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6. Construction Phase	Hydrus Defence Exempt Environmental Appraisal Volume I	Reference: MER-110-009280

was granted planning permission from West Berkshire Council in February 2008 (Planning Reference: 07/02438/COMIND). The CACE covers an area of 0.53ha and mainly comprises areas of hardstanding for open storage with temporary office and welfare accommodation units.

A temporary construction area will be additionally established in the western part of the Hydrus Development Site and will be known as the Hydrus Construction Area. This will house construction accommodation and welfare facilities, including canteen, WCs, changing facilities and site offices, in temporary buildings up to two storeys in height. On completion of construction, the area will be reinstated to form part of the landscape scheme for the Proposed Development.

The base layers of the proposed access / circulation routes will be laid down so the site vehicles and equipment can use them during the construction phase. However, the final surface course will not be laid until the external works and landscaping is undertaken.

Enabling works for the Proposed Development i.e. installation of services and utilities, has been completed prior to the submission of this planning application under permitted development rights as defined by the Town and Country Planning (General Permitted Development) Order 1995 (Ref. 6-1) and therefore is not described within this DEEA.

External lighting for the Hydrus Development Site during the construction phase will be provided for the following locations:

- Perimeter fencing;
- The construction worker accommodation and welfare facilities (located in the Hydrus Development Site Construction Area);
- The access/ circulation route in the north-east and south-west of the Hydrus Development Site; and
- Two tower cranes (which will be located to the north-west and south-east of the proposed Operations Building footprint).

These areas will be lit using high pressure sodium luminaires, mounted 6m above ground level (AGL) on steel columns. The columns will be located approximately every 20m within the stated areas. Flat glass fittings will be used to reduce upward light spillage. Construction lighting will provide an illuminance of up to 50 lux at the site boundary, but this would be operational for only short periods when working hours (as set out in the CoCP) coincide with hours of darkness, generally during the winter months. The construction worker accommodation and welfare facilities, the access route and the tower cranes will have an average illuminance of 20 lux. It is also important to note that within the construction enclave, in periods of darkness during working hours, mobile task lighting may be required for specific activities. This lighting will provide sufficient illumination for safety and will be positioned so that it does not intrude unnecessarily on adjacent buildings and land uses, or constitute a hazard and will be chosen to minimise light pollution effects.

After work has finished for the day and all construction workers are checked out of the Hydrus Development Site, all of the lights on site will be turned off. Over

night therefore, it will only be indirectly lit by the existing street lights on Griffin Road and Cwm Road, and lights associated with the AWE Aldermaston main site perimeter fence.

In order to control surface water run-off (i.e. rainwater) during the construction phase, a Sustainable Drainage System (SuDS) will be provided for the Hydrus Development Site. A number of SuDS features will be incorporated including a detention basin, swales, cut off ditches and soakaways (comprising a granular infiltration blanket under the welfare accommodation). The SuDS scheme will be installed in stages. The detention basin and swales will be constructed first to provide attenuation during Site Establishment. The SuDS attenuation culverts will then be constructed in the main construction phase with the substructure of the Operations Building, see section 6.3.2.1. The SuDS scheme will ultimately discharge into the existing AWE Aldermaston storm water sewer. Pollution prevention measures such as oil separators, silt separators and penstocks (pollution control valves) will be provided to ensure that no particulates or contaminants are discharged into the existing AWE Aldermaston storm water sewer. Further information regarding the SuDS design can be found in *Chapter 8: Water Resources*. The detailed construction SuDS drawings are included with the planning application package which has been submitted to WBC.

Parking for construction workers will be provided within the WECE. The existing controlled access points for the WECE and CACE for both vehicles and pedestrians will be utilised during the construction phase. In addition, a third controlled access point will be established to further isolate the Hydrus Development Site from the CACE. By the end of Site Establishment, local control arrangements will be put in place by AWE, who will establish a Work Control Centre (WCC) within the Hydrus Development Site Construction Area to ensure that all activities are undertaken in accordance with AWE's Code of Construction Practice (CoCP) (Ref. 6-2) and Construction Site Rules (Ref. 6-3). In addition, Safe Systems of Work (SSoW) will be produced for all activities.

6.3.2 Main Construction Works

The main building works comprise the following stages:

- Groundworks and sub-structure;
- Superstructure;
- Fit-out; and
- External Landscaping.

6.3.2.1 Groundworks and Sub-structure

Prior to construction of the permanent buildings, the existing ground levels will be re-profiled and reduced to the required level for foundations. The Operations Building will be constructed in two halves; north phase and south phase. The southern half of the Operations Building containing the IVA halls (the south phase) will be constructed first, see Figure 6-1.

Operations Building South Phase

Construction of the Operations Building will require dewatering of the Silchester Gravels, and to a certain extent the underlying Bagshot Formation. The

Silchester Gravels contain a perched water table and overlies the Bagshot Formation, which in turn overlies the London Clay Formation (see *Chapter 7: Ground Conditions*). Dewatering is necessary to ensure that suitable ground conditions are maintained for construction of the southern half of Operations Building sub-structure; the IVA hall reinforced concrete slab, the Induction Voltage Adder (IVA) machine bases and the associated SuDS attenuation trenches.

A circular trench approximately 4m wide will be excavated from within the Silchester Gravels down to the existing groundwater level, around the Operations Building. A narrow trench approximately 600mm wide will then be excavated in the base of the circular trench, through the Bagshot Formation and down to the top of the London Clay, to loosen material but not to remove it. Heavy duty interlocking trench sheets will then be driven down through the loosened material into the top of the underlying London Clay layer to form a perimeter cut-off wall. The trench sheets will be installed using two vibrating hammers mounted on 30 tonne (t) tracked excavators. Once the trench sheet cut-off wall is fully installed, the circular trench will be widened on the inside of trench sheet cut-off wall, to allow installation of a dewatering system.

The dewatering system will consist of a series of wells installed at approximately 1-2m into the Bagshot Formation around the inside of the cut-off wall. This will be carried out using a rotary drilling rig and flush water. Solid waste would be stored in 1t bulk bags and disposed of in accordance with AWE standards and the relevant legislation. Slurry waste will be placed in containers to settle and any water will be removed to allow disposal of the residues as solid waste. The waste water will be filtered through "Sand Shakers" and re-circulated to the drilling rig.

Two temporary bases for tower cranes, which will be used during the construction of the north phase of the Operations Building, will be constructed during this phase. This is to ensure that drilling of the piles required for the bases will not damage the sub-structure of the Operations Building. The tower cranes' superstructure will not be erected until needed during the construction of the sub-structure for the north phase of the Operations Building.

The dewatering system will draw down the perched groundwater within the Silchester Gravels to the top of the Bagshot Formation. The cut-off wall sealed in to the underlying London Clay will create a cofferdam and will prevent groundwater from flowing back into the isolated internal area. Once the perimeter well points have drawn down the groundwater they will then only be needed to deal with any accumulation of rainfall that falls inside the cofferdam. The water extracted from the perimeter well points will be screened to minimise suspended solids and then discharged via a V-notch tank to allow visual assessment of the water quality, flow monitoring and access for sampling if required.

The circular trench will then be extended to allow construction of the SuDS attenuation culverts around the Operations Building (inside the cofferdam). The short sections of attenuation culvert adjacent to the proposed SuDS detention pond on the southern side of the Operations Building will be constructed first. These sections will then be used to store and regulate the flow of groundwater extracted from the perimeter well pointing system. The discharge limit from the outfall will not exceed the Environment Agency set limits of 10.9 l/s and 100 mg/l of suspended solids. Further information regarding the SuDS design can be found in *Chapter 8: Water Resources*.

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At the same time, the main excavation for the IVA hall slab and IVA machine bases will start and will progress down to as close to top of the Bagshot Formation layer as possible. An additional vacuum dewatering system will then be installed around the areas of deepest foundations (the IVA machine bases and an associated attenuation trench) into the London Clay, to stabilise the sand and silts within the Bagshot Formation and prevent softening of the formation below the foundations. Once the Bagshot Formation is de-watered the main excavation will proceed to approximately 4.3m below ground level (BGL) (96.0m AOD) to allow construction of the IVA machine bases and the associated attenuation trench.

On completion of the IVA machine bases, the vacuum dewatering system will be removed from around the IVA machine bases and the wells grouted up. The excavations around the IVA machine bases will be backfilled with foam concrete to facilitate the construction of the IVA Hall reinforced concrete ground slab and the top section of the attenuation trench. The reinforced concrete slab will be constructed with an impermeable gas membrane installed beneath it to prevent soil gas ingress (see *Chapter 7: Ground Conditions* of this DEEA). The finished floor level of the IVA hall will be 100.3 metres (m) Above Ordnance Datum (AOD). Suitable inert structural fill will be used to back fill around the installed SuDS attenuation culverts.

Operations Building North Phase

Work will begin on the north phase of the Operations Building, upon completion south phase, see Figure 6-1.

The Silchester Gravels will be excavated to approximately 1m BGL to allow the construction of the reinforced concrete ground slab for the northern half of the Operations Building and the central hardened structure. Excavation to this level is necessary to achieve the appropriate bearing capacities and to form level areas for the impermeable gas membrane (see *Chapter 7: Ground Conditions* of this DEEA). The north phase of the Operations Building will be constructed using two tower cranes. The finished floor level will match the southern concrete ground slab at 100.3 mAOD. A 100mm isolation joint will be installed between the two concrete ground slabs.

The Lightning Protection System (LPS) sub-structure will be constructed at the same time as the north phase of the Operations Building. The LPS will comprise eight masts supporting a catenary structure made up of steel cables. Each mast will be supported on piled concrete pad foundations. Eight 15m deep by 0.6m diameter bored piles will be constructed per mast. This will be carried out using a rotary drilling rig.

Support Building

The Support Building will be constructed on mass pad foundations with a finished floor level of 100.3 m AOD. The mass pad foundations will be constructed above an impermeable gas membrane to prevent soil gas ingress (see *Chapter 7: Ground Conditions* of this DEEA). A cement based material will be used as fill between the gas membrane and the ground slabs.

Electrical Substation

Construction of the Electrical Substation will occur at the same as the south phase of the Operations Building, see Figure 6-1.

The Electrical Substation will be constructed on raft foundations with a finished floor level of 100.3 m AOD. The raft foundations will be constructed above an impermeable gas membrane to prevent soil gas ingress (see *Chapter 7: Ground Conditions* of this DEEA).

6.3.2.2 Superstructure

Operations Building North and South Phases

The superstructure of the Operations Building will comprise a structural steel frame to enable the installation of weather proof cladding as the external façade of the building. The superstructure works will include penetrations and encast items that will support plant and equipment. It will also include the installation of suspended mezzanine floors in both the north and south phases of the Operations Building, as well as, a first floor which covers most of the north phase. The roof of the Operations Building will comprise a standing seam cladding system that overlays insulation on a structural steel deck that spans between the structural steel rafters.

Due to the completion of the south phase of the Operations Building, before work will have begun on the north phase, a temporary frontage will be erected to seal off and protect the IVA hall. Adhesive cover will also be used to protect the south phase roof from weathering until the north phase roof is erected.

Support Building and Electrical Substation

The superstructure of the Support Building and Electrical Substation both consist of structural steel framework with weather proof cladding. The erection of the cladding will be undertaken using mobile elevated work platforms running on prepared surfaces at ground level.

The Support Building and Electrical Substation will both be constructed with Sedum green roofs which will be installed with a stainless steel man-safe system to allow regular inspections and maintenance works.

6.3.2.3 Fit-Out

Fit-out for the north phase of the Operations Building, the south phase of the Operations Building, the Support Building and the Electrical Substation will occur on completion of each superstructure, see Figure 6-1.

The fit-out phases will include installation of architectural steel work, windows and doors, furnishing of internal areas and installation of mechanical and electrical systems (such as utilities, air conditioning, heating, lighting, fire alarms and security systems). The air handling plant, fans and filters will be located in dedicated plant rooms. Major plant installation will be accommodated through access panels above the plant. Welfare facilities comprising toilets, changing rooms, kitchens and tea stations will also be completed within the fit out works. The fit out works will be programmed and scoped to ensure they are adequately interfaced with the building services and equipment installation programmes.

6.3.2.4 External Works and Landscaping

The external works include the finishing of the vehicle access routes, operational drainage and landscaping.

The landscaping proposals are aligned with the architectural appearance of the building and contribute to creating a pleasant environment in which to work. Landscaping will occur over a period of 12 months due to seasonal dependence for planting. The landscaping phase will overlap with the commissioning phase on the north phase of the Operations Building and the integrated testing and commissioning phase for the Hydrus Facility as a whole. The landscape scheme will include wet grassland in and around the SuDS detention basin and swales. Further details are located within *Chapter 13: Landscape and Visual* and *Chapter 15: Ecology* of this DEEA.

During this period the vehicle access routes base layer will be cleaned in preparation for the laying of the final surface course. Pedestrian pavements and any other hardstanding external area will also be finished during this phase.

6.3.2.5 Integrated Testing and Commissioning

Once the main construction phase of the project is nearing completion, the entire Hydrus Facility will undergo integrated testing and commissioning to ensure that the Hydrus Facility is compliant with standards set by the relevant regulators e.g. the Nuclear Installations Inspectorate and the Environment Agency. The duration of this period is dictated by the stringent safety design requirements that must be demonstrated but for the purposes of this DEEA it is assumed to be 6 months.

6.4 Materials and Resource Use

Extensive planning will take place in advance of construction in order to reduce the amount of materials used, and reduce the number of deliveries to the Application Site. This will be achieved by maximising loads on deliveries and re-using existing materials. Estimates of key construction materials are shown in Table 6-1.

Table 6-1: Schedule of Key Construction Materials

Item	Total
Excavated materials	28,000m ³
Piping	2,300m
Drainage	430m
Concrete	18,000m ³
Hardcore/Stone	6,500m ³
Asphalt	700 m ³
Structural steelwork	5,000 tonnes
Cladding and roofing	18,000 m ²
Internal partition walls	3,120 m ²

NB: Concrete for the Proposed Development will be brought to site ready-mixed.

The excavation works are estimated to generate approximately 28,000m³ of spoil. The Proposed Development has sought to re-use spoil whenever possible, both within the Application Site and elsewhere within AWE Aldermaston, so as to reduce HGV off-site movements. Approximately 11,000m³ of excavated material

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will be reused to form landscaping bunds within the Hydrus Development Site. However, for the purposes of this DEEA it is assumed that all of this material will be disposed of offsite.

A full list of plant and equipment to be used during construction is provided in Table 6-2.

Table 6-2: Schedule of Mechanical Plant to be used during Construction

Plant	Stage					
	Enabling Works	Sub-structure	Super-structure	Cladding & roofing	Fit-out	Land-scaping
Tracked wheeled 360 degree excavators	√	√				√
Breakers	√	√				
Crushers	√					
Dumpers	√	√				√
Vibrating roller	√					√
Vibrating hammers	√					
Concrete pump		√				
Power floater		√				
Poker vibrator		√				
Rotary Drilling Rig		√				
Mobile cranes/ tower cranes/ crawler cranes	√	√	√	√	√	
Hoist				√	√	
Air compressors		√	√	√	√	
Diamond cutting tools/ saws					√	
Power tools	√	√	√	√	√	
Wheel washing plant		√	√	√	√	√
Scaffold		√	√	√	√	
Mobile access platforms (MEWP/ scissor lift)			√	√	√	
HGVs	√	√	√	√	√	√
Skips and skip lorries	√	√	√	√	√	√
Fork lift trucks					√	
Generators	√	√	√			
Mechanical and electrical plant			√	√	√	
Telehandler		√	√	√	√	
Water pumps	√	√				

6.5 Hours of Work

As stated in the AWE Code of Construction Practice, normal working hours will be 07:00 to 19:00 on weekdays and 07:00 to 16:00 on Saturdays (when required). However, programme demands may necessitate that there could be peak construction periods when working hours will be extended. Extensions will be subject to the relevant notifications to West Berkshire Council (WBC).

Activities likely to generate noise that may affect sensitive areas will occur during normal working hours, other than in exceptional circumstances. Where such activities have to occur outside normal hours, these will be subject to discussion with WBC and local residents. Adequate notification in advance of the time of the works and the likely duration will be provided where reasonably practicable.

Escorted abnormal load deliveries will have specific delivery times that will be planned and coordinated with WBC and where required, the Police.

6.6 Traffic

6.6.1 Construction Phase Traffic

A detailed Construction Phase Traffic Management Plan will be prepared to safely and effectively manage traffic from the Proposed Development. The plan will ensure that vehicles and personnel are segregated where possible, the number of vehicles brought to the Application Site is reduced as far as practicable and all parties are aware of the traffic arrangements for the site. There are several benefits of ensuring careful traffic management:

- Reducing the disturbance to the local community;
- Reducing the impact on other AWE operations;
- Improving the ability to comply with security arrangements;
- Reducing environmental impacts, especially overall exhaust emissions;
- Reducing health and safety risks; and
- Bringing financial savings to the project with reduced delivery costs.

It is estimated that up to 245 construction workers will be required on site at any one time to carry out the works. Further details of the average and peak numbers of construction workers are described in *Chapter 12: Socio-Economics* of this DEEA. Consequently, it is estimated that 354 construction car and van movements (comprising 344 construction worker car movements and 10 van movements), and 80 construction HGV movements, will be generated each day at the peak of construction. For large pre-planned loads or abnormal loads, local authority guidelines and designated routes / timing will be complied with.

Further details of estimated vehicle movements during construction of the Proposed Development are described in *Chapter 9: Transport* of this DEEA.

6.6.1.1 Traffic Routing Plan

AWE Aldermaston is located just off the A340 in Aldermaston near Reading in Berkshire. The nearest motorway connection is Junction 12 of the M4. The

preferred route (as shown in purple on Figure 6-2) for construction traffic (construction worker and delivery vehicles) from the M4 is via the A4 to the north of site, passing south through Aldermaston village before turning left into AWE Aldermaston through the West Gate for parking and lorry marshalling.

Construction related deliveries will be searched and processed at the WECE Marshalling Area (see *Chapter 1: Introduction, Figure 1-3*). The area allows for approximately 18 vehicles to be searched at any one time, following AWE Aldermaston site security procedures. Once a delivery vehicle has passed the initial security search it will be escorted via the A340 to the A340 Gate, and then onto the Hydrus Development Site and/or CACE. Delivery vehicles leaving the site will exit by the A340 Gate. Further details regarding deliveries can be found in *Chapter 9: Transport* of this DEEA.

Construction workers will access the AWE Aldermaston by the West Gate and will park within the WECE. The WECE construction parking area provides approximately 510 parking spaces. The Transport Assessment (see *Technical Appendix C* of volume II of this DEEA) assumes that up to 172 car spaces will be required for construction workers on the Proposed Development, and that these will lead to 344 construction worker vehicular movements (assuming spaces are occupied all day). Construction workers will be transported via bus to the appropriate area within the construction enclaves using the existing road network. Following security checks they will then be transported to the Hydrus Development Site. Where possible, construction vehicles will be controlled and scheduled for access outside of peak hours. In terms of trip distribution, it is assumed that construction workers live in the same location as operational staff (for further detail, see *Chapter 9: Transport* of this DEEA).

Improvements to junctions on the A340 and within AWE Aldermaston site have already been implemented to accommodate other construction works (i.e. New Office Accommodation and HEFF) on the AWE Aldermaston Site. These improvements provide sufficient capacity to accommodate construction traffic movements resulting from the Proposed Development.

6.7 Construction Management and Monitoring

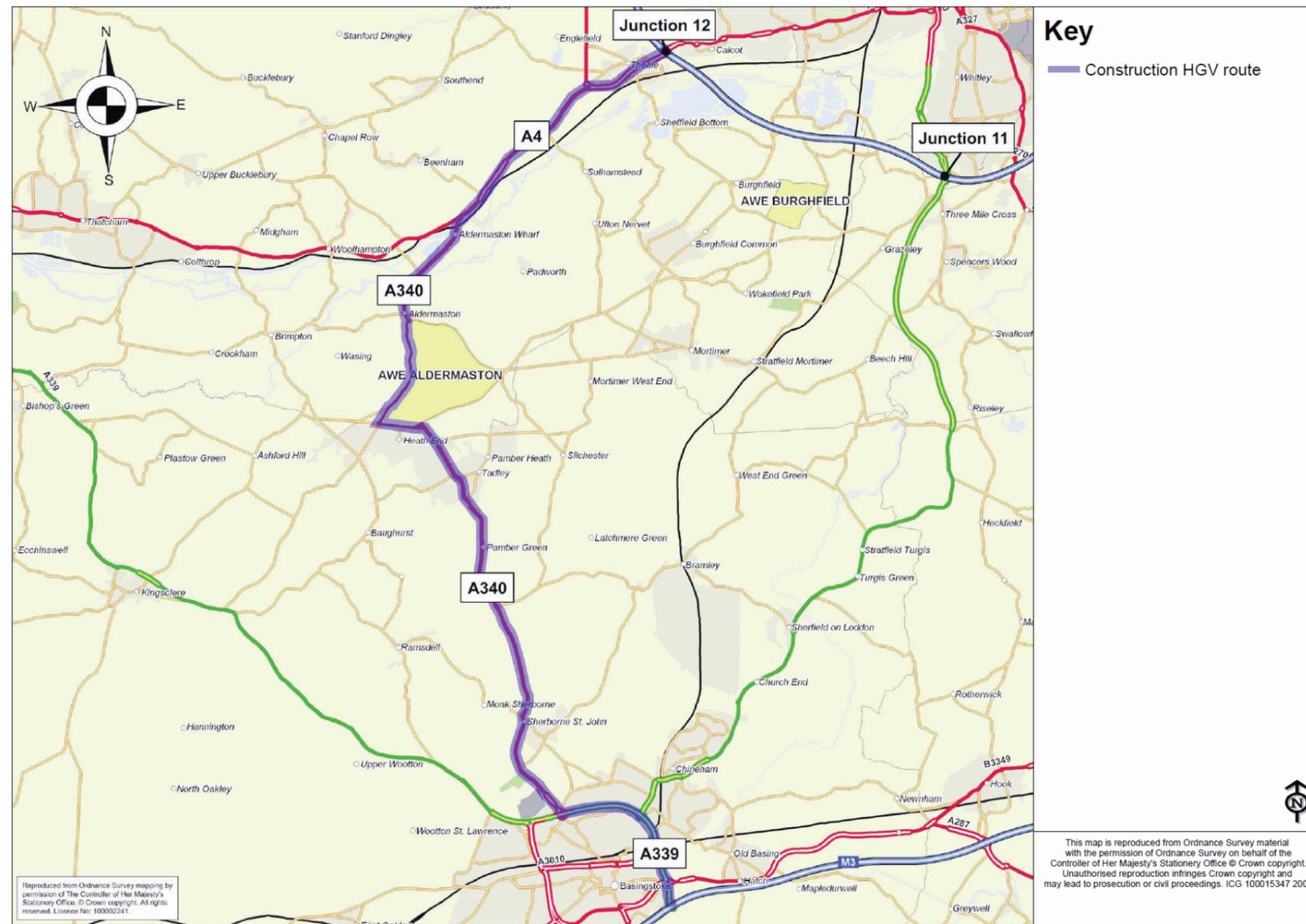
6.7.1 Management

AWE will have overall responsibility during all stages of construction to ensure that all construction activities are in compliance with the CoCP, AWE Construction Site Rules, and statutory and consent obligations. The AWE CoCP explains the overall approach of AWE to manage and control environmental impacts arising from construction activities. Further details of control measures for potential impacts are described in *Chapters 7 to 16* of this DEEA.

A SSoW statement will be produced prior to construction, which will include a method statement and an environmental risk assessment for all construction activities. During construction, the environmental control measures set out in the CoCP will be implemented through the Contractors' Construction Environment, Safety and Health (ESH) Plans and Project Register of Environmental Aspects (PREA).

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Figure 6-2: Proposed Construction HGV Routes



AWE will ensure that a Site Waste Management Plan is prepared and maintained to minimise and control waste arisings. Throughout all phases of construction a 'good housekeeping' policy will be applied, as outlined in the AWE CoCP. All work areas will be kept tidy and road surfaces will be kept clean and in a good condition. Relevant dust suppression measures and controls will be employed on the Application Site to minimise airborne dust. Further details of dust suppression methods are described in *Chapter 10: Air Quality* of this DEEA.

Construction will adhere to Best Practicable Means (BPM) as defined in Section 72 of the Control of Pollution Act 1974 (CoPA) (Ref. 6-4) in order to minimise noise and vibration impacts on sensitive receptors.

In addition, the implementation of the Construction Phase Traffic Management Plan will reduce the impact of HGVs in terms of noise and vibration. The local residents will be kept informed of especially noisy activities occurring outside of normal working hours and their expected duration. Further information can be found in *Chapter 11: Noise and Vibration*.

In order to reduce the risk of pollution, plant and equipment will be continuously maintained in accordance with the manufacturer's specifications. In addition, plant and equipment will be located away from sensitive receptors and residential areas on or near to the AWE Aldermaston.

All site works will comply with the Environment Agency Pollution Prevention Guidelines (PPG) 5: Works and Maintenance In or Near Water (Ref. 6-5). Further information can be found in *Chapter 8: Water Resources*.

In total 21 trees will be removed. Five individual trees and a woodland group will be retained within the Application Site during construction; these will be protected in accordance with BS5837: Trees in Relation to Construction (Ref. 6-6). A temporary protective fence will be erected around each tree or group of trees for the duration of the construction works. The protective fence will incorporate the Root Protection Areas (RPA) of each of the trees. Further information can be found in *Chapter 13: Landscape and Visual* and *Chapter 15: Ecology* of this DEEA.

6.7.2 Monitoring

Monitoring of specific environmental impacts during construction will be undertaken, including noise and air quality monitoring, in accordance with the CoCP. Noise monitoring will include an initial assessment of the baseline noise prior to construction works, as well as monitoring during construction.

Monitoring will also be undertaken regularly to enable the proactive management of dust. Wind speed and direction will be included in this monitoring. AWE will keep residents, businesses and the local community informed about the potential impacts of any construction works.

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6.8 References

- Ref. 6-1 Her Majesty's Stationery Office (HMSO) (1995). Town and Country Planning (General Permitted Development) Order 1995.HMSO.
- Ref. 6-2 AWE (2006). Atomic Weapons Establishment (AWE) Code of Construction Practice. AWE plc. Aldermaston.
- Ref. 6-3 AWE (2007). AWE Construction Site Rules. AWE plc. Aldermaston.
- Ref. 6-4 Her Majesty's Stationery Office (1974). Control of Pollution Act. HMSO. London.
- Ref. 6-5 Environment Agency (2007). PPG 5: Works or Maintenance in or Near Water.
- Ref. 6-6 HMSO (2005). BS5837: Trees in Relation to Construction