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0 EXECUTIVE SUMMARY

This report has been prepared in support of the Notice of Proposed Development to be submitted on behalf of the Secretary of State for Defence for the development of a Research Facility at AWE Aldermaston.

The requirements of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, and subsequent amendments to date, have been used as a basis for determining the requirements of this report and to consider environmental impacts resulting from the construction and operation of the proposed facility.

The proposed building will constitute a Laser Research Facility. The building will replace most of the current facilities excluding target fabrication and amplifier testing.

The new facility is to comprise the following:
A new laser facility including associated offices and laboratories (6200m^2 footprint). During construction the facility will have its own security fencing and access gates, during operation the facility will be included within the AWE site fence and accessed through the current gates. The new facility will include laser equipment housed in a laser hall, a target hall, control room and supporting offices and laboratories.

The Facility will comply with the Site Licence Conditions, as regulated by the Nuclear Installations Inspectorate (NII, an arm of the Health and Safety Executive HSE), whilst environmental issues are regulated by the Environment Agency (EA). AWE currently operates an Environmental Management System which has been independently accredited by LRQA to ISO 14001. A sustainability appraisal has been carried out in accordance with the MoD Sustainability Appraisal Handbook For the MoD Estate (October 2003).

The environment, both local and regional, into which it is proposed to locate the facility, is described, including the location of population centres, geology, hydrogeology, surface water quality, location of landfills and the location of sites of nature significance. The report concludes that the immediate on-site area of the proposed development is heavily industrialised and not of notable environmental significance. The local area surrounding the site is generally rural in nature and contains good quality surface waters and notable assemblages of flora and fauna, and Sites of Special Scientific Interest. There is some solvent contamination present in the soil close the site of the proposed development.

Consequences of construction, operational and decommissioning activities are considered. The report concludes that the proposed Facility will not cause a significant negative impact to the local environment.

The volumes of liquid and solid effluent estimated to arise from the facility are not likely to be significant compared with the site total [Appendix 8: Operational Phase PREA]. Aerial discharges will be within EA consents, whilst secondary potential impacts, such as associated additional traffic movements, will be limited to the construction phase and will not cause any discernible additional environmental impacts once the facility is in operational mode.

1 INTRODUCTION

This document presents environmental information, in accordance with the requirements of the Secretary of State for Defence's Policy regarding environmental assessment, and AWE internal procedures to minimise the environmental impact of new facilities constructed at AWE.

This Environmental Report has been prepared to support a Notice of Proposed Development (NOPD) on behalf of the MoD for a Replacement LASER Research Facility at AWE Aldermaston.

This Report of the environmental impacts of the proposed development has been carried out in accordance with the requirements in Schedule 3 of Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (Ref. 1) and in line with Department of the Environment guidance (Refs. 2, 3 and 4).

This Environmental Report reviews the proposed facility and the operation of the facility in order to identify those features which have the potential to give rise to environmental effects. The report considers the materials which will be used during normal operations and their possible routes of entry into the environment and other potential environmental impacts.

Detailed safety considerations associated with the construction of the Facility and its operation will be assessed within the Environment, Health and Safety Plan for the project, and in detail as part of the Safety Case, which will be prepared in support of this development, in line with AWE Company Policy and requirements of the Nuclear Site Licence.

The new Laser Research Facility at AWE will provide a UK facility serving the needs of both AWE and the wider academic community. In the absence of testing, and in the light of the Comprehensive Test Ban Treaty, plasma physics provides the assurance required for safety and reliability.

The new facility will provide data in novel High Energy Density regimes for material properties studies, and will provide an opportunity to perform leading edge science across a broad range of relevant areas of research.

The new facility will include laser equipment housed in a laser hall, a target hall, control room and supporting offices and laboratories.

The next stage of mandatory safety documentation will report on the design options, safety principles and acceptance criteria. The optimum technical and safety solutions are being developed to fully engineer the preferred option. Safety justification for this will be included in future safety documentation and will be approved in accordance with AWE Safety Management Procedures.

The overall building will be constructed in-line with the relevant building regulations and to modern standards.

The location for the facility has been decided upon by taking into account the operational requirements of the site as a whole and is as shown in figures appended to the NOPD (Ref. 5).

AWE is a Nuclear Licensed Site, regulated by the NII. The site operates in line with 36 Licence Conditions. These conditions, specifically Licence Condition 19 (Construction or Installation of New Plant) and Licence Condition 20, (Modification of Plant Under Construction) exist to cover the development of new facilities. The proposed facility is to be designed and operated in line with these and other Licence Conditions.

Within this document 'the AWE site' refers to the 250 hectares covered by AWE (Aldermaston), whilst the 'proposed location' refers to the hectare on which it is proposed to build the Facility.

2 FACILITY DESCRIPTION

The replacement Laser Research Facility at AWE will provide a UK facility serving the needs of both AWE and the wider academic community.

2.1 Structure

The proposed facility will include laser equipment housed in a laser hall, a target hall, control room and supporting offices and laboratories.

The facility is to be equipped with suitable ventilation systems and utilities to meet the safety, environmental and operational requirements. The building is to be constructed in line with all relevant Building Regulations and reviews will be carried in accordance with the AWE Safety Management System (SMS) at all stages of the design, construction, operation and eventual decommissioning.

The building footprint dimensions are 100 metres long by 60m wide with a maximum height of 26m on the eastern elevation and 21m on the western elevation (most visible to the public). Building drawings can be found in the NOPD [Ref. 5].

The facility will contain a Heating and Ventilation and Air Conditioning (HVAC) system to control the atmosphere within the facility.

The facility is designed to operate for a 50 year life span.

2.2 Waste Disposal

2.2.1 Trade Wastes

The facility will generate hazardous wastes which will be kept as low a level as is reasonably practicable and handled using industry best practice techniques and processes in accordance with the Environmental Protection

Act (1990) and under the duty of care imposed by the waste management licensing regime. The wastes are likely to consist of oil, metals, hazardous and non-hazardous chamber washings (note: any oil requiring removal from site will be subject to disposal to a registered oil treatment organisation). The amount of hazardous waste produced during routine cleanings will be negligible. Hazardous waste will include:

- Lead
- Beryllium
- Solvents
- Oils

Small amounts of lead may arise from disposal of PPE used in the movement of lead blocks and from redundant diagnostics equipment used in the facility.

The preparation of beryllium components will be undertaken in a dedicated fume cupboard, which will have a filtered extract system to prevent aerial discharges. Beryllium disposal routes are available on-site. Experience from the HELEN, the existing laser research facility, has shown that beryllium contamination has not been an issue.

The main sources of trade waste will be from chemicals and solvents used in the laboratories and darkrooms. It is expected that the quantities of liquid trade waste will not exceed those currently produced at HELEN, which has a trade waste agreement of 2000 litres per month.

2.2.2 Radiological Waste

Various target materials are used in laser experiments. These can be made radioactive by the laser / target interaction. Exact quantities of radioactive materials produced are currently being assessed, however this will be in the order of milligrams per year.

For example a typical gold target used in Orion has a mass of 10 milligrams. A minute quantity of the target can be made radioactive by the laser. The estimated quantity of low level radioactive gold which will be produced per year is less than 1 microgram (1.0×10^{-6} grams)

The low-level radioactive particulate produced will either be collected by the vacuum pump filters or collected onto tissues when the target chamber is cleaned. It is these filters and tissues containing minute traces of radioactive material that will enter the controlled Low Level Radioactive Waste stream.

Small target support structures that are very close to the target also are made radioactive by the interactions of the protons generated by the laser / target

interaction. These support structures are stored locally and returned to service after a few days when the radioactivity has reached background levels.

Very small amounts of tritium may be used in the facility. The annual discharge of tritium will be orders of magnitude less than the existing site authorisation.

There will be some activation products in the target area from neutron releases. All radioactive waste generated will be subject to the Radioactive Substances Act 1993 which requires that waste is minimised according to Best Practical Means (BPM).

All radioactive discharges will be below consent limits and authorisations imposed under the Radioactive Substances Act (1993).

3 ENVIRONMENTAL IMPACT DURING CONSTRUCTION ACTIVITIES

A Pre-Tender Environment, Safety and Health Plan (ESH) (Ref. HA/HAA12/A/3/SC/100253) has been prepared in support of the proposed development of the Facility, in line with the requirements of the Construction, Design and Management Regulations, 1994. This outlines potential environmental impacts associated with the construction, the successful contractor will augment this with a Construction Phase Health and Safety Plan, prior to the commencement of the construction activities. The ESH plan will be used to make the construction team aware of potential impacts and to define any specific procedures that are required to ensure that construction activities do not cause adverse environmental impacts. In addition to the ESH plan a Project Register of Environmental Aspects (PREA) will also be prepared for the construction and operational phases of the project. This is a specific requirement of CSI 1601 to ensure compliance with the AWE Environmental Management System (EMS). The construction phase and operational phase PREAs are presented in Appendix 7 and Appendix 8.

3.1 Traffic

AWE has undertaken a traffic survey and transport strategy (AWE/CD09/B/03-04/GFR11); this document projects the expected increases in traffic due to the construction of all major projects including Orion. Orion will only contribute a relatively small increase in traffic to the cumulative total, approximately 13 HGV's plus a maximum of 200 workers per day. The majority of vehicle movement will be during the normal working day (7am-6pm). Following an option study, the project management team have decided to bring the concrete into site via ready mixed concrete trucks, this will entail continuous 24-hour operation for up to one week for major elements, i.e. one truck arriving directly after another.

The main routes to be used are expected to be the A4 and A340 through Aldermaston Wharf and Village and the A340 through Tadley (the main routes from the M4 and M3). These routes will see a small increase in the number of vehicles using them during peak times. The primary entrance used for this traffic will be the West end of site; this will increase the congestion in this area by a minor amount.

During the peak of development work there is expected to be a 9% increase in the number of vehicles on site (approximately an additional 130 vehicles per hour during peak working hours (7-8am & 4-5pm), when compared with the current number of vehicles. Site traffic currently accounts for 61% of traffic on the surrounding roads during peak hours.

3.2 Noise

The noise from construction of Orion is not expected to be excessive. However it is a construction site and some noise will be generated. Most work will be carried out during working hours (7am – 6pm) so no disturbance is expected offsite. A construction noise assessment has been undertaken in accordance with the relevant British Standards. The model was based on a pessimistic assumption of the numbers of plant and running time (based on 5.5 day working). The noise modelling has indicated that the combination of construction plant and traffic is unlikely to lead to any complaints (in accordance with BS 4142 Method for rating industrial noise affecting mixed residential and industrial areas). There is predicted to be a <1dB(A) increase in noise level at the site boundary, nearest neighbour and the likely construction traffic routes. There will be a slightly higher increase at Aldermaston Court (Manor House and Portland House) however this increase is still below levels likely to cause complaints.

3.3 Surface Water Runoff

Surface water runoff will be captured from the new facility via the surface water drainage system and discharged through one of the surface water outfalls, which is approved and consented by the EA. The facility will be using 'grey' water for its domestic facilities.

See paragraph 4.8 for further information on water saving schemes, which will be used during normal operations.

3.4 Ecology

The proposed Facility is not being developed on an area of ecological significance. The existing site is considered to be brownfield as it lies within the boundary of Aldermaston site and is a paved area. The general area is already developed as part of the AWE (A) site and contains buildings with supply roads and paving. Intervening areas are grassed. The area is poorly colonised and receives only basic ground maintenance. As such the impact upon flora and fauna has been identified as minimal in preliminary assessments. However the ecology issues arising during the pre-construction

phase will be dealt with e.g. a mature tree is located on the site of the proposed development and its removal will need to be timed to minimise disruption to habitats that currently depend on it. All nesting birds are protected, so a survey will be required before removal of this tree. All tree removals will be carried out during the autumn. The project has funded the planting of six semi-mature trees around the AWE site to replace those removed.

3.5 Soil

EDGE Consultants UK LTD conducted an intrusive soil and groundwater contamination and geotechnical investigation on the proposed location. The investigation found elevated levels of lead in one soil sample; this exceeded Contaminated Land Exposure Assessment (CLEA) guidance for Industrial/Commercial Use. In Groundwater tests of four boreholes levels of Volatile Organic Compounds (VOCs) were found to be present above Environment Agency Environmental Quality Standards. The proposed location is adjacent to the A12Q area where VOCs are known to be present in relatively high levels, a remediation project is currently underway and the levels of VOCs found at the Laser Facility Site is expected to reduce. Due to the low levels of contamination, any contamination will be dealt with as part of AWE's site wide remediation commitment. Radiological testing has not identified any areas of concern to human health or soil disposal.

Any areas of made ground containing chemical contamination will be removed and disposed of in accordance with the requirements of Part 2 of the Environmental Protection Act 1990 and the associated waste statutory instruments such as the Waste Management Licensing regulations 1994, Special waste regulations 1996. The potential for the creation of dust due to wind-blown soil / building material particles is considered minimal, due to the limited potential area of exposed soil, the short time of exposure and adopting measures such as water damping as necessary. Thus the excavation of material from the area of the proposed Facility will have no adverse environmental impacts.

3.6 Groundwater

The strategy for the disposal of groundwater abstracted during construction is under development and will be discussed with the relevant authorities in due course.

4 ENVIRONMENTAL IMPACT DURING ROUTINE OPERATIONS

Each key environmental area has been identified and the interactive impacts of the proposed building during normal operations are reviewed below.

The decommissioning of the facility at the end of its life will be undertaken once a specific decommissioning safety case has been produced. At this stage only the general method of decommissioning of the facility, and any

potential environmental impacts, are known. However, the facility is being designed with decommissioning issues in mind. The generation of neutrons will lead to the activation of some equipment in the target area which will generate additional volumes of radioactive waste during eventual decommissioning. To reduce the amount of radioactive waste a six-month delay will be applied, this time period and associated decay will increase the amount of waste which can be sent as clean, free release. Radioactive waste remaining after this period will be the target chamber and pipework, vacuum pumps and chryso coils. A BPM for decommissioning will be produced as appropriate. An initial BPM study has been completed, this will be followed by a final BPM study to identify the final design requirements.

4.1 Humans

The proposed Facility is designed to operate in a safe manner, to protect both the local population and staff working within the facility and within the AWE site. It will be subject to a justification on safety grounds at each stage of its life cycle, i.e. design, construction, operation and decommissioning. This will be achieved through the production of Safety Cases for the various phases. All requirements of the Nuclear Site Licence will be met prior to construction commencing, throughout construction, commissioning and the operation of the Facility, and during decommissioning.

All requirements of building regulations will be met by the design, along with compliance with other statutory regulations including the Health and Safety at Work etc. Act, 1974. Due to AWE security requirements the fire safety requirements will be designed into the building e.g. specialist safety spaces and low fire hazard corridors, The plans have been approved by the HSE and MOD Fire Authorities.

A Facility Emergency Response Plan (FERP) will be prepared for site workers, during construction, and for staff during operations. The FERP will also contain details of contingency plans for accidental environmental discharges.

4.2 Radiation

Certain areas of the Facility will be designated for control under the Ionising Radiation Regulations, 1999. The area outside the facility will not require designation under the Ionising Radiation Regulations. 1999.

Experiments are conducted in a controlled and enclosed environment with shielding up to 1.5metres thick. This shielding is designed to limit the maximum gamma dose outside the experimental area to 0.5mSv per year.

This means that the remainder of the building is categorised as being suitable for general access, as is the area immediately outside the building adjacent the experimental area.

The lasers will focus on a target chamber, a sealed vessel housing the tiny targets. The action of the lasers when fired at the target will generate a burst of intense ionising radiation, including gamma and fast neutrons.

These bursts will occur over a very short duration, but require that the walls of the Target Hall be capable of acting as shield walls to ensure that as far as is possible, no radiation escapes outside of the Target Hall. For this reason the walls of the Target Hall will be 1.5 metre thick reinforced concrete.

The Orion laser target area will be provided with an electrically shielded enclosure to control the emission of the electromagnetic transients generated by the laser target. This will ensure the environment in the remainder of the Orion building and immediately outside will meet the limits given in BS EN 61000-6-3, Generic Standard - Emission Standard for Residential, Commercial and Light-Industrial Environments.

Since electromagnetic radiation falls rapidly with distance (roughly inverse square law) then adherence to this standard will ensure there is no environmental impact outside the AWE site. Compliance with BS EN 61000-6-3 is required within the Orion building to enable the use of low cost commercial/domestic equipment and ensure the safety of personnel. Compliance with BS EN 61000-6-3 will also ensure compliance with the European EMC Directive, Wireless Telegraphy Act and NRPB Restrictions on Exposure to Electromagnetic Fields.

Further control measures will be applied to prevent conducted EMP from being a problem both to the rest of the AWE site and to services external to AWE.

The facility will also be designed to modern standards for laser safety (non-ionising radiation). The design will be in accordance with British Standards 60825 series of documents.

4.3 Noise

The facility will be designed in order to minimise the impact of any noise at the site boundary.

Ambient and specific noise level surveys were undertaken in September 2001 and compared against WHO guidelines for nuisance and do not represent a pollution problem.

A Noise Survey was carried out in March 2005 in accordance with British Standards, the results were assessed against the likelihood of complaints. At perimeter locations during the daytime it was found that the noise from the AWE site, although audible at a few locations, is not the dominant noise source, this can be assigned to local traffic. At night plant noise is more noticeable but still unlikely to cause complaints.

4.4 Traffic

The operational traffic for the facility is expected to be 50 staff per day (existing HELEN staff) plus visitors, a relatively minor increase in vehicles. The number of visitors will be a maximum of 12 per day for 60 days of the year. The main routes used will be the A340 through Aldermaston and Tadley. There will be an impact on the West Gate entrance due to the increase in staff using that gate for access to other facilities. The Orion Facility is not expected to be commissioned until early 2010.

4.5 Surface / Groundwater

The foul and surface water drainage systems for the proposed site will be designed to ensure integrity and all effluent will be removed by piped systems. Water discharged into the surface water drainage system will pass into one of the surface water outfalls, where water is monitored by chemical analysis and released to local surface water courses under EA consent.

The construction of the proposed Facility should have no impact upon the direction of groundwater flow beneath the building. The Facility will require limited volumes of water for domestic and cleaning activities during operation, and therefore will not place additional demands upon the volume of groundwater abstracted by AWE (A) from the Chalk aquifer. In summary, the potential for radioactive or other contamination of the surface or groundwaters is negligible during routine operations.

4.6 Air Quality

All toxic gaseous emissions will be subject to filtration using scrubbers, carbon filtration or High Efficiency Particulate Air (HEPA) filtration before discharge to the environment. These discharges will be assessed and the methodology documented including all assumptions. All discharges from the facility will remain within EA agreed limits for the AWE site.

On the existing laser research facility, HELEN, amplifiers and mechanical components are cleaned using a solvent (HFE7100) in a high-pressure spray booth and ultrasonic tank. This cleaning facility reclaims a proportion of the solvent for reuse.

There are 2 circumstances under which Amplifiers and mechanical components require cleaning:

- Prior to initial assembly
- When components require replacing

The major consumption of HFE7100 occurs during initial assembly. Components are replaced infrequently (about every 5 years) so the day-to-day use of HFE7100 is not significant.

If the HELEN cleaning facility were used to clean all the new ORION amplifiers prior to initial assembly, it is estimated that 900 litres of HFE 7100 would be required. (50 Amplifiers x 1 barrel of solvent each at 18 litres solvent per barrel). Additional solvent would be required for cleaning mechanical components. Total consumption of HFE7100 for initial cleaning could be in the region of 1000 - 1500 litres.

The component replacement programme is likely to need about 1 barrel (18 litres) of HFE7100 every 2 –4 months.

HFE7100 is manufactured by 3M and replaces traditional ozone depleting solvents. It is non-ozone depleting, has low global warming potential (GWP) and is not a volatile organic compound (VOC). This grade has one of the lowest toxicological profiles of the new CFC replacement materials. Nevertheless, in the detail design phase, the project team will use Best Practicable Means (BPM) studies to substantiate the cleaning facility design.

Alternatives, which could be considered, include:

- Improved solvent recovery
- Use of a water-based system (uses a solution of demineralised water and surfactants)

4.7 Visual Impact

The building will be built to modern standards and be in keeping with surrounding developments. The overall building envelope is described in section 2.1.

The facility will not have an adverse effect on visual impact, when mitigating factors such as external treatment and landscaping are considered. Planting at the perimeter of the site will rapidly obscure the view from the perimeter at Paices Hill. In addition, views from inside the perimeter when at the Recreation Society for example, will be made more attractive by the proposed external treatment.

4.8 Energy Usage

The following will be developed to reduce energy usage in non-experimental areas:

- High efficiency thermal insulation of the building
- High efficiency, low NOx boilers
- Air to Air plate heat exchangers on all ventilation equipment.
- Variable speed pumping on LPHW, Chilled water and De-mineralised water systems.
- Optimised control, night set back (taking into account condensation calculations). This relates to air & water heating systems & ventilation system air volumes including clean rooms.
- Variable speed drives on ventilation system fans, i.e. speed invertors.
- Energy efficient motors and fans
- Lighting management systems and the use of energy saving lamps and tubes with high frequency switchgear.
- Grey water system for toilet and urinal flushing. (Collection of rainwater from building roof)
- Improvement of power factor correction.
- Use of active harmonic filters.
- Use of percussion spray taps with auto shut off on wash hand basins.
- Showers with flow rates between 9 and 6 litres/min.
- WC's with 6.0 litre flush.
- Proximity infra red controls for urinal flushing.

5 OPERATIONS DURING ACCIDENT CONDITIONS

AWE has in place emergency procedures designed to respond to incidents, as required by Site Licence Condition 11, Emergency Arrangements. A Safety Case will be produced which identifies the hazards and quantifies risk within the facility and the mechanisms to be put in place to control accident conditions. The emergency response plans deal with the specific or generic hazards identified within the safety case and how the impacts can be minimised.

AWE Aldermaston is a Control of Major Accident Hazards (COMAH) site and is regulated under this by the EA /HSE. The company has its own Major Accident Prevention Policy (MAPP) [Ref.AWE/DSDG/A/PS/AD/007] and all facilities are required to keep inventories of chemical holdings and identify potential Major Accidents to the Environment (MATTE). All MATTE scenarios will have a contingency plan as part of their Facility Emergency Response Plan.

ENVIRONMENTAL SETTING

6.1 General

The AWE (Aldermaston) site is located on the border between Hampshire and Berkshire, approximately 10 miles south east of Newbury and 11 miles south west of Reading. The Aldermaston site covers an area of approximately 250 hectares and is located on an upland plateau, at an elevation of about 100 metres above Ordnance Datum. The AWE site is generally level, with little natural relief. The AWE site lies to the south of the valley of the River Kennet, between Brimpton in the west and Burghfield Common to the northeast.

The AWE site is roughly triangular in shape. A dense network of roads, buildings and paved areas covers the central and much of the western part of the site. The eastern half of the site is more open, with wooded and grassed areas. An open area of playing fields is present on the western section of the site.

Land use in the surrounding area is predominantly rural, with the exception of the small village of Aldermaston to the northwest and the larger conurbations of Heath End and Tadley to the south. The remainder of the immediately surrounding area consists of deciduous and coniferous woodland. Wasing Wood and Paices Wood are located to the west, Benyon's Enclosure to the east and Aldermaston Court to the north. To the west of the site, adjacent to Wasing Wood, is located an area of historic gravel extraction which is currently utilised as a public waste amenity site (garden waste only). Young's Industrial estate is located upon part of the former area of gravel extraction. This comprises light industrial premises and plant associated with the former gravel extraction activities.

6.2 Geology

Information about the geology beneath the AWE site has been obtained from the British Geological Survey 1:50,000 map for the area, and from numerous intrusive investigations that have been undertaken across the site by the company. The geological sequence (from the surface) is described below;

- Made ground is present on parts of the site, generally consisting of re-located natural materials of orange - brown, silty, sandy clay and silty sand with gravel - size fragments of flint, brick, tile and concrete. Where present the made ground is often less than 3m in thickness.
- The Plateau Gravels consist of coarse grained gravels, which vary in thickness from about 1m in the north west of the AWE site to between 3 and 4 m in the east, with deposits of up to 6m in certain areas. The base of the Plateau Gravels is undulating in nature.
- The Bagshot Beds consist of sands, silts and silty sands to silty clays. They are variable in depth across the site, due to their fluvial nature, and in a number of areas comprise a thin upper clay unit, underlain by a sand unit, underlain by a lower, thicker clay unit. They are approximately 15m to 18m in thickness.

- The uppermost beds of the London Clay comprise alternations of fine sand and silty clay which pass down into a compact blue grey clay. These uppermost beds of the London Clay are often difficult to distinguish from the overlying Bagshot Beds; however, at two locations on AWE site a siltstone gravel layer has been proven between the Bagshot Beds and the London Clay. The London Clay has been shown to be between 80 and 90m in thickness within the AWE site water supply boreholes.
- The Reading Beds, formed of mottled grey green silty clays and sands, underlay the London Clay, and are about 10m in thickness.
- The Upper Chalk is a very fine grained, consolidated, but relatively soft, white pure limestone containing vertical fissures and horizontal bedding planes and containing nodules and tabular layers of flint.

6.3 Hydrogeology

6.3.1 Regional

The Chalk is a major aquifer of national importance, with significant groundwater abstractions via boreholes by Water Utilities, Water Supply Companies, industry and private individuals within the Berkshire / Wiltshire area and eastwards towards London. In addition to groundwater supplies the Chalk provides spring sources and baseflow to streams from the Marlborough, Berkshire and North Hampshire Downs and Chiltern Hills which feed the Thames and maintain water abstractions in the London area.

The Plateau Gravels and the Bagshot Beds form shallow aquifers (such as that beneath the AWE site), which may be locally extensive. Domestic and agricultural abstractions from the shallow aquifers have declined in number and a few remain, mainly for agricultural purposes. There are no public supplies drawn from these beds within the Berkshire / Wiltshire area.

6.3.2 Local

Two minor aquifers, contained within the Plateau Gravels and the Bagshot Beds, and one major aquifer, the Chalk, are present beneath the site. The Groundwater Vulnerability Map for the Upper Thames and Berkshire Downs (Ref. 8) indicates that the Plateau Gravels are highly vulnerable to contamination where present at the surface, whilst the Bagshot Beds are of intermediate vulnerability where they outcrop. The London Clay is of hydrogeological significance, as it confines the underlying Chalk and also reduces its vulnerability to contamination, as the London Clay is generally an aquiclude, preventing the migration of contaminated groundwater from the surface. The Chalk is the most permeable of the deposits and is used as a major water supply source.

Hydrogeological studies undertaken within the AWE site indicate that groundwater tables are present within both the Plateau Gravels and the Bagshot Beds. The elevations of the respective water tables vary seasonally, with a range of approximately 0.5m to 1m. It is considered that groundwater

within the Plateau Gravels flows radially beneath the AWE site from a 'high point' near the southwestern corner of the site.
The groundwater within the Chalk is considered to flow generally towards the east, but may be influenced locally by the abstraction of groundwater by AWE (A).

Groundwaters within the Plateau Gravels flow radially from beneath the site, and are discharged either at springs located at the junction of the Plateau Gravels and the Bagshot Beds, or as baseflow into surface waters and streams. In a similar fashion, groundwaters within the Bagshot Beds will either discharge at springs that form at the junction of the Bagshot Beds and the London Clay, or will form baseflow into surface waters and streams. The greater hydraulic conductivity of the Plateau Gravels means that the majority of the recharge to the AWE site in the form of precipitation will remain within the Plateau Gravels, with approximately 2% recharge of groundwater from the Plateau Gravels into the underlying Bagshot Beds.

6.3.3 Groundwater Quality

The quality of the groundwater in the Chalk of the western end of the London Basin (in particular the area between Lambourne and Basingstoke) has been the subject of detailed investigation by the British Geological Survey. The survey shows the Chalk groundwater to be of good quality but with local evidence of contamination.

6.3.4 Groundwater Abstractions

There is a large public supply borehole within 4km of AWE (A); Thames Water Utilities abstract groundwater from the Chalk 3km north west of the AWE site at Ufton Bridge.

Groundwater abstractions require licensing by the Environment Agency if the abstraction exceeds 50 m^3yr^{-1}. Abstractions of a lesser volume are recorded by the Local Council's Environmental Health Department. There are six licenced groundwater abstractions located within a 3km radius of the site. These are listed within Appendix 1. There are nine private, unlicensed groundwater abstractions located within a 3km radius of the site. These are listed within Appendix 2.

6.4 Hydrology

The Environment Agency lists eight surface watercourses within 3km of the centre of the AWE site. Of these four are classified under the Environment Agency's (EA) General Quality Assessment (GQA) Scheme. The GQA scheme was introduced in order to quantify surface water quality and to identify water quality trends over time. The scheme classifies the surface waters with regard to biological oxygen demand (BOD) dissolved oxygen and total ammonia, with there being six categories. These are A - very good (water suitable for any abstraction and very good salmonid and cyprinid fisheries), B - Good, C - fairly good (potable supply after advanced treatment

and a natural ecosystem, D - fair, E - poor, F - bad (very polluted river which may cause nuisance and severely restricted ecosystem).

The eight watercourses are listed below:

- Fishermans Brook
- Aldermaston Stream
- River Enborne
- Wasing Stream
- Westend Brook
- Padworth Stream
- Silchester Brook
- Church Brook

Appendix 3 contains the classifications of the four of these local surface waters which are recognised within the GQA scheme. The Environment Agency has indicated that there are five surface water abstractions within 3km of the proposed location. These are listed within Appendix 4.

6.5 Sites of Nature Importance

Information has been obtained regarding the location of sites of nature importance within 3km of the proposed location. This has indicated that there are two sites of nature significance within 1km of the proposed location . Within 3km of the proposed location are 9 statutory Sites of Special Scientific Interest, 1 Local Nature Reserve and 1 National Nature Reserve. Information on the SSSIs has been provided by English Nature, and the SSSIs are listed within Appendix 5. An indication of the reason for the SSSI notification is included.

6.6 Location of Landfill Sites

Seven landfill sites have been identified within 1km of the proposed location. None of these landfills have valid operating licences, indicating that the licences have either been surrendered, returned, expired, lapsed or revocated, or the landfill was operated prior to the requirement for licensing under the Control of Pollution Act, 1974. Six of these landfills were associated with the large gravel works located 500m southwest of the proposed location. The landfills are listed within Appendix 6.
geotechnical information.

6.7 Summary of Environmental Setting

The proposed location of the Facility is within a developed area of the AWE site. The area is presented in the NOPD (Ref 5) and will be almost completely surrounded by existing AWE buildings and facilities. The surrounding land comprises woodland and agricultural land, with local populations within the village of Aldermaston to the northeast and Tadley to the south.

The immediate area surrounding the proposed location of the Facility is not considered environmentally sensitive, due to the heavily industrialised nature of the AWE site. However, the general area surrounding the AWE site is considered sensitive, due to its rural nature with good quality groundwaters, surface waters and sites of nature conservation significance.

It is considered that the sensitive environment in the area surrounding the AWE site will not be impacted upon by the construction or operation of the proposed Facility.

7 SUSTAINABILITY APPRAISAL

A sustainability appraisal has been undertaken in accordance with the Sustainability Appraisal Handbook – For the MoD Estate (Version 3.1, October 2003). The appraisal team consisted of representatives from the MoD, the Orion Project and AWE Planning and Environment Departments. This section of the AEI document summarises the findings of the appraisal – the impacts of Project Orion during construction and operation phases and the mitigation measures which the project team have put into effect. It also identifies the following further actions which will be undertaken:

- The strategy for the disposal of abstracted groundwater to be finalised and discussed with and presented to the relevant authorities prior to implementation
- A plan to be drawn up for accommodating the potential for unexpected features to be discovered with the advice of the MoD's archaeology specialists.
- A specialist ecologist to be employed to inspect the only area with the potential to provide a habitat for protected species.

The sustainability assessment can be found in Appendix 9.

8 CONCLUSION

The Assessment demonstrates that the operations to be undertaken within the proposed Facility do not represent a significant environmental impact. The construction, operation and eventual decommissioning will be carried out in accordance with the AWE SMS and EMS which will ensure adequate controls are in place to manage safety and environmental impact. The factors outlined below are considered important in displaying the low environmental impact of the proposed facility:

- *Construction activities will cause limited increases in traffic volumes over the construction period, and noise effects will be minimal during construction.*
- *During normal operations environmental impacts are insignificant with respect to site totals and the new facility will present an improvement over the existing arrangements.*
- *The visual impact of the facility will be minimised, and there will be no significant increase in noise levels background levels within the area.*
- *Other local developments will be built to harmonise with the facility .*

The potential for release of material into the environment and consequent contamination is extremely low, given the systems and procedures in place. The construction and normal operations of the proposed Facility are therefore considered to have the potential for minimal environmental impact. The construction of the proposed replacement LASER facility will improve the overall environmental impact of the AWE Aldermaston site.

References

1 Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.

2 Environmental Assessment- A Guide to the Procedures. Department of the Environment, HMSO 1989

3 Preparation of Environmental Assessments for Planning Projects that Require Environmental Assessment - A Good Practice Guide. Department of the Environment, 1995.

4 Department of the Environment Circular 02/99 'Environmental Impact Assessment'

5 NOPD Submission DSD01/B/CV/NOPD/HAA13000/001, issue 07, 12th August 2005.