



**Review of AWE's Evidence for Meeting the Requirements of Improvement Notice
IN/2015/ONR/LAG/001 Concerning Long-term Management of Higher Activity Wastes at Aldermaston**

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EXECUTIVE SUMMARY

Review of AWE's Evidence for Meeting the Requirements of Improvement Notice IN/2015/ONR/LAG/001 Concerning Long-term Management of Higher Activity Wastes at Aldermaston

Summary

This report summarises ONR's assessment and conclusions concerning AWE's technical justification, made in its letter of 6 June 2016, that it has met the requirements of Improvement Notice (IN), IN/2015/ONR/LAG/001.

Background

ONR served AWE with the IN in June 2015. The IN cited the inspector's concern that the long-term strategy for the management of Higher Activity Wastes (HAW) at Aldermaston had not reduced the future risk to the health and safety of the public and employees so far as is reasonably practicable (SFAIRP) in contravention of the Health and Safety at Work Act 1974 Part 1, sections 2(1) and 3(1).

The IN schedule required that by 30th September 2016, the following two measures were needed to remedy the contraventions:

1. Complete the activities that enable AWE to recommend options to take forward as part of the future HAW programme (Item 1);
2. Demonstrate that the options recommended to manage HAW on Aldermaston Site minimise the risks to the health and safety of the public and AWE's employees from the waste so far as is reasonably practicable throughout the anticipated storage life of the waste on the site (Item 2).

The IN followed a series of ONR enforcement actions from circa 2000, and culminated in an ONR investigation into AWE's failure to meet Licence Instrument (LI) 511, a Specification made under Licence Condition 32(4).

The intent of the IN was to provide the first step of a staged regulatory approach to bring AWE into sustained compliance with its legal duties concerning the safe management of its HAW.

Conclusions

I am satisfied with the claims, arguments and evidence laid down within the Evidence Pack provided by AWE to demonstrate compliance with the requirements of the IN (IN/2015/ONR/LAG/001).

AWE has made positive progress and has met the IN so far as it could reasonably do at this interim stage prior to the programme of work going forward. However, there remains a technical compliance gap between ONR's expectations set out in regulatory guidance, and some aspects of AWE's plans for its radioactive waste-management across the life cycle through to disposal which need to be addressed in a timely fashion in the next phase of work.

Specifically, I conclude:

Concerning Schedule Item 1

- AWE has identified a range of technically credible options.
- AWE has recommended an option, consisting of various waste-stream specific treatments backed up by safe on-going and interim storage, referred to as "Option 4" to [REDACTED] Option 4 includes:
 - Early, on-site, hazard reduction by the [REDACTED]
[REDACTED] waste packages with the potential to

- reduce the on-site fissile hazard from HAW, of between [REDACTED] depending on underlying assumptions made.
 - Longer-term project plans for a future treatment facility or facilities for the remaining compactable HAW packages comprising [REDACTED] waste packages (including current and future arisings) [REDACTED]
 - Near-term hazard reduction, by [REDACTED] of the “High Inventory Drums” and [REDACTED] through on-site treatment into disposable waste packages which represent [REDACTED] of the total hazard.
 - Near-term improved characterisation techniques etc. of notionally HAW, to enable recategorisation, and then prompt disposal of [REDACTED] waste packages as LLW.
 - Demonstration of safe and robust interim storage of passivated and disposable waste packages, and the on-going safe storage of those waste packages pending future treatment into passivated and disposable forms. Some of the packages pending treatment could be several decades old before any future treatment.
 - A collaborative approach [REDACTED] to work up plans to treat a small number of so-called “problematic” waste packages.
- No further evidence is required by ONR for close out of Item 1.

Concerning Schedule Item 2

- I consider that the waste-management options selected by AWE, if properly planned, managed and implemented, are consistent with the future risks to the public and workers from HAW being reduced SFAIRP. However, considerable further work must be done to implement the options.
- There remain prima facie compliance gaps between some aspects of AWE’s plans for HAW against ONR’s expectations set out in regulatory guidance (e.g. continued long-term storage of HAW which has not been fully passivated and continued long-term containment in carbon steel containers which needs further justification.)
- There is notable complexity in the approach outlined in AWE’s HAW Forward Plan, resulting in several technical risks and uncertainties concerning the timely and successful hazard reduction required by ONR.
- The multi-decade timescale requires the on-going support of the MoD concerning the management of Aldermaston’s HAW inventory. Similarly, [REDACTED] as appropriate, will need to continue to work collaboratively with AWE, without prejudicing their existing duties.
- While not part of the ONR assessment, the acceptability of the plans to a wide range of non-regulatory or industry stakeholders has not yet been fully established.
- Given these risks there is a need for further work-up by AWE of contingencies and back-up plans. The HAW Forward Plan should be kept under review, and if not progressing satisfactorily, the deployment of the [REDACTED] compactor and treatment facility should be reconsidered by AWE, in order to bring about the necessary hazard and risk reduction sought by ONR.
- No further evidence is required by ONR for close out of Item 2.

Recommendations

The following is recommended:

Recommendation 1 The IN is closed as I consider AWE has satisfied the requirements of the IN as far as it could reasonably do at this stage prior to the programme of work going forward.

Recommendation 2 ONR retains enhanced and focussed attention on securing further improvements to AWE’s HAW Forward Plan, the Plan’s early

implementation phase, and the key milestones required for the successful out-turn.

Recommendation 3 Where we have assessed a compliance gap, or significant potential for a compliance gap in the future, AWE should undertake appropriate work as may be necessary, to close that gap, mitigate its impact and/or reduce its likelihood from occurring. **This includes the principal area of concern:**

Recommendation 3a ONR has assessed a compliance gap concerning the lack of a full substantiation of the carbon steel containers over the timescale of concern: i) AWE should develop appropriate Safety Functional Requirements (SFRs) and demonstrate substantiation against these. ii) AWE should develop and implement an appropriate examination, inspection, maintenance and test (EIMT) schedule that confirms the waste packages are performing in accordance with the required SFRs iii) AWE should justify the choice of future waste package container material including overpacks showing that associated risks are ALARP, as part of an optioneering study, for the storage of HAW in unconditioned forms over several decades of storage.

Recommendation 4 All activities, where there is a significant risk from non-timely delivery, should have **worked up and/or deployable contingencies** commensurate with its risk and impact of not working as intended, in order to minimise any significant detriment to the hazard reduction sought by the HAW Forward Plan. The Strategic Case showing risks are ALARP should be updated as appropriate, to confirm the overall status of the HAW Forward Plan. **This includes the principal area of concern:**

Recommendation 4a AWE should maintain the capability for [REDACTED] compactor and treatment facility (as profiled in Option 1) until such time that AWE and MoD have provided sufficient evidence (which is acceptable to ONR, e.g. through a Hold Point Control Plan) that the [REDACTED] treatment route will deliver the required hazard and risk reduction.

Recommendation 5 Accountabilities and responsibilities should be clearly defined in the Plan, such that the duty holder(s) are clearly established with respect to ONR vires. In particular ONR should establish specific engagement with MoD, [REDACTED] and AWE on those aspects where each has legal duties under the legislation enforced by the ONR.

Recommendation 6 AWE should continue to work closely with [REDACTED] and collaborate as appropriate to develop improved hazard and risk reduction approaches applicable to HAW management on Aldermaston. There are several good recent examples of this collaborative approach working in practice, e.g. with respect to common problematic wastes and improved characterisation of wastes techniques etc. Such an approach promises to help define “future relevant good practice for HAW management”, and limit the risk of future compliance gaps emerging.

ONR will progress these recommendations as Regulatory issues.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
BAT	Best Available Techniques
DBC	Developed Business Case
EIMT	Examination, Inspection, Maintenance and Test
GDF	Geological Disposal Facility
HAW	Higher Activity Waste
HOW2	(Office for Nuclear Regulation) Business Management System
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ILW	Intermediate Level Waste
IN	Improvement Notice
IPT	Integrated Project Team
LC	Licence Condition
LI	Licence Instrument
LLW	Low Level Waste
MoD	Ministry of Defence
NDA	Nuclear Decommissioning Authority
NWAT	Nuclear Waste Assessment Team (part of Environment Agency)
NII	Nuclear Installations Inspectorate
ONR	Office for Nuclear Regulation
PLBC	Programme Level Business Case
PSR	Preliminary Safety Report
RGP	Relevant Good Practice
RAMSCAP	Radioactive Materials Storage Container Approvals Panel (former AWE body)
RWM	Radioactive Waste Management Limited
SAP	Safety Assessment Principle(s)
SFAIRP	So Far as is reasonably practicable
SFR	Safety Functional Requirement
█	█
SLC	Site Licence Company
TAG	Technical Assessment Guide (ONR)
WAC	Waste Acceptance Criteria
█	█

TABLE OF CONTENTS

1	PURPOSE OF REPORT	8
2	BACKGROUND	8
3	AWE'S WORK TO MEET THE IMPROVEMENT NOTICE	9
4	ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR.....	11
5	ONR ASSESSMENT AND MATTERS ARISING.....	13
6	CONCLUSIONS	22
7	RECOMMENDATIONS.....	24
8	REFERENCES	26



1 PURPOSE OF REPORT

1. This report summarises ONR's assessment and conclusions concerning AWE's response, made in its letter of 6 June 2016 [1], to the Improvement Notice (IN) IN/2015/ONR/LAG/001 [2] since AWE had not demonstrated that its long term strategy for the management of Higher Active Wastes (HAW) at Aldermaston Site reduced the future risk so far as is reasonably practicable throughout the anticipated storage life of the waste on the site.

2 BACKGROUND

2. There is a considerable inventory of HAW on AWE's Aldermaston Site, as listed in [REDACTED]. Currently most of the [REDACTED] waste packages are within dedicated on-site waste stores.
3. ONR has previously assessed there to be no significant risk to the public or the workforce from the waste packages in the on-site waste stores [3]. The current condition of the waste packages is considered to be satisfactory. However the hazard presented by the totality of the waste inventory is such that members of the public have the potential to receive a dose greater than 5 mSv in the event of a serious accident. In addition the inventory on site is likely to increase as operations continue and older facilities are decommissioned [REDACTED], with [REDACTED] further HAW packages arisings predicted to 2060.
4. Moreover, none of the HAW has yet been treated into a passivated, immobilised and disposable form in accordance with extant and previous regulatory guidance (see Section 4). This has been of concern to ONR, and its predecessor organisation the Nuclear Installations Inspectorate (NII), for a considerable period of time, and one without a satisfactory conclusion to date.
5. Formal regulatory enforcement action to seek to reduce the hazard presented by the HAW commenced in 2000 with NII issuing a Specification (LI 49) [3] under Licence Condition 32(4). This required AWE to have inspected, reduced in volume and packaged 670 Intermediate Level Waste (ILW) (now considered a subset of HAW) drums into standard disposal waste containers by 31 December 2006.
6. When it was recognised that AWE was not going to achieve the requirements of LI49 and following discussions with the licensee a further Specification, LI 511, was issued in March 2007. It required at least 1000 compactable HAW packages to have been reduced in volume and encapsulated by 20 February 2014.
7. In March 2014, following the failure to meet the requirements of LI 511, ONR conducted an investigation [4]. This concluded that a proportionate response to the breach of the Specification would be for ONR to seek to reduce the hazard from the HAW through alternative regulatory and enforcement action. The aim of this enforcement action should be to place the waste into a passively safe and immobile form in compliance with relevant industry good practice, and ONR's safety assessment principles (SAPs). However, to achieve such hazard reduction, would require AWE to consider the processing and storage of all its HAW streams.
8. Therefore, in June 2015, ONR served AWE with an IN (IN/2015/ONR/LAG/001) [2] under cover of a letter dated 8 June 2015 [5]. It cited the inspectors reason that "[AWE has] *not demonstrated that your long term strategy for the management of Higher Active Wastes at Aldermaston Site reduces the future risk to the health and safety of the public and your employees from the waste so far as is reasonably practicable throughout the anticipated storage life of the waste on the site.*"

9. The IN schedule required that, by 30th September 2016, the following two measures were needed to remedy the contraventions:
- **Item 1:** Complete the activities that enable AWE to recommend options to take forward as part of the future HAW programme;
 - **Item 2:** Demonstrate that the options recommended to manage HAW on Aldermaston Site minimise the risks to the health and safety of the public and its employees from the waste so far as is reasonably practicable throughout the anticipated storage life of the waste on the site;
 - or carries out any other equally effective measures to comply with the notice.
10. The intent of the IN, as described in the PAR “Regulatory Strategy and Enforcement Action for the Management of Higher Activity Waste” [3], is to provide the first step of a staged regulatory approach to bring AWE into sustained compliance with its legal duties concerning the safe management of its HAW. Thus, ONR has targeted the entirety of AWE’s HAW inventory and management lifecycle, and has embarked on a staged approach to enforcement.
11. Now that AWE has met the requirements of the IN, ONR’s regulatory approach will continue to consider whether further proportionate enforcement action is needed to ensure the recommendations are implemented and appropriate passivation of the waste is achieved. This approach recognises that passivation of the waste will require a number of different activities to be established and completed over a sustained period.
12. Alongside this formal enforcement action, as part of its on-going engagement, ONR has continued to influence timely delivery of programmes of work by AWE and provide continued confidence in the safe and secure storage of waste on the Aldermaston site.

3 AWE’S WORK TO MEET THE IMPROVEMENT NOTICE

13. AWE wrote to ONR [6], in August 2015, proposing the detailed activities it would undertake to close out the IN against both schedule items.

3.1 SCHEDULE ITEM 1

14. Against schedule Item 1 (see paragraph 9), AWE agreed to produce a Programme Level Business Case (PLBC) that would recommend options for management of the HAW inventory in accordance with “Forward Plan Version 1.5”. AWE noted that the recommendations would be subject to further scrutiny and sanction from both [REDACTED] and MoD. Additionally, AWE acknowledged that future implementation of the chosen options may also require authorisation and/or permissioning from the Regulators.
15. AWE agreed that the HAW Forward Plan would be updated to narrate the programme options.
16. To support the PLBC, AWE noted that it would also produce a number of other deliverables:
- A “Strategic BAT/ ALARP” Case for the two lead options (Option 1 – which includes an [REDACTED] compaction component and Option 4 – which includes consideration of [REDACTED] for [REDACTED] high inventory packages).
 - An AWE/MoD Investment Appraisal 2 focussed on information to recommend options, from a financial perspective, at a comparable level of study/project maturity.
 - [REDACTED]

[REDACTED]

3.2 SCHEDULE ITEM 2

17. Against schedule Item 2 (see paragraph 9), AWE agreed to produce a Storage Substantiation Study Report as the primary deliverable. The report would provide a demonstration that the HAW storage capabilities provide an appropriate regime for on-going protection of all forms of HAW packages over the projected programme timescales.
18. AWE stated that the storage substantiation report would be supported by:
 - A drum substantiation report. This would provide a demonstration of the suitability of the means of producing, characterising, placing into storage and maintaining containers of solid HAW. The report would identify specific components of the currently stored inventory that may not be capable of substantiation for on-going interim storage prior to processing, and recommend appropriate mitigation actions, such as overpacks.
 - A review of the package surveillance programme, to include a plan for implementation of any necessary enhancements for packages in storage
 - Additionally, links would also be established to on-going substantiation of the current HAW stores safety case and resultant recommendations.

3.3 CURRENT STATUS

19. In June 2016 AWE provided an “Evidence Pack” consisting of the agreed documentation under a covering letter [1] to support close out of the IN.
20. The pack contained information concerning two broadly based options, both of which consider the entirety of the site’s HAW stocks [REDACTED] and predicted arisings [REDACTED]. These options being “Option 1” and “Option 4”; both options share several common requirements and core components, including:
 - On-site long-term storage of raw and then the subsequent conditioned waste packages potentially over many decades pending the availability of a Geological Disposal Facility (GDF);
 - Improvements to the waste storage facilities and enhancements to the waste package surveillance regime;
 - Limited on-site direct encapsulation of waste into disposable waste packages;
 - Re-categorisation of [REDACTED] nominally HAW packages to enable prompt disposal as LLW;
 - A capability to process problematic and / or non-conforming wastes.
21. The main discriminating feature between Option 1 and Option 4 is that:
22. **Option 1 concerns treatment of the HAW using an [REDACTED] capability.** This would involve construction of an [REDACTED] “supercompaction” and packaging facility supported by a repacking capability for “non-conforming” waste to produce disposable packages drums. [REDACTED]
23. **Option 4 concerns a significant amount of [REDACTED] treatment.** [REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
24. In April 2016, before submission of the evidence pack to ONR, AWE wrote to MoD to confirm its recommendation of the Option 4 for the management of HAW at Aldermaston, and activities to optimise current HAW storage arrangements to avoid the need for a new-build store. AWE also confirmed that any further work on the original [REDACTED] treatment' option (Option 1) had ceased with the design frozen at the Concept Design Phase. [REDACTED]
- [REDACTED]
25. Pending any instruction from MoD to the contrary, AWE stated that it would continue to plan and implement Option 4.
26. MoD is currently considering AWE's recommendation of Option 4. In the meantime, AWE is continuing to progress work exclusively on Option 4. Once ONR has considered MoD's decision, the activities should progress under the enhanced oversight of ONR (see Recommendation 2).

4 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR

4.1 ASSESSMENT STRATEGY

27. ONR has carried out a programme of work, which included:
- Sampling of information provided by AWE including the strategic ALARP and BAT case and the storage substantiation case, and several documents requested by ONR that support these key documents;
 - Attending routine monthly meetings on site to monitor progress against the requirements of the IN;
 - Engagement with other stakeholders connected with the viability of the options, including the MoD, [REDACTED] and the Environment Agency;
 - Attending relevant meetings with industry, which included workshops attended by AWE and other nuclear licensees seeking to establish collaborative engagement on waste-management issues.
 - Routine and targeted site inspections, as part of normal regulatory business, where these are relevant to the HAW management.
28. The assessment has focussed on the proposed management of the higher hazard inventory components, while not ignoring the potential hazard arising from the remainder of the HAW inventory that poses less risk to employees and the public. While not ignoring the wider context, the assessment was concerned exclusively about whether the AWE activities have satisfied the requirements of the IN.
29. While many of the references and argument are applicable to both Items 1 and 2 of the schedule, the assessment has considered both the individual items and the overall requirement of the IN.
30. ONR assembled a regulatory team comprising the relevant Site Inspector, a Project Inspector, and specialist inspectors covering Nuclear Liabilities and Mechanical Engineering. We have also sought and received assessment advice from the Environment Agency's Nuclear Waste Assessment Team (NWAT) focussed on the long-term performance of the waste packages.
31. For the assessment work, a proportionate approach was adopted. Effort has been concentrated on those waste packages containing the highest fissile loadings and

those wastes within the oldest containers. ONR considers that such packages are likely to pose the largest risks and hazard to the public and workforce from across AWE's packaged HAW inventory. In addition, there is a relatively small volume of waste which has chemical and/or physical properties that could make it difficult to passivate directly into a form suitable for disposal, or be prohibitively expensive to do so using existing technology for the waste volumes present – e.g. contaminated oils. Hence, potential "legacy" waste has also been a focus.

4.1.1 STANDARDS AND CRITERIA

32. The relevant standards and criteria adopted within this assessment are principally the Safety Assessment Principles (SAP) [7], internal ONR Technical Assessment Guides (TAG) [8], relevant national and international standards and relevant good practice informed from existing practices adopted on UK nuclear licensed sites. The key SAPs and any relevant TAGs are detailed within this section. National and international standards and guidance have been referenced where appropriate within the assessment report. Relevant good practice, where applicable, has also been cited within the body of the assessment.

4.1.2 SAFETY ASSESSMENT PRINCIPLES

33. Relevant extracts from the SAPs [7], include:

- *ENM.6: When nuclear matter is to be stored on site for a significant period of time it should be stored in a condition of passive safety whenever practicable and in accordance with good engineering practice.*
- *ECS.1: The safety functions to be delivered within the facility, both during normal operation and in the event of a fault or accident, should be identified and then categorised based on their significance with regard to safety*
- *EMT.1: Safety requirements for in-service testing, inspection and other maintenance procedures and frequencies should be identified in the safety case*
- *EMC.8: integrity of metal components and structures: Geometry and access arrangements should have regard to the need for examination*
- *EMC.13: Materials employed in manufacture and installation should be shown to be suitable for the purpose of enabling an adequate design to be manufactured, operated, examined and maintained throughout the life of the facility.*
- *RW.5: Waste should be stored in accordance with good engineering practice and in a passively safe condition.*
- *RW.6: Radiological hazards should be reduced systematically and progressively. The waste should be processed into a passive safe state as soon as is reasonably practicable.*

Also note:

- Paragraph 791 [concerning strategies for radioactive waste]: *The timescale for the achievement of passive safety is an important aspect of strategy*
- Paragraph 821. *Where it is proposed to defer the processing of radioactive waste into a passive, safe state, the reasons for the deferral should be substantiated.*
- Paragraphs 812-813. *Good engineering practice for storing radioactive waste includes that the waste form and its container should be physically and chemically stable; the waste should be immobile or immobilised; the need for monitoring to ensure safety should be minimised etc.*

4.1.3 TECHNICAL ASSESSMENT GUIDES

34. The following Technical Assessment Guide has been used as part of this assessment [8]:

- Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites, NS-TAST-GD-024 Revision 4.

4.1.4 NATIONAL AND INTERNATIONAL STANDARDS AND GUIDANCE

35. The following additional documents have been used as part of the assessment:
- the Regulator’s “Joint Guidance” concerning the management of HAW on nuclear licensed sites [9];
 - Industry Guidance on “Interim Storage of Higher Activity Waste Packages” [10];
 - the NDA’s “Strategy Document” effective from April 2016 [11];
 - the NDA’s “Higher Activity Waste Strategy” [12].
36. The above documents are, in turn, firmly linked to fundamental national and international standards, such as the IAEA [safety standards](#).

5 ONR ASSESSMENT AND MATTERS ARISING

5.1 OVERVIEW

37. AWE has described, in detail, within its Evidence Pack [1], a range of waste-management activities which when taken together represent a suitably detailed plan that covers the life-cycle for current and future HAW arisings, as outlined in [REDACTED] through to disposal. Further assessment on each HAW stream is considered in more detail within subsection 5.3.
38. The waste-treatment options identified and taken forward by AWE (see subsection 3.3) seem to be appropriately tailored to the physical and chemical properties of each HAW stream and at a high-level appear consistent with good practice described in industry and regulatory guidance [9,10] with near-term focus on those packages with the highest hazard inventory.
39. The implementability of the Option 4 recommendation is reliant on the availability of [REDACTED]

5.2 ITEM 1 OF IMPROVEMENT NOTICE

40. The requirement of Schedule Item 1 [2], as described in paragraph 9, is for AWE to recommend worked-up options to take forward as part of its future HAW programme.
41. Both short-listed options, as previously identified, have substantial components that are identical. The two main technical discriminators between Option 1 and Option 4 concerns the pattern of on-site hazard reduction over time.
42. I consider the main safety benefit from Option 4 over Option 1, is the potential for a better near-term significant hazard and risk reduction. AWE has estimated in its “strategic ALARP” case that processing of [REDACTED] waste packages at [REDACTED] has the potential to reduce the “fissile hazard” from between [REDACTED] dependent on the particular selection of packages from the population [REDACTED] which will be influenced by [REDACTED]
43. However, should the [REDACTED] not deliver the expected throughput then AWE has estimated that [REDACTED] waste packages would still need to be processed to make Option 4 preferable. Further, even when the [REDACTED] drums are processed, it still leaves potentially up to a [REDACTED] waste packages [REDACTED]

[REDACTED]) needing the development of a successor facility to treat the remainder before 2060 for consistency with AWE's decommissioning plans. Such a facility is unlikely to be available before [REDACTED], by which time several of the HAW waste packages awaiting processing into passivated and disposable forms, will be several decades old and hence it is likely to be considerably more onerous to demonstrate they remain in a safe condition.

44. Conversely, Option 1 has a predicted slower, but steadier pattern of hazard reduction, which is scheduled to commence late [REDACTED] and with a significant site hazard reduction achieved after 15 years of operation essentially with the completion of existing stocks of compactable HAW packages, followed by onward treatment of future arisings. In the medium term beyond circa [REDACTED] Option 1 could achieve better hazard reduction compared with Option 4. While this promises a more sustainable solution to the bulk of on-site hazard from HAW, it assumes the timely build and commissioning of a major new [REDACTED] treatment facility. However, ONR has concerns that AWE may not be able to deliver a fully functional new facility on the necessary timescale.
45. Option 4 has a distinct advantage over Option 1 in so far as the [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] I consider, introduce significant further uncertainty to the timely hazard reduction at site.
46. The Evidence Pack [1] has also shown that [REDACTED]
[REDACTED]
[REDACTED]
47. AWE has assessed the total lifetime cost between the two options to be similar (~6% difference). Given the number of base-line assumptions, and inherent uncertainty, I do not consider cost to be a discriminatory factor. AWE has established a significant affordability benefit from Option 4 in the near-term, with Option 1 being almost twice as expensive to implement to [REDACTED]. However, "affordability" is not usually a relevant factor for ONR to consider in its assessments.
48. I consider, on the basis of the case presented, there is not a strong safety-relevant discriminator between either option. Further, I consider that both Options 1 and 4 are consistent with regulatory requirements and are reasonably practicable to implement. However, both options are subject to significant technical risks that, if realised, could delay or close one or more of the selected treatment routes. This in turn may constitute a further non-compliance and could lead to further enforcement action by ONR on the appropriate duty holder(s) to bring it back into legal compliance.
49. I am therefore satisfied that there is sufficient evidence for Item 1 of the IN to be closed out.

5.3 ITEM 2 OF IMPROVEMENT NOTICE

5.3.1 OVERVIEW

50. The requirement of Schedule Item 2 [2], as described in paragraph 9, is for AWE to demonstrate that the options recommended to manage HAW on Aldermaston Site minimise the risks to the health and safety of the public and AWE's employees from the waste so far as is reasonably practicable throughout the anticipated storage life of the waste on the site.

51. I have established, as described in subsection 5.2, that the hazard reduction arising from the proposed work activities in the HAW Forward Plan (concerning both Option 1 and Option 4) is reasonably practicable to deliver. Therefore, it follows that a failure to deliver the overall programme of hazard reduction would also mean that the risks to the health and safety of the public and the work force, would not have been reduced so far as is reasonably practicable.
52. As previously discussed AWE has recommended Option 4 to the MoD, and is only currently pursuing this option moving forward. Therefore I have only assessed Option 4 against Item 2 of the IN, although many of the necessary waste-management activities between the two options are identical.
53. I consider the following are key components of Option 4 that need to be fully addressed by the appropriate duty holders in order to demonstrate that the risks arising from the on-site storage of HAW have been reduced SFAIRP:
- Early, on-site, hazard reduction from the [REDACTED]
 - Tangible near-term progress to scope out the longer-term project plans for a future treatment facility or facilities for the remaining compactable HAW packages comprising of [REDACTED] packages (including current and future arisings) representing [REDACTED] of the hazard from HAW (see subsection 5.3.3). A small number of packages from other HAW streams are earmarked for treatment in such a facility.
 - Near-term hazard reduction of the “High Inventory Drums” and [REDACTED] through on-site treatment into disposable waste packages (see subsection 5.3.4). These waste streams represent [REDACTED] of the total hazard and comprise [REDACTED] waste packages.
 - Near-term recategorisation and then prompt disposal of LLW (see subsection 5.3.5).
 - Demonstration of safe and robust interim storage of all passivated waste packages, and the on-going safe storage of waste packages pending future treatment into a passivated form - many of these packages could be several decades old by that step (see subsection 5.3.6).
 - Tangible progress with working up timely plans and implementation of “problematic wastes” (see subsection 5.3.7).
54. In addition there are a small number of “other” HAW waste streams representing up to [REDACTED] of the total fissile hazard. The significance of which appears minor (see subsection 5.3.8).
55. Additionally I have considered the following other factors to be important in the assessment of AWE’s Evidence Pack that it has met the requirements of Schedule Item 2, these being: :
- Interactions with and roles of the MoD and [REDACTED] moving forward (see subsection 5.3.9).
 - Wider strategic factors (see subsection 5.3.10).
 - Other factors consistent with relevant good practice of waste management (see subsection 5.3.11).

5.3.2 PASSIVATION OF [REDACTED] “HIGHER HAZARD” COMPACTABLE PACKAGES

56. Use [REDACTED] to treat compactable HAW, has the potential to result in the creation of both passivated and disposable 500 litre stainless steel waste

packages. As well as the generally greater corrosion resistance afforded by stainless steel, as opposed to the 'protected' carbon steel of the 205 litre packages, the inner annulus grout provides additional containment and chemical passivation. The fissile hazard reduction potentially realisable, from treating [REDACTED] Aldermaston carbon steel waste packages, is according to AWE, between [REDACTED]

- 57. The 500 litre stainless steel waste containers are widely used in the industry for the storage of HAW. If the resultant 500 litre waste packages are stored under the conditions suggested by AWE, the waste packages should be consistent with the industry storage guidance [10], and regulatory expectations, for many decades of safe interim storage, pending availability of a GDF.
- 58. Work to define a "running order" of the overall the population of packages proposed for [REDACTED] of [REDACTED] packages, consistent with ALARP considerations, appears to be progressing satisfactorily. However, I recommend that AWE provides ONR with the detailed basis of its proposed package selection [13], including how the age of the waste package is factored in.
- 59. I also note the following concerns:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- **Sensitivity of Strategic ALARP Case.** Should the throughput of AWE packages not meet expectations, I understand, dependent on the detailed assumptions made, [REDACTED] of the envisaged [REDACTED] HAW packages could still realise sufficient hazard reduction to maintain its preference in AWE's case. Should this eventuality be realised, then it would suggest greater emphasis would need to be placed on hazard reduction of the other HAW streams [REDACTED] including the remaining 205 litre drums, and / or challenge the position of Option 4's implementation as reducing risks SFAIRP. I consider that AWE would need to re-justify its position should the hazard reduction profile described in the Evidence Pack not be met or exceeded.

- 60. Given the above points I am concerned that there is a significant risk that a major component of the HAW Forward Plan may not deliver timely hazard reduction. I therefore recommend that AWE continues to work up and maintain as appropriate project management contingencies (see Recommendation 4) to ensure the progression of hazard reduction is maintained.

5.3.3 PASSIVATION OF REMAINDER OF COMPACTABLE HAW AT NEW FACILITY (LONGER TERM)

61. Even with the near-term treatment of [REDACTED] “higher hazard” packages into passivated and disposable 500 litre waste packages there would still be a substantial number, [REDACTED] (including current and predicted future arisings), of non-passivated packages in storage for several more decades. These would still represent a significant HAW hazard [1], and continue to represent a significant on-site risk.
62. Treatment of these requires the development of a future processing facility, which is unlikely to be operational before [REDACTED] and is currently only in the earliest stages of planning. While this means the AWE HAW inventory can be more readily taken into its account during the design phase of the facility (or facilities), the lack of a firm plan suggests considerable risk to its implementation and timescale for hazard reduction.
63. There is an assumption that the future treatment facility may include so-called thermal treatment, for which UK-based trials and practice overseas appears promising [14]. While there is a high expectation that thermal treatment may result in improved passivation of the wasteform and volume reduction compared with the current baseline treatment in grouted packages, the practicability of deploying such technologies to relevant heterogeneous HAW wastes has not yet been established. This again implies significant scope for delay in hazard reduction to substantiate the development.
64. The lack of a well-defined technology to treat these wastes makes an assessment problematic, especially given the large number of HAW packages it involves, as shown in [REDACTED]. The NDA has recently launched an Integrated Project Team (IPT) on thermal treatment, and AWE is actively engaged in this [14]. This is putting the work on a more formal project-management orientated footing. I recommend that ONR continues to engage the NDA’s IPT and review relevant outputs in the context of AWE’s plans.
65. There are a number of specific issues of concern, which will need addressing by AWE through the IPT etc., these include:
 - **WAC.** There is considerable uncertainty regarding the acceptability of some of the waste at a future facility. It is important that in the development of such facilities, the waste envelope of the AWE HAW informs the facility’s specification. However, it cannot be discounted that it may be unduly onerous to do so for a facility at another site whose focus may be on a different waste feedstock.
 - **Availability and throughput.** The availability of a central facility is not yet defined. There is considerable uncertainty regarding acceptability of AWE waste streams, and the throughput that may be available to AWE especially if there are requirements to co-treat waste to optimise the resulting passivated wasteform. This has the potential to delay further on-site passivation and hence hazard reduction, and put further burden on the demonstration that the existing mild steel containers are adequately safe.
 - **Prioritisation.** At an off-site facility AWE’s HAW wastes may be given lower priority, e.g. compared with higher hazard wastes from other sites, with the potential to delay the start of treatment of the relevant AWE waste streams.
 - **Ageing waste packages** [13]. Additional storage time of the raw waste packages puts further pressure on substantiating the safety of the package during storage. It therefore follows that AWE will need to substantiate container life and a surveillance regime, necessary to demonstrate the on-going safety of [REDACTED] waste packages while they remain in an untreated form. Until the availability of the new processing facility is more firmly established, such a regime will need a substantial margin to accommodate the uncertainties.

66. Taking the above concerns together, there is significant uncertainty that a replacement treatment capability will be available by the [REDACTED] as assumed by AWE. Therefore there is the expectation that AWE should be able to substantiate the containment of the waste packages (some of which will be many decades old by then) over an appropriate timescale taking into account the uncertainties noted above. This has yet to be fully demonstrated by AWE; see Recommendation 3a. A workable contingency beyond indefinite storage pending the emergence of the new facility should also be worked up (see Recommendation 4).

5.3.4 ON SITE IMMOBILISATION FOR DISPOSAL

67. Should the [REDACTED] option fail to deliver the expected hazard reduction, or be delayed, the progress of passivation of the non-compactable and/or non-conforming HAW packages is likely to become an even more significant component of the hazard reduction objective in the HAW Forward Plan.
68. Option 4 consists of the on-site treatment of a small number of relatively high inventory items [REDACTED]. These items, specifically “High Inventory Drums” and [REDACTED] are proposed to be passivated, in the near term [REDACTED] according to the HAW Forward Plan [1]), using “standard” waste immobilisation approaches within containers approved for disposal and made from stainless steel. RWM, as the developer of the GDF concept, appears to be well engaged with AWE in working up these plans consistent with regulatory guidance. Further, ONR continues to seek and receive authoritative regulatory advice from the Environment Agency, on any implications on disposability from ensuring prompt passivation.
69. These waste streams, together constitute almost [REDACTED] of the total HAW hazard. I consider that it is reasonably practicable that these waste streams are processed promptly into passively safe and disposable waste packages.
70. Therefore, should the work not be delivered to schedule it could represent a failure to do all that is reasonably practicable to reduce risks.

5.3.5 RECATEGORISATION OF HAW TO LLW

71. AWE proposes to recategorise several thousand waste packages from HAW to LLW, based around improvements to characterisation techniques being adopted, and is in my opinion consistent with relevant good practice. As well as being good practice, not to do so, may represent a compliance gap against LC32(1) – To minimise so far as is reasonably practicable the rate of production and total quantity of radioactive waste accumulated on the site at any time. While tackling the lower hazard packages does not yield significant hazard reduction directly, practice elsewhere has shown that it enables better focus and management of the more hazardous HAW remaining.
72. Recategorisation, followed by disposal as LLW, has been proposed by AWE for at least part the inventory of several nominal HAW streams, these include some of the problematic wastes, concrete lined drums, and standard waste packages.
73. At several recent meetings, attended by ONR as observers, AWE has shared their approach with NDA SLCs who have expressed interest in utilising AWE’s learning.
74. However, should the scope of re-categorisation fail to be realised (e.g. either technical performance, or difficulty to demonstrate consistency with WAC at LLW disposal facilities), then the implications could be significant in terms of additional storage space necessary at site. I recommend that further work or evidence be provided by AWE concerning optimisation of store capacity, including the possibility of a new store being required and the implications to the overall strategic ALARP case should a new-build store be necessary; see also Recommendation 4.

5.3.6 WASTE STORAGE SYSTEM

Store and environmental controls

75. AWE has presented evidence that the store environmental controls are being upgraded to be more in line with regulatory expectations and industry guidance [10, 9]. These modifications aim to improve the control of temperature and relative humidity in the stores which in turn should better control corrosional processes across the waste storage system, including the waste packages (especially any exposed carbon steel surfaces [13]) and store infrastructure components.
76. This is important on-going work to reduce the current compliance gap. However, some packages may have already experienced non-ideal storage conditions and hence potentially have already been adversely affected. This puts extra regulatory emphasis on the need for a detailed surveillance programme and provision of a significant reworking / overpacking capability to mitigate any detrimental impacts.
77. While the proposed improvements to environmental controls are welcome, AWE needs to demonstrate that the environmental conditions in the store are appropriately homogeneous and that any inhomogeneity is not significant [13]. Without this assurance, there may need to be further waste packages incorporated into the surveillance programme.
78. There is also a risk that AWE may require further on-site storage capacity, given the number of inter-related uncertainties, which when the cost is taken into account may detrimentally affect their current Strategic ALARP case presented as part of the Evidence Pack [1]. A new store could be purpose built to modern standards and designed to meet regulatory requirements more readily than further major modifications to existing stores.
79. I consider AWE will need to reconsider its decision not to recommend a new store, if: i) the necessary environmental controls proposed prove to be inadequate at reducing the risk of detrimental corrosion, and/or ii) any of the HAW treatment options proposed, and associated hazard reduction profile, be significantly delayed especially if the additional storage period of unpassivated waste packages cannot be substantiated appropriately.

Waste container

80. Many of the waste packages are in containers which are already several decades old and well beyond their nominal design life. Several thousand waste packages, mainly those in the 205 litre drums, are unlikely to be processed into passively safe waste packages, suitable for interim storage before disposal, for several more decades.
81. Given the potential significance, a mechanical engineering specialist has also assessed the proposals and current status of storage on site [13] as noted below.
82. External or internal corrosion in the body section, of the carbon steel waste containers has the potential to disrupt waste package safety functions and future treatment options.
83. More generally, it is important to note that the industry guidance [10] assumes packages, usually in corrosion resistant stainless steel containers, that are designed for long periods of interim storage of wastes that have been treated and immobilised to be passively safe. Where stainless steel or other corrosion resistant materials are not used, good practice is for “thick walled” containers.

84. AWE therefore has not adequately demonstrated the adequacy of the structural integrity of the waste package containers, used to store HAW in unconditioned forms, over the extended period of planned storage. See Recommendation 3a.

5.3.7 PROBLEMATIC WASTES

85. In the Evidence Pack, AWE has described relatively small volumes of “problematic” HAW, for which it does not yet have a definite plan as to how best to immobilise into disposable and passivated waste packages. While, the fissile hazard from these wastes is very small [REDACTED] of the total hazard inventory), but in some instances the nature of the material presents other hazards (e.g. potentially mobile contaminated oils) which require timely passivation to be consistent with ALARP considerations.
86. This waste challenge is relevant to Option 4 with the potential of added quantities of problematic wastes arising from not being able to meet [REDACTED] for compactable and other wastes. This might mean there being a wider range of non-compliant packages becoming defined as “problematic” and hence requiring further bespoke on-site solutions.
87. [REDACTED]
[REDACTED]
[REDACTED] Early engagement between AWE and the NDA’s Problematic Waste IPT [15] is encouraging, and while early in the process, I have seen sufficient evidence that the collaborative approach may deliver acceptable solutions based on existing technology deployed in the UK or overseas, or see co-ordinated R&D to work up common solutions consistent with ALARP considerations.
88. However, I am concerned that, based on industry practice, seemingly low-priority work can be delayed, and the quantity of “problematic” wastes could increase if some components of the large-volume compactable HAW cannot [REDACTED]
[REDACTED] This in turn could lead to a relatively large volume “legacy waste” with challenging chemical and / or physical properties which would not be consistent with regulatory guidance.

5.3.8 OTHER WASTE TYPES

89. There are a small number of other HAW waste types, which I have not assessed in detail. These include:
- [REDACTED] which are earmarked for either “entombment” or decay storage within 3m³ boxes in the next ~10 years. As presented by AWE this seems a reasonable position, being consistent with standard good practice.
 - Additional wastes, which could represent [REDACTED] of the fissile hazard, are said to be in safe storage, pending treatment at a future on-site facility in the 2030s. In any case, standard disposable waste packages, using stainless steel 500 litre drums, are proposed.
90. There is the possibility of some additional nuclear materials being redefined as waste in the future or other waste streams emerging that are not part of the HAW inventory as currently defined (e.g. during decommissioning activities). These potential additions ought to be more than offset by the work on re-categorising HAW to LLW. Additionally, there is the possibility of waste items emerging which may be suitable for treatment using one of the options identified by AWE, and/or become an addition to the “problematic waste” stream for bespoke consideration as part of a strategic framework with NDA etc.

5.3.9 ENGAGEMENT WITH MOD AND NDA

91. The ability to implement either option is reliant on the availability of funding and sanction from the MoD.
92. [REDACTED]
[REDACTED]
[REDACTED] noting that many of these will be several decades old before such a facility is ready. While, over the assessment period, [REDACTED] [REDACTED] have been demonstrably supportive of AWE's proposals, over the period of time considered, its priorities may change and potentially adversely impact on AWE's plans.
93. [REDACTED]
[REDACTED]
[REDACTED]
94. Hence, I am concerned about the potential delay on the HAW Forward Plan from the on-going contractual steps required across the different organisations, and the project management complexity required to manage a multi-organisational programme of work. [REDACTED]
[REDACTED]
[REDACTED]
95. However, there are several examples, observed over the assessment period, where waste management experience at AWE has been shared beneficially with the NDA's SLCs. For example, proposed improvements, and existing waste characterisation methods promise to realise substantial re-categorisation of HAW into disposable LLW at existing UK facilities where these can be shown to meet the relevant WAC.
96. To mitigate these stakeholder risks, it is important that ONR maintains appropriate engagement with MoD and NDA at all levels. This includes the "A6 Strategic Stakeholder Forum" (see subsection 5.3.10).

5.3.10 STRATEGIC FACTORS

97. There are a number of strategic factors which I consider need careful consideration in an overall and balanced assessment against the notable technical concerns.
98. For example, while the HAW inventory is significant, noting close proximity to local populations inter alia, the hazards posed by the HAW is not so significant when compared with many other HAW streams, stored under similar arrangements, at other nuclear licensed sites (although the ubiquitous use of carbon steel, as the primary containment, is not adopted widely elsewhere, and not for storage periods spanning many decades).
99. Some other nuclear licensed sites also have significant quantities of non-passivated HAW in store with comparable plans for a staged approach to bring their HAW inventory into regulatory compliance.
100. With the exception of conditions arising from serious accidents, the majority of AWE's HAW is inherently relatively immobile "solid" waste, and hence of comparatively low risk under normal operating conditions. For the relatively small amount of mobile wastes, e.g. contaminated oils, AWE seem to be appropriately and proportionately focussed on these in a manner consistent with the expectations set out in regulatory guidance.

101. Consolidation of waste and nuclear materials at nuclear licenced sites across the UK is profiled within NDA's recently published updated strategy [11]. The NDA's strategy which was widely consulted on, specifically notes existing arrangements between MoD and NDA to receive irradiated fuels and store them on an interim basis in specialised facilities at Sellafield. Further, ONR has previously approved plans to consolidate storage/treatment of waste and nuclear materials, e.g. Harwell-Sellafield of certain contact handleable waste streams [16].
102. NDA has a broad strategic role which extends beyond its ownership of 17 nuclear sites across the country. For example, it advises UK Government on relevant policy matters and its responsibilities include implementing policy on the long-term management of nuclear waste and developing UK-wide strategy and plans for nuclear Low Level Waste (LLW).
103. ONR senior management, together with regulatory colleagues in the Environment Agency, regularly engage with peers of AWE, MoD and the Defence Nuclear Safety Regulator (DNSR). This engagement provides high-level oversight of AWE's HAW management programme for meeting the schedule of activities comprising Option 4.

5.3.11 OTHER

104. Other relevant aspects of the evidence pack have been sampled. For example, there is good evidence, from a recent ONR inspection of site's package records, including for problematic and other HAW packages, which form part of the surveillance programme, that the waste package records are satisfactory [17] and in accordance with relevant guidance.

5.3.12 SUMMARY

105. I consider that AWE has made sufficient progress in developing its HAW Forward Plan to demonstrate that it will be able to manage HAW on the Aldermaston Site in a way that minimises the risks to the health and safety of the public and AWE's employees from the waste so far as is reasonably practicable throughout the anticipated storage life of the waste on the site.
106. More work is required before the proposed option can be considered fully consistent with regulatory expectations. There are currently several risks to a successful outcome. Given these risks there is a need for further consideration of contingencies and back-up plans.
107. However, with maintained regulatory oversight to monitor progress against the plan and further activities to close out compliance gaps (see Section 7), I am satisfied that there is sufficient evidence for Item 2 of the IN to be closed out, in addition to the more clearly established evidence to close out Item 1.

6 CONCLUSIONS

Overview

108. This report presents the findings of ONR's assessment of AWE's Evidence Pack to support the close-out of the IN as a first stage of ONR's regulatory strategy to bring about AWE's sustained compliance. In summary, I conclude that AWE has:
 - provided sufficient information for ONR to complete its assessment, and provided all requested additional information in a timely and co-operative manner [18,19];
 - proposed activities that appear focussed on near-term hazard reduction of the highest hazard waste packages, consistent with ONR expectations;

- made commitments to improve the storage environment of the HAW inventory, consistent with extant regulatory and industry guidance;
- demonstrated that some aspects of their proposed approach and on-going activities, are consistent with good practice;
- demonstrated good working relationships with the NDA, and its SLCs, to collaborate on industry-wide solutions to HAW management where there are “gaps” in the AWE’s plans.

However, there is considerable work for AWE to do and there are several potential risks to delivery.

6.1 SCHEDULE ITEM 1

109. I conclude that AWE has met the requirements of schedule Item 1. It has completed appropriate activities to enable it to recommend credible forward options as part of their future HAW programme. No further action is required by AWE to close-out Item 1.

6.2 SCHEDULE ITEM 2

110. Item 2 of the IN requires that AWE demonstrates that the options recommended to manage HAW on Aldermaston Site minimise the risks to the health and safety of the public and AWE’s employees from the waste SFAIRP throughout the anticipated storage life of the waste on the site
111. AWE’s HAW Forward Plan [1] seeks to minimise risks by the reducing the hazard from a number of waste streams using a range of techniques, with a proportionate approach focussed on the treatment of higher hazard waste packages into disposable and passivated waste packages in accordance with regulatory expectations.
112. AWE has recommended Option 4 to the MoD for its future consideration, and AWE is now pursuing this Option exclusively in the HAW Forward Plan, while MoD considers its position.
113. There is good consistency between AWE’s HAW Forward Plan comprising Option 4, the NDA’s Strategy [11], and specifically the NDA’s strategy on HAW [12] regarding consolidation and central processing. This meets ONR’s expectation that waste management strategies should be consistent with government policy and other relevant strategies [7]. The processing of [REDACTED] over the period [REDACTED] could reduce the fissile hazard from HAW between [REDACTED].
114. The near term encapsulation of the [REDACTED] and high inventory drums over the period [REDACTED] could reduce the hazard by a further [REDACTED].
115. The planned work to demonstrate that [REDACTED] notionally HAW packages can be disposed of as LLW represents reasonably practicable action that contributes to the minimisation of the total quantity of radioactive waste accumulated on the site.
116. All existing waste packages, as currently stored, remain safe. Further AWE is upgrading its stores to align more closely with industry good practice [10]. However, further work is required in some areas to demonstrate the adequacy of the structural integrity of the waste storage containers over the extended period of planned storage (see Recommendations 2 and 3).
117. The complexity of the HAW Forward Plan (Version 2), for example its accountabilities (See Recommendation 5), interconnectivities, interdependencies, and many different assumptions, means that there is considerable uncertainty whether it is reasonable to assume the plan is likely to succeed. I note considerable uncertainty, with the options

as currently proposed, as to whether existing HAW stores will have capacity to cope with both existing and predicted future arisings of HAW.

118. At this stage there is limited evidence of workable contingencies to manage the HAW should the preferred / chosen option fail to deliver the expected outcomes. Other than the previously rejected [REDACTED] compactor”, there does not seem to be any substantive project management contingency options to ensure the [REDACTED] Option 4 delivers the timely hazard reduction sought by ONR. The plans for an [REDACTED] compactor need maintaining such that it could be readily deployed if required to bring about the necessary hazard and risk reduction sought by ONR. See Recommendations 4 and 4a.
119. AWE has shared several of its good HAW practices with NDA SLCs, e.g. concerning characterisation, records management and surveillance. It should continue to do so. See Recommendation 6.
120. Hence, while it is more difficult to conclude whether AWE, through its selection of Option 4, has demonstrated sufficient evidence to close out Item 2 unless AWE maintains appropriate [REDACTED] capability for a suitable compactor and treatment facility as a workable contingency.
121. On balance, I am satisfied with the claims, arguments and evidence laid down within AWE’s Evidence Pack [1] are sufficient to justify closure as it has done, in my opinion, everything that it could reasonably do at this interim stage.

7 RECOMMENDATIONS

122. It is recommended that:

Recommendation 1 The IN is closed for the reasons listed in Section 5 and 6 as AWE has satisfied the requirements of both Schedule Items.

Recommendation 2 ONR, working jointly with the Environment Agency, retains enhanced and focussed attention on securing further improvements to AWE’s HAW Forward Plan, the Plan’s early implementation phase, and the key milestones required for the successful out-turn.

Recommendation 3 Where ONR has assessed a compliance gap, or significant potential for a compliance gap in the future, AWE should undertake appropriate work as may be necessary, to close that gap, mitigate its impact and/or reduce its likelihood from occurring. This includes the principal area of concern:

Recommendation 3a ONR has assessed a compliance gap concerning the lack of a full substantiation of the carbon steel containers over the timescale of concern: i) AWE should develop appropriate Safety Functional Requirements (SFRs) and demonstrate substantiation against these. ii) AWE should develop and implement an appropriate examination, inspection, maintenance and test (EIMT) schedule that confirms the waste packages are performing in accordance with the required SFRs iii) AWE should justify the choice of future waste package container material including overpacks, as part of an optioneering study, for the storage of HAW in unconditioned forms over several decades of storage, as being ALARP.

Recommendation 4 All activities, where there is a significant risk of non-timely delivery, should have worked up and/or deployable contingencies commensurate with its risk and impact of not working as intended, in order to minimise any significant detriment to the hazard reduction sought by the HAW Forward Plan. The Strategic ALARP case should be updated as appropriate, to confirm the overall status of the

HAW Plan as and when risks are realised or significant new information is established. Such contingencies should include:

- Due consideration of the Joint Guidance [9], or measures of an equal or better standard, such as immobilisation of waste as soon as is reasonably practicable into more passively safe forms.
- Given the long life-cycle, opportunities to realise improved hazard and risk reduction, should continue to be reviewed and developed as necessary to confirm that the overall approach remains ALARP and consistent with relevant good practice.

Recommendation 4a AWE should maintain capability for an [REDACTED] compactor and treatment facility (as profiled in Option 1) until such time that AWE and MoD have provided sufficient evidence (which is acceptable to ONR, e.g. through a Hold Point Control Plan) that the [REDACTED] will deliver the required hazard and risk reduction.

Recommendation 5 Accountabilities and responsibilities should be clearly defined in the HAW Work Plan, such that the duty holder(s) are clearly established with respect to ONR vires. In particular ONR should establish specific engagement with MoD, [REDACTED] and AWE on those aspects where each has legal duties under the legislation enforced by the ONR.

Recommendation 6 AWE should continue to work closely with [REDACTED] and collaborate as appropriate to develop improved hazard and risk reduction approaches applicable to HAW management on Aldermaston. There are several good recent examples of this collaborative approach working in practice, e.g. with respect to common problematic wastes and improved characterisation of wastes techniques etc. Such an approach promises to help define “future relevant good practice for HAW management”, and limit the risk of future compliance gaps emerging.

ONR will progress these recommendations as Regulatory Issues using the ONR Issues Database.

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[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

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[REDACTED]	[REDACTED]	[REDACTED]
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[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]