



Integrated Waste Management Strategy Development Programme

FINAL

May 2012

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1 INTRODUCTION

Nuclear site operations and successful site restoration depend on the availability of waste management routes and facilities. Effective management of both radioactive and non-radioactive waste is therefore essential to the delivery of NDA's mission and is a significant part of our decommissioning work.

This document describes NDA's Integrated Waste Management (IWM) Strategy Development Programme. It does not describe detailed plans for the physical treatment, storage and disposal of waste, as that is the role of our contractors' Site Integrated Waste Strategies and Lifetime Plans; rather it articulates the work required to develop a comprehensive NDA Integrated Waste Management Strategy that will drive Lifetime Plan development and lead in due course to the estate wide optimisation of waste management.

The purpose of documenting the strategy development programme is to:

- Provide reassurance that the central importance of IWM to the delivery of our mission is recognised and that we have a credible programme to realise opportunities and address key challenges
- Seek feedback and support from within NDA, the Site Licence Companies (SLCs), regulators and the wider stakeholder community

In the areas of Low Level Waste (LLW) and Non Radioactive waste the UK Strategy and Policy are clear and form the basis of our contractors Lifetime Plans. However the baseline for Higher Activity Waste (HAW¹) management in current lifetime plans is founded on site specific retrieval, treatment, conditioning and packaging (almost exclusively grouted), followed by interim storage until disposal in the Geological Disposal Facility (GDF). This results in an arguably suboptimal estate wide approach to HAW management because economies of scale and opportunities for sharing best practice and avoiding repeating work are missed. Lifetime plans for Scottish sites are being reviewed to ensure they are consistent with Scottish Government Higher Activity Waste Policy.

In NDA Strategy II we set out areas for work that we believe will move HAW Strategy towards:

- Better application of the waste hierarchy including more characterisation, sorting, segregating, re-use and recycling.
- Consideration of more treatment options
- Optimised selection of package and interim store designs
- Greater integration across the estate, in particular by sharing treatment and interim storage assets and capabilities (where appropriate).
- Adoption of alternative options that mitigate risks associated with current reference strategies.

Specific changes to IWM Strategy will be supported in due course by specific business cases. Even before developing such detail, it is clear that optimised and integrated waste management is

¹ HAW is defined as HLW, ILW and small amount of LLW not suitable for disposal in the current LLW disposal facility

the right approach to take. If the programme aspirations are realised, the economic benefits will be substantial and could lead to significant reductions in the UK's nuclear liability.

This document describes the **Outcome** of the Integrated Waste Management Strategy Development Programme and the desired **Benefit**. It summarises within eight categories, the Strategic Guidance **Products** and outlines the **Benefits Realisation** approach by which these Products will lead to estate wide optimisation of waste management.

2 DOCUMENT PURPOSE

In our role as Strategic Authority and Client, we develop strategy for integrated and optimised management of waste across our estate. Our strategy is delivered by our site contractors.

This workplan does not describe detailed plans for the physical treatment, storage and disposal of waste, as that is the role of our contractors' Site Integrated Waste Strategies and Lifetime Plans; rather it articulates the work required to develop a comprehensive NDA Integrated Waste Management Strategy that will drive Lifetime Plan development and lead in due course to the estate wide optimisation of waste management.

NDA's strategies for Low Level Waste and for Non Radioactive and Hazardous Waste are mature² and drive the current lifetime plans, but there is more to do in the area of Higher Activity Wastes, therefore HAW strategy development is a key focus of the Programme described here.

Whilst there is a focus on HAW, the programme remains an integrated waste management programme, with work in other areas, notably the need for waste management strategies to be *integrated* across the estate and *integrated* across nominal waste categories (High, Intermediate, Low and Non Radioactive).

The purpose of documenting the strategy development programme is to:

- Provide reassurance that the central importance of IWM to the delivery of our mission is recognised and that we have a credible programme to realise opportunities and address key challenges
- Seek feedback and support from within NDA, the SLCs, regulators and the wider stakeholder community

² See UK Strategy for the Management of LLW from the Nuclear Industry and NDA Strategy II.

3 CASE FOR CHANGE – WHAT IS THE PROBLEM?

In the UK we have been producing and managing radioactive waste for many decades. A major part of the NDA's role is to address historical waste that was managed in a way that falls short when compared to modern standards. This part of our role is a very pertinent reminder of the need to manage waste in a responsible manner to ensure it is safely managed now and for future generations. We now aim to convert wastes to a passively safe and disposable form, reducing the burden on future generations.

Waste management is not a straightforward process of site specific waste retrieval and disposal. It requires a series of steps: pursuing opportunities for waste minimisation, re-use and recycling, waste treatment, packaging, storage, transport and then final disposal. However, the focus of recent years was to prepare waste management solutions that supported ongoing site operations. This approach can be effective, but is unlikely to be efficient or optimised because the desired outcome (operations can continue unhindered) does not require consideration of these waste management steps.

Our desired outcome now is that waste is managed well, whilst supporting operational and decommissioning needs. This means greater focus on all aspects of the waste lifecycle and thinking about whether waste is better managed by sites working independently or by them sharing assets and capabilities.

We have already seen significant change in LLW management. There has been more application of the waste hierarchy and waste producers are working together and with the supply chain to deliver more optimised waste management. This change was driven by the UK Nuclear Industry LLW Strategy published in 2010³.

Following on from publication of the UK Nuclear Industry LLW Strategy, our strategy development programme will now focus more on HAW management. Figure 1 shows that the baseline for HAW management in current lifetime plans is founded on site specific retrieval, treatment, conditioning and packaging (almost exclusively grouted), followed by interim storage until disposal in the GDF. This results in a suboptimal estate wide approach to HAW treatment, storage and disposal.

Overall, we believe there are opportunities at a strategy level to reduce risk (programme, cost, etc) in the HAW management programme and also to provide a step change in benefit. Most of the opportunities are likely to centre on improvements to the current strategy, with an emphasis on effective use of the waste hierarchy.

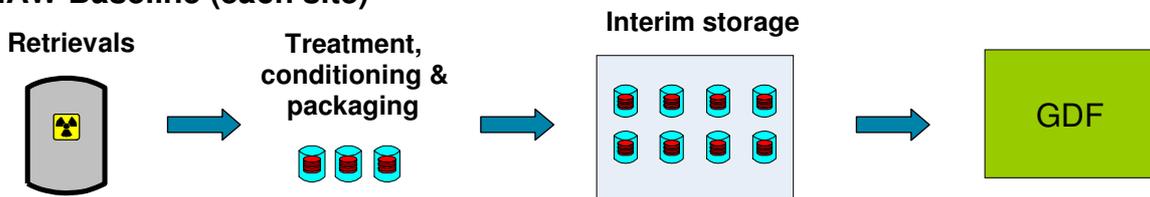
We must also ensure best use of current and planned waste management facilities. Policy for HAW management in England and Wales is long-term management by geological disposal, whereas in Scotland the Policy is for management in near-surface facilities. It is imperative that we ensure the very best use of these facilities as and when they become available.

³ <http://www.nda.gov.uk/documents/upload/UK-Strategy-for-the-Management-of-Solid-Low-Level-Radioactive-Waste-from-the-Nuclear-Industry-August-2010.pdf>

In light of this, we believe HAW Strategy should move towards (see Figure 1):

- Better application of the waste hierarchy including more characterisation, sorting, segregating, re-use and recycling.
- Consideration of more treatment options
- Optimised selection of package and interim store designs
- Greater integration across the estate, in particular by sharing treatment and interim storage assets and capabilities (where appropriate).
- Adoption of alternative options that mitigate risks associated with current reference strategies.

HAW Baseline (each site)



HAW Strategy

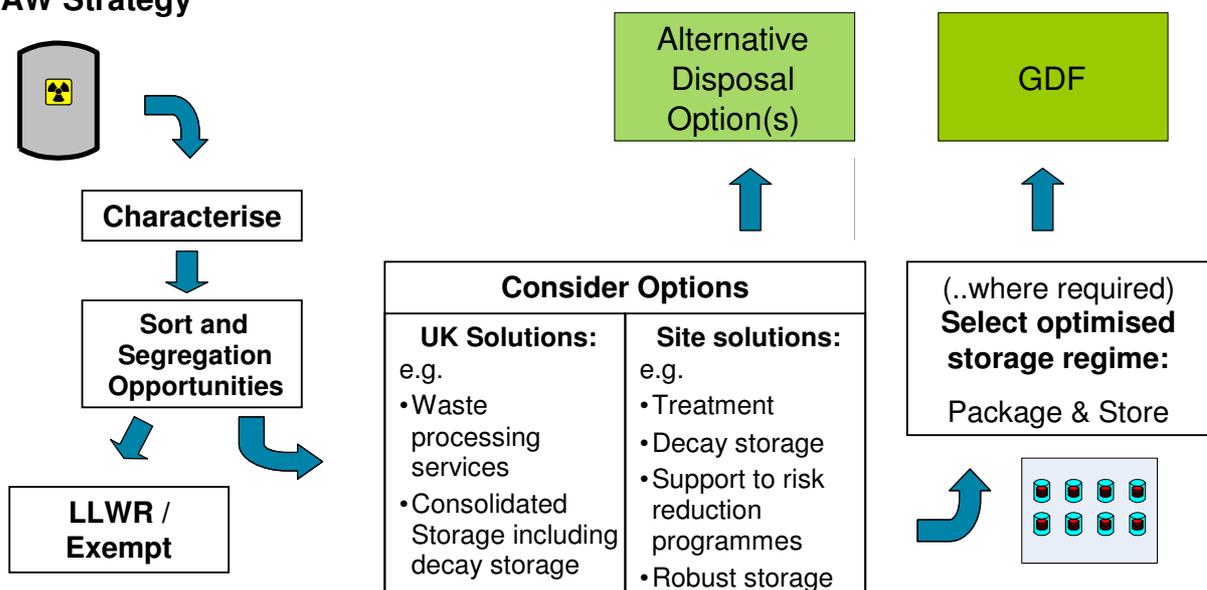


Figure 1: Proposed developing strategy for HAW as compared to reference baseline approach

Our work programme comprises discreet packages of work, which will address those areas of waste management that we think will, at current time, benefit most from further strategic guidance (Products). The importance and urgency associated with developing these products will differ. We also believe that these discreet packages of work are required to provide the building blocks for the overarching integrated waste management strategies that we will develop later in the programme, be that HAW strategy or the overall NDA IWM Strategy. With time the content of the programme will change as work is completed and priorities change.

As well as seeing opportunity for improvement ourselves, there are other drivers for development of waste management strategy. These are also reflected in our programme and include: mandates from Government through policy change; input from our stakeholders; the need for continuous improvement; and responding to changing needs in the industry (for example, transition from operational to decommissioning sites).

Changes to IWM Strategy will be supported in due course by specific business cases. Even before developing such detail, it is clear that optimised and integrated waste management is the right approach to take. If the programme aspirations are realised, the economic benefits, will be substantial and are likely to reduce the UK's nuclear liability by several billion pounds. This reduction in liability will be achieved if we secure a significant reduction in waste volumes, a more optimised approach to waste treatment and storage across the whole of the site and a risk-based approach to disposal.

Approaches more closely founded on the application of the waste hierarchy will form a strong environmental proposition. Add to this greater estate wide integration of implementation and contractual arrangements and the management and commercial cases will also be strengthened.

Since the strategies will include consideration of in-situ interim and decay storage they will not necessarily be founded on a "*spend now to save later*" mentality and therefore strong, affordable, financial cases may be achievable.

Background information regarding Higher Activity Waste Management can be found in NDA's Strategy⁴ and underpinning HAW Credible Options paper available on the NDA's website⁵.

⁴ <http://www.nda.gov.uk/strategy/>

⁵ <http://www.nda.gov.uk/documents/upload/Higher-Activity-Waste-Credible-Options-February-2011.pdf>

4 DRIVING CHANGE – BENEFITS REALISATION

It is important to be clear how this strategy development programme will lead to optimised waste management across the estate. To this end we describe products, outcomes, benefits and the approach to benefits realisation.

The desired **Outcome** of the Integrated Waste Management strategy development programme is clear:

Outcome – A set of optimised lifetime plans founded on a clearly articulated NDA Integrated Waste Management Strategy incorporating NDA, and where appropriate non-NDA, liabilities. Once established, ongoing review will ensure continued development and improvement of both strategy and plans.

To achieve this outcome, projects within the programme will create **Products**

Products

- A - Strategic Guidance to SLCs regarding **Higher Activity Waste TREATMENT**
- B - Strategic Guidance to SLCs regarding **Higher Activity Waste STORAGE**
- C - Strategic Guidance to SLCs regarding **Higher Activity Waste DISPOSAL**
- D - Strategic Guidance to SLCs regarding **Specific Waste Streams**
- E - Strategic Guidance to SLCs regarding **Low Level Waste DISPOSAL**
- F - IWM Position Statements to support Strategy development for other NDA themes
- G - Revised IWM topic strategies and public facing documents
- H - Strategic and/or tactical Guidance (for SLCs and others) regarding **Integrated Waste** issues

The **Benefit** that we seek is also clear:

Benefit Statement - All wastes managed in a manner that protects people and the environment (complies with Government policies), provides value for money and closes our radioactive waste liabilities.

And the approach to **Realising the Benefit** is well established:

Benefits Realisation – A key element in achieving the strategic outcome is our Site Strategic Specifications. This is the means by which we translate strategy into requirements, which in turn influences the ongoing development of lifetime plans. Benefits realisation will then be through NDA's client capability to select the right site contractors and manage delivery contracts. Where appropriate NDA's National Programme Team will actively oversee the delivery of multi-site waste management projects.

5 STRATEGY DEVELOPMENT PROGRAMME AND PRODUCTS

Our programme covers four different types of activity: support to Government, strategy development, support to other driving strategies and monitoring strategy implementation.

- I. *Support to Government* – we support Government waste management initiatives by providing expertise when requested.
- II. *Strategy development* – following the NDA Strategy Management System (SMS) we develop strategy positions on a range of Integrated Waste Management issues. The strategy development programme is sub-divided into the lifecycle steps of treatment, storage and disposal for specific project delivery tasks or in some cases we will address waste groups.
- III. *Support to other driving strategies* – IWM supports other strategies and in particular Site Restoration, Spent Fuel and Nuclear Materials. In doing this we will ensure that interfaces are clear and strategies are complementary.
- IV. *Monitoring strategy implementation* – once our strategies are being delivered there remains a need to monitor implementation to assess progress and be aware of issues that may require a review of a strategic position.

These work areas can apply across the waste management arena in an integrated way or can apply to specific waste categories. Figure 2 sets out the projects we will be undertaking. The figure also identifies Product groups, which will be the main outputs of the work programme (also in Figure 3). The products (A to H) are described further in Section 6.

6 PRODUCT GROUPS

A - Strategic Guidance to SLCs regarding Higher Activity Waste TREATMENT

This product will identify major waste treatment opportunities with respect to volume reduction and waste passivity and estate-wide use of existing and future planned facilities. The NDA's SMS process will be followed to generate credible and preferred strategic option for the estate-wide use of thermal technologies and for establishment of treatment centres and the estate-wide use of mobile treatment technologies. Key products will be:

- A1 - Guidance regarding treatment options to be considered for use by SLCs
- A2 - Strategic and technical analysis of treatment capabilities currently available and proposals to develop others
- A3 - Strategic assessment of thermal treatment technology
- A4 - Guidance regarding treatment capabilities that will be available to SLCs (technology, location, date available)

Other strategy development tasks may be initiated as the programme evolves, e.g. chemical dissolution, pre-treatment.

B - Strategic Guidance to SLCs regarding Higher Activity Waste STORAGE

This product considers the waste storage system as a whole and to date includes: Industry Guidance on HAW Interim Storage; ILW storage consolidation opportunities; and, the use of disposable robust self-shielding containers.

The opportunity of consolidating ILW storage across the NDA estate could reduce the number of ILW stores being built across the UK and Winfrith and Harwell off-site ILW transfers would support early site clearance initiatives or a reduction in site footprint. The consolidation project will also consider EdF Energy and MoD sites. Key products will be:

- B1 - Guidance to SLCs regarding the selection of disposable waste container type for different circumstances, including exceptional circumstances for use of containers that are not a final disposal solution
- B2 - Guidance to SLCs regarding HAW store operation supported by ongoing technical programmes
- B3 - Strategic instruction to SLCs regarding HAW storage consolidation (and developing the process of implementation).

C - Strategic Guidance to SLCs regarding Higher Activity Waste DISPOSAL

This activity considers the final part of the HAW management lifecycle, disposal. The main objective is to ensure the Radioactive Waste Management Directorate (RWMD) and SLC programmes interface effectively, particularly in the following areas:

- (i) the impact of waste packaging solutions on long-term storage and disposal
- (ii) site export scheduling to the GDF (or alternative disposal facility)
- (iii) the planned starting date for GDF operations.

The product will take the following into consideration:

- The GDF project and RWMD activities including NDA Strategy governance and support arrangements
- Progress against the UK Government's Managing Radioactive Waste Safely programme and the GDF voluntarism process
- Scottish Government's Higher Activity Waste Policy and Implementation Strategy
- The other HAW IWM Products; (A) Treatment, (B) Storage and (D) Treatment, storage and disposal of graphite.

Key products will be:

C1 – Formal issue of NDA's Site Strategic Specification for RWMD

C2 – Updated instruction to SLCs to ensure optimised schedule for GDF disposals

C3 – Guidance to SLCs regarding the use of alternative disposal routes; e.g. near surface disposal (note close link to Scottish Higher Activity Waste Implementation Strategy development)

C4 – The first NDA Strategy periodic review of RWMD programme.

D – Strategic Guidance to SLCs regarding specific waste streams

D1 Graphite – This product will provide the strategy position on the long-term management of graphite wastes including: bulk reactor graphite, fuel sleeves and test reactor graphite. The product includes the following activities:

- assessing the current baseline for management of graphite wastes
- determine whether there is a case for change in graphite management strategy
- establish credible options where there is a case for change (Gate A – Credible Options)
- determine forward programme of work including determining level of effort required for R&D and involvement in international work programmes.

D2 National Alpha Waste Management Strategy – This product will provide the strategic position on the lifecycle management of alpha-contaminated radioactive waste streams and in particular plutonium bearing wastes (PCM). It will include;

- The current status of the Sellafield PCM Strategy including; Harwell PCM transfers, the development programme for thermal treatment and SMP decommissioning wastes.
- The preferred lifecycle management approach for alpha contaminated waste including retrievals, waste conditioning and long-term storage of all relevant waste streams in the UK.
- An integrated national baseline programme for lifecycle management of alpha contaminated waste streams.

- Credible strategic options for alpha-waste consolidation for (i) treatment purposes only, (ii) storage only and (iii) treatment and storage. Credible options should consider NDA only and, if appropriate, broader UK opportunities.

E – Strategic Guidance to SLCs regarding Low Level Waste DISPOSAL

This area of work has a number of purposes:

- to ensure NDA has an established, robust position on the long term use of the Low Level Waste Repository and has determined how we will respond to a number of potential scenarios that could result from the Environment Agency's assessment of the LLWR Environmental Safety Case.
- to provide guidance on our expectations with respect to the management of VLLW and other lower hazard LLW in response to the developing market solutions.

This product will focus on the performance and implementation of the approved UK Solid LLW Strategy for the nuclear industry. The main products are as follows;

E1 – Definition of long term vision for the optimum use of LLWR in estate wide LLW management (driver is contract break point in 2013). This includes consideration of the Environmental Safety Case and the potential to divert wastes away from GDF (e.g. Graphite and other decommissioning wastes).

E2 – Determining how we will respond to a number of potential scenarios that could result from the Environment Agency's assessment of the LLWR Environmental Safety Case.

E3 – Developing a strategic position on the use of alternative disposal routes for LLW. This will include consideration of:

- Assessment of arisings, need and capacity,
- Accommodating different needs in different parts of the country
- Use of Very Low Level Waste in the LLWR Cap construction
- Assessment of Sellafield on-site / near-site disposal plans
- Improve understanding of how on-site disposal affects our ability to clear our sites
- CIRIA / Environment Agency work on erosion of landfills in coastal environments

Involvement of stakeholders is particularly important to this work package.

F – IWM Position Statements to support Strategy development for other NDA themes

Key strategy theme interfaces are with Site Restoration, Spent Fuel and Nuclear Materials. As well as a driving strategy IWM is also a key enabling strategy and will provide expertise for the following activities;

F1 – Support to Site Restoration in a number of areas: in situ storage; in situ disposal and on site disposal; the use of specific NDA sites for HAW treatment, storage and disposal and a summary of waste route availability; and legacy facility studies.

F2 – In support of Non NDA Liabilities Strategy – a decision regarding whether NDA could provide interim storage for MOD submarine ILW.

G – Revised IWM topic strategies and public facing documents

By creating products in groups A-F we will be in a position to update formal NDA Strategy Publications, including:

- G1 – Final Plan for IWM Strategy Development (this document)
- G2 – Review an update of HAW Topic Strategy (possibly resulting in a stand alone NDA HAW Strategy)
- G3 – Review and update of all IWM Topic Strategies in advance of next published NDA Strategy
- G4 – UK Nuclear Industry LLW Strategy Update (v2)

H – Strategic and/or tactical Guidance (for SLCs and others) regarding Integrated Waste issues

The tasks in this product will investigate and realise the opportunities for a more integrated approach to waste management in the NDA estate.

Four specific areas of work have been identified at the current time:

- H1 – Revision of NDA's specification to waste producers for the production of their Integrated Waste Strategies
- H2 – Developing a strategic position on how the opportunity to decay store waste should be considered by waste producers
- H3 – Identification of opportunities for alternative management of waste close to waste class boundaries and establishment of criteria to support decision making (in particular how to assess wastes that could be consigned either to the GDF or LLWR).
- H4 – Consideration of whether the UK should adopt an alternative or more detailed classification system (i.e. move away from L, I and H level waste classification).

7 DELIVERING THE PROGRAMME

Delivering the IWM Strategy Development Programme will require some flexibility in order to respond to the different needs of different aspects of the work. Engaging with stakeholders throughout will be important and more details are given below.

The work programme is owned and coordinated by the Head of Integrated Waste Management in the Strategy Function of the NDA. Delivery of the packages of work that will lead to final products will be achieved through a number of means depending on what the specific requirements are. Options include delivery by NDA Site Licence Companies, Research and Development (R&D) supporting and technical underpinning tasks, RWMD Upstream Optioneering projects, project teams with representatives from several organisations (including Non-NDA waste producers) and external resource where required.

The NDA Strategy Management System will provide the framework for delivering the products. Part of the SMS system is to recognise the interfaces with other topic areas. Apart from those specifically mentioned in the programme other key interfaces will be with critical enablers, in particular R&D and Transport and Logistics.

8 STAKEHOLDER ENGAGEMENT

The products within the IWM Strategy Development Programme should result in significant improvements in the way we manage our wastes from a whole lifecycle perspective. They may also result in the implementation of multi-site treatment and storage opportunities, substantial reduction in volumes for certain waste streams, more effective waste processing and the use of alternative disposal routes. Such solutions will require continual stakeholder involvement to ensure views are properly captured, understood and taken into account.

Engagement with key stakeholders will primarily occur through existing arrangements, e.g. Governments and Regulator interface meetings and engagement with the planning authorities primarily co-ordinated via NuLeAF (Nuclear Legacy Advisory Forum) and SCCORS (Scottish Councils Committee on Radioactive Substances).

CoRWM is also a key stakeholder and in the development of the NDA's IWM strategy we are keen to continue active engagement especially in the following areas:

- Interim Storage & HAW Topic Strategy
- Geological disposal
- R&D
- Transport

As the IWM Strategy Programme develops it is envisaged that separate issue specific or region specific workshops will be required involving targeted groups of stakeholders. Dependent on the issue, there may also be a need to engage with specific Local Authorities and Site Stakeholders Groups. National Stakeholder Events will also be used to discuss waste related topics. All Engagement opportunities will be captured and detailed via the National Engagement Plan.

Each strategy development project will produce its own Stakeholder Engagement Plan and it is the responsibility of the project manager that an effective plan is in place and is being implemented.

**Integrated Waste Management
Strategy Development Programme
May 2012**

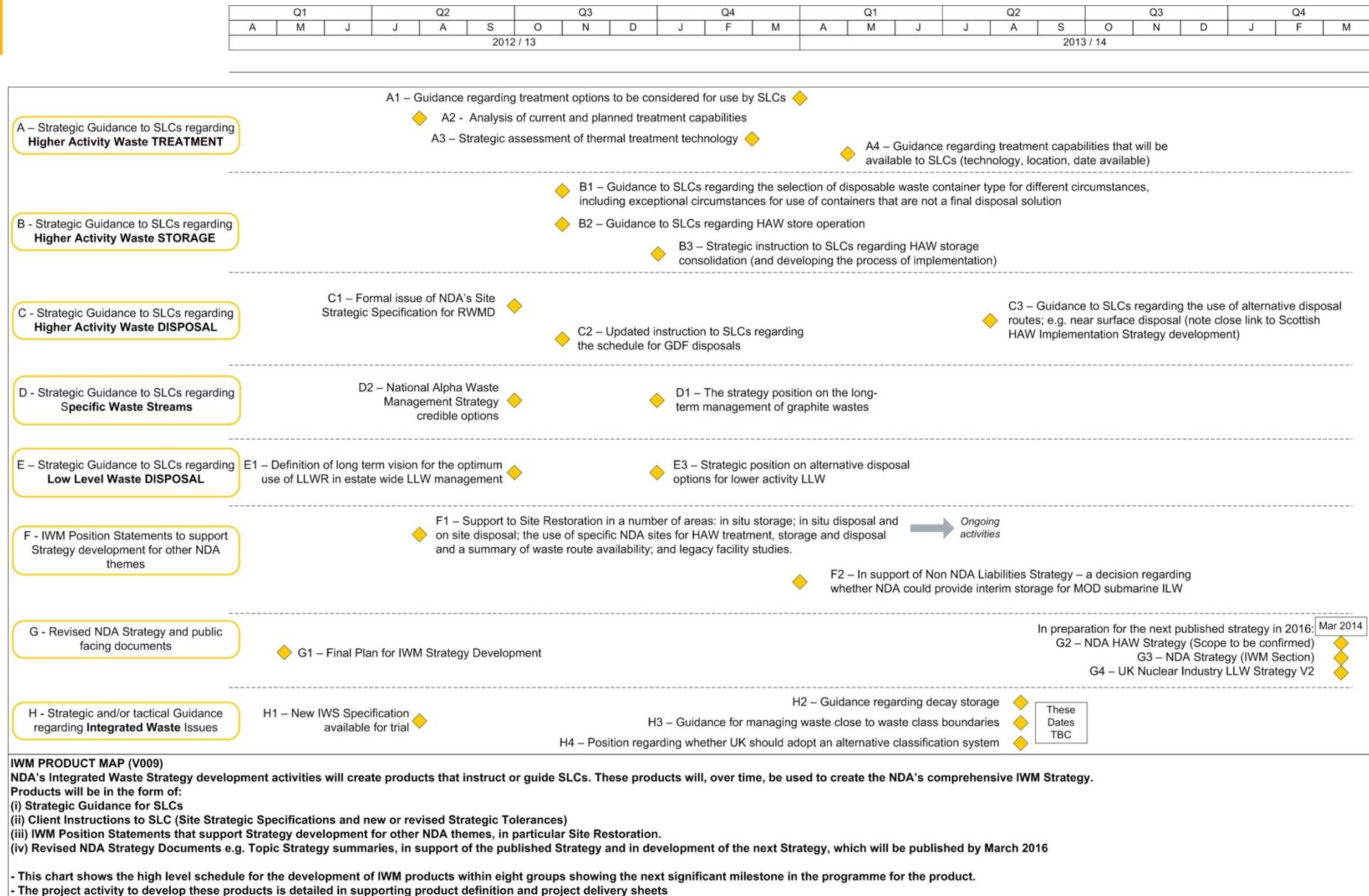


Figure 3 – Product Map and High Level Schedule (indicative timescales, subject to change as programme develops)