

<b>Plant:</b>	MSSS
<b>Title:</b>	Note For the Record defining the Magnox Swarf Storage Silo Retrievals Ventilation System registration proposal for Plant Notification Level inclusion within the Environmental Permit, EPR KP3690SX.
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## 1. Introduction:

The Magnox Swarf Storage Silos (MSSS) is an aging facility which continues to deteriorate with time. MSSS is one of the most hazardous facilities on the Sellafield site, and the removal and storage of the highly radioactive waste inventory from the facility is essential in reducing both the radiological and environmental associated risks.

Waste retrieval operations from Compartment 10 (C10) on the MSSS facility commenced in April 2022 using the Silo Emptying Plant 2 (SEP 2), utilising the 2<sup>nd</sup> Extension Ventilation System as a temporary ventilation system [Ref. 1]. A further two SEP machines, (SEP 1 and SEP 3) will be built and commissioned over the coming years to facilitate sustained retrieval operations on the MSSS facility from all compartments.

This ventilation configuration has been deemed fit for purpose for the retrieval of Miscellaneous Beta Gamma Waste (MBGW) from compartment 10 [Ref. 2]. However, the abatement within the 2<sup>nd</sup> Extension (Wet Scrubber and demister system) is not viewed as the Best Available Technique (BAT) for particulate activity abatement under future full sustained retrievals of both solid and sludge wastes. To progress into the sludge waste within the compartments, an improved abatement system is required.

As part of the preparations towards full sustained retrievals on the MSSS facility, a new Retrievals Ventilation System (RVS) is being constructed to minimise and reduce facility gaseous discharges during operational activities which will include additional and improved gaseous abatement using High Efficiency Particulate Air (HEPA) filters. This new stack requires registration in the Environmental Radioactive Substances Activities (RSA) Permit and appropriate Plant Notification Levels (PNLs) setting [Ref. 3]. The RVS is expected to be brought in to service in the 2024/25 financial year.

MSSS currently has two Ventilation systems registered within the RSA Permit [Ref. 3]. These are the 'Original building, 1st and 2nd extensions Magnox Swarf Storage Silo (MSSS) stack' A2 (referred to as 2nd Ext Discharge Stack throughout this document) and '3rd extension Magnox Swarf Storage Silo (MSSS) stack' A12 (referred to as 3rd Ext Discharge Stack throughout this document).

Both the 2<sup>nd</sup> and 3<sup>rd</sup> Ext Discharge Stacks A2 and A12 will be removed from the RSA Permit following implementation of the RVS Stub Stack, leaving MSSS with one statutory discharge outlet for the ventilation of the MSSS compartments going forward in to sustained waste retrievals.

The 3<sup>rd</sup> Ext Discharge Stack (A12) was made redundant in March 2019. The 3<sup>rd</sup> Ext Discharge Stack is now a historical outlet within the RSA Permit [Ref. 3] and will be removed from the Permit following RVS implementation. Therefore the associated PNLs for the 3<sup>rd</sup> Ext Discharge Stack are noted within Table 3 identifying their removal from the permit, but are not discussed further within the document.

The purpose of this paper is to determine the initial PNLs for the new RVS Stub Stack. Over time the PNLs will be reviewed as operational discharge data become available and with the increasing number of operational SEP machines on the facility and moving on to sludge retrieval activities. In time, the MSSS Stack Co-ordinator will determine whether it is appropriate for the RVS Stub stack to be downgraded to an 'other outlet' and removed as a scheduled stack from the RSA Permit once sufficient real time discharge data are available, with full sustained retrievals from all three SEP Machines in operation.

This document will set out the initial RVS Stub Stack PNLs. The appropriate review points have been outlined (including stack sampling arrangements) within Appendix 2 as MSSS progresses to full sustained retrieval activities to ensure they remain fit for purpose and meet permit compliance requirements.



## 2. Discussion to determine RVS Plant Notification Levels:

### Options for setting the initial Plant Notification Levels for registration of RVS into the Environmental Permit:

Prior to the RVS Stub Stack entering active service, it requires registration within the RSA Permit [Ref. 3] and the PNLs will be set for the four radionuclides and radionuclide groups that are currently sampled for in MSSS. These are Alpha, Beta, Caesium-137 and Strontium-90. The PNLs will be set in accordance with the Environment Agency 'Criteria for setting limits on the discharge of radioactive waste from nuclear sites' [Ref. 4] whereby PNLs 'should be set on individual outlets as necessary to ensure that BAT is used to control discharges'.

It should be noted that exceeding a PNL is not a noncompliance with the RSA Permit and their purpose is to drive BAT into operations through visible and structured trending and oversight. The action required if a PNL is exceeded is notification to the EA and proportionate investigation establishing whether BAT is being applied. A PNL identifies whether a discharge trend warrants attention to validate assumptions and performance, which engages the EA. Plant operations would only be impacted in the event that the operations are considered as not representing BAT, which would be a permit noncompliance with or without PNLs. The design of the PNL system anticipates that PNLs from across site will be exceeded as a result of routine operational variability at an approximate rate of 4 per year, though a total of only 3 have been exceeded since implementation in October 2020 due to lower-than-expected plant operations, which demonstrates the intent is not to constrain operations.

Guidance on how to set PNLs is presented in SLSP 2.10.300.01 [Ref. 5]. As stated within, the method used to calculate stack triggers assumes that plants have been operating for a period greater than 12 months and that consistent operational data has been obtained. Given that the RVS will be classified as a new ventilation system and that the plant will be in a new operational phase of its lifespan, MSSS will need to be considered as a new plant until operational data are gathered. Therefore, this paper will consider the most appropriate approach when setting the initial PNLs in the absence of actual operational discharge data for the new ventilation system.

Initial discussions were held with Sellafield Subject Matter Experts (SME), MSSS Plant Management and the Environment Agency (EA) to discuss appropriate options and methods of setting the initial PNLs for the RVS Stub Stack and are stated below:

1. Use the existing MSSS 2<sup>nd</sup> Extension PNLs and 'transfer' them to the RVS Stub Stack.
2. Utilise the estimated gaseous discharges as per the RVS Flow sheet [Ref. 6].
3. Any alternative approach used industry wide following guidance from EA.

Option 1; utilising the existing PNLs for the 2<sup>nd</sup> Extension was discounted due to the current PNLs being significantly higher than the predicted gaseous discharges of RVS as per the flow sheet [Ref. 6]. There is significant head room currently incorporated within the PNLs for the MSSS 2<sup>nd</sup> Extension stack compared to the actual discharges from the stack (see Appendix 1 for summary of gaseous discharges since C10 Waste Retrieval activities commenced). The current MSSS PNLs are a significant percentage of the site annual limits. Table 1 below illustrates the existing 2<sup>nd</sup> Extension Discharge Stack (A2) PNLs within the RSA Permit and compares them with the 12 month 'worst case' predicted annual gaseous discharges with RVS under a full retrievals operating regime. The use of the existing 2<sup>nd</sup> Extension PNLs for the initial operation of the RVS would provide unnecessary head room which would not be in line with the current PNL setting guidance within Reference 5 and would not readily enable the notification of elevated gaseous discharge trends as they are designed to. It is therefore considered that 'Option 1' does not adhere to the principles of applying BAT and would not be fit for purpose.

Following discussions with the EA, it was advised that the appropriate approach would be Option 2; utilise the estimated gaseous discharges as per the RVS Flow sheet to determine the initial PNLs. This approach is routinely adopted in other nuclear facilities across the country, for relevant aqueous PNLs and for setting internal management controls across aqueous and gaseous processes at Sellafield Limited so is deemed



most appropriate and consistent. The other two options were discounted upon this regulatory guidance. Following the RSA major permit variation in 2020, PNLs for MSSS remained unchanged. The determination of new PNLs for MSSS will recognise the installation of additional gaseous abatement, which will reduce total gaseous discharges and therefore demonstrate BAT and will also bring the facility in line with the approach for setting the PNLs for other outlets within the RSA Permit.

Following the guidance provided by the EA, it was decided there was no requirement to progress an alternative method as per option 3, and therefore option 3 will not be considered any further.

**Table 1: Comparison between current MSSS PNLs and predicted ‘Worst Case’ annual gaseous discharges with RVS under full retrievals.**

Stack	Radionuclide (MBq per year)			
	Alpha	Beta	Cs-137	Sr-90
Current Original building, 1 <sup>st</sup> and 2 <sup>nd</sup> extensions Magnox Swarf Storage Silo (MSSS) stack (A2) PNL <sup>A</sup>	2.80E+00	2.70E+03	1.60E+03	3.70E+02
‘Worst Case’ predicted annual gaseous discharges with RVS under full retrievals <sup>B</sup>	3.22E-02	1.23E+00	6.25E-01	1.72E-01
Worst Case predicted annual gaseous discharges with RVS under full retrievals as a percentage of the current 2 <sup>nd</sup> Extension PNLs	1.15%	<0.10%	<0.10%	<0.10%

A: Annual Plant Notification Levels – taken from Environmental Permit KP3690SX [Ref. 3]

B: Worst Case annual discharges taken from RVS Flow sheet with all 3 SEP Machines operational [Ref. 5]. Using the worst case predicted discharges provides the greatest pessimism in this comparison.

As can be seen in table 1 above, there is a ~99%+ headroom between the worst-case predicted annual gaseous discharges with RVS under full retrievals compared to the existing 2<sup>nd</sup> Extension PNLs. Given that the RVS will have improved abatement (Scrubber, Demister and single bank HEPA filtration), it is acknowledged that providing such significant head room between predicted discharges and the currently applied PNLs is not required. Therefore, it is deemed that a reduction from the existing 2<sup>nd</sup> Extension PNLs is both achievable and justified.

**Initial Plant Notification Levels for inclusion into the RSA Permit for the Retrievals Ventilation System Stub Stack.**

Option 2 was determined as the appropriate methodology for setting the initial PNLs for the MSSS RVS following EA guidance. Reference 6 defines both the ‘worst case’ and ‘best estimate’ annual gaseous discharges for each radionuclide or nuclide group and are highlighted within Table 2 below as potential values for setting as the initial RVS PNLs.



**Table 2: Predicted Retrievals Ventilation System annual gaseous discharges and associated off site public dose.**

RVS Stub Stack	Radionuclide			
	Alpha	Beta	Cs-137	Sr-90
'Best Estimate' predicted annual gaseous discharges with RVS under full retrievals. <sup>1</sup> (MBq per year)	1.32E-03	1.04E-01	9.76E-02	7.73E-03
Dose from Best Estimate annual discharge ( $\mu\text{Sv y}^{-1}$ ) <sup>3</sup>	3.09E-05	2.02E-05	1.89E-05	8.42E-07
'Worst Case' predicted annual gaseous discharges with RVS under full retrievals. <sup>2</sup> (MBq per year)	3.22E-02	1.23E+00	6.25E-01	1.72E-01
Dose from Worst Case Estimate annual discharge ( $\mu\text{Sv y}^{-1}$ ) <sup>3</sup>	7.54E-04	2.38E-04	1.21E-04	1.87E-05

1. Best estimate predicted discharges based on a higher scrubber DF of 1700 improving abatement. Full list of assumptions noted within Ref 6.
2. Worst case predicted discharges based on the lower substantiated scrubber DF of 450. Full list of assumptions noted within Ref 6.
3. Ground level <10m effective stack height used to add pessimism to the calculations.

Both of the 'best estimate' and 'worst case' annual gaseous discharges are based on the assumption of all three SEP machines being in active operations. Optimally PNLs are set with actual discharge data, therefore meeting the intent to identify trends which differ from normal, allowing the check to be made as to demonstration of BAT at the appropriate time. Using a statistical approach in relation to normal discharges recognises that BAT has no de-minimis level and it is not necessary to set in relation to significance e.g. dose or proportion of limits. However, it is accepted that in the absence of the normal data a setpoint is required that has the closest possible theoretical link to expected discharges and the flowsheet data forms this best available dataset.

By this method the PNL's will not be set too low as to be exceeded unnecessarily due to routine plant operations and retrieval activities whilst initially operating only the SEP 2 machine with the 'new' ventilation system. This would reduce confidence in the PNL process, add a distraction at a time of complex plant operations and result in non-value adding work for the facility. However, a PNL could still credibly be exceeded if discharge expectations are not met, therefore meeting its intent. Plant discharges will continue to be monitored and trended routinely against both internal triggers and the PNL to identify any abnormal or increased gaseous discharges. The PNLs will be reviewed as part of the site wide annual PNL review, which will ensure due consideration once operational data are available over a suitable period (Appendix 2) and will potentially further reduce the PNLs and align with SLSP 2.10.300.01.

The associated critical group dose (Adult) from the gaseous discharges under the most pessimistic assumptions can be seen to be trivial with the highest annual predicted dose being 7.54E-04 $\mu\text{Sv/y}$  for Alpha. The total combined worst-case dose is 1.13E-03 $\mu\text{Sv/y}$  with three SEP machines operational within sludge, which is significantly lower than the dose from actual annual discharges for the latest available 12-month period (from May 2022 – April 2023) of 1.06E-02 $\mu\text{Sv/y}$  (Appendix 3).

Utilising the worst-case discharge estimate for all three machines has been decided as the appropriate approach rather than setting the PNLs for the implementation of each individual SEP machine and incrementally increase the PNL as each machine enters active service. This is because with the addition of each machine, the challenge to the abatement system will increase and potential discharges rise as a result. Therefore, for each new machine coming online there would be the requirement to review the PNLs and produce a BAT justification to increase the PNLs if required, which would result in additional workload for both Sellafield Ltd. and the EA through the requirement for RSA permit variation. It is a core principle of internal management controls and PNLs that a predictive lookahead is considered in establishing setpoints.

Despite the proposed use of the most pessimistic annual discharges available, the proposed PNLs still represent a near 99% reduction in the existing 2<sup>nd</sup> Extension PNLs for all radionuclide / nuclide groups.



Despite being a significant reduction in head room compared to the current PNLs in place for the 2nd Extension, it is not believed that these proposed new PNLs will be set too low as to be exceeded unnecessarily due to routine retrievals activities due to the built-in pessimism within the RVS flowsheet calculations [Ref. 6].

In addition to the in-built calculation pessimisms, the current 2<sup>nd</sup> Ext Ventilation System utilises the wet scrubber and Demister with a minimum substantiated Decontamination Factor (DF) of 450 [Ref. 7]. The RVS will utilise both the existing abatement and a single stage HEPA filtration with a DF of 1000. Therefore, the new RVS will have a combined DF of 1450, or if calculated as in-series, a DF of 450000 could be assumed. This ventilation configuration is specifically designed to be able to mitigate the additional challenge from three SEP Machines undertaking sustained waste retrieval operations.

The DF values above are conservative as the HEPA filter DF is only claimed as 1000, however they are deemed to be 99.9% efficient [Ref. 7]. Also, the scrubber is currently performing much better than the DF of 450 used by the Safety Case. Through SQEP Stack Co-ordinator and Liquid Effluent Co-ordinator (LEC) trending the scrubber has been found to operate at a much higher DF with a monthly average of approximately 4000 over the past 3 years since the 2<sup>nd</sup> Extension was reinstated. Therefore, the quoted flow sheet discharges used for the initial PNLs in Table 2 are expected to be higher than the actual discharges that will be seen once the RVS is operational.

The initial PNLs to be implemented at the start of the operational life of the RVS are as highlighted within Table 3. These will serve as the interim PNLs until sufficient data are available for formal review, see Appendix 2 for PNL review guidance. The 2<sup>nd</sup> Ext (A2) and 3<sup>rd</sup> Ext (A12) discharge stacks are to be removed from the RSA Permit following transition to the Retrievals Ventilation System.

**Table 3: Initial RVS PNLs for implementation and existing A2 and A12 registrations for withdrawal from the RSA Permit.**

Stack	Radionuclide (MBq per year)			
	Alpha	Beta	Cs-137	Sr-90
<b>PNLs for implementation to permit</b>				
Initial PNL for RVS Stub Stack	3.22E-02	1.23E+00	6.25E-01	1.72E-01
<b>Permit Registrations for withdrawal</b>				
Current Original building, 1st and 2nd extensions Magnox Swarf Storage Silo (MSSS) stack (A2) PNL	2.80E+00	2.70E+03	1.60E+03	3.70E+02
3rd extension Magnox Swarf Storage Silo (MSSS) stack (A12) – Redundant	1.50E+00	3.50E+03	4.80E+03	4.40E+02

- Note: The proposed PNLs are based on the latest available flowsheet data [Ref. 6], which has been authorised and is correct at the time of finalising this paper.

The formal implementation of the RVS into operations will be undertaken via a future Plant Modification Proposal (PMP). An update to the MSSS Ventilation Environment Case [Ref. 8] will be required to implement the new RVS, including abatement, and any associated Environmental Procedural Controls via the MSSS DAP Environment Case Summary [Ref. 9]. Upon the transition to the new RVS, the EA will be informed in writing by the MSSS Duty Holder who will 'notify the Environment Agency in writing of the completion of active commissioning of HEPA filtration for the MSSS ventilation stack within one month of the date of completion', as per permit condition 4.3.10 [Ref. 3].

### 3. Conclusion:

PNLs are a monitoring tool designed to drive visibility of the implementation of BAT into operations. Unlike the plant limits which they replaced in October 2020, exceeding PNLs is not a noncompliance and they are intended to be set with little headroom. Sellafield Limited reviews all PNLs on an annual basis and it is expected that the initial setpoints will reduce when data are available to underpin routine discharge levels.

It is proposed that the MSSS MSC approves this Note for the Record and accepts the initial PNLs for the MSSS RVS Stub Stack as per Table 3. Upon approval of this NFR a proposal will be made to the Environment Agency which will include this NFR to justify that BAT is being applied to the setting of the new PNLs for registration within the RSA Permit [Ref. 3] in advance of the RVS Stub Stack undergoing any commissioning activities. The existing 2nd Ext (A2) and 3<sup>rd</sup> Ext (A12) discharge stacks will be removed from the RSA permit following RVS becoming fully operational.

The approval of this Note For the Record also accepts the staged review process of the PNLs (Appendix 2) and endorses the investigation into the potential future opportunity to downgrade the RVS Stub Stack to an 'Other Outlet' once sufficient discharge data become available and providing that actual discharges are sufficiently low as to enable a stack downgrade.

#### Glossary:

AECWP	Aerial Effluent Control Work Party
BAT	Best Available Techniques
C10	Compartment 10
DF	Decontamination Factor
EA	Environment Agency
iCAM	Intelligent Continuous Air Monitor
MBGW	Miscellaneous Beta Gamma Waste
MSSS	Magnox Swarf Storage Silo
PMP	Plant Modification Proposal
PNL	Plant Notification Level
SME	Subject Matter Expert
RSA	Radioactive Substances Activities
RVS	Retrieval Ventilation System
SEP	Silo Emptying Plant

#### References:

1. MSSS Stack Manual. EHS&Q Issue 12– ND&MPG/ENV/002 Sellafield Ltd. 2022
2. BAT Justification for aerial discharges during SEP 2 active commissioning and C10 waste retrievals. RP/■PLN-3755/SAFE/00390/A. Sellafield Ltd. 2018.
3. Permit with introductory note The Environmental Permitting (England & Wales) Regulations 2016 EPR/KP3690SX/V012. Environment Agency. 2021
4. Criteria for setting limits on the discharge of radioactive waste from nuclear sites. Environmental Permitting Regulations (England and Wales 2010). Environment Agency. 2012.
5. Guidance for Managing and Monitoring the disposal of Radioactive Gaseous Waste SLSP 2.10.300.01. Issue 4. Sellafield Ltd 2022.
6. MSSS Retrievals - Retrievals Ventilation System aerial flowsheet with 2nd Extension scrubber and HEPA abatement. CA/■PLN-3755/PROC/00188/C. Sellafield Ltd 2023.

7. Engineering Standard: Procurement Specification for HEPA Filter Media. ES\_0\_1730\_2. Issue 6. Sellafield Ltd 2021
8. Environment Case for the Magnox Swarf Storage Silo Quiescent Passive Ventilation System, Pressurised Inerting Phase 1, and active commissioning of Silo Emptying Plant 2 / Miscellaneous Beta Gamma Waste retrievals on C10. RP [REDACTED] PLN-3755/SAFE/00378/J Sellafield Ltd. 2023
9. DAP Environment Case Summary. [REDACTED]/ENV/002. Issue 8. Sellafield Ltd. 2022
10. Public dose factor tables. SLF 2.11.109.01 Issue 2. Sellafield Ltd. 2013.



**Appendix 1: Review of monthly discharges following commencement of Miscellaneous Beta Gamma Waste retrievals.**

Early retrieval activities of Miscellaneous Beta Gamma Waste (MBGW) from C10 commenced in April 2022 utilising the existing 2<sup>nd</sup> Extension abatement only. Figure 1 illustrates the monthly discharges for all radionuclides/ radionuclide groups for the 6 months before, and 12 months after retrieval activities commenced.

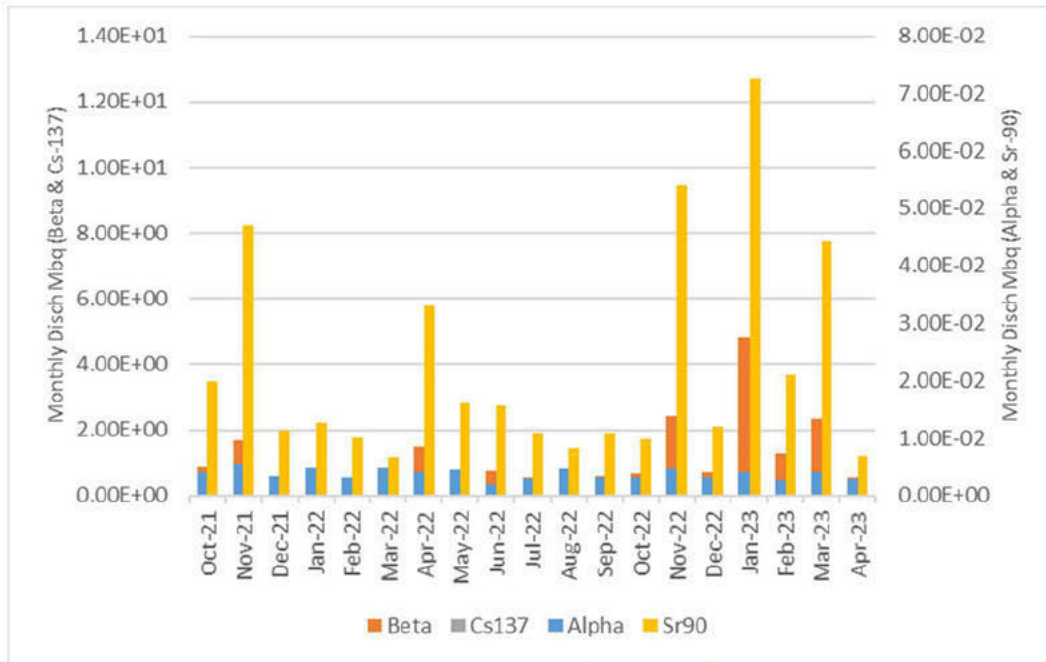


Figure 1: MSSS monthly statutory gaseous discharge trends of 2<sup>nd</sup> Ext Vent system. October 21 – Apr 23.

As can be seen, there has been no step change or increase in gaseous discharges for any of the radionuclides / nuclide groups since C10 MBGW retrieval activities commenced. It must be noted that the available discharge data under retrieval activities is still very limited, however discharges have remained stable which is reassuring whilst the facility is in the early retrievals phase of operations. Note the November 2022, January and March 2023 discharges are slightly elevated when compared to the previous months, however these are attributed to Low Pressure (LP) Steam isolations which have a known impact in causing minor discharge elevations. This is due to the humidification of the air ventilation air stream being unavailable, resulting in a reduced scrubber efficiency and leading to a daily gaseous discharge of up to approximately 1MBq, the current beta daily Plant Action Level (PAL). It is noted that the addition of nitrogen into the compartments for creating the inert atmosphere required for waste retrievals has the potential to further reduce scrubber performance, but no noticeable effects have been seen since the commencement of C10 MBGW retrievals. Also, in future, any post-scrubber activity entrainment will be abated via the HEPA filtration of the RVS.

**Appendix 2: Review Points of MSSS Plant Notification Levels as full sustained retrievals is approached**

Four Review Points have been specified below, whereby known increases in challenge to the RVS abatement system will occur. There is no significant increase in workload to the MSSS Stack Co-ordinator as the review of PNLs is an annual requirement as per SLSP 2.10.300.01 [Ref. 5]. The below review points are specifying when formal review is required. Should there be an overlap in review points (example: point 2 introduced before the point 1 review is undertaken) an annual 12 month review will be undertaken as per Reference 5.

**Review Point 1: Early retrieval activities with SEP 2 only and RVS**

Review the discharge data for the RVS Stub Stack whilst using SEP 2 on C10 once the MBGW/sludge interface has been crossed. This will be the first increase in challenge to the RVS so the gaseous discharges will require review to determine that the PNLs remain appropriate and fit for purpose.

Once 12 months of discharge data are available in this operational configuration, a review as to whether the implemented PNL remains appropriate will be undertaken using the guidance within SLSP 2.10.300.01 [Ref. 5]

#### **Review Point 2: SEP 1 and SEP 2 in active operation on MSSS**

Review the discharge data of the RVS Stub Stack as per Review Point 1 once both SEP 1 and SEP 2 are in active operations within MSSS. This configuration will result in additional challenge to the RVS abatement system so a review to determine that the PNLs remain fit for purpose will be required.

#### **Review Point 3: SEP 3 online, full retrieval activities with RVS**

Review the discharge data from the RVS Stub Stack as per Review Point 1 once all three SEP machines are in active service within MSSS. This configuration will result in the final additional challenge to the RVS abatement system so a review to determine that the PNLs remain fit for purpose will be required.

#### **Review Point 4: PNL Formal review**

Upon the availability of operational data of the MSSS facility operating in full sustained retrieval capacity following the third and final SEP machine going into active operation (12-24 months of discharge data), the Annual Plant Notification levels will be checked as part of the annual review process [Ref. 5] to confirm they remain fit for purpose and will be updated as required and the permit updated. With adequate full data available with the final ventilation and operational configuration in place, the PNLs can be confirmed to be fit for purpose (if still utilising RVS Flow Sheet Data).

Once sufficient operational data are available from full retrievals, the MSSS Stack Co-ordinator will investigate as to whether the stack can be downgraded from a scheduled stack to the classification of 'Other Outlet'. With operational experience gained of the RVS system online with 3 SEP machines in operation, discharge data for 12-24 months has been deemed sufficient for this review point.

Stack discharges would still require to be monitored as per requirements of an 'Other Outlet' but not formally sampled, analysed and reported to the Environment Agency. Operational advantages of this would be that Statutory Sampling would no longer be a requirement, providing maintenance, sampling and analysis savings, both financially and man hours. The detailed arrangements would be determined by BAT assessment at the time, but it is likely to be recommended that stack monitoring papers should be retained as a contingency should sampling be needed for higher resolution and analysis should it be required if the stack is downgraded to an Other Outlet in the future.

### **4. Stack sampling**

When the RVS enters active service, the MSSS Ventilation System is to be considered a new plant due to the new untested plant configuration. There will be a new accountancy stack sampler in service to support the RVS (brought into service via the update to Reference 7). Currently the 2<sup>nd</sup> Extension Ventilation system has daily changes of the accountancy filter card samples which is considered to be a high-resolution sampling regime when compared to other facilities on the Sellafield site that undertake weekly sample changes.

As both the Ventilation and the accountancy stack sampling systems will be considered to be new configurations, it is recommended that MSSS maintains a high sampling resolution with daily samples being taken by the Health Physics team, following the same arrangements currently undertaken on the 2nd Extension ventilation system.



The MSSS Stack Co-ordinator will gather daily discharge data over a period of 12 months minimum once the RVS is operational to determine the discharge baseline. The high resolution in samples taken will allow an increased ability to identify any abnormal discharges and attribute them to plant conditions or operations, allowing for operational experience to be gained, (a continuation of current good practice). Upon the gaining of operational data and understanding, it can be considered as to whether a reduction in sampling resolution could be achieved through agreement with the MSSS Duty Holder, saving on Health Physics resource.

If daily sampling has been reduced, the MSSS Stack Co-ordinator will have the ability to request an increase in sample resolution back to daily sampling with the implementation of each new SEP machine for a sufficient periodicity to confirm any changes to discharge baseline to identify impacts upon the RVS discharges by the staged increase in waste retrieval operations.

### Appendix 3 – Dose Calculations.

Long-term gaseous dose release ratios (LADRRs) from SLF 2.11.109.01 [Ref.10]

	Infant (T13)	Child (T12)	Adult (T11)
Pu239	7.05E-03	1.28E-02	2.34E-02
Cs-137	8.22E-05	8.36E-05	1.94E-04
Sr-90	2.18E-04	1.64E-04	1.09E-04

(Assumes a ground (<10m) release for all calculations. This is a pessimistic approach). Adult used as critical group.

#### Dose from RVS discharges during operations - worst case as per flow sheet

	Annual Discharge		LADRR (Sv yr <sup>-1</sup> / TBq)	Dose (Sv yr <sup>-1</sup> )	Critical Group Dose (uSv yr <sup>-1</sup> )
	MBq	TBq			
<b>Alpha</b>	3.22E-02	3.22E-08	2.34E-02	7.54E-10	7.54E-04
<b>Beta</b>	1.23E+00	1.23E-06	1.94E-04	2.38E-10	2.38E-04
<b>Cs137</b>	6.25E-01	6.25E-07	1.94E-04	1.21E-10	1.21E-04
<b>Sr90</b>	1.72E-01	1.72E-07	1.09E-04	1.87E-11	1.87E-05
					<b>1.13E-03</b>

#### Dose from RVS discharges during operations - best case as per flow sheet

	Annual Discharge		LADRR (Sv yr <sup>-1</sup> / TBq)	Dose (Sv yr <sup>-1</sup> )	Critical Group Dose (uSv yr <sup>-1</sup> )
	MBq	TBq			
Alpha	1.32E-03	1.32E-09	2.34E-02	3.09E-11	3.09E-05
Beta	1.04E-01	1.04E-07	1.94E-04	2.02E-11	2.02E-05
Cs-137	9.76E-02	9.76E-08	1.94E-04	1.89E-11	1.89E-05
Sr-90	7.73E-03	7.73E-09	1.09E-04	8.42E-13	8.42E-07
					<b>7.09E-05</b>

**Dose associated with the last 12 months of available monthly discharge data.**

12-month rolling total discharges (May 2022 – April 2023).

	Alpha (MBq)	Beta (MBq)	Cs-137 (MBq)	Sr-90 (MBq)
Total	4.13E-02	1.57E+01	3.37E+01	2.82E-01

	Discharge (year)		LADRR (Sv yr <sup>-1</sup> / TBq)	Dose (Sv yr <sup>-1</sup> )	Critical Group Dose (uSv yr <sup>-1</sup> )
	MBq	TBq			
Alpha	4.13E-02	4.13E-08	2.34E-02	9.67E-10	9.67E-04
Beta	1.57E+01	1.57E-05	1.94E-04	3.05E-09	3.05E-03
Cs-137	3.37E+01	3.37E-05	1.94E-04	6.54E-09	6.54E-03
Sr-90	2.82E-01	2.82E-07	1.09E-04	3.08E-11	3.08E-05
					<b>1.06E-02</b>

**Appendix 4 – Authorisation emails.**

██████████

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From: ██████████  
 Sent: 22 June 2023 16:35  
 To: ██████████  
 Subject: RE: RVS PNL paper up rev for signing following flow sheet approval (██████████)  
 Attachments: NFR - MSSS RVS PNL Permit variation initial proposal Issue 1 - signed for MSC.pdf

This email has been classified as ██████████

Good afternoon ██████████

I have reviewed ██████████ MSC/2023/034: Note For the Record defining the Magnox Swarf Storage Silo Retrievals Ventilation System registration proposal for Plant Notification Level inclusion within the Environmental Permit, EPR KP3690SX, Issue 1 and am happy to sign onto the document confirming approval as AECWP Chair. The document is attached with electronic signature, combined with this email as evidence.

Thanks

██████████

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From: ██████████  
 Sent: 22 June 2023 14:38  
 To: ██████████  
 Cc: ██████████  
 Subject: FW: RVS PNL paper up rev for signing following flow sheet approval (██████████)

This email has been classified as ██████████

Good afternoon ██████████

I have reviewed ██████████ MSC/2023/034: Note For the Record defining the Magnox Swarf Storage Silo Retrievals Ventilation System registration proposal for Plant Notification Level inclusion within the Environmental Permit, EPR KP3690SX, Issue 1 and am happy to sign onto the document as checker.

Regards

██████████



Environmental Management

Also available to contact on 'MS Teams'.  
I am a Domestic Abuse Contact.

From: [Redacted]  
Sent: 22 June 2023 12:54  
To: [Redacted]  
Subject: FW: RVS PNL paper up rev for signing following flow sheet approval [Redacted]

This email has been classified as [Redacted]

I have reviewed the document and I'm happy to sign onto MSC/2023/034: Note For the Record defining the Magnox Swarf Storage Silo Retrievals Ventilation System registration proposal for Plant Notification Level inclusion within the Environmental Permit, EPR KP3690SX, Issue 1 as RSA Permit Specialist.

Please take this email as evidence to this effect.

I've also added my signature and date of 'signing' to the attached pdf.

Many Thanks,

[Redacted] - RSA Permit  
Environmental Permitting and Process



From: [Redacted]  
Sent: 22 June 2023 12:46  
To: [Redacted]  
Cc: [Redacted]  
Subject: RE: RVS PNL paper up rev for signing following flow sheet approval [Redacted]

This email has been classified as [Redacted]

I've checked that the revised NFR uses the appropriate data from Rev C of the process flowsheet and can therefore confirm that I'm happy to sign onto MSC/2023/034: Note For the Record defining the Magnox Swarf Storage Silo Retrievals Ventilation System registration proposal for Plant Notification Level inclusion within the Environmental Permit, EPR KP3690SX, Issue 1 as Checker (CRWA).

Please take this email as evidence to this effect.

I've also added my signature and date of 'signing' to the attached pdf.

Kind regards,

NEHS&Q Delivery

Additional Process Engineering data transcription check:

To: [Redacted]  
Subject: RE: MSSS RVS PLN Paper - MSC Action [Redacted]

This email has been classified as [Redacted]

[Redacted]

I can confirm that the appropriate discharge numbers have been transposed correctly from the flowsheet, CA/ [Redacted] PLN-3755/PROC/00188/C, into the NFR, [Redacted] MSC/2023/034, and the supporting calculation.

[Redacted]

[Redacted]

MSSS Retrievals  
H320, Hinton House, Risley, Warrington, WA3 6GR

[Redacted]

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From: [Redacted]  
Sent: 28 June 2023 11:06  
To: Egan, [Redacted]  
Cc: [Redacted]  
Subject: MSSS RVS PLN Paper - MSC Action [Redacted]

This email has been classified as [Redacted]

Morning [Redacted]

I took the RVS paper (attached) through to MSC this morning and it was approved subject to one minor action which I need your help with please.

I am needing you to check that the discharge values I used from your flow sheet have been transposed and interpreted correctly in to my calculations.

As per discussions we had during the authoring process, I have used the worst case predicted discharges for the calculations. Can you please confirm that the discharges have been transposed correctly (from process engineer perspective) and you are content as such? I have attached both the flowsheet and the calculations (see dose assessments tab, data is highlighted in green). (worst case and best case)

Also a quick confirmatory check that the 'worst case and best case discharges' have been correctly transposed to the text of the document (tables 1,2 and 3)

The calculations, and transposing of data have been checked by [Redacted] as Env Specialist already, so no need to check the calcs as such, just that the correct data has been carried over correctly.

Thanks very much, and appreciate the support

[Redacted]

[Redacted]

Silos Programme

[Redacted]