RWE Solutions RWE NUKEM	RAF CATAPULT PIT	TR/051700/016 Issue B October 2002 J Armitage
Title: Land Quality Statement		

Revision details:

Issue A submitted to UKAEA

Issue B submitted to UKAEA incorporating client comments.

Authors Signature:	
Checked By:	**Date:**
Approved:	**Date:**
Document Status:	(not applicable for internal documents) **DAS No:**..... **Date:**..... **Signature:**.....

RWE NUKEM Limited, Kelburn Court, Daten Park, Risley, Warrington, WA3 6TW
Tel: 01925 858200 Fax: 01925 811866
Email: Info@rwenukem.co.uk

1 EXECUTIVE SUMMARY

The Catapult Pit was constructed at RAF Harwell in the late 1930's/early 1940's to house a prototype pneumatic catapult designed to assist the take-off of bombers. The structure comprising a circular pit and two radial trenches was backfilled with construction spoil during the early years of the UK nuclear development programme at Harwell. Some historic records indicated that radioactive materials and beryllium had been stored in the pit and recent site investigations detected the presence of uranium near the bottom of the pit in one location.

In pursuit of its programme of dealing with historic nuclear liabilities and releasing land for beneficial use the UKAEA decided to remediate the Catapult Pit by removing its contents and replacing them with clean fill.

The remediation process was designed to remove any residual risk to the public, to groundwater and to the environment in general.

Excavation of the structure was undertaken within large weather protection facilities (WPF), (tents) to minimise the impact to the general public and the local environment. Air samplers were positioned at 4 points at the perimeter fence to monitor levels of radioactivity and metals.

During the excavation of the Catapult Pit material was subject to comprehensive in and ex situ monitoring/assay to ensure waste was correctly sentenced. Both chemical and radiological analysis was performed on samples by a UKAS accredited laboratory to provide reassurance to the on site activities.

On completion of the excavation of the RAF Catapult Pit a series of validation surveys were undertaken on the empty structure to ensure that no residual contamination remained. The surveys comprised:

- Health Physics contamination surveys of all exposed surfaces
- Smear samples taken from exposed surfaces for radiological and beryllium analysis
- Soil sample collection from orifices for radiological and chemical analysis

The validation survey demonstrated that the RAF Catapult Pit structure was remediated to the specifications outlined by UKAEA and that all wastes were removed and no radioactive materials remain on site. The structure was filled with imported material to reinstate the site back to its original condition.

A further survey on completion of backfilling was undertaken in which gross gamma (radiation) readings were taken over the Catapult Pit structure and the surrounding area. The purpose of this survey was to demonstrate that the backfill materials used for site reinstatement exhibited a gross gamma count of the same or lower than prior to the remediation works. Post remediation survey results found that the area was comparable to gross gamma data gathered during pre characterisation investigation.

The RAF Catapult Pit has been successfully remediated and the site does not present a hazard to the end users or the natural environment.

2 THE LAND QUALITY STATEMENT

The purpose of this document is to provide evidence that the site has been remediated and that it does not present a risk to health and safety or the environment nor that it will not represent a potential legal liability.

The document contains the relevant data to demonstrate that the site has been restored to the clearance criteria targets set by the UKAEA.

This document provides a brief synopsis of the remediation of the RAF Catapult Pit. Two other key documents exist relating to the restoration of the area:

- The Remediation Experience (a more comprehensive document covering the project in greater detail)
- Records and Data (containing relevant supporting information: radiological and chemical analysis results, waste information, survey information etc.)

This document can be read as a stand alone document or in conjunction with the above.

3 OVERALL SOURCE-PATHWAY-RECEPTOR SUMMARY

An analysis of sources, pathways and receptors was undertaken to investigate the potential pollution linkages relating to the RAF Catapult Pit and is tabulated in Table 3.1.

Potential Sources	Potential Pathways	Potential Receptors
Radioactivity from Uranium	Via air/dust Soil gas/structures/services Direct radiation Leaching via groundwater/migration	A*, C*
Elevated levels of Uranium in groundwater	Via groundwater flow	B
Chlorinated hydrocarbons (carbon tetrachloride). Also slightly elevated levels of Hg	Via groundwater flow	B

Receptors considered for the Catapult Pit contract.
A Recreational users of the playing field area
B General population via water use
C Workers during remediation contract
D Site workers at Harwell International Business Centre
E Pupils/teachers of Chilton Down Primary School
*** Only during remediation works**

Table 3.1. Source Pathway Receptor summary of the RAF Catapult Pit, (modified from ENSR, 2001)

Pollution linkages (the Source Pathway Receptor framework) were broken after the successful removal of all materials (the source) from the pit and trenches. A further breakdown of individual sources is found below.

Radioactive materials

Removal of all radioactive waste from the structure broke the pollution linkage by removal of the source (contaminated soil) thus removing hazards to receptors. Established working methodologies ensured that workers dose uptake was kept as low as reasonably practicable resulting in the project dose restraint objective (DRO) not being exceeded. Removal of the source will ultimately cease production of radiologically contaminated leachates percolating down to groundwater residing in the underlying chalk aquifer.

Chlorinated solvents

During remediation a potential source of groundwater contamination was removed (a small quantity of Trichloroethene, TCE) thus removing the potential for further contamination. It must be noted that chlorinated solvents are problematic due to their recalcitrance, especially in chalk aquifers. Residual quantities may still be encountered in borehole water samples. Additionally, solvents other than TCE (Carbon tetrachloride, Chloroform) have been found in local boreholes, and have been encountered in groundwater beneath the Harwell site.

4 SITE DESCRIPTION

4.1 Location

The Catapult Pit is a subsurface concrete structure comprising a circular pit and two radial trenches, situated adjacent to the Harwell International Business Centre (Ordnance Survey grid reference SU483864). It lies in the south eastern part of a playing field which is bounded to the east by Perimeter Road which runs parallel with the A4185, to the north by Fermi Road, to the south by Frome Road and to the west by rough grass and the former RAF runway.

Harwell International Business Centre is to the north, Rutherford Appleton Laboratories is found to the west of the site and a primary school is situated to the south.
Figure 4.1 shows the Catapult Pit and surrounding area (note that the northerly trench is entitled Trench 1 and the southerly trench, Trench 2).

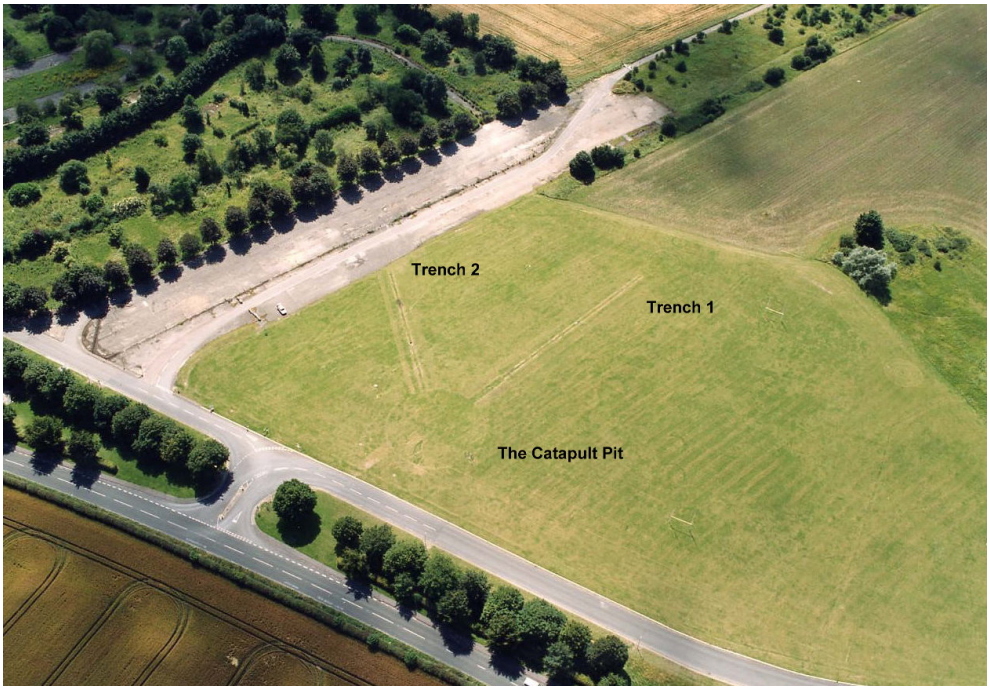

Figure 4.1. Aerial view of the RAF Catapult Pit. The road at the bottom of the picture is the A4185, the road parallel is Perimeter Road. (Photograph courtesy of Harwell UKAEA Image Resources). Note the faint outline of the structure on the grass.

The general dimensions of the structure are as follows:

The Pit

Diameter	30m
Depth	3.5m
Volume	2356m^3

(Note the pit did contain other features such as: entry alcoves to allow personnel to access the structure, a 2.8m deep 1.5m diameter central bearing housing in the centre of the pit base, a small chamber immediately adjacent to the main pit and the pit base contained a network of cast iron pipes and inspection holes shown in Figure 4.2).

Figure 4.2. The Catapult Pit interior. Note the additional features: Alcove 1 and 2, manhole and pipework.

Trench 1 and 2 (Figure 4.3)
Length 82m
Width 2.1m (at pit end), 1.5m (at distal end)
Depth 2.85m
Volume 340m^3
(Note: The design of the trenches were quite similar with the exception of some minor differences).

4.2 Topography

The surrounding area is relatively flat lying (as the area is a playing field), although the actual pit lies somewhat higher than the surrounding areas. A full topographic survey was undertaken in May 2001 (ENSR, 2001), and a final survey was undertaken in October 2002 to demonstrate that the area was reinstated to its original condition.

Figure 4.3. A view of the interior of Trench 2.

4.3 Geology

The geology of the immediate area consists of mainly Cretaceous sediments: the Chalk and underlying Greensand. Much of the area has drift deposits (clays, sands and gravels) of Recent age. Table 4.1 summarises the general geological succession of the area.

Stratum	Description	Typical thickness[#]
Coombe Deposits	Red-brown sandy silty clays with occasional gravel	1 - 4 m
Grey Chalk subgroup*	Grey or buff chalk, very clayey towards base	45 – 90m
Upper Greensand	Fine sand and silty sand	<1.0 – 45m

*Formerly known as the Lower Chalk
[#] Indicative regional thickness

Table 4.1. General geological succession (modified from ENSR, 2001, Geological Survey of Great Britain, 1971).

4.4 Hydrogeology

According to the Environment Agency (NRA, 1996) the Grey Chalk subgroup is classified as a major aquifer with overlying soils exhibiting a high leaching potential. Therefore groundwater quality beneath the Catapult Pit is classed as highly vulnerable to contaminants that reside in soils etc. above. Groundwater levels at the Catapult Pit are typically 7m below the ground surface (UKAEA, 1999).

4.5 Hydrology

The Catapult Pit and immediate vicinity lies at an elevation of approximately 118m AOD and is slightly elevated in comparison to the surrounding area. On a larger scale the surrounding land falls to the northeast. The general Catapult Pit area becomes heavily waterlogged after heavy rainfall and areas of standing water have been observed all over the site. Conversely in drier conditions the site has a tendency to dry out rapidly resulting in the ground cracking. Of the surface water bodies in the area, the closest is situated 600m to the north west of the site which is thought to be a field drainage channel.

4.6 Climate

Remediation works were undertaken during the months of February 2002 to May 2002. During this period weather conditions were not unusual for the time of year.

Rainfall was lower in the first half of 2002 than the previous year, however, May and June 2002 was considerably wetter than the previous year.

The prevailing wind for the Catapult Pit area is generally southwesterly and, excluding a few exceptions, the general wind speed from February to May was 3m/s. Notable highs in which site operations were suspended were on 26/02/02 when gusts of up to 25m/s (Force 10) were recorded and slight damage was sustained to the WPF (tent) fabric.

4.7 Habitats

UKAEA have carried out ecological surveys of the Catapult Pit area and this is described as “simple amenity grassland based on mixtures of perennial ryegrass and creeping bent. The area is rated as an ecologically impoverished sward of National Vegetation Classification MG7. No rare or endangered floral or faunal species are known to the site”.

4.8 Radiological (background information)

Walkover surveys measuring surface radiation were undertaken prior to the works by RWE NUKEM to establish baseline conditions of the RAF Catapult Pit and surrounding area. An area immediately north of the site was selected as a background area by which the final site conditions would be compared. Prior to the remediation of the structure the background radiological conditions were considered to be typical of the area. Generally the surface gamma count rates

were moderately lower than surrounding areas which was attributed to the fact that the Catapult Pit area was predominantly chalk compared to the surrounding areas which had a higher clay content.

4.9 Site Ownership Record

4.9.1 Historical records

The Catapult Pit was constructed in 1939-1940 to house a prototype pneumatic catapult system designed to assist the launch of certain types of bombers. The project was unsuccessful as the main pneumatic rams became inoperable during testing. The structure was infilled during the late 1940s, early 1950s. Records of the materials used to fill the structure were not comprehensive: most of the fill was thought to be construction spoil, however anecdotal evidence suggested that the pit was used for the temporary storage of beryllium and radioactively contaminated materials. A series of site investigations by AEA Technology in 1997 revealed the presence of a small pocket of natural uranium ore.

4.9.2 Site ownership/history

At the time of the construction of the Catapult Pit the site was an RAF airfield. Subsequently the site was taken over by the UKAEA, which owns the land to this day.

4.9.3 Uses/history, previous facilities/buildings uses

The Catapult Pit area is adjacent to a former airfield. The discovery of steel mesh under the turf in the area suggested that there may have been vehicle/aircraft movements over the grassed area. The area became a recreational area following the closure of the RAF base.

4.9.4 Current status of facilities & services

As the area is used for recreational purposes, no facilities/services are found in the area.

5 SITE REMEDIATION SUMMARY

5.1 Pre establishment works

Prior to the main remediation phase, there was a pre establishment site investigation undertaken during May – June 2001 to establish baseline and background conditions for the Catapult Pit and immediate area. This included:

- Surface radiological surveys of the immediate periphery of the pit and trenches
- Surface radiological survey of a background area
- Shallow (200mm) soil sample collection from a background area to establish background radiological and chemical conditions
- Surface radiological surveys of the periphery of the pit and trenches

- Shallow (200mm) soil sample collection from the periphery of the pit and trenches
- Intrusive (borehole) investigation of the pit and trenches to assess the presence/absence of radiological/chemical contamination. Each core recovered was monitored with Health Physics instruments and samples (one per metre) were despatched for radiological/radiochemical and chemical analysis.

Data gathered from the sample analysis of the background area samples were collated and used to calculate the background 95th percentile value for each analyte. This was used to establish a clean up criteria on which the final condition of the Catapult Pit would be based.

Underground services, noise and topographic surveys were also undertaken to further establish baseline conditions. All findings were reported in NUKEM Nuclear, (2001, TR/05170000/005) and the conclusions drawn are outlined below.

General

The Catapult pit and trenches appear largely to have been filled with freshly excavated chalk/weathered chalk with some natural drift deposits comprising sands, gravels and clays.

Levels of compaction within the pit were found to be generally higher than those of the trenches with the exception of the deeper central area (the probable location of the central bearing). Surficial soils of the surrounding area comprise sandy, gravelly and sometimes clay rich topsoil which were similar to the topsoils of the pit and trenches.

During the site investigation there was little evidence of large quantities of manmade waste within the structure from the core samples collected, however previous trial pitting by AEA Technology identified distinct layers of household/industrial waste. The pit and trench shallow depth peripheral samples collected did not reveal any evidence of radiological contamination by overspill from the infilling of the structure as the soil appeared broadly similar to that found in the background survey area.

5.1.1 Radiological

Radiological analysis was performed on peripheral and intrusive (borehole) samples from the pit and trench as well as from the background survey area. The analysis suite included methods to detect/identify alpha, beta and gamma activity within the samples. Gamma spectrometry was used to detect and quantify activities of naturally occurring and some artificial radionuclides. Further analysis provided information for uranium, plutonium and strontium.

No significant activity was detected from the samples collected during the investigation by RWE NUKEM. Peripheral samples were uncontaminated when compared to existing legislative standards and background survey results. None of the samples from Trench 1 and 2 were found to contain radiological activity of concern whilst intrusive samples were generally comparable to the background

area. Four samples from the pit were found to have slightly elevated gross alpha and beta activities. Whilst the levels were not of regulatory concern they may have indicated the presence of enhanced natural background conditions or finely dispersed contamination within the soil.

Previous site investigations undertaken by AEA Technology did reveal a body of contamination at a trial pit situated a few metres east of the centre of the pit, close to a NUKEM borehole where significant radiological activity was detected. Four boreholes were drilled in the vicinity of (but not into), that contaminated area but did not reveal additional contamination. The outcome of the intrusive investigation of this area of the pit suggested that the previously identified contamination was confined to an area of less than 25m^2.

5.1.2 Chemical

Chemical analysis (including metals, metalloids and organics) was undertaken on soil samples collected during the pre establishment works. General levels of metals/metalloids were low throughout the Catapult pit structure and largely below national guidance levels (Environment Agency, 1997). Organic chemical analysis also indicated a relatively uncontaminated site with the exception of some tar material found within the pit.

The background survey area provided a benchmark of the general levels of contamination present in the area. With the exception of elevated levels of PAH, the soils were typical of a largely uncontaminated site adjacent to an industrial complex. PAHs are chemical compounds formed by incomplete combustion of organic compounds and are found in the heavier fractions of petroleum products, (lubricating oils, asphalt and tar-like materials).

The levels of contaminants in peripheral and intrusive samples (when compared to the background area) were generally low with the exception of a small number of locations where slightly enhanced levels of metals (zinc and lead) and PAH were present.

6 SITE REMEDIATION

The RAF Catapult Pit was remediated during November 2001 and June 2002 by RWE NUKEM Limited and sub contractor D Morgan PLC by the controlled excavation of the contents of the structure. Waste was carefully excavated in no more than 300mm lifts and subject to health physics monitoring before during and after each layer. Representative samples from each 3m^3 were taken for on site laboratory analysis by gamma spectrometry to ensure waste was correctly consigned.

The process of remediation involved the complete removal of waste from the whole structure (the concrete structure was left *in-situ*). The excavation work was undertaken within large tents (Weather Protection Facilities, WPF) to minimise the impact of dust etc. to the surrounding area.

Figure 6.1. The Tents (WPFs) in which excavations were undertaken.

The Pit

Excavators drove onto pit surface and carefully excavated the pit contents in shallow layers to the concrete base. As the excavation got deeper the waste in the pit was benched for safety purposes and a small ramp was left at one part of the Pit to allow the excavator to leave the pit. The excavated surfaces were monitored by Health Physics personnel to detect the presence or absence of radioactive contamination and samples were collected at regular intervals for further analysis at the on site laboratory. Some of these samples were also sent to a UKAS accredited laboratory to provide extra reassurance. Excavated waste was loaded into lorries and removed from site to landfill only when the sample results demonstrated that it was acceptable.

In the trenches the excavator straddled the narrow structure and dug waste again, in shallow layers and loaded the waste into a dumper which transported the waste to the lorry loading area. The same monitoring and sampling methodology was used during the trench excavations.

Figure 6.2. The Catapult Pit during excavation. Note the waste was excavated in layers and benched for safety purposes.

Figure 6.3. Excavations in the Trench. Note the small excavator in the distance straddling the trench and loading waste into a dumper.

6.1 Controlled Waste

Controlled waste leaving site was predominantly a mix of weathered chalk, chalk, sandy gravels and clays. This material reflects the local geology of the area and was assumed to be the case from the intrusive investigation that was undertaken in May – June 2001. There was also a volumetrically small proportion of other waste e.g. builders rubble and other material of man made origin. All wastes leaving site were categorised as Controlled Waste or Low Level Radioactive Waste.

Table 6.1 summarises the quantity and loads of controlled waste excavated and disposed of to landfill. All controlled waste was consigned to the landfill site at Sutton Courtenay (Waste Recycling Group, Sutton Courtenay Landfill Site).

Area	No. of Lorries	Total weight (te)
The Catapult Pit	272	5150

Table 6.1. Quantity of controlled waste removed during remediation works.

Figure 6.1 summarises the weights and types of waste removed from the Catapult Pit and trenches.

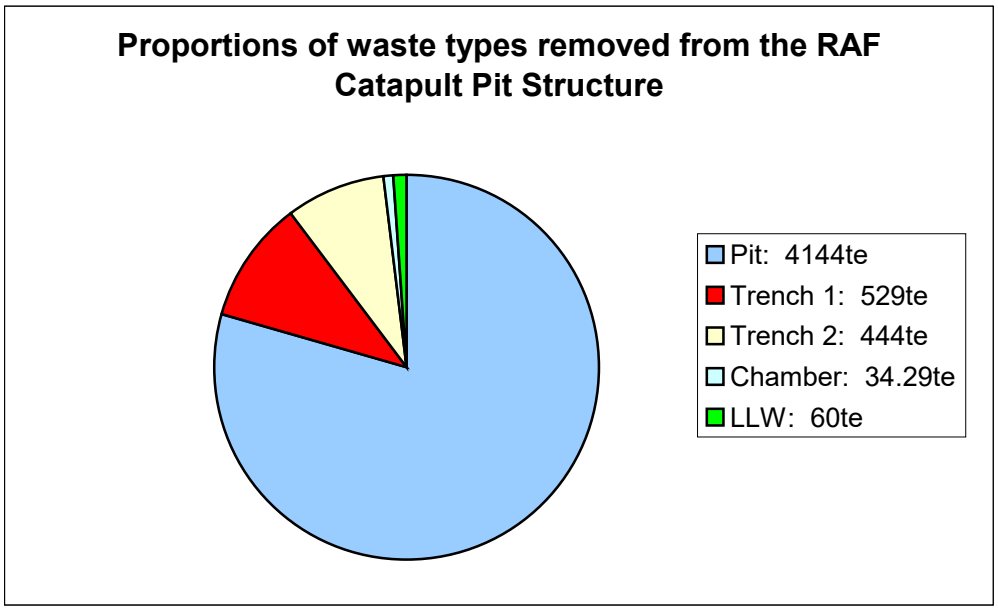

Figure 6.1. Pie chart of the proportion of waste types removed from the RAF Catapult Pit.

6.2 Low Level Waste

The quantity of low level waste (LLW) removed from the RAF Catapult Pit was greater than indicated by the pre establishment works. A total of 4 Half Height ISO (HHISO) containers were filled with LLW from the Catapult Pit area and a further six 200litre drums of LLW was removed from Trench 1. Table 6.2

summarises the quantity and type of low level waste removed during the remediation of the RAF Catapult Pit.

Total weight of waste (te)	Total weight of uranium (kg)	Total activity of uranium (MBq)
60.2	181	4575

Table 6.2. Summary table of Low Level Waste from the RAF Catapult Pit.

The predominant radiological contaminant was uranium, which was encountered in two forms:

- Natural uranium ore material
- Refined uranium

Very small quantities of man made radionuclides were detected in the Pit and were well below levels of regulatory concern.

6.3 Sampling and Analysis

The design of the remediation programme resulted in the majority of the sampling being undertaken during the pre characterisation works in May – June 2001. Soil samples were collected during the excavation and were subject to the following:

- High resolution gamma spectrometry
- Gross alpha and beta
- Metals including beryllium
- organics

A limited number of samples were also subject to Uranium and Plutonium alpha spectrometry and Strontium 90 analysis. During the main remediation phase samples of excavated material were subject to both on and off site gamma spectrometry to ensure that waste was correctly consigned.

Throughout the remediation programme the work area and site boundary were monitored for radiological activity and airborne metals by static air samplers. Within the WPFs air quality was monitored using a variety of environmental monitors to ensure that the works were not resulting in the escape of radiological and chemical contamination.

6.3.1 Air sampling

Air sampling at the site perimeter and work area for metals (As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Se and Zn) and gross alpha/beta was undertaken during the excavation phase of the project and at no point did concentrations of metals exceed action levels.
No detectable airborne radiological activity was generated during the contract as a result of the remediation works.

6.3.2 Miscellaneous air monitoring

Environmental monitoring for harmful gases, mercury and organic chemicals were undertaken within the tent structures. No problems were encountered during the project.

6.4 Remediation records

A series of validation surveys were undertaken on the empty Catapult Pit structure in order to demonstrate that the remediation process was successful. The results are outlined below. The empty structure is shown in Figure 6.1.

Figure 6.1. The empty RAF Catapult Pit structure. (Photograph courtesy of Harwell UKAEA Image Resources).

6.4.1 Smear Surveys

Smear surveys of the exposed surfaces were taken for gross alpha/beta counting, and beryllium analysis. A total of 191 smears were taken and all found to be lower than the clean up target of <0.4 Bq/cm^2 (α) and <4.0 Bq/cm^2 (β).

A total of 75 smears were taken to confirm that no beryllium was present and despatched to the off site laboratory for analysis. The results demonstrated that the clean up target of <10μg/m^2 had been achieved.

6.4.2 Health Physics surveys

Direct probe survey

All accessible surfaces within the Catapult Pit structures were monitored for any residual radiological activity using a 1667 low energy beta probe. The monitoring demonstrated that the concrete surfaces of the structure were not radiologically contaminated as the clean up target of <0.4 Bq/cm^2 (α) <4.0 Bq/cm^2 (β) had been met.

Dose rate survey

Dose rate surveys were undertaken using an environmental dose rate meter on all empty structures. No readings above background (0.15μSv/hr) were detected throughout.

6.5 Validation Soil samples

Small samples of waste were collected from each individual structure (pit, trench 1 and 2) and were made up of the last scrapings of material left behind.

A total of eight samples were collected (three from the pit, three from Trench 1 and two from Trench 2) and subject to the following analysis:

- Gamma spectrometry
- Gross alpha/beta
- Metals/metalloids
- Organics

6.5.1 Gamma spectrometry

The waste samples collected were subject to analysis by gamma spectrometry. All of the samples with the exception of one were found to be radiologically clean as compared with the background area. The one sample that exhibited a very slightly elevated level of activity was from the pit end of Trench 1. The contents of all of the samples was made up from the final scrapings from the base of the structure, therefore the structure was essentially empty after this sample collection process. Monitoring of the area showed no elevated levels remaining.

6.5.2 Gross alpha/beta

All soil samples were subject to gross alpha/beta counting and six results did exceed agreed background levels. As mentioned in the previous section (Section 6.5.1) all the material was removed from the structure in the process of collecting the sample.

6.5.3 Metals (including Be)

Metals analysis was performed on the waste samples to ensure that elevated metals did not remain in the Catapult Pit. The sample analysis did identify the presence of slightly elevated levels of some metals as compared with background data, the source of which was concluded to be due to painted ironwork at the base of the structure. Again, as the samples were composed of the final scrapings of the structure the structure was regarded as free from waste material.

6.5.4 Organics

The samples were also analysed to investigate any potential contamination by hydrocarbons/organic compounds. The soil materials did contain measurable concentrations of total hydrocarbons. This was associated with the metal structures in the trenches which would have been lubricated during operation.

6.6 Validation survey conclusion

The RAF Catapult Pit structure was cleared of all accessible soil materials during the excavation phase.

Samples were taken from the small amounts of material that remained in orifices, near pipework etc. Very small quantities of residual radiological and chemical contamination were detected within the structure which amounted to the mass of the 8 samples (approximately 10kg).

Additional excavation took place within the Pit to remove soil material around a piece of cast iron pipework as residual chemical and radiological contamination was still present. Approximately 7.4te of concrete and soil was removed from the area to expose natural bedrock/soils to ensure that contaminated material was removed.

7 CONCLUSION

The remediation of the RAF Catapult Pit was successful. All wastes were removed from the structure thus breaking any present or future pollution linkages, (removal of the source of contamination). The remediation process was completed effectively and at no point did the site works result in any uncontrolled discharges of contamination into the environment.

Remediation targets for the project have been met for both chemical and radiological parameters as summarised below:

- Direct probe measurements of exposed surfaces of the Catapult Pit demonstrated that surface contamination did not exceed 4.0Bq/cm^2 (β).

- Dose rate surveys of the RAF Catapult Pit demonstrated that radiological conditions were as background (<0.15μSv/hr).

- Smears of the concrete surfaces did not reveal contamination levels above 0.4Bq/cm^2 (α) and 4.0Bq/cm^2 (β).

- Smears collected for beryllium analysis showed no beryllium contamination.

- Validation survey soil sample analysis identified that some metals and radiological activity exceeded the 95th percentile values as calculated from the background survey. All these soils were removed from the RAF Catapult Pit, therefore no contamination remained in the structure.

- Following backfilling, field measurements of gross gamma counts were taken and were found to be comparable to data gathered prior to commencement of the remedial works.

The RAF Catapult Pit was reinstated to its original land use and can once again be used by the general public as a recreational area.

8 REFERENCES

This section provides the reader a list of all additional documents relevant to the remediation of the RAF Catapult Pit.

TR/051700/001. NUKEM NUCLEAR, 2001. RAF Catapult Pit The Remediation Plan.

TR/051700/004. ENSR, 2001. Baseline environmental survey, former RAF Catapult Pit , Harwell. Report no. 20862-1.

TR/051700/005. NUKEM NUCLEAR, 2001. Pre establishment Technical Report.

TR/051700/006. NUKEM NUCLEAR, 2001. Fill Material Specification Technical Report.

TR/051700/007. NUKEM NUCLEAR, 2001. Fire Plan

TR/051700/008. NUKEM NUCLEAR, 2001. NUKEM design review.

TR/051700/009. RWE NUKEM, 2002. Calibration of the Safespec gamma spectrometer and 1667 beta/gamma probe for natural uranium ore, refined uranium and caesium 137 in soil.

TR/051700/010. Commissioning Report for the RAF Catapult Pit

TR/051700/015. RWE NUKEM, 2002.The Remediation Experience (including the Records and Data section).

Method Statements

MS/051700/001 - 010	Pre establishment works Method Statements.
MS/051700/011 - 039	Main works Method Statements

Other Documents

AEA Technology, 1997a. Initial characterisation of the Catapult Pit, Harwell. Report AEAT-1719, May 1997.

AEA Technology, 1997b. Characterisation of the Catapult Pit , Phase II: Borehole installation, Radon survey and excavation into the trench arms. Report AEAT-2680, December 1997

ENSR, 2001. *Baseline environmental survey, former RAF Catapult Pit* , Harwell. Report no. 20862-1

ENVIRONMENT AGENCY, 1997. Interim Guidance on the disposal of “contaminated soils” 2nd edition

GEOLOGICAL SURVEY OF GREAT BRITAIN, 1971. Sheet 253, Abingdon (Drift and Solid Edition) 1:63,360 map.

NRA, 1996. 1:100000 Scale Groundwater Vulnerability Map, Sheet 38, Upper Thames and Berkshire Downs

UKAEA, 1999. Safety Report for the remediation of the Catapult Pit, Harwell. Report no. AEL/N174/R1.