

BRADWELL SITE

**VARIATION TO PERMIT EPR/ZP3493SQ FOR
GASEOUS AND PARTICULATE DISCHARGES AT BRADWELL SITE**

BRAD/EN/REP/141

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CONTENTS

Purpose

Scope

Section 1: Remove Named Ventilation Outlets for Plant which has been Entirely Deplanted

Section 2: Combine Named Ventilation Outlets for Plant which has been Decommissioned, where Radiological Characterisation is known and Remaining Source Term Suitably Contained

Section 3: Proposed Monthly Gaseous Environment Agency Return Format

Conclusion

References

Appendix A: Outlets to be deleted from Permit EPR/ZP3493SQ

Appendix B: Suggested Combined Outlets and New Outlet Names

Appendix C: Proposed Monthly Gaseous Environment Agency Return Format

Purpose

Prior to entering Care and Maintenance Bradwell Site is undergoing decommissioning to reduce and in some cases remove radiological hazards and source terms, which necessitate changes to the named outlets in the permit. Changes to Schedule 3, Table S3.1 of permit EPR/ZP3493SQ are requested to align with projected gaseous and particulate discharges in the lead up to Care and Maintenance.

Scope

This report outlines the request for the following:

1. Remove named ventilation outlets for plant which has been entirely deplanted (Section 1 and Appendix A).
2. Combine current named ventilation outlets and rename in preparation for the site's requirements for Care and Maintenance (Section 2 and Appendix B).
3. Propose a new format for the monthly discharge return (Appendix C).

Where changes are proposed for outlets, each section describes:

- The technical description of activities;
- The operating techniques to protect the environment and optimise the protection of people;
- The quantity of gaseous radioactive waste discharged;
- The monitoring of discharges, and
- The impacts on people and non-human species of discharges.

For additional information on each current named outlet, the sampling frequency and estimates also refer to ENREP/166 (Ref. 1) and ENREP/68 (Ref. 2).

Section 1: Remove Named Ventilation Outlets for Plant which has been Entirely Deplanted

It is requested that the following outlets be removed from Schedule 3, Table S3.1 of permit EPR/ZP3493SQ.

(A6) Fuel Element Debris (FED) Retrieval Ventilation Plant
(A14) Ponds Water Treatment Plant Decarbonating Tower
(A19) R1 and R2 Inner and Outer Gas Cubicle Rooms
(A27) Central Workshops Maintenance Facility
(A28) Ponds Water Treatment Plant Carbonating Tower

1.1 Technical Description of Activities

(A6) Fuel Element Debris (FED) Retrieval Ventilation Plant

This discharge route is not in use and there is no requirement for this in future. All FED Retrieval discharges are reported under (A4) MEU.

(A14) Ponds Water Treatment Plant Decarbonating Tower

This plant item is completely deplanted.

(A19) R1 and R2 Inner and Outer Gas Cubicle Rooms

This area is completely deplanted.

(A27) Central Workshops Maintenance Facility

This area is completely deplanted.

(A28) Ponds Water Treatment Plant Carbonating Tower

This plant item is completely deplanted.

1.2 Operating Techniques to Protect the Environment and Optimise the Protection of People

Operating techniques are not required as no source term exists from which the environment and public require protection.

1.3 Quantity of Gaseous and Aqueous Radioactive Waste Discharged

There is no radiological source term which would result in a gaseous or particulate discharge.

1.4 Monitoring of Discharges

There is no radiological source term which would require monitoring.

1.5 Impact on People of Discharges

There is no radiological source term and therefore no impact on people.

1.6 Impact on Non-Human Species of Discharges

Current guidance from Reference 3 advises that human doses from gaseous discharges can be assumed to be the same for non-human species.

Section 2: Combine Named Ventilation Outlets for Plant which has been Decommissioned, where Radiological Characterisation is known and Remaining Source Term Suitably Contained

It is requested that the following outlets be removed from Schedule 3, Table S3.1 of permit EPR/ZP3493SQ and combined into two outlets with new names of Reactor 1 and 2 Buildings, and Ponds Buildings. Consideration has been given to the guidance in Reference 4 when making this request.

2.1 Reactor 1 and 2 Buildings

Discharges from the newly named outlet would be comprised of:

- (A1) Reactor 1 and 2 Shield Cooling Air (SCA)*
- (A2) Reactor 1 and 2 Blowdown Stack*
- (A12) Reactor 1 and 2 Upper/Lower Maintenance Room*
- (A20) Reactor 1 and 2 Blowdown & Evacuation Main Room*
- (A21) Reactor 1 and 2 East & West Circulator Hall Ventilation Systems*
- (A22) Reactor 1 and 2 Pile Cap Ventilation System*
- (A23) Reactor 1 and 2 Boiler House Ventilation System*

2.1.1 Technical Description of Activities

(A1) Reactor 1 and 2 Shield Cooling Air (SCA)

In preparation for C&M, the shield cooling fans have been decommissioned and the height of the cooling stacks has been lowered to the Boiler House roof level. When the reactor buildings are clad, the stacks will vent passively within the space between the cladding and the building and discharges will not communicate directly to the environment.

(A2) Reactor 1 and 2 Blowdown Stack

In preparation for C&M, blowdown pipework has been modified to vent from the reactor side of the reactor outlet gas valve on Boiler 3 (R1) and Boiler 10 (R2), directly to atmosphere through a four inch pipe, situated at Pile Cap level east side.

(A12) Reactor 1 and 2 Upper/Lower Maintenance Room

Situated beneath each lower maintenance room is a storage void used for the accumulation of redundant reactor components and defueling equipment. Following completion of defueling these facilities have been shut down although radioactive waste remains stored within the voids. No further active discharges are made from this route.

(A20) Reactor 1 and 2 Blowdown & Evacuation Main Room

The blowdown and evacuation main room contains plant, pipework and valves associated with the reactor blowdown system. The blowdown filter system has now been isolated from the reactor blowdown circuit and no further active discharges are made from this route.

(A21) Reactor 1 and 2 East & West Circulator Hall Ventilation Systems

Largely deplanted up to the gas circulators, the Circulator Halls are now being used to store suitably contained radioactive waste and processing facilities for radioactive waste which have their own dedicated ventilation system or MEU's; results from these ventilation systems are reported under the appropriate named discharge outlet.

(A22) Reactor 1 and 2 Pile Cap Ventilation System

When clad, discharges from this area will not have a direct route to atmosphere. The area has largely been deplanted in preparation for overcladding for Care and Maintenance.

(A23) Reactor 1 and 2 Boiler House Ventilation System

When clad, discharges from this area will not have a direct route to atmosphere. The area has largely been deplanted in preparation for overcladding for Care and Maintenance although the Boilers remain.

2.1.2 Operating Techniques to Protect the Environment and Optimise the Protection of People

During the period prior to entering Care and Maintenance, all decommissioning work is risk assessed for its potential to create airborne contamination, the potential for measurable discharges to the environment and the requirement for any forced air HEPA filtered ventilation. When plant areas are quiescent, all discharges will be subject to a risk based BAT assessment for sampling frequency including the need for active ventilation. Only one route (A2) communicates directly to atmosphere.

2.1.3 Quantity of Gaseous and Aqueous Radioactive Waste Discharged

Outlined in Table 1, all discharges are estimates and based on historical data. SRV stands for Standard Reporting Value.

Table 1: Current combined annual discharges for proposed Reactors 1 and 2 Buildings.

| Approved Outlet | Plant Name | Beta particulate SRV/month MBq | Tritium SRV/month GBq | C-14 SRV/month GBq |
|-----------------|------------------------------------------------------------|--------------------------------|-----------------------|--------------------|
| A1 | R1 and R2 Shield Cooling Air | < 2.00E-06 | N/A | N/A |
| A2 | R1 and R2 Blowdown Stack | < 2.00E-06 | 4.80E-01 | 3.50E-02 |
| A12 | R1 and R2 Upper/Lower Maintenance Room | N/A | N/A | N/A |
| A20 | R1 and R2 Blowdown and Evacuation Main Room | N/A | N/A | N/A |
| A21 | R1 and R2 East and West Circulator Hall Ventilation System | 5.00E-04 | < 1.00E-04 | N/A |
| A22 | R1 and R2 Pile Cap Vent Plant | < 1.00E-05 | N/A | N/A |
| A23 | R1 and R2 Boiler House Ventilation System | N/A | N/A | N/A |
| Annual Totals | | 6.17E-03 | 5.76E+00 | 4.20E-01 |

2.1.4 Monitoring of Discharges

All discharges will continue to be subject to a risk based sampling assessment using the process described in Ref. 2 (BRAD/ENREP/68). As part of the risk assessment process, consideration will be given to periodic monitoring to confirm estimates in areas where source term remains. The next commitment for actively sampling discharges is for tritium discharges from the reactor (A2), scheduled next in 2018.

2.1.5 Impact on People of Discharges

Using PC-Cream dose assessment software, the Individual Dose to the public from the discharges as outlined in Table 1 is well below 1 μSv per year (Ref. 5).

2.1.6 Impact on Non-Human Species of Discharges

Current guidance from Reference 3 advises that human doses from gaseous discharges can be assumed to be the same for non-human species.

2.2 Ponds Buildings

Discharges from the newly named outlet would be comprised of:

- (A9) *Active Waste Vault Ventilation Plant*
- (A10) *Magnox Vaults 7A, 7B, 8A & 8B Ventilation Plant*
- (A11) *Active Waste Handling Building Ventilation Plant*
- (A13) *Reactor 1 and 2 Bottling Hood Vent*
- (A24) *Final delay Tank Building and Access Walkway*
- (A25) *Ponds Building Ventilation Plant*
- (A26) *C3 Working Conditions Facility Ventilation Plant*

2.2.1 Technical Description of Activities

(A9) Active Waste Vault Ventilation Plant

This ventilation plant actively ventilates active waste vaults 0B, 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 6A and 6B which are currently being emptied of fuel element splitter waste, after which the vaults will be decontaminated and characterised.

(A10) Magnox Vaults 7A, 7B, 8A & 8B Ventilation Plant

This ventilation plant ventilates vaults 7A, 7B, 8A and 8B, now empty of active waste, which are being decontaminated and will then be characterised. The vent plant has been decommissioned and the area continues to be ventilated through use of a HEPA filtered MEU (A4).

(A11) Active Waste Handling Building Ventilation Plant

This building is now undergoing decommissioning including removal of the Jordan waste processing cabinet and ventilation plant, but continues to be ventilated by use of a HEPA filtered MEU (A4). After decontamination, the area will be characterised.

(A13) Reactor 1 and 2 Bottling Hood Vent

This Plant has been decommissioned and no further discharges are made from this route.

(A24) Final Monitoring and Delay Tank Building & Access Walkway

The area is being deplanted; all active effluent operations are now via the ADAP plant (ventilation discharges are reported through outlet A8 and CEARAS ADAP Sentencing Tanks) located elsewhere. After decommissioning of the FDT Building, including removal of all tanks and pipework, the area will be decontaminated and characterised.

(A25) Ponds Building Ventilation Plant

The ponds building ventilation plant was designed to extract air from the main ponds building, predominantly the cooling pond area which has now been emptied and sealed to contain loose contamination. The Ponds Building ventilation plant has been deplanted and the area is being ventilated via the C3 Working Conditions Facility Ventilation Plant (A26).

(A26) C3 Working Conditions Facility Ventilation Plant

The C3 Working Conditions Facility was a permanent maintenance facility for working on contaminated plant. The ventilation plant is now being used to assist with ventilation from the Ponds Building. The facility is now undergoing decommissioning including removal of the ventilation plant but will continue to be ventilated by use of a HEPA filtered MEU (A4). After decontamination, the area will be characterised.

2.2.2 Operating Techniques to Protect the Environment and Optimise the Protection of People

During the period prior to entering Care and Maintenance, all decommissioning work is risk assessed for its potential to create airborne contamination, the potential for measurable discharges to the environment and the requirement for any forced air HEPA filtered ventilation. When plant areas are quiescent, all discharges will be subject to a risk based BAT assessment for sampling frequency including the need for active ventilation.

2.2.3 Quantity of Gaseous and Aqueous Radioactive Waste Discharged

Outlined in Table 2, all discharges are estimates and based on historical data. SRV stands for Standard Reporting Value.

| Approved Outlet | Plant Name | Beta particulate SRV/month MBq | Tritium SRV/month GBq | C-14 SRV/month GBq |
|-----------------|---------------------------------------------------|--------------------------------|-----------------------|--------------------|
| A9 | Active Waste Vault Ventilation Plant | 6.20E-05 | 4.53E-03 | N/A |
| A10 | Magnox Vaults 7A, 7B, 8A and 8B Ventilation Plant | ** | 1.11E-02 | N/A |
| A11 | Active Waste Handling Building Ventilation Plant | 3.84E-03 | N/A | N/A |
| A13 | Reactor 1 and 2 Bottling Hood Vent | N/A | N/A | N/A |
| A24 | Final Delay Tank Building and Access Walkway | < 1.00E-05 | < 1.00E-04 | N/A |
| A25 | Ponds Building Ventilation Plant | 8.49E-03 | < 5.00E-05 | N/A |
| A26 | C3 Working Conditions Facility Ventilation Plant | 2.14E-03 | < 5.00E-05 | N/A |
| Annual Totals | | 1.75E-01 | 1.90E-01 | |

** Beta particulate measured and reported under MEU (A4), on average 0.0015 MBq/month

2.2.4 Monitoring of Discharges

All discharges will continue to be subject to a risk based sampling assessment using the process described in Ref. 2 (BRAD/ENREP/68). As part of the risk assessment process, consideration will be given to periodic monitoring to confirm estimates in areas where source term remains, in particular the Ponds Main Bays and C3 Working Facility.

2.2.5 Impact on People of Discharges

Using PC-Cream dose assessment software, the Individual Dose to the public from the discharges as outlined in Table 2 is well below 1 μ Sv per year (Ref. 5).

2.2.6 Impact on Non-Human Species of Discharges

Current guidance from Reference 3 advises that human doses from gaseous discharges can be assumed to be the same for non-human species.

Section 3: Proposed Monthly Gaseous Environment Agency Return Format

The proposed new monthly gaseous Environment Agency Return format is shown in Appendix C.

Conclusion

In conclusion, variations to permit EPR/ZP3493SQ are requested from the Environment Agency while Bradwell is being decommissioned and before the site enters Care and Maintenance. Deletion of redundant outlets and the combination of existing outlets will result an improved risk assessment which considers the whole of an area, rather than each area in isolation, and will streamline the monthly return process. Further variations will be forthcoming for Care and Maintenance.

References

- Ref. 1: EN/REP/166 Techniques for Sampling and Assessment of Radioactive Disposals.
- Ref. 2: EN/REP/068 Justification of Radioactive Gaseous Discharge Sampling Frequency at Bradwell Site.
- Ref. 3: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota, Module 2 Details Guidance (DOE-STD-1553-2002).
- Ref. 4: How to comply with your environmental permit for radioactive substances on a nuclear licensed site. Environment Agency, August 2012.
- Ref. 5: EN/REP/144 Assessment of doses to the public in support of the proposed variation for gaseous discharges under permit EPR/ZP3493SQ.

Appendix A: Outlets to be Deleted from Permit EPR/ZP3493SQ

| Delete Completely from permit | |
|--------------------------------------|-------------------------------------------------------|
| A6 | Fuel Element Debris (FED) Retrieval Ventilation Plant |
| A14 | Ponds Water Treatment Plant Decarbonating Tower |
| A19 | Reactor 1 and 2 Inner and Outer Gas Cubicle Rooms |
| A27 | Central Workshops Maintenance Facility |
| A28 | Ponds Water Treatment Plant Carbonating Tower |

Appendix B: Suggested Combined Outlets and New Outlet Names

| Existing Outlets | New Combined Outlet |
|---------------------------------------------------------------------|-----------------------------------|
| A1 Reactor 1 and 2 Shield Cooling Air (SCA) | Reactors 1 and 2 Buildings |
| A2 Reactor 1 and 2 Blowdown Stack | |
| A12 Reactor 1 and 2 Upper/Lower Maintenance Room | |
| A20 Reactor 1 and 2 Blowdown and Evacuation Main Room | |
| A21 Reactor 1 and 2 East & West Circulator Hall Ventilation Systems | |
| A22 Reactor 1 and 2 Pile Cap Ventilation System | |
| A23 Reactor 1 and 2 Boiler House Ventilation System | |

| Existing Outlets | New Combined Outlet |
|------------------------------------------------------|------------------------|
| A9 Active Waste Vault Ventilation Plant | Ponds Buildings |
| A10 Magnox Vaults 7A, 7B, 8A & 8B Ventilation Plant | |
| A11 Active Waste Handling Building Ventilation Plant | |
| A13 Reactor 1 and 2 Bottling Hood Vent | |
| A24 Final Delay Tank Building and Access Walkway | |
| A25 Ponds Building Ventilation Plant | |
| A26 C3 Working Conditions Facility Ventilation Plant | |

Appendix C: Proposed Monthly Gaseous Environment Agency Return Format

| OUTLETS | | RADIONUCLIDES ASSOCIATED WITH PARTICULATE MATTER MBq | TRITIUM GBq | CARBON-14 GBq |
|------------------------------|------------------------------------------------------------|------------------------------------------------------------------|--------------------|----------------------|
| New | Reactors 1 and 2 Buildings | | | |
| New | Ponds Building | | | |
| A3 | Fuel Element Debris (FED) Dissolution Ventilation Plant | | | |
| A4 | Mobile Extraction Units (MEU's) | | | |
| A5 | Intermediate Level Waste (ILW) Drying Plant | | | |
| A7 | Fuel Element Debris (FED) Sorting Ventilation Plant | | | |
| A8 | Aqueous Discharge Abatement Plant (ADAP) Ventilation Plant | | | |
| A15 | Health Physics and Chemistry Laboratory 1 (C0) | | | |
| A16 | Health Physics and Chemistry Laboratory 2 (C2) | | | |
| A17 | Low Level Waste Management Facility | | | |
| A18 | Health Physics Laboratory Fume Cupboard | | | |
| A29 | Active Waste Intermediate Storage Facility (ISF) | | | |
| CEARAS ADAP Sentencing Tanks | | | | |
| Monthly Totals | | | | |