

Issue Date: June 2010	UNCLASSIFIED DIRECTORATE MAJOR PROJECT	Issue No: FINAL 2
18. Residual Impacts and Conclusions	Hydrus Defence Exempt Environmental Appraisal Volume I	Reference: MER-110-009292

18. RESIDUAL IMPACTS AND CONCLUSIONS

18.1 Introduction

This chapter of the Environmental Appraisal (DEEA) assesses the residual impacts of the Proposed Development. Residual impacts are defined as those impacts that remain following the implementation of the mitigation measures. Mitigation measures relate to both the construction and operational phases of the Proposed Development and are discussed in full in the relevant Technical Chapters. In addition, each Technical Chapter also contains detailed consideration of both positive and negative residual impacts arising. The significance criteria applied to these impacts is outlined in *Chapter 2: DEEA Methodology* and within the individual technical chapters of this DEEA.

18.2 Background

The DEEA for the Proposed Development has been undertaken in parallel with the design process. Hence, a number of measures have already been undertaken to eliminate adverse environmental and social impacts. These include, for example, appropriate height and massing to provide overall scale appropriate to the site's location, and development of the Sustainable Drainage System (SuDS) proposals to reduce surface water run-off from the site.

With respect to the construction process, a Contractor will be appointed to develop a Construction Environmental Management Plan (CEMP), which will be developed in accordance with AWE's Code of Construction Practice (CoCP) (Ref. 18-1). This will incorporate all of the commitments within the DEEA to include:

- All commitments for environmental protection, restricted operations, site access, housekeeping procedures and good neighbour relations;
- Provisions for affected parties to register complaints and procedures for responding to complaints;
- Details of operations likely to result in disturbance, with an indication of the expected duration of each phase to key dates; and
- Provisions for reporting on environmental performance.

The CEMP will address all relevant environmental issues including: noise and vibration, waste management, air emissions, protection of archaeological resources, hours of working and amenity.

18.3 Residual Impacts

The DEEA process has involved the identification of residual impacts as part of each of the technical assessments provided in Chapters 7-15 of this DEEA. A summary of residual impacts identified is provided in Table 18-1.

18.4 Conclusions

The Proposed Development is for a replacement hydrodynamics research facility along with supporting facilities at AWE Aldermaston. The facility will deliver a key

capability required to underwrite the safety and reliability of the UK's sole nuclear deterrent. The Proposed Development consists of the following main elements:

- The permanent facilities provided as part of the Proposed Development include: the Operations Building with a Lightning Protection System (LPS) comprising eight catenary towers and associated suspended catenary cables; the Support Building; an Electrical Substation; a Sustainable Drainage System (SuDS); landscape scheme; a circulatory access route around the Operations Building and an operational vehicle waiting area. A full description and drawings of the proposals are provided in *Chapter 5: The Proposed Development* of this DEEA. Supplementary information is presented in the Hydrus Design and Access Statement, together with drawings that accompany the planning application.
- The temporary construction enclaves that will be implemented in order to isolate construction activities from the AWE Aldermaston Site. Further details of the construction enclaves, can be found in *Chapter 6: Construction Phase* of this DEEA.
- Landscape and biodiversity proposals including; grassed mounds with hedgerow planting wrapping around the Operations Building. Groups of semi-mature trees and woodland blocks will also be placed around the Hydrus Development Site. Overall there will be a substantial increase in tree cover across the Hydrus Development Site. Further details can be found within *Chapter 13: Landscape and Visual* of this DEEA.

As part of the Government Estate, AWE has a commitment to adopt the principles of sustainability in all new developments. Sustainability is a core part of the Aldermaston and Burghfield Site Development Context Plan (SDCP08) (Ref.18-2), as detailed in the strategies prepared to support the delivery of the SDCP08.

All the elements of the Proposed Development described above, have been designed with respect to policy, meeting strategic and local requirements, and in implementing part of the Regional Strategy. The proposals comply with policy at National, Regional and Local level and meet their overriding objectives of serving the employment and other needs of the locality, whilst fulfilling the principles of sustainability.

The construction phase will lead to a number of short-term minor adverse residual impacts. Long-term operation of the Proposed Development will generally have a negligible impact upon the majority of environmental receptors, with a range of positive impacts including benefits in terms of socio-economics, and ecology.

The overall conclusion of the DEEA is that the Proposed Development will be a positive step towards meeting a number of the strategic objectives of regional and local policy whilst also delivering a key defence capability for the UK Government. The Proposed Development will help secure the long-term viability of AWE Aldermaston for the local area and will provide a number of employment opportunities during the construction phase, and will safeguard existing employment during the operational phase.

18.5 References

- Ref. 18-1 Atomic Weapons Establishment (AWE) (2006) Code of Construction Practice. AWE plc. Aldermaston.
- Ref. 18-2 Atomic Weapons Establishment (AWE) (2008) AWE Aldermaston & Burghfield: Site Development Context Plan 2005-2015. AWE plc. Aldermaston.

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Table 18-1: Summary of Residual Impacts

Potential Impact/Known Receptors	Nature of Impact (prior to mitigation)	Mitigation	Scale	Significance of Residual Impact After Mitigation
GROUND CONDITIONS				
Construction Phase				
Mobilisation of existing soil contamination (chemical or radiological) during construction activities impacting on construction workers by ingestion, inhalation or dermal contact.	Negligible to Minor	Adherence of construction workers to safe working including provision of SSoW and CDM 2007 and AWE protocol. Completion of all works specified in the Remediation Statement. Use of current soil sample information as well as confirmatory sampling and analysis on soils proposed to be excavated to ensure excavated soils are reused / disposed of in accordance with current legislation and best practice (either pre-sentencing or post excavation).	Local	Negligible to Minor Adverse
Exposure of construction workers to contaminated groundwater during construction, by ingestion, inhalation or dermal contact.	Negligible to Minor	Adherence of construction workers to safe working including provision of SSoW and CDM 2007 and AWE protocol. Completion of all works specified in the Remediation Statement.	Local	Negligible
Presence of existing contamination in soils impacting on controlled waters, principally groundwater at site boundary.	Moderate	Excavation and appropriate disposal of shallow soils in north-east of the Proposed Development area, as described in Remediation Statement (<i>Technical Appendix A</i>). These works will have to be documented and validated during the construction process.	Local / District	Negligible to Minor Adverse
Presence of existing contamination in groundwater impacting on controlled waters, principally off-site groundwater in shallow aquifer.	Minor	Additional monitoring of speciated PAHs in boreholes within the Proposed Development area in final monitoring rounds to confirm absence of these contaminants at concentrations that may represent a risk to controlled waters.	Local	Negligible to Minor Adverse
Presence of existing contamination in groundwater impacting on controlled waters/groundwater in chalk aquifer (New water supply borehole within the Proposed Development boundary).	Negligible	Assumes competent well construction and implementation of good housekeeping measures as outlined in the CEMP in the vicinity of the new borehole during the Construction Phase	District	Negligible
Short-term, localised reduction in groundwater levels within the cofferdam by dewatering required for construction of Hydrus Facility.	Moderate	-	Local	Minor Adverse
Severing potential pollutant linkage down-gradient of cofferdam.	Negligible	-	Local	Negligible to Minor Beneficial
Short-term reduction in groundwater through flow down gradient of cofferdam.	Minor	-	Local	Negligible to Minor Adverse
Creation of new pathways by construction of piled foundations for eight lightning masts associated with the Operations Building.	Negligible	-	Local	Negligible
Presence of explosives and unexploded buried ordnance in shallow soils impacting upon construction	Minor	Adherence of construction workers to safe working including provision of SSoW and working under CDM 2007 AWE protocol	Local	Negligible to Minor Adverse
Accidental spillage of contaminants (fuels or chemicals) from vehicles / building materials and/or substances stored on site impacting construction workers, soils and/or controlled waters (principally groundwater underlying the site)	Minor	Adherence of construction workers to safe working including provision of SSoW and working under CDM 2007 and AWE protocol. Storage of fuels and chemicals in appropriately bunded areas with impermeable bases. Storage and use will be undertaken in accordance with site-specific method statements and in line with Environment Agency guidelines. Availability of emergency spill kits.	Local	Negligible to Minor Adverse

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Potential Impact/Known Receptors	Nature of Impact (prior to mitigation)	Mitigation	Scale	Significance of Residual Impact After Mitigation
Disturbance of contaminated dust and silt and impacts on human health and controlled waters	Minor	Provision of wheel washing facilities. Damping down of soil surface in accordance with method statement and a geotextile membrane/ DPM sheet will be used, on which any soil waste arisings will be placed to prevent cross contamination. Implement SSoW to protect the health of workers from known and unknown contamination, including adherence to CDM 2007 and AWE CoCP.	Local	Negligible to Minor Adverse
Mobilisation of contaminants due to changes in infiltration rates	Low to Negligible	-	-	-
Installation of piled foundations	Moderate	Correct installation of piled foundations. Dewatering of Silchester Gravel aquifer. Profiling the ground around the piles to ensure there is no ponding at the surface.	Local	Negligible
Operational Phase				
Presence of existing contamination (both chemical and radiological) in soils and groundwater impacting human health.	Negligible to Minor	-	Local	Negligible
Impacts of existing contamination in soil and groundwater on development – fabric of structures/ services etc	Negligible to Minor	Use of appropriate concrete and materials	Local	Negligible
Localised change in groundwater flow paths as a result of deep foundations associated with the Proposed Development.	Minor	-	Local / District	Negligible
Changes to groundwater quality following the recovery of groundwater levels beneath the Hydrus Facility, following removal of sections of the cofferdam.	Minor	-	Local	Negligible to Minor Beneficial
Impacts on soils and groundwater from vehicle spillage and runoff	Minor	Good housekeeping, including minimisation of storage of fuels / chemicals at the proposed development	Local	Negligible
Storage and use of chemicals / fuels	Minor	Where chemicals and fuels are stored on site, drip trays and double skinned bunded tanks on bunded impermeable surfaces will be used.	Local	Negligible
Soil gas migration impacting the Proposed Development	Minor to Moderate	Design and Installation of gas protective measures based on current understanding	Local	Negligible
Impacts from buried unexploded ordnance	Negligible	Future excavations to adopt a SSoW in line with AWE protocol.	Local	Negligible
Mobilisation of contaminants due to changes in infiltration rates	Negligible to Minor	-	Local / District	Negligible to Minor Adverse
WATER RESOURCES				
Construction Phase				
Surface Water Quality	Short-term, Moderate	Construction work completed in accordance with relevant AWE Construction Site Rules. Production of Construction Environmental Management Plans. Exposed ground to be kept to a minimum, stockpiles to be covered or seeded with use of silt fences and/or cut off trenches. Discharge from wheel wash / plant washing facilities to be contained and recycled according to AWE Waste Water Risk Assessment procedures. Appropriate labelling, storage and handling of all potentially contaminative materials including use of sheeting, bunds and drip trays. Implementation of operational safeguards to prevent accidental spills during construction.	Local / District	Negligible

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		<p>Protection of existing boreholes within the Application Site to avoid damage or direct discharge of potentially contaminative substances to groundwater.</p> <p>Groundwater or surface water generated during excavation or dewatering to be contained and passed via a silt trap prior to discharge to surface water drainage system.</p> <p>Implementation of construction phase SuDS drainage strategy for surface water runoff and water from dewatering works.</p>		
Surface Water and Flood Risk	Short-term, Moderate	<p>Construction work completed in accordance with relevant AWE Construction Site Rules.</p> <p>Production of Construction Environmental Management Plans.</p> <p>Implementation of construction phase SuDS drainage strategy for surface water runoff and water from dewatering works.</p>	Local / District	Negligible
Water Infrastructure	Short-term to Long-term, Moderate	<p>Construction work completed in accordance with relevant AWE Construction Site Rules.</p> <p>Production of Construction Environmental Management Plans.</p> <p>No discharge of groundwater, rainfall run-off or wastewater to site drainage network without provision for silt removal, containment, chemical testing and approval in accordance with AWE Waste Water Risk Assessment procedures.</p> <p>Implementation of construction phase SuDS drainage strategy for surface water runoff and water from dewatering works.</p>	Local / District	Negligible
Operational Phase				
Surface Water Quality	Long-term, Low	<p>Implementation of Operational Environmental Management System in line with AWE current policies.</p> <p>Implementation of operational phase surface water drainage strategy (SuDS)</p> <p>Use of SuDS incorporating ponds as storage to attenuate increases in surface water run-off.</p> <p>Use of SuDS in the form of positive drainage systems which drain via a bypass separator to attenuation ponds and use filter traps adjacent to impermeable pavement.</p>	Local / District	Negligible to Minor Beneficial
Surface Water and Flood Risk	Long-term, Low	<p>Maintenance of SuDS features such as vegetation on the swales and detention basin, the maintenance of surface water drainage channels and the shallow cut-off ditch around the site perimeter.</p> <p>Cleaning and repair of the petrochemical interceptors and the maintenance of the impermeable roads and cellular storage.</p>	Local / District	Negligible
Water Infrastructure	Long-term, Low	<p>Maintenance of SuDS features such as the green roofs and vegetation on the swales and detention basin.</p> <p>Maintenance of water efficiency measures in the completed development.</p>	Local / District	Negligible
TRANSPORT				
Construction Phase				
Impact on pedestrian and cyclist severance	Negligible	N/A	Local/ District	Negligible
Impact on pedestrian and cyclist safety	Negligible	N/A	Local/ District	Negligible
Impact on pedestrian and cyclist amenity	Negligible	N/A	Local/ District	Negligible
Impact on pedestrian and cyclist delay	Negligible	N/A	Local/ District	Negligible
Impact on passenger transport users severance	Negligible	N/A	Local/ District	Negligible
Impact on passenger transport users safety	Negligible	N/A	Local/ District	Negligible
Impact on passenger transport users amenity	Negligible	N/A	Local/ District	Negligible

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Impact on passenger transport users delay	Negligible	N/A	Local/ District	Negligible
Impact on car driver safety	Negligible	N/A	Local/ District	Negligible
Impact on car driver delay	Negligible	N/A	Local/ District	Negligible
AIR QUALITY				
Construction Phase				
Construction phase nuisance dust (residential dwellings)	Direct, reversible	Follow CoCP	Local	Negligible
Construction phase traffic emissions (residential dwellings)	Temporary, reversible	None required	Local	Negligible
Operational Phase				
Operational emissions (residential dwellings)	Direct, reversible	None required	Local	Negligible
NOISE AND VIBRATION				
Construction Phase				
Construction noise (to residential dwellings/hotel)	Temporary	Follow Best Practicable Means (BPM)	Local	Negligible
Construction traffic noise (to residential dwellings/hotel)	Temporary	None required	Local	Negligible
Construction vibration (to residential dwellings/hotel)	Temporary	None required	Local	Negligible
Operation Phase				
Operational traffic noise (to residential dwellings/hotel)	No change	None required	Local	No change
Noise from the normal operation of fixed plant (to residential dwellings/hotel)	Direct	Plant design mitigation strategy	Local	Negligible
Noise from the operation of alarms with Test Events (to residential dwellings/hotel)	Direct, reversible	Design consideration to external alarm systems	Local	Negligible
Noise from the operation of fixed plant associated with firings (to residential dwellings/hotel)	Direct	Plant design mitigation strategy	Local	Minor Adverse to Negligible
Noise during the commissioning of fixed plant associated with firings (to residential dwellings/hotel)	Direct, reversible	Noise monitoring	Local	Minor Adverse to Negligible
SOCIO ECONOMIC				
Construction Phase				
Employment created during construction phase	Short-term	N/A	Local	Minor Beneficial
Operational Phase				
Employment created once in operation	N/A	N/A	Local	Negligible

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Aerospace and Defence Sector	Long-term	N/A	Local	Moderate Beneficial
Retail and leisure	Medium-term	N/A	Local	Minor Beneficial
Local housing market	N/A	N/A	Local	Negligible
Open Space	N/A	N/A	Local	Negligible
Libraries and Local education services	N/A	N/A	Local	Negligible
LANDSCAPE AND VISUAL				
Construction & Operational Phases				
Landscape Impact:				
AONB	No effect	N/A	N/A	Neutral
Landscape Features	Twenty-one trees will be lost. Remaining trees (including one veteran tree) and a copse will be retained and protected. New planting will strengthen existing infrastructure.	Landscape Masterplan including sculpted bunds, hedge planting, SuDS and Sedum green roofs.	Local	Neutral
Local Character Areas:				
Aldermaston Park, Pasture and Woodland Fringe	Direct and indirect limited views of masts and building roofs in some areas	Design evolution. Landscape Masterplan	Local	Negligible
Tadley Urban Area	Indirect	N/A	N/A	Neutral
Haughurst Hill Heath, Associated Pasture and Woodland	Indirect	N/A	N/A	Neutral
Site Character Areas:				
Contained Intensive Industrial Plateau	Direct (construction) and indirect (operational)	N/A	Local	Neutral
Contemporary Urban Edge	Direct (construction) and indirect (operational)	Restoration of Construction areas and new landscape establishes improved landscape setting	Local	Neutral
Contained Open Space	Direct (construction) and indirect (operational)	Restoration of Construction areas and new landscape establishes improved landscape setting	Local	Neutral
Intimate Enclosed Woodland Plateau Edge	Direct	Improved adjacent landscape setting	Local	Neutral
Open Grassy Heath Plateau with Buildings	Direct	Improved adjacent landscape setting	Local	Neutral
Woodland Plateau Edge	Direct (construction) and indirect (operational)	N/A	N/A	Neutral to Negligible
Wide Plateau Corridor	No noticeable change	N/A	N/A	Neutral to Negligible
Night Time Lighting Effects on Character	The level of lighting will increase, but will be seen in the context of surrounding well-lit areas	Design evolution and Landscape Masterplan	Local	Negligible
Visual Impacts:				
Residential	Small minor additional elements on the skyline	Planting of additional small groups of trees and tall hedgerow. Species will be predominately Oak and Birch and other native tree and under storey species which are characteristic of the area	Local - District	Negligible to Minor Adverse
Public Footpaths, Open Access Areas and Recreation Paths (including AONB)	Small minor additional elements on the skyline	N/A	Local	Negligible to Minor Adverse
Transport Corridors	Small minor additional elements above tree cover in a limited number of places	N/A	Local	Negligible

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Employment (including Manor House Hotel)	Views from parts of hotel	Planting of additional small groups of trees and tall hedgerow. Species will be predominately Oak and Birch and other native tree and under storey species which are characteristic of the area	Local	Minor Adverse
Night time lighting	Additional lighting seen in context of already well-lit industrial sector	Design evolution, Masterplan and lighting design	Local	Minor Adverse to Negligible
CULTURAL HERITAGE & ARCHAEOLOGY				
Construction & Operational Phases				
Removal of archaeological deposits and structures during groundworks and construction	Direct	None required – archaeological trial trenching has already been completed within the Hydrus Development Site	Local	Negligible
Impact upon historic setting of Aldermaston Court Registered Park and Garden	Indirect	Design evolution and Masterplan	Local/District	Minor Adverse
ECOLOGY				
Construction & Operational Phases				
Habitats:				
Grassland (VER 1)	Loss of grassland habitat. Damage/destruction of grassland during construction operations.	Retention of some areas of acid and rough grassland. Best practice guidelines to be adhered to during construction, including material storage and handling, siting of construction plant and restricted vehicular movements away from the retained grassland areas.	District	Slight Adverse
Acid grassland (VER2)	Loss of grassland habitat. Damage/destruction of grassland during construction operations.	Grassland will be created through the landscape proposals using amenity and wildflower seed mixes and maintained appropriately with any bare patches re-seeded as soon as possible.	District	Slight Adverse
Woodland (VER 3)	Risk of damage to the root systems and canopies of retained trees during construction due to movement and siting of plant and siting of material storage.	The small copse on the Hydrus Development Site provides habitat for invertebrates and two species of reptiles (slow worm and grass snake) and are to be retained within the development. These features are of ecological value and will add maturity to the Proposed Development planting scheme. Best practice guidelines adhered to during construction, including material storage and handling, siting of construction plant and restricted vehicular movements away from the woodland boundaries and tree root systems.	County	Negligible
Veteran Oak tree (VER 4)			District	Negligible
Species:				
Bats (VER 5)	Impact of construction noise and vibration to potential roosting habitat within the veteran Oak tree. Loss of the structural diversity and varied floral community which currently benefit invertebrate species, thus reducing foraging potential for bats. Loss of stand alone trees, thus reducing foraging potential for bats. Increase in lighting across the site which can affect bat behaviour.	Construction works would be generally undertaken during daylight hours in accordance with the CoCP, so there would be minimal impact on nocturnal animals. The retention of the copse, veteran tree and associated grassland on site, along with the proposed landscape strategy to provide additional native trees and species-rich grassland aims to strengthen existing linear features and attract invertebrate species which will benefit foraging bats. The lighting around the areas most frequently used by foraging bats (the copse, veteran tree and associated grassland) will remain unchanged. Bat boxes will be erected on semi-mature to mature trees to provide additional roosting sites. New lighting has been designed to the specifications set out in the Bat Conservation Trust 'Bats and Lighting in the UK' 2008 guidelines with column locations and lux levels discussed with an experienced ecologist.	District	Slight Adverse
Badgers (VER 6)	Disturbance to badgers using the site as foraging and commuting habitat.	Disturbance during the construction phase would be minimised by limiting the hours of construction in accordance with the CoCP; and by covering trenches overnight or providing a means of escape so that badgers do not become trapped. As badgers frequently construct new setts, a badger resurvey of the Hydrus Development Site would be undertaken before site clearance or construction commences.	District	Negligible

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Reptiles (VER 7)	Loss of grassland and wetland habitat. Injury or death caused by construction activities.	Favourable habitat (the copse, running wet ditch and associated grassland) will be retained. One hibernaculum will be created within the copse on site using existing material found within the woodland site to provide compensatory habitat for reptiles and amphibians.	District	Slight Adverse
Amphibians (VER 8)	Loss of terrestrial habitat Disturbance, injury or death caused by construction activities.	<p>The slow worm and grass snake populations will be retained on Hydrus Development Site and protected during construction and upon completion.</p> <p>A Method Statement has been produced which recommends all reasonable precautions to be taken to minimise impacts on great crested newts during the construction period. Herpetofauna exclusion fencing will be erected along the proposed building footprint for the new structures and access road during the construction works to exclude reptiles and amphibians from the construction area.</p> <p>An ecologist will undertake a destructive search of any habitat scheduled for removal as part of the clearance or construction works. Any reptiles or amphibians found during the fencing installation and associated vegetation removal will be relocated into suitable habitat within the woodland and scrub habitat on the other side of the herpetofauna fencing.</p> <p>The SuDS detention basin and swales will increase the wetland habitat on the Proposed Development site.</p> <p>Grassland will be created through the landscaping proposals using amenity and wildflower seed mixes and maintained appropriately. The areas of meadow grassland will undergo a reduced mowing regime to allow the grassland to flower, especially around the existing copse and veteran oak tree, plus proposed hedgerows and SuDS detention basin to increase the value of the site to reptiles and amphibians and to ensure they are not harmed during mowing.</p> <p>Tree planting will be limited around the copse and associated grassland and the SuDS features to the south east of the Proposed Development to maintain the existing conditions for the herpetofauna.</p>	District	Slight Adverse
Invertebrates (VER 9)	Loss of grassland habitat The structural diversity and varied floral community will be lost.	<p>The veteran oak tree, copse, wet ditch and associated grassland will be retained and incorporated into the landscape proposals.</p> <p>The creation of the artificial hibernaculum within the copse, the Sedum roof to the Support Building and Electrical Substation and planting introduced around the SuDS will provide compensatory habitats for invertebrates currently using the Hydrus Development Site.</p> <p>Areas surrounding the copse and veteran oak will remain undeveloped and managed as grassland to maintain the invertebrate communities on site. A sympathetic grassland mowing regime will help maintain and develop the diversity of the new grassland.</p>	District	Slight Adverse
Breeding Birds (VER10)	Loss of grassland, bare ground, copse and trees on site which support foraging and nesting birds. Slight increase in disturbance from increase in people, traffic and noise during the construction period.	<p>The copse and associated grassland edges would be retained as part of the Proposed Development.</p> <p>The project would include the creation of native wildflower grassland which would form replacement grassland margins. The landscaping proposals also include the planting of native trees and hedgerows which will provide additional nesting and foraging opportunities for birds.</p> <p>Tree bird boxes will be erected to benefit a range of small bird species. The bird boxes will be positioned around the Proposed Development as compensation for the clearance of suitable bird breeding habitat during site clearance.</p> <p>The incorporation of a Sedum roof on the Support Building and Electrical Substation as part of the redevelopment proposals will also provide foraging habitat for birds including black redstarts which are known to forage and breed within the wider AWE Aldermaston Site.</p>	District	Negligible