note being drafted for publication in 2015.	Conservation Teams (BCRT)
Addressing limestone decay: evaluation of nanolime.	2C2	Analysis of nanolime as an appropriate consolidant for historic buildings. Consideration of dose methods and degree of penetration, as well as efficacy of approach. Outcomes will allow staff to respond to requests for use of nanolime as stone consolidant.	Conservation Teams (BCRT)
Stone Deterioration	2C2	Joint research with the Getty Conservation Institute to understand the decay mechanisms found with Magnesian limestone and methods to repair and identify suitable replacement stone. Testing has been completed and research is currently being written up.	Conservation Teams (BCRT)

Protective Glazing: An evaluation of secondary glazing systems for the protection of stained glass windows and the improvement of energy efficiency in historic buildings.	2C2	This research has shown that properly designed protective glazing not only prevents physical damage to important historic glazing, it radically improves its longevity by eliminating harmful condensation. A secondary benefit has been an improvement to the energy saving in the rest of the building. A final phase of research due to finish in autumn 2015 is testing different designs to ensure the same benefits accrue.	Conservation Teams (BCRT)
SEAHA - Damp Towers 2 - Reducing the amount of driving rain through solid masonry structures	2C2	Following on from 20 years of research on damp towers this project will investigate how specific mortar mixes and methods of mortar placement can be employed to reduce water ingress. Outcomes will include better advice in the future for re-pointing to reduce the impact of wind driven rain on historic buildings, particularly towers.	Conservation Teams (BCRT)
Performance of Natural Hydraulic Lime Mortars	2C2	Scientific examination of natural hydraulic lime mortars (used in historic building conservation) to provide a greater foundation of knowledge about the specific factors affecting their performance. This will allow new products to be evaluated based on (chemical) composition and data sheets, rather than having to be individually tested.	Conservation Teams (BCRT)
Paint research	2C2	Research conducted with the Paint Research Association to look at the performance of a range of commercial paints in order to assess their suitability for use on historic fabric. Due to be completed by 2016.	Conservation Teams (BCRT)
Monitoring tiled pavements	2C2	Assessing the change of micro-climates and its effects on weathering of important medieval tiles at Cleeve Abbey. Research has been completed and monitoring will be completed in 2015. Further monitoring likely once proposed permanent shelter built.	Conservation Teams (BCRT)
Degradation of archaeological remains: research and preservation *in situ* guidance.	2C2	Guidance being written (see Table 6). Completion 2015	Senior Science Advisor
Assessing impacts on and capacity for (re)burial of sandstone architecture.	2C2	External work commissioned, test site set up and monitoring on-going. Output – technical report. Completion date 2018/19.	Collections Conservation
Assessing impacts on and capacity for (re)burial of archaeological timber artefacts.	2C2	Research ongoing. Completion 2015/16. Output – research report.	Archaeological Conservation and Technology Team
Effects of bracken rhizomes and their control on archaeological sites.	2C2	Internal review of existing information is completed. Produce project proposal for guidance leaflet by July 2015.	Environmental Studies Team

Assessing impacts of climate on exposed prehistoric rock art.	2C2	CASE studentship. Research ongoing. Output - PhD.	NHPP Activity Lead
Assessing trends and priorities of insect attacks on interiors and collections.	2C2	Project completed	NHPP Activity Lead
MEMORI: Detection of chemical degradation of historic collections/ interiors.	2C2	Consortium project partnered by English Heritage. Grant funded through EC 7th Framework. Project completed. Outputs include development of new tools, web site, several journal articles and reports.	Collections Conservation Team
MEMORI 2		Continuation project of above, to commercialise prototype air quality testing product. EHT joint project with NILU. Funded by Norwegian government.	Collections Conservation Team
Change or Damage? Assessing damage from climatic changes to interiors and furniture.	2C2	Collaborative project completed. 4 journal articles published.	Collections Conservation Team
Heritage Smells: Developing non-invasive condition surveying tools for historic collections: VOC.	2C2	Collaborative project completed. Output - 2PhDsSurveying tool developed and details published.	Collections Conservation Team
Developing non-invasive condition surveying tools for historic collections: OCT.	2C2	Collaborative project completed. Output – new tool developed and details published.	Collections Conservation Team
Responding to corrosion of historic iron.	2C2	Collaborative project completed. Output – conference held successfully by September 2013.	Collections Conservation Team
"Collections Demography" on dynamic evolution of populations of objects.	2C2	Collaborative project completed. Outputs include PhD and book.	Collections Conservation Team
Improved winter marble sculpture covers		AHRC Collaborative doctoral project – PHD. Year completed. UCL+EHT. Trials ongoing at Brodsworth.	Collections Conservation Team
Improved mould treatment and prediction		Joint PhD with EHT and National Trust – at Birkbeck. Now into second year. Has produced first mould populations survey of heritage environments in the UK.	Collections Conservation Team

Improved conservation of arch copper alloy and bone		Clothworker's funded conservation fellowship. 1 year. EHT internal. Started Jan 15.	Collections Conservation Team
Assessing the impact of LED lighting on pigments and paper in collections		Commissions funded project, collaborative with UCL and EHT. Started 2015.	Collections Conservation Team
Comparison of Painting Lining Methods for Historic House Environments		SEAHA PhD with UCL. Starting Oct 15.	Collections Conservation Team
Strategic stone study.	2D5	35 English counties have been completed so far and the data loaded onto the BGS website. . West Sussex is due to be completed by June 2015 (to provide information for the Local Authority's Mineral Plan) and East Sussex in January Options are being explored to complete the remaining 7 counties and improve awareness of the data and website.	Conservation Teams (BCRT)
Thatch supply research.	2D5	This pilot scheme focussed on East of England long straw thatching is on track. The planting trials of five wheat varieties commenced on site in autumn 2012 to monitor and evaluate the growing, husbandry and harvesting of the cereal crops, including the use of different fertilisers.. Experimental roofs have been thatched but their erection is awaiting final agreement on their permanent location. The longevity and performance of each roof will then be monitored. End date – min of 5 years	Conservation Teams (BCRT)
Design of industrial freezing plant for artificial frosting of Collyweston log.	2D5	The artificial freezing trials carried out at Apethorpe Hall have now been completed. A method of preparing the stone and a freezing and thawing regime has successfully split it down, enabling the on-site roofing contractors to make Collyweston slates. These have been used to re-roof outbuildings at Apethorpe where their performance is being monitored. The contractor who conducted the trials has taken on the lease of the freezer and has made new slates and used them to re-roof buildings. Once the monitoring has been completed, a guidance note is to be prepared describing the successful method, which it is hoped will induce others to produce new slates	Conservation Teams (BCRT)

Behaviour of traditional building elements in fires.	2C1	Fire resistance of traditional timber doors: Investigating nature of fire development in rooms typical of larger historic houses in museum use, and the impact on panelled doors. Testing has been completed and a report and guidance will be issued in early 2015 Fires in thatch roofs – investigating modes of ignition associated with chimneys and wood burning stoves.	Conservation Teams (BCRT)
Happisburgh Palaeolithic Landscape	3A3	Investigating the stratigraphic relationships and correlation between on-shore and off-shore Pleistocene sediments at Happisburgh, Norfolk, through an innovative combination of off-shore survey (diving and ROV), geophysics and coring on the foreshore and cliffs.	NHPP Activity Lead
Stour Basin Palaeolithic Project	3A3	Mapping Pleistocene deposits and developing a predictive model for assessing Palaeolithic potential in an area of Kent under high development pressure, including testing the use of Ground Penetrating Radar to investigate sub-surface deposits in areas of varying geology.	NHPP Activity Lead
Investigations of the Brooksby Sands and Gravels	3A3	Exploring an early Middle Pleistocene channel of the Bytham River using the emerging technique of 3D Electrical Resistivity Tomography (ERT) survey to map sediment bodies, with follow-up borehole sampling and trial trenching to ground-truth and enhance the geophysical survey.	NHPP Activity Lead
Identifying top priority wetland sites.	3A5	Statements of significance for each site are being produced. These will be published online in 2015	Environmental Studies Team
Small wetlands; their definition, potentials and threats.	3A5	Research report is being edited following comment.	Environmental Studies Team
The Mesolithic of the Wetland/Dryland Edge	4G1	Two projects using a combination of archaeological, palaeoenvironmental and modelling techniques to assess the distribution and significance of Mesolithic deposits in the vulnerable wetland landscapes of the Kennet Valley and the Somerset Levels, and assist in managing the early Holocene resource.	NHPP Activity Lead
Ultrasonic thickness testing: new ways to manage marine heritage	6B1	Technique being tested as part of other projects	NHPP Activity Lead

TABLE 6 – ENGLISH HERITAGE SCIENCE-BASED GUIDANCE

Heritage science guidance in production / development for this plan period	NHPP activity / Supporting action	Current stage / Completion date	Owner / approach
Amino acid racemisation.	Supporting action	Planning / 2015/16	Scientific Dating Team / external authorship
Animal bones and archaeology.	Supporting action	Published October 2014	Environmental Studies Team / internal and external authorship
Archaeological science and project planning.	2E2	*Cancelled*. Due to changes in the planning process this was thought unnecessary.	Capacity Building Team / internal authorship
Dating techniques for Pleistocene sites.	Supporting action	Proposal stage 2014/15	Scientific Dating Team / external authorship
Destructive sampling of human skeletal remains.	Supporting action	Published February 2013 and updated Re-issued March 2105	Environmental Studies Team / internal authorship
Fieldwork and science for historic parks and gardens.	Supporting action	The need for and scope of this guidance is being discussed as part of the Heritage 2020 HE Action Plan	Investigation and Analysis Division / internal authorship
Guidance on the study of ceramic production sites.	Supporting action	Responding to comments from external consultation	Archaeological Conservation and Technology Team / internal authorship
Guide to good practice in data archiving for underwater and remote survey methods in archaeology.			Capacity Building Team / external authorship
Marine geophysics data acquisition, processing and interpretation guidance.	Supporting action	Published May 2013	NHPCT / external authorship
Multi-light imaging techniques for heritage applications.	Supporting action	Published March 2013	Geospatial Imaging Team/ internal authorship
Preservation *in situ*, condition assessment and monitoring.	2C2	Out for consultation in April 2015. Publication 2015	Capacity Building Team / internal and external authorship
Radiocarbon dating.	Supporting action	Consultation held. Publication in 2015	Scientific Dating Team / internal authorship

Heritage science guidance in production / development for this plan period	NHPP activity / Supporting action	Current stage / Completion date	Owner / approach
Residues analysis guidelines and research framework	Supporting action	Authoring. Publication 2015/16	Capacity Building Team / external authorship
Update “Where on Earth are We?”	Supporting action	Final editing	Imaging and Visualisation Team/ internal authorship
Update archaeometallurgy guidelines.	Supporting action	Publication in April 2015	Archaeological Conservation and Technology Team/ internal authorship
Update existing dendrochronology.	Supporting action	Authoring. Consultation planned for April 2015	Scientific Dating Team / internal authorship
Update “The Light Fantastic”.	Supporting action	Planning / 2015/16	Remote Sensing Team/ internal authorship
Treatment of human remains from wreck sites.	Supporting Action	Consultation complete. Now with the Ministry of Justice for review	Designation Department

TABLE 7 ENGLISH HERITAGE CONTRIBUTION TO METHODOLOGICAL IMPROVEMENT

Ongoing and proposed methodological improvement projects (current plan period for NHPP)	Existing project code where known	Measurable	Owner
Building Information Modelling (BIM).	n/a	A BIM Special Interest Group has been established and a sharepiont set up to share experience and ideas	Remote Sensing Team
Faunal remains recovery processing and recording.	4888	Analysis of existing data. Project completion is dependent on the production of suitable datasets from commissioned and internal projects. Publication planned for March 2016	Environmental Studies Team
Enhancing dendrochronological dating a) softwood project; Conifer Dendrochronology, Baltic b) dating of oak timbers in regionally difficult areas c) Bayesian analysis of dendro dates.	 2468 5104 (Wilts) 5116 (Devon II) 5525	 a) Produce Synthetic conifer paper by March 2016. b) Wilts: 6 Research Reports due to be issued in April 2015. A review article has been published. Devon II; Produce Research report by December 2015 c) PhD research complete. Practical Bayesian Dendrochronology by Emma Marie Jones http://ethos.bl.uk/OrderDetails.do?did=1&uin=uk.bl.ethos.577405	Scientific Dating Team
Regional environmental reviews.	6125, 6477, 5867, 6145, 4605, 4608, 6671	The southern mollusc review (4608) is published (Research Report 52/2011: http://research.english-heritage.org.uk/report/?15004) and both the Southern Review of vertebrate remains for the Mesolithic period (6477) and for Saxon to the post-medieval period (6145) should be completed by end April 2015. Both the Midlands Vertebrate review (4605) and the midlands preview of plant macroscopic remains (5867) are being edited following referees comments. The southern review of plant macroscopic remains is in progress (publication 2016). The southern review of vertebrate remains for the Roman period will be published in 2017.	Environmental Studies Team Capacity Building Team

Ongoing and proposed methodological improvement projects (current plan period for NHPP)	Existing project code where known	Measurable	Owner
Improve Age at death analysis of adult human remains.	6841	Collaborative PhD proposal put forward as part of AHRC CDP award bid. The project was awarded to Southampton University. PhD will start in October 2015	Environmental Studies Team
Evaluation of factors affecting geophysics in different regions, soil conditions, depths and waterlogging.	6302, 6303, 6304, 6624, 6633 , 6637	Wetland and prehistoric archaeology has been investigated in collaborative projects with external partners using ERT sections and GPR profiling in two Mesolithic wetland/dryland edge projects, 6624 in the Somerset Levels and 6633 in the Kennet Valley. A further collaboration, 6637, tested similar methodologies in the Stour Basin in Kent. Surveys in the Vale of Pewsey for the Marden Environs project, 6302, investigated geophysical response in the interface zone between Chalk uplands and the Upper Greensand while further to the west surveys for NAIS project 6303 investigated the variable non-chalk geologies of lowland West Wiltshire. A further project, 6304 NAIS Lakes and Dales, looking at sites in and around the Lune valley demonstrated that geophysical survey can be successful over what have often been considered unpromising upland Carboniferous and Devonian geologies	Remote Sensing Team
Use of portable analytical equipment for on site geochemical analysis.	n/a	The methodology was developed through the completion of three geochemical surveys (Rendlesham, St Algar's Farm and Tankerville). These has been published as research reports: Rendlesham: http://research.english-heritage.org.uk/report/?15104 St Algar's Farm: http://research.english-heritage.org.uk/report/?15158 Tankerville: http://research.english-heritage.org.uk/report/?15274	Archaeological Conservation and Technology Team
Validate the accuracy of radiocarbon wiggle-matching of undated tree-ring sequences in the Medieval period.	Proposed new project	Publication of pilot study in 2016	Scientific Dating Team
Impact of diet (determined through isotope data) on radiocarbon dating of human bone.	5117	Publication of research 2017	Scientific Dating Team
Improve discrimination of ruminant milk source in pottery (cow, sheep, goat)	Proposed new project	Produce proposal for future round of CASE studentships. Any proposals will await the production of the Guidelines and Research Agenda for organic residue analysis (Project 6745)	Science Advisors

Ongoing and proposed methodological improvement projects (current plan period for NHPP)	Existing project code where known	Measurable	Owner
Earthworm calcite dating of buried soils. Rapid assessment project.	4892	Article accepted for publication in Quaternary Geochronology	Environmental Studies Team
Osteological analysis of Romano-British infants from Yewden villa, Hambleden, Buckinghamshire to establish feasibility of using archived collections.	5798	Project is complete. 3 publications produced	Environmental Studies Team
Medieval Wool (Sheep) Project to investigate variation in sheep skeletons with an emphasis on the detection of castrates and the effect of different breeding and nutritional regimes.	5170	Complete analysis of ewe data by end of 2015 and encourage use of research by external researchers. 2 presentations given in 2014. One paper has been submitted to Journal of Archaeological Science and another 3 papers are in preparation	Environmental Studies Team
New uses for Lidar survey data.	3A4	A research report will be published in March 2015	Remote Sensing
Evaluation of new technologies: structure from motion.	1571	Case study Research Report due March 2015.	Imaging and Visualisation Team
Evaluation of new technologies: terrestrial laser scanning	7A2, 6689	Case study Report on Harmondsworth Barn is being written.	Remote Sensing Team
Chronological synthesis of dated Neolithic pollen sequences from England.	6276	ERC-funded project for completion May 2016	Scientific Dating Team
Project to develop the dendrochronology of non-oak hardwood species (e.g. elm and ash).	Proposal	Develop Project Proposal by March 2015	Scientific Dating Team
Research into treatment of waterlogged leather.	Supporting action, 5670	Project completed and Research Report published	Conservation and Technology Team
Conservation of composite objects from marine environments: the chain pump from The *Northumberland.*	5941	Assessment completed Conservation programme for the pump developed and in place	Conservation and Technology Team

ANNEXES

Annex 1 set out the National Heritage Protection Plan (NHPP) Measures or groups of activities with a common aim, and Supporting actions.

Annex 2 summarises the three reports from the National Heritage Science Strategy (NHSS).

Annex 3 lists the National Heritage Science Strategy (NHSS) aims and priorities.

Annex 1 – National Heritage Protection Plan (NHPP) measures and Supporting actions

Measure 1: Foresight.
Foresight is essential to a plan focused on establishing threats and developing responses.

Measure 2: Threat: Assessment and Response
This group of activities is aimed at 'winnable battles' to counter, offset or mitigate the loss of our most important heritage.

Measure 3: Understanding: Recognition/ Identification of the Resource
Rapid survey of areas of the country where even basic identification of what heritage we have is poor and where there is a real risk of losing nationally significant landscapes and assets before we even know what is at risk.

Measure 4: Understanding: Assessment of Character and Significance
This measure focuses on a range of themes and places which are insufficiently understood, threatened by change, and of potentially high significance.

Measure 5: Responses: Protecting Significance
The development of formal protection systems, such as Designation, and the development and expansion of Historic Environment Records.

Measure 6: Managing Change
This measure sets out the participation (often statutory) by English Heritage and other organisations in the planning process, giving pre-application advice and providing timely, constructive advice on managing major change to the historic environment.

Measure 7: Responses: Protecting and Managing Major Historic Estates
This measure focuses on protectingprotecting and managing change to the national collection of historic sites, properties and archives in our care and working with others who manage major historic estates

Measure 8: Responses: Grant-aid for Protection
The provision of grant-aid and advice to owners and managers of heritage assets; also the funding of emergency investigation to offset the imminent and unavoidable loss of nationally significant assets.

Supporting actions

Capacity building: Training and skills development; standards and guidance development; research frameworks and resources; methodological and technical development and knowledge transfer (e.g. conferences, workshops, seminars).

Information Management: Developing better sectoral information systems and new online resources.

Community engagement in protection: Community participation in heritage protection; toolkits for use by local communities; celebrating excellence in protection (awards and recognition).

Socio-economic research: Developing sector intelligence research; research on perceptions and values of heritage; research on economic values.

For more information about the NHPP, see **www.english-heritage.org.uk/nhpp**

ANNEX 2 – NATIONAL HERITAGE SCIENCE STRATEGY (NHSS) SUMMARY OF THREE REPORTS

The three reports and vision and strategy document produced for the NHSS are available online at **http://www.heritagesciencestrategy.org.uk/**

REPORT 1	THE ROLE OF SCIENCE IN THE MANAGEMENT OF THE UK'S HERITAGE
Summary	Defines heritage sub-sectors used in reports; identifies typical materials and contexts within which they are found; summarises principal decay mechanisms, their monitoring and management. Three themes address gaps in knowledge and practice.
Themes	1 – Understanding material behaviour *Better knowledge of decay rates and mechanisms, particularly for modern materials*
	2 – Understanding environments *Adapting to and managing environments*
	3 – Improving practice *Improved assessment and monitoring tools i.e. Non Destructive Testing(NDT); past, present and future conservation techniques; access to equipment and information*
Conclusions	Currently there is a reasonable understanding of how to manage decay, but a lack of detailed information on rates of deterioration and thresholds at which damage occurs.
REPORT 2	THE USE OF SCIENCE TO ENHANCE OUR UNDERSTANDING OF THE PAST
Summary	Reviews main drivers for, and types of scientific investigation of cultural heritage. For each sub-sector considers the frequency of use of techniques and areas for improvement. Contains sub-sector specific recommendations which are summarised into three themes covering areas of commonality.
Themes	4 – Development of tools and access to equipment *Improvements to tools; sharing of purchase and use*
	5 – Raising awareness of existing techniques and their application *Guidance and advice*
	6 – Data use and management *Widening access to information; digital storage and sharing*
Conclusions	Investigation should be driven by focused research questions not just the presence of available equipment; results do and should further public understanding and engagement with cultural heritage; there is a disparity in the quantity of output both between and within the heritage sub-sectors.
REPORT 3	UNDERSTANDING CAPACITY IN THE HERITAGE SCIENCE SECTOR
Summary	Overview of who heritage scientists are, number of people, where they work across the heritage sub-sectors, and looks at areas where there is lack of people to provide for current needs. Considers training routes into heritage science and current funding.
Themes	7 – Addressing practitioner capacity and capability *More varied career structure and long-term job opportunities*
	8 – Accessing information and infrastructure *Transfer of knowledge to practice; coordination of guidance / standards; information sharing*
	9 – Funding and its public benefit *Disparities in funding; prioritisation of funding, links with industry; public benefit and value of funding heritage science; better engagement with social and economic*

	sciences
Conclusions	Current economic pressures may impact future aspirations and therefore there is a need to consider how to re-focus budgets; sector as a whole needs to improve recording of how money is spend and get better at demonstrating and measuring the benefits that it provides.

ANNEX 3 – NATIONAL HERITAGE SCIENCE STRATEGY (NHSS) STRATEGIC AIMS AND PRIORITIES

Strategic Aim 1	Demonstrate the public benefit of heritage science and increase public engagement and support for it
Supporting strategic objectives	**Increase public benefit** - Develop better ways to understand, demonstrate and measure the economic and social benefit of our heritage and of heritage science
	Develop policy - Ensure heritage science is included within policy development, in areas such as sustainability, environmental and climate change, through research and understanding of how these issues relate to the management and enjoyment of cultural heritage.
	Public engagement and support - Promote and develop activities to improve public access, enjoyment, understanding and support for heritage science, for example through exhibitions, public access to sites and laboratories, and presentations and publications aimed at a wider audience.
Strategic Aim 2	Improve partnership within the sector and with others by increasing collaboration to help practice make better use of research, knowledge and innovation and to enhance resources, funding and skills
Supporting strategic objectives	**Improving understanding** - Develop and apply new and better investigative methods for understanding cultural heritage.
	Improving preservation - Improve conservation practice through the application of heritage science, taking account of society's views by identifying sustainable measures, such as low energy methods of environmental control.
	Using resources better - Ensure that better value is achieved from existing funding, scientific equipment and facilities through partnerships and collaboration,
	Building future capacity - Promote the use of heritage science in schools, to help develop the understanding of cultural heritage and inspire future interest in heritage science as a career.
	Strengthening links with other sectors - Strengthen relations with other sectors such as universities and industry and support promotional activity in the humanities and sciences at local, national and international levels.