Decommissioning & Demolition of a Redundant UK Research Facility at AWE Aldermaston – 12453

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ABSTRACT

The redundant two-storey brick built research facility on the AWE Site at Aldermaston, UK is in the closing stages of decommissioning and demolition. The facility was used for a variety of purposes up to 1995 predominately involving the use of alpha-emitting isotopes. The two main areas of alpha-based contamination have been decommissioned with the removal of hot -boxes and fume cupboards on the ground floor and HEPA filter units and ventilation equipment on the first floor. Many of these activities were undertaken using both airline fed suits, (supplied via a free standing mobile unit), and full face respirators. Asbestos materials were located and cleared from the first floor by specialist contractor. All sections of active drain running from the building to the site active effluent disposal system were removed early in the program using established techniques with specialist monitoring equipment used to provide confidence in the data required for disposal of the decommissioning debris. In particular a dedicated High Resolution Gamma Spectrometer (radioactive materials scanning unit) was utilized to categorise waste drums and wrapped packages. The building has been decommissioned and the monitoring and sampling of the structure was completed in November 2011 – the results demonstrating that the building was clear of contamination in accordance with UK clearance and exemption requirements. The demolition plan was developed and implemented in December with site excavation of foundations and site clearance currently ongoing in preparation for final site backfill activities and project close. A number of useful lessons have been learnt during the operations and are set out at the rear of the main text.

INTRODUCTION

The Research facility at AWE Aldermaston was a multi-function building which had been used for radioactive handling and research studies from the early 1950s. Numerous operations were undertaken throughout the facilities during its operational life predominately involving alpha-emitting isotopes. All operational research work ceased in 1994, with the Facility's transferral to Decommissioning in 1995. Following Post Operational Clean-Out (POCO), the Facility entered a Care and Maintenance (C&M) phase to await commencement of decommissioning and demolition works.

The contract was awarded in January 2009 to decommission and demolish the research facility. The contractor undertook an intense period of familiarisation and training for the staff involved. This was reflected in a mobilisation, pre-works and initial decommissioning period that has seen an excellent working relationship develop between Client and Contractor. A One Team approach was adopted throughout the project and it has seen the project set high safety standards and resulted in a first-rate safety performance. The integrated One Team approach has delivered many day to day benefits and its value to the project cannot be over emphasised.

OUTLINE FACILITY DESCRIPTION

Fig 1: The Facility showing the Ground Floor Access

The research facility is located in the Nuclear Storage and Production Area of AWE's Aldermaston site. It is mainly a two-storey building of brick construction, clad on the upper storey with overlapping asbestos concrete panels under a flat roof, (Figure 1). Historically, it comprised five main sections:

Radioactive Laboratories: A two-storey steel-concrete construction mounted on a substantial concrete slab. The ground floor contained the Lower Pressurised Suit Area (LPSA) and four adjacent laboratories holding various items of plant and equipment. Other components on this floor included an inlet plant and control room, lobby, barrier area, small office and battery room. The first floor holds the main plant room - Upper Filter Maintenance Area, (UFMA) where the redundant extract fans and motors were located.
Stack and Monitoring Unit: The original ventilation discharge stack was connected to the outlets from the extract filters via pipe work from the first floor. This unit was isolated and taken out of service at an early stage in the program after a replacement temporary discharge stack and associated ventilation system was installed.
Workshop/Mess Room: A separate brick building located on the south west side of the main facility.
Office Accommodation: A single story brick building connected to the main facility via a covered walk way.
Non-Hazardous Materials Store: Single storey, modular structure located away from the facility on a concrete foundation.

The ground floor provided access to the change barrier and to the centrally located LPSA. This contained area included a series of five process boxes and fume cupboards (Figure 2). These were accessed from inside the LPSA by operatives wearing airline fed suits via a stainless steel entry tunnel. A 0.25Te goods lift was used to move equipment and waste materials between the two floors.

The UFMA contains the ventilation system associated with the ground floor hot-boxes and fume cupboards. This fully contained area held 164 filter assemblies, associated ductwork, access staging and electrical services. In operation was accessed by operatives wearing respirators and only for inspection purposes. The filter assemblies were located in two separate banks to provide a first and second stage exhaust air filtration during the facility life. The primary filters discharged the air into a large 'Precipitron' unit, a commercially sourced electrostatic particulate precipitator, prior to the secondary filters and then discharged to the stack.

THE DECOMMISSIONING PLAN

The decommissioning plan has been arranged into four work paths, each with clear objectives and responsibilities. This approach enables good control and communication with each work path having a dedicated operational team. Initial decommissioning operations have focused on removing high hazard areas to reduce the facilities hazard category and the need for hazardous condition working operations. The four main project stages are:

Stage 1 Preliminary Works

Mobilisation, Production of initial safety documentation, Installation of a new breathing air system, Installation of dedicated decommissioning power supplies, Installation of new Ventilation system, External Active Drains Removal.

Stage 2 Decommissioning

Ventilation Systems (UFMA); Pressurised Suit Area on the ground floor (LPSA), General Area Decommissioning; Decontamination of Facility, Waste Processing Operations, Radiological End Point (REP)

Stage 3 Data Quality Objective Process

Strategy and Justification; Survey & Sample, Report; Sanction

Stage 4 Demolition

Above Ground Structures; Floor Slabs, Making Good Grounds

Stages 1 to 3 are complete with Stage 4 making good progress. The end state will be a backfilled excavation to allow possible future re-development of the site.

OPERATIONAL PLAN AND PROGRESS

The Project Team was put together in accordance with the Construction Design and Management (CDM) model required of a Construction (demolition) project. The Client (AWE) provided the scope for the works to be performed together with Project and Controls Management to measure and record project progress; the Principle Contractor (Nuvia) provided a decommissioning team, suitably qualified and experienced in decommissioning techniques to perform the decommissioning tasks; and a demolition sub-contractor (Cuddy) to provide this service. A One Team approach was developed and actively encouraged for the duration of the project propagating the safe, efficient, commercially aware manner in which this project has been delivered thus far.

The Contractor gained invaluable experience early on in the project by undertaking certified training delivered by AWE in Pressurised Breathing Air-Suit (PBAS) techniques. By mixing the Contractor's operatives with seasoned AWE Health Physics and Decommissioning Operatives the opportunity was taken to integrate experienced operational staff in the techniques necessary for working in alpha-contaminated facilities.

Following the completion of the Preliminary Works, the overall approach adopted was, to have four teams of operatives working in parallel on four workfronts (the UFMA, LPSA, Services/Maintenance and Waste Processing). A patented Modular Containment System (MCS) was utilised which allowed enclosures to be created around the two main contaminated areas, each with dedicated entry/exit tunnels. The hierarchy of hazard reduction focused first on the ground floor LPSA facility, undertaken in PBAS until the hazards had been reduced sufficiently to allow use of powered respirators. In the UFMA areas it was judged that the hazards were sufficiently well-defined to permit entries using respirators. In the event, robust monitoring techniques during the project showed that PBAS suits would be required in certain areas within the UFMA (e.g. Hot Box Filter System).

Preliminary Works Stage 1

The Safety Case was produced and approved for the decommissioning plan. During this period, mobilization was undertaken with operatives completing familiarisation tasks and additional training (work specific). A novel approach was implemented of a mobile stand-alone commercially sourced free breathing air system which replaced the redundant system. This provided greater flexibility and minimised disruption, being installed outside the main building. The system was connected to new supply pipe-work within the facility to provide the required PBAS operating conditions required to decommission the two main high hazard areas. This approach significantly reduced the potential waste burden, as the mobile unit having been positioned outside radiological area, is able to be redeployed on completion of its duty. The establishment of replacement electrical supplies for small power and lighting units within the building was also undertaken over this period. This is a common requirement when decommissioning older facilities to provide confidence in the safety and reliability of supplies during operations. In this case, 415v three phase and 110v supplies were provided for power and lighting purposes.

The incumbent ventilation system for the main facility was intended to be used during the early stages of the decommissioning, although plans had been made to install a replacement system during the final stages. However it became apparent that the requirement for the extract system (provide a minimum velocity of 0.7m/sec airflow across the entry position into the two alpha-contaminated areas) could not be met as the building filters were clogging. As a result, the installation of the new ventilation extract system and discharge stack was brought forward allowing the original system to be shut down at an earlier stage in the program. This separated the now redundant extract filter units and ventilation stack from the newly-installed system permitting this section of work to be performed at an earlier point in the program.

The new extract ventilation system was based on the use of two high capacity, double HEPA-filtered air-movers at each floor level. At each working position the air-movers were located outside the man-entry position drawing air from within the adjacent active facility through a primary HEPA filter and flexible metal ductwork; typical arrangements shown in Figure 2. This arrangement maintained the necessary airflows across the man-entry openings and provided balanced air-flows within-building. The building extract discharged to the new ventilation stack whilst the second discharged locally into the building via a ‘diffuser sock’.

Monitoring showed that the original air-inlet system and plenum system was uncontaminated and could be removed routinely using standard equipment and techniques. The system occupied a large ground floor area and several metric Tonnes of exempt steel waste were produced during this operation. The four air-inlet ducts were sealed where they entered into the main part of the ground floor building through two of the separation walls. The shut down and large scale removal of the original ventilation system permitted the ventilation control room to be cleared of equipment for an alternative use - such as a waste drum and handling equipment store.

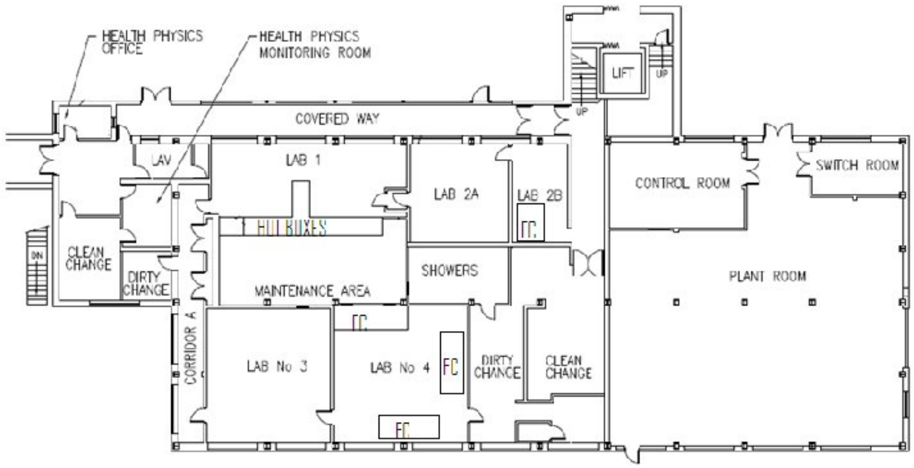

Fig 2: A Plan of the Ground Floor of the Research Facility

During preparatory works a number of redundant active drains were decommissioned and removed. The drains ran in external concrete ducts from the outer boundary of the building to the on-site active effluent disposal system. By enclosing sections of the concrete ducts within a temporary tented structure, duct covers were removed under carefully controlled conditions, giving access to lengths of the discharge pipe work. A shallow drip tray was placed below the exposed length to retain liquids and other debris released from the pipes during operations. Each length of pipe work was drilled in a number of places on the upper surface of the pipe and the interior filled with expanding foam, sealing and encapsulating possible contaminants. The pipe sections were then cut with hand held power tools into suitable lengths and placed into drums for Low Level Waste (LLW) disposal. After appropriate local monitoring, the concrete covers were replaced and the tented enclosure removed. The empty concrete ducts will be removed for disposal at the building demolition stage after appropriate final monitoring to confirm their radiological condition.

Decommissioning Operations Stage 2

The LPSA

A plan of the ground floor of the facility is shown in Figure 3. The LPSA is a centrally located containment servicing the hot boxes and initial work in this area required the adoption of PBAS operations. The objective for this area was to reduce the radiological hazard by decommissioning the five hot-boxes in order to permit the adoption of less onerous respirator-based man-entry operations. The area was originally contained within a steel clad enclosure with a number of roof penetrations through which ventilation ducting passed. Entry into this enclosure was from the external corridor through a 3.5m long 3 x 1m stainless steel tunnel. In the final stages of decommissioning and in order to decommission the entry tunnel, a second entry position was created into the LPSA using a temporary enclosure attached to an opening through an MCS panel in Lab 4.

Figure 3 also shows the set up of the new ventilation system for the LPSA and close proximity of the two air-mover units to the original entry position. The exterior sections of the hot-boxes within Lab 1 were also enclosed within MCS sections to allow them to be decommissioned and removed from the LPSA facility. Operatives wearing airline fed suits made entries into and out of this area using established techniques designed to minimise the risk of cross contamination. The airline fed suits were covered with disposable ‘over suits’ that were cut away on exit from the controlled area – the over suits are designed to prolong the life of the air-fed suit giving protection from physical and radiological contamination damage.

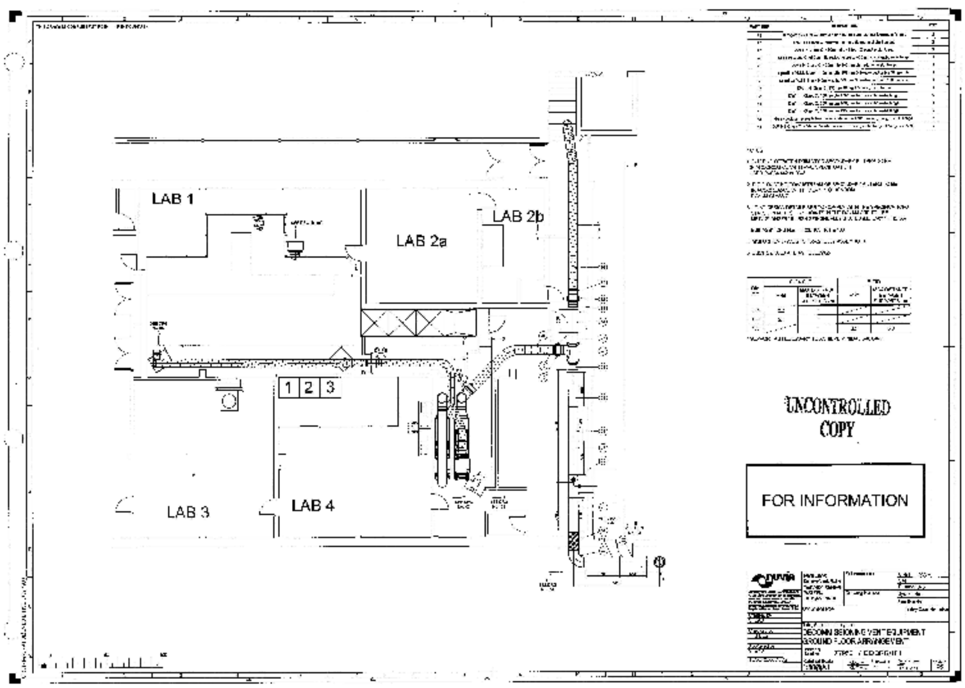

Fig 3: Lab layout and typical ventilation arrangement

The radiological checks made on the air-fed suits (‘dry swabbing’ due to the presence of alpha-emitting contamination) post oversuit removal consistently demonstrated the absence of surface contamination to the air-fed suit.

The hot-boxes were cleared of residual items, partially decontaminated and then size-reduced using standard hand-held power tools. Due to the levels of alpha contamination the waste generated during the initial stages of the work was predominantly Intermediate Level Waste (ILW). This required a significant level of size reduction to be undertaken to minimise the volume generated as wastes posted out of the area used a dedicated disposal port provided as part of the MCS structure. Standard ‘bagging-out’ techniques were used to dispose of items into 200 l drums. The operations included the removal of the hot box steel support structure. Once removed, the linoleum floor covering was lifted and removed, exposing a contaminated concrete screed (60mm thick) covering the steel base sheeted enclosure surrounding LPSA area. The floor screed was removed and the steel surface painted (to contain any residual contamination) for removal at a later date. Approximately twenty 200 litre drums of low level waste were recovered from the floor and these materials, after wrapping, were transferred to a half-height ISO container for disposal together with other debris. Since the levels of airborne contamination throughout the area had been sufficiently reduced, the removal of the steel roof, side and base sheets of the enclosure was undertaken with operatives wearing powered respirators. Decommissioning proceeded with the removal of the steel walls and floor which had been secured to the concrete base of the building and supported by shallow steel frames. Removal of the stainless steel access tunnel concluded the removal process and revealed a 1m deep concrete lined sump which once held electric pumps used with an adjacent showering facility.

The three fume cupboards in Lab 4 were not connected directly into the LPSA area and the extract ventilation was effected through separate ducting leading to the UFMA facility on the first floor. Since the levels of contamination were much lower in these units they were first enclosed by a number of MCS panels allowing man-access to operatives wearing powered respirators. This allowed the fume cupboards to be cleared and size-reduced for disposal into drums as LLW. Monitoring for contamination on the floor and external surfaces of the LPSA concluded the operation. The MCS panel was replaced on conclusion of operations, providing an external containment for the LPSA structure.

The UFMA

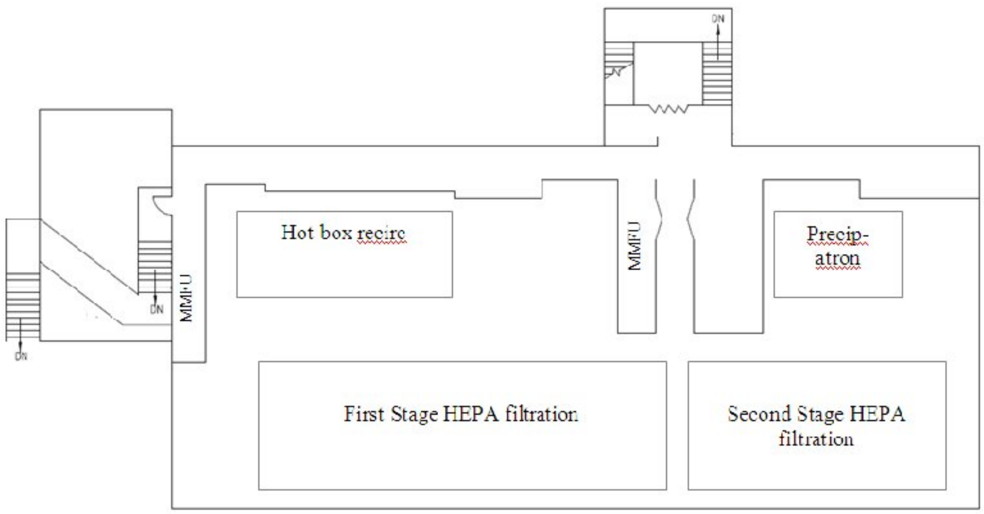

Fig 4: A Plan of the First Floor of the Research Facility

Figure 4 shows the first floor arrangement for the facility. Once the new HEPA-filtered ventilation system and stack had been installed and commissioned, a new man-entry point was constructed close to the top of the stairwell ahead of the original entry tunnel using MCS panels. Space at the top of the stairway was restricted and a two position HEPA-filtered system was developed in this area. Power supplies, HEPA-filter and waste drum 'bagging out' inlets were provided using additional MCS panels. Lower levels of contamination allowed operatives to undertake the strip-out work using respirators and disposable 'over suits' rather than airline-fed suits.

Work in the UFMA required the removal, size reduction and packaging of 164 filter assemblies, associated ductwork, services, support structure and access staging. The extract filter units were removed by separating them at the mounting and support plate positions and bagging them up for disposal as LLW. Considerable care had been taken during the removal phase of the support and access platforms to maximize the potential for 'exempt' disposal. Components with the original surface finish were decontaminated using a household cleaning agent (Cillit Bang) resulting in 5900Kg of metal to be disposed of as exempt waste.

An ALARA tie-down coating [1] was routinely applied to surfaces contain contamination within the working locality. The coating is a water-based, strippable adhesive, used on steel, aluminium and other metal or painted surfaces and applied thinly by airless-spray drying within 24 hours of application. All lengths of ventilation ducting were accessed and treated with ALARA prior to size reduction using hand tools, resulting in the minimisation of waste volumes.

Due to the extract fan motors being mounted outside of the UFMA, they were removed without the need of filtered air (therefore ‘free breathing’). Many of these items were identified after monitoring as further candidates for ‘exempt’ disposal.

After passing through the primary filters, the extract air was directed to an electrostatic ‘Precipitron’ unit, out to the secondary filters and on to the discharge stack. The removal of the ‘Precipitron’ was originally thought likely to be undertaken under PBASO conditions due to its operational intent and uncertain internal conditions. However, monitoring showed very low levels of internal contamination allowing powered respirators to be used. The commercially-sourced ‘Precipitron’ operated by electrostatic attraction of particulates in the extract air to a wire network within its body. The interior was flushed with water to remove the particulates through an opening in its base, discharging to the site effluent system. It was then dried by heating with steam and passed through external pipes fed from site services through locally lagged pipes. Some of the lagging, (fibres sealed by painting), was seen to be damaged and tests showed the presence of asbestos. A specialist asbestos contractor removed the lagging on the former steam pipes in order to progress the decommissioning of the ‘Precipitron’. The Preciptron was finally decommissioned, size reduced and after careful monitoring disposed of as LLW.

A separate stand alone recirculation filtration system existed within the UFMA in support of the the hot boxes. Monitoring found the system to be highly contaminated and a tented enclosure was constructed to contain the possible spread of contamination to other areas within the UFMA. Operations were conducted in PBAS and the system was decommissioned with Wastes sentenced as Intermediate Level Waste (ILW) and LLW Surface Contaminated Objects (SCO-II).

Old, disused legacy filters were located within the UFMA and required disposal as part of the area decommissioning. Each filter was approximately 0.3m in diameter and 1.3m long. The filtering medium was asbestos with each unit internally contaminated by alpha-emitting isotopes, though careful monitoring established that 11 were suitable for disposal as LLW. These were wrapped, removed from the area and placed directly into an ISO container. The remaining three were disposed of as ILW requiring size reduction of the filters to enable them to be placed into a 200 litre waste drum. The key challenge was the prevention of the spread of asbestos filter material during sectioning for disposal. The technique adopted was to pour a fluid epoxy resin into the filter body such that the internal contents were stabilized enabling the filters to be cut without releasing radiological or asbestos contamination. The project team developed the technique as part of the One Team approach. Size reduction of the filters followed the successful trial for this procedure and upon completion, a learning forum was held to develop and improve the process. The six sections were disposed of into a number of lined 200 litre drums. The work in the UFMA is now complete having removed all filters, the precipitron and the stainless steel entry tunnel.

General Area Decommissioning

Following the removal of contaminated equipment and services, other more general redundant services were removed from the LPSA & UFMA. The areas were intimately monitored and decontaminated using widely available techniques such as concrete planing and scabbling. Following the removal of contamination from the building fabric within the LPSA, the MSC panels were removed and the area returned to free breathing allowing all surfaces to be finally monitored in preparation for REP conditions.

Waste Handling & Monitoring

The contaminated waste produced from the decommissioning operations fell into the three main radiological waste categories: exempt waste, LLW and ILW.

During the process of decommissioning the research facility, it was clear that mainly items would be surface contaminated, together with quantities of more active debris. Significant quantities of debris were placed into LLW drums following waste characterization using standard instruments. Supporting this approach has been the dedicated drum gamma scanning facility (High Resolution Gamma Spectrometry - HRGS) installed within the control room on the ground floor. This calibrated facility was used to monitor all drummed and packaged waste and provided a detailed isotopic record of drum or package contents ahead of disposal. The use of the HRGS is not yet common practice on the AWE site but its use has been invaluable on this project.

ILW wastes were sentenced mainly due to the presence of high active alpha particulate using 200 litre drums specifically configured for ILW wastes. The waste materials were initially sentenced at source through probe and surface smear readings and with due regard to provenance and the HRGS was employed to assay and confirm the sentencing decision.

In the UK exempt materials currently refer to items with a specific activity below 0.4Bq/g alpha. However, the exemption used here was 0.1 Bq/g, taken from the limits within the Environmental Permitting Regulations 2010 (EPR '10). Although it is known that the exemption values vary for different radionuclides, a single limit has been chosen for this study. This is based on the most restrictive value within the facility's radionuclide fingerprint. By working to this level across the facility, it has been ensured that the residual risk of exceeding clearance limits is As Low As Reasonably Practicable (ALARP). (The new exemption limits came into effect in October 2011.) Due to decommissioning and demolition wastes being disposed of after this date (potentially in 2012), the amended value was used.

The original vertical steel ventilation stack was fully inspected, monitored and removed from the building. This unit was a 30m tall fully welded construction weighing approximately 13 metric Tonnes. It was hot cut into three 10m long sections and lowered by crane to the ground. Monitoring of the cut sections confirmed its exempt status allowing it to be disposed of into the metal recycling waste stream.

Decommissioning Stage 3 – Data Quality Objective (DQO)

As a matter of standard procedure, the DQO process was undertaken to support the release of a former active building or facility for demolition. A key feature of the process is the creation of a History File documenting operations and the preparation of a technical report, justifying the approach to the monitoring and sampling programme.

A detailed DQO report was prepared covering all required aspects of the building clearance, monitoring and the basis for the sampling matrix, [2]. The research facility had four key areas which required monitoring and decontamination to an extent commensurate with the nature of the activities carried out in each area. The purpose of this monitoring regime was to confirm that the activity of the bulk material from each area was below the 0.1 Bq/g limit, ensuring that the resultant demolition spoil is exempt from regulatory control and therefore suitable for reuse elsewhere on site, or disposal at an appropriate offsite facility under UK regulations.

As all major process equipment such as hot-boxes, fume cupboards, tanks, sinks and drains within the areas were removed, only the walls, ceilings and floors were required to provide samples for analysis. The base slab and surrounding soils and sub-soils will be assessed as part of this study on completion of the removal of the base slab. The total surface area of all the rooms selected for sampling is approximately 4000 m^2

Numerous performance parameters (such as standard deviation, confidence limits and willingness to falsely accept or reject the null hypothesis) were derived through review of historical information, collection of preliminary data and close liaison with both former and current facility staff. These parameters were used in the derivation of a statistically robust sampling plan that recommended a total of 33 samples, required to be able to confidently determine whether the average residual activity of the bulk material of the building is above or below the specified action level.

WASTE MONITORING FOR DISPOSAL

High Resolution Gamma Scanning

A major objective for the decommissioning teams was to reduce the amount of ILW generated throughout the project, taking into account that much of the contamination comprised alpha-emitters. By using the HRGS it was possible to detect the 59.5 keV emissions from ^{241}Am. This is a relatively low energy emission which is easily attenuated by the waste matrix. The overall process required a system capable of providing the activity of ^{241}Am with an associated realistic uncertainty and a low enough Minimum Detectable Activity (MDA). The measured value or MDA plus the uncertainty was used to provide an upper estimate of the ^{241}Am activity at the 95% confidence threshold. This was then be combined with the nuclide fingerprint to generate an upper 95% confidence value for the total activity.

Establishing the nuclide fingerprint was an early activity within the program and involved the taking of samples from a variety of materials and locations. One of the issues in this campaign was to provide sufficient activity for analysis as this facility had already undergone significant POCO. Although an issue for nuclide fingerprinting, this actually assisted in the calibration of the HRGS as there were few instances of extreme activity accumulation. This meant that it was unlikely that there would be extreme localisation of activity within waste drums / packages. Nevertheless the calibration had to take into account the potential for non-uniform activity distribution within the package. As previously mentioned, the type of waste package commonly used was the 200l drum.

The HRGS employed was a Canberra BEGe 2825 mounted on a ‘Big MAC’ cryostat. The calibration was undertaken using Canberra’s ISOCS modeling code including the ISOCS Uncertainty Estimator (IUE). Using this code it is possible to generate a calibration that takes into account the size of the drum, the degree of fill, activity distribution, waste materials, and waste density. In practice, for a commercial decommissioning project, the activity distribution is not precisely known; however it is possible to run many models with varying activity distributions and see the effect this has not just on the computed efficiency, but the variation of computed efficiencies i.e. the uncertainty. This combined with variations in drum dimensions, degree of fill, waste materials, measurement position, bulk density, and counting statistics enable the derivation of a Total Measurement Uncertainty (TMU). It is this TMU that is used to generate the upper estimates of activity. The MDA for a 15 minute count where the detector is positioned 50cm from the drum and the drum is continuously rotating at 1rpm was 7 Bq/g total activity. The system was calibrated in a similar manner for varying drum types as well as ‘flat pack’ packages within limitations determined by the detectability of ^{241}Am emissions.

Demolition Works Stage 4

The Principle Contractor engaged a sub-contractor for the demolition stage of the project. Local authority provided approvals to demolish following a successful application consisting of a demolition and transport plans and an outline safe system of work. The demolition is being carried out as a Civil Demolition (no radiological issues) with the Principle Contractor providing on site monitoring support. Following the removal of all radioactivity from the building, the sub contractor prepared a program of works which included a soft strip of the remaining 'domestic' redundant services. In addition the soft strip removed all non-structural components from the building such as doors and door frames windows, furniture, floor coverings etc. Final items for removal were safety items such as the site tannoy and the fire alarm system. Currently the Sub Contractor is mobilising onto site, in order to prepare for demolition tasks. His main focus (safety notwithstanding) and the most important aspect of the task is the quality of the segregation of wastes.

LESSONS LEARNT

The original process to gamma scan drums of waste was found to be cumbersome and time consuming requiring the use of a small mobile crane and drum trolleys to physically transport drums from the facility to the assay area and then to the to the storage area to await disposal. A review of the process found that by changing the building slightly (opening cut through an internal wall) and applying suitable controls drums could quickly be transferred to the assay area and then onto the area for the storage of wastes pending collection for disposal.

Asbestos was detected late in the project and, as might be expected, caused some delays to the program. In all older facilities where any form of steam heating has been used it is important to look for evidence of asbestos, as it was in common use until relatively recent times. In the event, the presence was quickly recognised and suitably qualified specialists employed to undertake its stabilisation and removal.

The introduction and use of MCS panels throughout the facility during this work greatly assisted with the control of contamination. There were very few examples of activity detected outside of the working area and the flexibility of the MCS units greatly assisted with decommissioning progress. The Modular Containment System is to be recommended to decommissioning projects everywhere as a primary tool for containing contamination in radiological decommissioning projects. In a similar vein, the introduction of modern HEPA filtered air-movers in place of the obsolete ventilation system and discharge stack greatly streamlined the ability to progress by reducing the building hazards thus enabling respirators to be used in place of full airline fed suit operations.

Following the conclusion of a contamination removal trial in another AWE facility using household cleaning products, 'Cilit Bang' was used in this facility to investigate the potential to reduce the waste category of contaminated items. The cleaning process was successful with levels being reduced from several hundred counts per second, down to single figure levels with a single cleaning/treatment cycle. This had led to further waste treatment arrangements being put in place to further exploit this development and to demonstrate a commitment and greater emphasis on reducing the volumes of wastes within the decommissioning arena. This should lead to a reduction in the levels of LLW generated across AWE.

As part of the One Team approach a number of Review Learn and Improve sessions were been held over the project duration. This included resin filled 'torpedo filter' cutting trails and the installation of a novel stand alone Breathing Air system.

Finally, the creation of an integrated co-operative working environment between the client and contractor (One Team) has seen the project set high safety standards and has resulted in a first-rate safety performance. There have been no lost time accidents or OSHA reportable events in two and a half years of work. The value of a One Team approach to the project cannot be over emphasised and is commended to others engaged in similar operations. One Team, One Goal.

PROJECT ACHIEVEMENTS

- A novel mobile free-breathing air unit was supplied and successfully installed outside the former research building to support airline fed suit entries into alpha contaminated areas, avoiding the need to decontaminate the process unit or consign it as waste.
- All the hot-boxes and fume cupboards in the LPSA were removed decontaminated and size reduced for disposal.
- 164 HEPA filter units were removed from the UFMA along with all of the ventilation ducting and fan motors.
- ILW wastes contributed just 7% of the total waste inventory from internal process equipment (and therefore exclusive of demolition spoil).
- Exempt waste made up approximately 11% of the waste from the building processes.
- LLW wastes contributed 82% of the building processes equipment filling 796 drums and 4 HHISO containers. Two additional HHISO containers were partially filled in accordance with waste segregation requirements. If the waste treatment requirements been introduced at an earlier point in the program the level of LLW would have been reduced with a greater percentage of materials classified as exempt.
- A new technique was trialled during the project - stabilising asbestos filters for safe size reduction and disposal.
- A dedicated high resolution gamma scanning unit was used to monitor wastes confirming their waste category for drums and wrapped packages prior to disposal.
- The final stages of the demolition paperwork are awaited, with demolition of a redundant research facility following on shortly.
- The completion of a two and a half year decommissioning – demolition project with no lost time accidents or reportable incidents.
- Program due to finish early (by approximately two months).

REFERENCES

[1] ALARA 1146: Carboline Product Data Sheet, Carboline Inc, St Louis, Missouri, USA.

[2] Data Quality Objectives Summary Report for Research Facility at AWE Aldermaston: Decommissioning and Demolition Project. Nuvia Internal Report, Z7950/DE/TR/020 Issue B, V Nesbitt, March 2011