

Permitting decisions- Refusal

We have decided to refuse the variation for Middlemarsh Landfill Site operated by Lincwaste Limited [a wholly owned subsidiary of FCC Environment (UK) Limited].

The decision was issued on 4 August 2026

The proposed facility location is Middlemarsh Landfill Site, Burgh Le Marsh, Skegness, Lincolnshire, PE24 5AD.

The variation application proposes the use of stabilised non-hazardous landfill leachate to irrigate the restored landfill surface during periods of soil moisture deficit, i.e. on a seasonal basis. The applicant states that, 'the irrigation activity is being implemented to encourage and sustain vegetation cover at the site and prevent dry conditions which are the prime cause of destructive wildfires'. The applicant has applied for a deposit for recovery activity to carry out this proposal.

The site is located within a Source Protection Zone (SPZ) and a Nitrate Vulnerable Zone (NVZ).

We consider that in reaching that decision we have taken into account all relevant considerations and legal requirements.

1.0 Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights [key issues](#) in the determination
- gives reasons for refusal
- summarises the decision making process in the [decision considerations](#) section to show how the main relevant factors have been taken into account.
- shows how we have considered the [Consultation](#) responses

Unless the decision document specifies otherwise, we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the refusal notice.

2.0 Key issues of the decision

2.1 Description of the facility

Middlemarsh Landfill (the Site) is operated by Lincwaste Limited, a wholly owned subsidiary of FCC Environment (UK) Limited (the Applicant).

Middlemarsh Landfill is located in the fen lands a short distance from the Wash, 2km to the west of Skegness at National Grid Reference TF 537 635 (See Figure 1 below). The site is located in a predominantly rural area. Middlemarsh Landfill is surrounded by a mixture of agricultural and marsh land and has a solar farm located to the north-east of the site.

Middlemarsh Landfill is a closed, capped and restored landfill which accepted non-hazardous waste. The site ceased accepting waste in 2014 after which the site has been progressively restored.

The variation application is to use stabilised leachate from Middlemarsh landfill for irrigating part of the restored landfill surface during periods of soil moisture deficit.

The surface water drainage ditches in/on the ground surrounding the site are the principal controlled water receptor at risk from the proposal.

Figure 1 – Site Location and Setting



From Supporting Statement and Non-Technical Summary ref: 14-K6143-ENV-R05

Figure 2 - Irrigation Zone within capped and restored area captured by surface water drainage zone



(From report: Middelmarsh Landfill Site – Landfill Irrigation Scheme – Risk Assessment, ref: 14-K6143-ENV-R03)

Figure 3 - Revised Restoration Plan



(From Waste Recovery Plan, Drawing ref: 716R243)

The variation proposal is for an R10 (Land treatment resulting in benefit to agriculture or ecological improvement) recovery activity which details:

- The use of stabilised, non-hazardous landfill leachate for irrigating the restored surface of Middlemarsh Landfill during periods of soil moisture deficit (typically the drier months, May–September).
- The volume proposed for this activity was as below:

Application Rate:

- Standard: 0.5–1 mm/day (maintenance dose).
- Maximum: Up to 3 mm/day during extended droughts.
- Daily Volume: Typically up to 36 m³/day, with a maximum of 30–46 m³/day depending on conditions.

- Seasonal Volume: Over a 90-day period (June–August), up to 3,240 m³ could be applied, but typical annual irrigation is expected to be 2,000–2,500 m³ per season (May–September), depending on weather and vegetation health.
- Leachate Source: Stabilised leachate from the Middlemarsh landfill.

Our guidance for demonstrating recovery includes some factors which can be used to show that the scheme would be carried out using non-waste:

1. Financial gain by using non-waste materials
2. Funding to use non-waste (not-for-profit organisations)
3. Obligations to do the works

The Waste Recovery Plan (WRP) states that the aim of the irrigation scheme is to eliminate this soil moisture deficit (SMD) during the driest months of the year (May to September), to provide several benefits including:

- the encouragement and sustainment of vegetation growth - to reduce soil erosion;
- the prevention of desiccation of the cap protection soils which could result in a reduced methane oxidation zone and/or increased soil erosion;
- aiding the development or restoration of existing habitats to give greater biodiversity and sustainability;

and

- providing carbon capture by the vegetation and within accumulation within the soil.

However, there is a lack of site specific evidence for Middlemarsh Landfill in the WRP relating to:

- SMD within the capped and restored areas at this site.
- Any current soil shrinkage or desiccation and / or erosion of the cap
- The use of other material to improve soil moisture deficit such as compost.
- An increased risk of surface wildfires occurring at this site (rather than links to possible future extreme weather events caused by dry vegetation).
- The amount of water available from the drainage board artificially managed surface water for agricultural irrigation of the site's grass cover crop.

The applicant also claims that a clear benefit to be delivered from the proposal is adapting to climate change (as a requirement of the site's environmental management system based on our latest guidance [Develop a management system: environmental permits - GOV.UK](#)), and that the protection of the cap against erosion and avoidance of surface wildfires is justification for carrying out the proposed irrigation.

However, the WRP has not described how the proposals (irrigation with leachate or non-waste alternative) would meet this need in a way that natural rainfall or periodic irrigation would not, or why the likelihood/impact is so great that they would otherwise complete the irrigation scheme using non-waste water. Therefore, irrigation with leachate does not meet the substitution aspect of the recovery assessment (see further information below).

2.1.1 Recovery versus Disposal (RvD) assessment

It is a requirement of all permit applications involving the deposit of waste for recovery that applicants must submit a Waste Recovery Plan ("WRP") with their application or as pre-application. The Agency can only issue a permit if we agree that the plan demonstrates that the applicant's proposals will meet the definition of recovery as set out in the Waste Framework Directive 2008 and explained in relevant Regulatory Guidance:

[gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits](https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits).

2.1.2 Pre-application advice

The premise behind this application for the use of landfill leachate as a surface irrigant to enhance and sustain vegetation cover in low effective rainfall areas of the UK - was discussed in industry and Environment Agency liaison meetings around 2020.

This led to the submission of a WRP for recovery (R10) to test the process to see if it could be permitted as recovery. This was assessed by our Environment Agency's Environment & Business (E&B) Department who responded that they couldn't see a reason why in principle this could not be permitted providing that the WRP can demonstrate a substitution or an obligation.

The applicant states in the non-technical summary that, "the response to the 2020 submission was used as the basis for this application to implement such a scheme on a candidate site".

An Environment Agency email in 2021 stated that "if you can develop the necessary evidence to satisfy the recovery test, we could consider an application for a bespoke land spreading permit."

In the non-technical summary, the applicant considers that the proposed activity does not fit into the bespoke land spreading permit which permits the use of sewage sludge or similar as an improvement to land through the addition of nutrients. The applicant states that the "proposed activity seeks to replace moisture and nutrients under a changing climate and therefore a "deposit of waste for recovery" application has been submitted".

We considered that there was sufficient information submitted to duly make the application and make a decision during determination in relation to the recovery activity.

2.1.3 Timeline for the application:

Application received 28/10/2022

Application fee received 11/11/2022

Application validated 22/05/2024

Not Duly Made (NDM) request for information (RFI) and fee sent 25/06/2024

Additional information requested included:

- A list of sensitive receptors
- Consideration of the risk of odour
- Clarification on area of irrigation
- Information on the infiltration strategy
- Updated Surface Water Management Plan
- Updated Competence Management Scheme (CMS) Certificate

NDM RFI responses received:

- 27/06/2024 - Updated CMS certificate
- 05/07/2024 - Additional fee paid to the Environment Agency

- 08/07/2024 - Remaining information

Duly made date 08/07/2024. Duly made letter sent 15/08/2024.

External consultation commenced 10/09/24

RFI for the Recovery versus Disposal (RVD) assessment dated 07/11/2024 in relation to the obligations for the work and financial costs.

Response received 21/11/2024

RFI for RVD dated 09/07/2025 in relation to the benefits of irrigating the site and what the cost impact will be/is if irrigation is not possible (e.g. drought situation)

- Include an appropriate waste code for the leachate you intend to irrigate.
- An up-to-date waste analysis for the leachate.
- Update your environmental risk assessment within the benefit station with regards to Nitrogen potentially going into the environment.

- Response received 23/07/2025

RFI for RVD dated 31/10/2025 in relation to further details regarding the impacts that the site has experienced due to the moisture deficit, benefits of irrigating the site and cost impact if irrigation is not possible and substitution.

- Response received 21/11/25 which includes an updated Waste Recovery Plan.

We did not ask for any further information because on completion of the recovery versus disposal assessment - we did not agree that the activity was recovery.

2.1.3 Substitution

The applicant has applied for an R10 recovery activity.

Deposit of waste may be a recovery activity if you are able to demonstrate that you could and would carry out the works using non-waste material. The Environment Agency refer to this as 'substitution'. A WRP must include evidence to support this.

The proposal is for the use of leachate to irrigate the restored landfill to encourage and sustain vegetation cover at the site and prevent dry conditions and vegetation dieback which may lead to damage to landfill restoration layer, cap and other infrastructure and / or lead to wildfires.

This irrigation activity could be carried out utilising non-waste water (from combination of sources) therefore, the proposal is for the use of leachate as a substitute for water.

WRP Section 1.1 states, "This irrigation activity could be carried out utilising water extracted from an aquifer".

However, the rest of section 4.1 relating to cost benefits refers to the source from mains water.

WRP, Section 5.2 states, "Clean water could be sourced from a combination of sources including the site's surface water management system (rainfall dependant) and natural resources (at less than 20m³/day)".

2.1.4 Substitution conclusion

We do not agree that substitution would be taking place, because the applicant has not demonstrated a clear need for the irrigation activity to take place.

2.2 Evidence to support recovery of waste

2.2.1 Financial benefit by using non-waste materials

The Environment Agency's guidance states that:

"You may provide evidence to show that if you used non-waste, you would benefit from a net financial gain or other worthwhile benefit."

and

"Your waste recovery plan must show that it would be commercially or otherwise worthwhile to complete the scheme using non-waste. For example, it would show that using non-waste produces a meaningful financial gain or is affordable and otherwise worthwhile."

and

Otherwise worthwhile' means there are indirect financial gains. For example, if you wanted to improve a flood defence system with non-waste, the investment may only pay for itself over a long period but you would avoid the potential disruption of a flood." The WRP shows the costs of financial gain in savings

originally for the costs of gas wells that have to be replaced in the event of a wildfire rather than money saved.

Due to the insufficient justification provided in the WRP further information was requested as detailed above. The updated WRP states that the need to irrigate is a direct consequence of climate change.

2.2.2 Costs associated with Climate Change

2.2.2.1 Costs for irrigation

The applicant's cost comparison for installing an irrigation system for water or leachate is the same estimated capital costs of £22,400 (table 1 of the WRP). The applicant considers the maintenance and operative attendance costs with a Leachate Irrigation system to be cost neutral.

Table 2 in the WRP gives a comparison of water and leachate costs over a 10 year period. After 10 years the total cost for irrigation using water is £66,665, where-as the total cost for irrigation using leachate is £28,151.

It is clear from the figures provided by the applicant that the costs over a 10 year period predict a financial gain from using the leachate (waste), rather than water (non-waste).

2.2.2.2 Costs associated with wildfires and desiccation and erosion of soil

The applicant states that, 'the desiccation and erosion of soils could result in the need to source additional restoration soils to improve or maintain the approved restoration scheme. If improvement were required across the whole of the site, this could cost around £116,000 assuming the importation of soils at £5 / m and provision of a shallow 0.2m cover layer. Costs associated with maintaining the soil through the importation of additional material alone are likely to dwarf costs associated with irrigating the site'.

Regarding wildfires – if a grass fire occurred on the surface of the landfill site, the applicant states that, 'this could lead to significant downtime of the landfill gas management infrastructure which would impact the control of gas emissions and landfill gas revenues. There would also be a need to remediate pipework which is likely to be costly, as well as to replant hedgerows as required by the planning permission'.

The applicant estimates the costs to remediate a wildfire could be in excess of £30,000 depending on the scale of the event.

Summary

We consider that it is unlikely that soils across the whole of the site would need to be replaced at the same time following soil desiccation / erosion and there is no information or evidence provided to confirm that there have been any

wildfires to date at the site. Therefore we do not agree with the estimated costs provided.

2.2.2.3 Cost benefit analysis of irrigation (water or leachate) / climate change

The applicant details the need for irrigation based on general evidence of climate change in the UK:

- More extreme summer temperatures (from [Met Office report details rising likelihood of UK hot days - Met Office](#))
- Increased likelihood of temperatures over 40 degrees increasing from a recent 1 in 25 years to 1 in 2 years by 2035 (from Kay et al (2025) Rapidly increasing chance of record UK summer temperatures. Weather Royal meteorological Society – Weather accessible at <https://rmets.onlinelibrary.wiley.com/doi/10.1002/wea.7741>)

The applicant has based their potential cost implications on 1 in 2 years for the return period of extreme weather within 10 years' time (2035) as a 'climatic marker parameter' of future trends – leading to an expectation of fire, drought and soil erosion which could lead to cap and infrastructure damage – trending towards an annual occurrence.

The applicant states that, 'irrigation is a precautionary approach taken against extreme weather conditions leading to drought and erosional effects'.

Summary

Further site-specific information or evidence is required to show that extreme weather events will take place every 1 – 2 years at the site. To date no evidence or information has been provided regarding fire, drought and soil erosion onsite.

2.2.2.4 Financial costs of Climatic Events

The applicant has estimated:

£25,000-£30,000 for the replacement of 0.1ha of restoration soils for a small scale event; or

£75,000 - £100,000 if the surface damage is more extensive and damages the cap over a similar area.

Up to £10,800 for the replacement of lost hedging, shrubs and tree planting (based on the costs incurred for replanting in 2025)

The applicant then compares the near £60,000 irrigation (with water) costs by 2030 which would offset two small scale or one larger scale remediation event or replacing the trees and shrubs each successive year from 2025 – 2030.
[Please note: the correct cost in table 2 is £45,345 by Yr 5 – 2030]

Or

The cost of irrigation would equate to slightly less than the cost of drought then rainstorm erosion requiring a single soil replacement and reseedling event over a 5 year period:

- Irrigation set-up and operational costs including water costs £45,345
- Restoration soil damage repair following drought induced erosion £50,000 - £75,000

The applicant states that, ‘this cost analysis demonstrates that irrigation is a proactive mitigation approach against expected increasingly more severe and frequent climatic induced conditions’. Table 4 of the WRP reportedly provides evidence that it is financially viable to irrigate the site regardless of whether water or leachate is used.

Table 4 – Costs over a 5 year and 10-year period

Event Types and Frequency per 10 year period	Potential Financial Implications of “Do Nothing”	Irrigation Mitigation Costs	
		by water irrigation	by leachate irrigation
2 events (1 re-soil & re-seed event per 5 years)	£50,000 - £60,000	Capital Outlay	
		£22,400	£22,400
3 events (1 re-soil & re-seed event per 3.3 years)	£75,000 - £90,000	Capital and Irrigation Cost	
4 events (1 re-soil & re-seed event per 2.5 years)	£100,000 - £120,000	5-year costs • £45,345	5-year costs • £25,382
5 events (1 re-soil & re-seed event per 2 years)	£125,000 - £150,000	10-year costs • £66,655	10-year costs • £28,151
Single event causing cap damage	£75,000 to £100,000		

5-year and 10-year cost projected projects are based on the costing structure presented in this report as:

- water purchase at £3,420 and operational costs at £166 per year for 2025, then inflationary uplifts at 1.6% for 2026, 1.8% for 2027, followed by 2% thereafter
- leachate irrigation is based on £466 per annum operational costs (including additional analysis) with the same inflationary uplifts

2.2.2.5 EA Financial costs summary comments

However, the costs provided in response to the request for further information (RFI) are projections for use of water as an alternative (or substitute) to waste (leachate), rather than specific volumes and costs for an activity that is ongoing or for which there is any evidence.

The costs are based on a return period of extreme weather of 1 in 2 years. However, the extreme weather events are unlikely to affect the whole of the UK and there is no evidence provided by the applicant of any extreme weather events affecting Middlemarsh Landfill to date. Photographs of restored landfill during dry summer (2019) are included in the WRP, but it is not clear if these are

photographs of Middlemarsh Landfill and there is no evidence of soil erosion or desiccation in the photographs.

Although Figure 4 of the WRP identifies areas of relative water stress and the Middlemarsh site is in an area of 'serious' water stress (Source: Environment Agency, 2007). No further site specific information about the situation at Middlemarsh Landfill site has been provided by the applicant.

The WRP does state that for Middlemarsh Landfill during 2025 created habitat loss was replaced by planting 2,500 trees and shrubs incurring a cost of £10,800 and that all of this has been lost during the summer 2025 dry conditions. 'This cost will be repeated for 2026 in order to replace / replenish the 2025 losses from dehydration'. No information has been provided to confirm that the 2026 re-planting has been actioned.

'Given that habitat loss from previous years was the reason for replanting and was outside of the original planning permission obligation timescales then short term irrigation over a limited area is unlikely to address water needs'.

The applicant has not provided evidence of the loss of plants and shrubs and replanting (e.g. photographs, receipts, invoices) at Middlemarsh Landfill. Furthermore, it is not clear whether the habitat loss took place over a number of previous years which would potentially impact the estimated costs of replanting. Also, it is not clear whether drought-resistant species were considered in order to reduce loss and require less irrigation using waste (leachate).

Furthermore, it is not clear which habitat loss / vegetation the applicant is referring to. With the exception of the smaller hedgerows crossing the site, the shrubs and trees are situated around the perimeter of the site – so this perimeter vegetation would not benefit from the smaller central irrigation area (as shown on the drawing entitled, 'Existing site layout and area of irrigation', ref: K6143-1000 and Revised restoration plan 716R243 showing the hedgerows) and is therefore not relevant to the proposals.

Section 3.2.3.2 of the WRP details that the irrigation is to be undertaken within 2.3 ha of the 3.6 ha area encapsulated by the ring of above cap drainage channels. The irrigation is only undertaken to the east of the north to south hedgerow which crosses the site within a central 2.3ha area to allow for an infiltration / stand-off before the hedgerow and the surface water collection channels.

In summary, the details in the WRP indicate that there may be a financial benefit to carrying out irrigation (water or leachate). We don't agree that the need for irrigation due to the impact of climate change has been based on site specific evidence and we are not confident that the cost estimates used by the applicant are accurate / can be relied upon. Therefore, we do not agree that there is a financial benefit for irrigation using leachate (as part of this recovery assessment).

In WRP table 4 the applicant estimates the 10 year irrigation using leachate costs is £28,151 against the 10 year irrigation using water costs is £66,665. However, the applicant estimates that the potential costs of 'doing nothing' over a 10 year period (1 re-soil and re-seed event per 2 years) is £125,000 – 150,000 and a single event causing cap damage is estimated at £75,000-£100,000.

2.3 Obligations to complete / carry out the scheme

2.3.1 Requirement for a top liner – Landfill Directive obligation

The applicant claims that a general obligation exists for the landfill (non-hazardous) to include a top liner in accordance with the Landfill Directive (LFD). For a landfill which has accepted non-hazardous waste the top liner is required to consist of a gas drainage layer, impermeable mineral layer, a drainage layer and top soil cover. The term 'top liner' referred to is the impermeable layer we and the GOV.UK guidance refers to as part of the 'cap'.

Restoration layers are usually 1-2m above the cap which includes a 50cm thick layer of top soil.

This is not a relevant obligation for us to consider when deciding whether a proposed activity is recovery as the requirement for a top liner in the LFD - is not relevant to the proposed activity of irrigation of the restoration layer.

Even if the proposed irrigation was accepted as a requirement under the LFD and the permit to maintain the restoration layer on top of the cap - the applicant has not provided evidence in the WRP why their irrigation scheme using leachate is necessary for this maintenance.

Page 11 of the updated WRP received on 21/11/2025 accounted for the fact that the Environment Agency do not agree that the Landfill Directive is an obligation to complete the works, as follows:

'The Environment Agency's position that the Landfill Directive "cannot be used as an obligation to deposit waste as a recovery activity" is understood. However, the assessment does not seek to rely on the Landfill Directive. The Directive and associated UK regulatory guidance establish an obligation on the landfill applicant to maintain the integrity and functionality of the landfill capping system, including the cover soils and vegetation layer, over the lifetime of the site as a mechanism to prevent an unnecessary pollution pathway from developing under conditions which were not fully realised when the site was originally permitted'.

The applicant states, *'the purpose of the activity is to sustain the vegetation cover and preserve the physical and hydraulic performance of the restoration soils, thereby preventing deterioration of the capping layer and avoiding pollution risk'*.

and

'...it will become increasingly difficult to maintain the integrity and functionality of the landfill capping and restoration soils as a result of climate change. Hence new approaches e.g. preventative maintenance are likely to be needed'.

We accept that irrigation using leachate - may be a potential approach, but we are not satisfied that the applicant has submitted sufficient evidence (see section 2.1 above) to demonstrate that irrigation is needed for the restoration layer at this site.

2.3.2 Planning permission obligation

The applicant also claimed in their original WRP that a specific obligation exists for maintenance of the restoration layer under the planning permission reference PL/0028/21. However, the planning condition number 4 specifically relates to the planting of shrubs and trees (this is complete) which require maintenance for 10 years – therefore this is not relevant to this application which proposes irrigation after the ten years have passed.

The WRP also states in relation to the planning permission, 'The approved restoration plan (Drawing 716R243) notes that: "Watering of plants will be undertaken during prolonged dry spells to prevent plants from dying during the first year, where practical to do so. Replacement of failures will be undertaken before the start of the next growing season following failure. Formative pruning of hedgerows will be undertaken at the appropriate stage of development (preferably in February) to ensure a good 'A-shaped' hedge form develops.'"

As this relates to the watering of plants during the first year of operation - this is also not relevant to the irrigation proposals (the site ceased accepting waste for disposal in 2014 and then the site was restored).

Furthermore, the updated WRP (21/11/2025) confirms that this planning condition has now expired as the site was closed to accepting waste within the landfill in 2014, after which the site was restored, "The obligation to maintain all trees, shrubs and bushes under the planning permission has now expired. Hence, this specific obligation is no longer valid."

2.3.3 Legislation - adhering to the waste hierarchy

The applicant also states that there is a legal obligation from the legislation to move the waste up the waste hierarchy to utilise the leachate rather than dispose of it.

We encourage waste to be recovered rather than disposed of. However, the applicant is still required to meet the requirements of the recovery assessment.

For the waste recovery assessment - depositing waste is a recovery activity if you can show that you could and would carry out the works using non-waste

material. The waste recovery plan must include evidence to support this. We refer to this as 'substitution'.

Evidence to support the recovery assessment includes:

- Financial benefit by using non-waste materials
- Funding to use non-waste materials (not-for-profit organisations)
- Obligations to complete the scheme.

We do not agree that this is an obligation.

2.3.4 Obligation summary

Requirement for a top liner – Landfill Directive (LFD) obligation

The applicant understands our position that the LFD “cannot be used as an obligation to deposit waste as a recovery activity”. However, they consider that there is an obligation from the LFD for a, “landfill operator to maintain the integrity and functionality of the landfill capping system, including the cover soils and vegetation layer, over the lifetime of the site as a mechanism to prevent an unnecessary pollution pathway from developing under conditions which were not fully realised when the site was originally permitted”.

However we are not satisfied that the applicant has submitted sufficient evidence (see section 2.1 above) to demonstrate that irrigation is needed for the restoration layer at this site to maintain functionality of the cap and prevent pollution.

Planning permission obligation

Planning condition number 4 specifically relates to the planting of shrubs and trees (this is complete) which require maintenance for 10 years – therefore this is not relevant to this application which proposes irrigation after the 10 years have passed.

The planning condition for watering to maintain all trees, shrubs and bushes has also now expired - as this relates to the watering of plants following the first year of planting.

Therefore this obligation is no longer valid.

Legislation obligation - adhering to the waste hierarchy

The applicant states that there is a legal obligation from the legislation to move the waste up the waste hierarchy to utilise the leachate rather than dispose of it.

We encourage waste to be recovered rather than disposed of, however, the applicant is still required to meet the requirements of the recovery assessment – which they have not done.

2.3.4 Obligation conclusion

We do not agree that there is an obligation to irrigate the site.

2.4 Evidence that the waste is serving a useful purpose / What is the purpose of the work?

The applicant proposes the recovery of non-hazardous leachate arising from Middlemarsh Landfill Site by irrigating the restored landfill (irrigation within 2.3 ha of the 3.6ha area encapsulated by the ring of above cap drainage channels – for further information see ‘EA Financial costs summary comments’ section 2.2.2.5) as a substitute for irrigation using water. The reason for the irrigation is to provide climate change impact mitigation measures, which were not fully envisioned when the permit was issued, which could cause significant damage to site infrastructure.

The aim is to reduce the potential for soil erosion, soil desiccation and wildfires and to support increased biodiversity during the drier summer months.

Although this is a novel approach, in principle leachate may be suitable for this purpose. However, the WRP:

- does not have enough information or evidence to support the genuine need for irrigation using leachate, as irrigation is not currently being undertaken.
- is not clear if or to what extent there is a soil moisture deficit at the site
Soil moisture deficit (SMD) is the amount of water missing from the soil relative to its full water-holding capacity, indicating how dry the soil is.

The applicant has not provided, evidence of substitution that the irrigation will be carried out using non waste (water) and a genuine need for irrigation with leachate in the WRP. Hence, we do not agree that there is an obligation for the proposal.

2.5 Is the material suitable for its intended use?

The applicant states that stabilised leachate is to be obtained from Middlemarsh landfill. Other leachate at Middlemarsh landfill will continue to be managed through tankering and disposal to meet the permit conditions.

- The applicant states that in WRP section 5.4 that, ‘stabilised [leachate] in this context means a leachate from a capped site, which has entered methanogenic conditions and effects of early acetogenesis have passed’. In this state the applicant considers, ‘there is little variability in leachate chemistry on a year to year basis, with depletion rates slowed due to the restricted infiltration into the waste mass. Consequently, it is reasonable to expect that the leachate chemistry will not vary significantly throughout the irrigation period’.

Therefore, stabilised leachate is essentially a leachate that is well characterised and understood. However it is unclear from the application how the leachate will be tested to ensure it meets stabilised quality, prior to irrigation (when the leachate is diverted from cells).

Landfill Irrigation Scheme Risk Assessment (ref: 14-K6143-ENV-R03) Section 2 states, “the leachate to be prioritised for irrigation is based on the ammoniacal-N content of the leachate and will be selected and blended to even out the distribution of nutrients and present a balanced load (Figure 8). This concentration range is within the lower 20% of the concentration range expected for WRP Digestate Compost type products, and therefore consistent with other nutrient applications”.

However, it is unclear how any leachate blending will take place and there are many other chemical parameters in leachate which may have an impact on the environment and which need to be assessed prior to any agreement for leachate irrigation.

We are satisfied that with the applicant’s description of stabilised leachate but we are not satisfied that all of the leachate at Middlemarsh Landfill will be stabilised due to the phased approach to landfilling and therefore the different ages, quality and stability of leachate at the site.

Although some site leachate quality data is provided in the application, it is unclear how the chemical parameter data provided is representative of the baseline chemical composition of Middlemarsh Landfill’s leachate. As a result, we cannot be confident that the leachate produced on site meets the applicant’s definition of ‘stabilised leachate’ and we are unable to assess that claim. For further information on leachate quality see section 7.1. We would also require frequent waste analyses, at least every 12 months to ensure that the nutrient and contaminant content was at a safe level for irrigation.

The applicant states that ‘leachate will be considered suitable for use as an irrigant if it complies with the following criteria:

- pH 7.0 to 9.0
- BOD <250 mg/l
- Cu, Cr, Ni, Pb < 0.5 mg/l (each)
- Zn <1 mg/l
- As <0.1 mg/l
- Cd < 0.02 mg/l
- Hg< 0.01 mg/l

- Chloride < 2,750 mg/l'.

However, we are not satisfied with this information, for example, it is unclear how the chemical parameter data is representative of the baseline chemical composition of the leachate and there are inconsistencies regarding leachate between the application documents. See section 5.0 'Environmental issues: likelihood of pollution' and sections 7.0 – 7.1.5.3 on leachate issues for further information.

The WRP originally did not provide a waste code for this leachate waste however the RFI response dated 23/07/2025 proposed waste code 19 07 03 - stabilised non-hazardous landfill leachate.

We do not agree that the leachate is a suitable irrigant for this site and the engineering design of the proposed irrigation area – for further information - see section 5, Likelihood of pollution section, below.

2.6 Quantity of waste to be used

In the WRP, section 5.2, the applicant includes statements explaining that the volume of irrigant will vary on a daily basis depending on weather conditions and that the volume of irrigant will be determined by the health of the vegetation on site and soil conditions and WRP, section 3.2.3.2 states this is expected to be at a rate of 10.6m³/hour for a 3 hour period, within a 2 hour to 4 hour period (depending on the efficiency and performance of the irrigation tubing), and only increase in duration if extreme drought conditions persist which lead to a greater evapotranspiration demand.

We have noted that there are inconsistencies in the figures for irrigation because different figures are included in the applicant's report Report No. 14-K6143-ENV-R01 - Landfill Irrigation Scheme - Overview' – see below for further information.

In section 5.2 of the WRP, the applicant states: "Clean water could be obtained from a combination of sources including the site's surface water management system (rainfall dependant) and natural resources (at less than 20m³/day)".

The volumes of leachate irrigant required, based on the application rates for the months of the year that this proposal covers, could potentially be considered appropriate if soil moisture deficit (SMD) occurs at the site to the extent the applicant predicts and irrigation was for 3.6ha (it is only for 2.3 ha) – therefore the applicant has over predicted the amount of irrigant required based on the 3.6 ha area.

Section 3.4 (pdf page 72) of the applicant's report Report No. 14-K6143-ENV-R01 - Landfill Irrigation Scheme - Overview' states: Evapotranspiration rates increase from 20mm/month at the beginning and end of summer to 46mm per month at the height of summer, with moisture losses illustrated in Table 2'.

(The figures in table 2 are based on regional rainfall data from 1931 to Sep 2022).

‘Table 2 Moisture Deficiency and Effective Rainfall Rates’ which includes showing their calculation of potential SMD in m^3/ha and $\text{m}^3/3.6\text{ha}$. However as explained in section 2.2.2.5, section 3.2.3.2 of the WRP the irrigation is to be undertaken within 2.3 ha of the 3.6 ha area – rather than the whole of the 3.6 ha area as detailed in Table 2. Therefore, the calculations are misleading as they are overpredicted.

The applicant’s calculation of maximum leachate irrigation volume required to mitigate their predicted SMD is a theoretical calculation using an irrigation area of 3.6 hectares, which is 38% greater area than the 2.3 hectare area confirmed above. The use of a larger irrigation area means the maximum daily and annual leachate irrigation volumes have been overcalculated – meaning that more leachate than is needed is demonstrated as required by their own calculations.

Section 3.4 also states that, ‘due to the gradient of the established cover soils, irrigation would be restricted to no more than 3mm/day. This is below the daily water need of a standard grass during the irrigation season and thus will prevent run-off from occurring whilst maintaining the aim of improvement to soil and vegetative cover during the driest periods of the year’.

‘Irrigation rates of 3mm/day equate to an overall volume of 30m^3 per day per hectare. Hence, over the whole landfill site this would equate to a maximum volume of 174m^3 per day. Over a 90-day period from June to August this would equate to $15,660\text{m}^3$ ’.

As stated above, the irrigation rates are overcalculated because they are based on an incorrect irrigation area, and they are different to irrigation rates detailed in the WRP which are $30\text{--}46\text{m}^3/\text{day}$ over a 3-4 hour period – a 3 hour period would relate to 31.8m^3 and a 4 hour period would relate to 42.4m^3 .

No information has been provided showing what/if any volumes of irrigation have taken place at the site to date (currently the application only refers to watering associated with the planning requirements for the planted vegetation for the planning restoration scheme).

Further justification from the applicant of the volumes to support that the minimum amount necessary would be used as required by recovery activities.

Without any empirical evidence data showing that a soil moisture deficit exists, it is not possible for the applicant or us to determine how much liquid is required to achieve the proposed benefit.

2.7 Will the proposal meet a quality standard?

Insufficient information has been provided to ensure that the quality standard is met, however due to the other points raised with the recovery assessment – we did not ask for further information on this point and so have formed no current view.

2.8 Supplementary Benefits

The WRP also includes overall supplementary benefits of the irrigation proposal of:

- Improving biodiversity and carbon capture due to increased vegetation - we do not have enough information on the needs of the restoration vegetation / species to know whether the proposal will achieve this;
- Achieving net zero – by utilising the leachate instead of treatment and disposal off-site at a large number of sites.
- Efficient use of resources - leachate instead of water and not needing to replace restoration soils if erosion / desiccation is prevented by the proposed irrigation. The applicant has provided insufficient information to demonstrate to us that there will not be a detrimental impact from the chemicals in the leachate - on the vegetation and soils which may in itself lead to the need for replacement.
- Nutrient alternative – we do not have enough information on the needs of the restoration vegetation / species.
- Cost Benefit - as mentioned above in section 2.2.2 entitled, 'Cost associated with climate change.'

Therefore, in summary although the WRP contains information on supplementary benefits - there is insufficient information in the application to justify these and address any possible associated detrimental issues (e.g. the impact of chemicals in leachate). Furthermore, there are queries in relation to overestimated costs associated with the cost benefit calculations.

2.9 Summary of recovery versus disposal assessment

We do not consider that the proposal meets the recovery test as defined in the Waste Framework Directive and outlined in our guidance.

In summary we do not agree that:

- there is a general or specific obligation to carry out the proposed works.
- leachate would be a substitute for water or other non-waste.
- the untreated leachate is suitable for the irrigation activity.

After considering the proposal to use leachate to irrigate and the information provided by the applicant we have concluded that the proposal is not a recovery activity and is in our view a disposal activity.

The applicant has applied for an R10 activity, therefore we cannot issue the variation as we consider the activity to be disposal.

3.0 Benefit Statement Assessment

3.1 Treatment to improve soil quality

As the aim of the proposed irrigation with leachate is to treat the soil to improve soil quality, by reducing soil moisture deficit - a benefits statement as part of the R10 recovery activity is required.

We have reviewed the application documents in relation to the use of landfill leachate as a source of irrigation and cannot recommend this activity as a recovery operation. Whilst the benefit statement provides figures concerning the nutrient and Potentially Toxic Elements (PTE) content, no waste analysis was provided in the original WRP. We received waste analysis as a response dated 23/07/2025 to an RFI. However, the data sheet does not clearly identify which sample(s) are representative of the final leachate proposed for spreading. In addition, the benefit statement/WRP has not identified the substances that are, or may reasonably be expected to be, present in the waste. It also does not justify the substances selected for testing or, where relevant, explain why certain substances have not been tested for.

Further sampling would be required over a longer period to provide confidence that the waste is uniform and consistent. The waste analysis information provided covers no more than approximately two years of sampling for each sampling point. There is also no reference to regular analysis of both the waste and receiving soils before irrigation, to demonstrate agronomic or ecological need and to confirm that nutrient and contaminant levels are safe for application.

We do not consider that the land at Middlemarsh Landfill requires regular applications of fertiliser. Therefore any Nitrogen or Phosphate addition from the leachate could pose a risk to the surrounding environment - from nutrients entering the watercourses that surround the site, as well as issues from the release of Nitrogen to air. The risk assessment's justification for drainage water entering the surrounding surface water channels, being retained locally and used as irrigation for surrounding fields also fails to understand environmental objectives for managing Nitrogen in any situation. Managing Nitrogen is particularly important in this location of Middlemarsh Landfill, as the site is situated in a Nitrate Vulnerable Zone (NVZ) and because some surface waters surrounding the site, or hydrogeologically connected to it, support protected species which the application has not provided suitable risk assessment for or shown cannot be adversely affected by discharges of leachate irrigant entering the water (by direct or indirect means).

The applicant provides in table 5 of the WRP - a partial list of the test parameters, upper limit values and declaration parameters for validation given in the PAS standard and shows that total nitrogen loadings are permitted at up to 9kg/T

which far exceeds that present in landfill leachates. However, they state in practice total nitrogen application rates are to be controlled to below 250kg of nitrogen per hectare per year in accordance with the site being positioned within an NVZ and the provided risk assessment (K6143-R003).

3.2 – Grass nutrient requirements

[Landfill operators: environmental permits - Manage leachate - Guidance - GOV.UK](#) shows the need for operators to consider the:

- total quantity of treated leachate applied to proposed irrigation areas, and
- cumulative effect the substances in the treated leachate has on soil quality within the proposed soil irrigation area and ground surrounding it.

Crops, including cover crops such as grass on the restoration soils at the site, may require application of substances necessary for normal plant growth, for example, water, nitrogen, potassium, phosphate and other micro-nutrients. Vegetation nutrient demand is highly specific to plant species, as well as functional types (e.g., grasses vs. woody plants) and growth stages, and not all vegetation types can tolerate the same chemicals and chemical concentrations. Vegetation chemical tolerance varies significantly between different plant species.

The application does not specify the nutrient and chemical requirements of the vegetation present above the restoration soils (vegetation species are detailed in the annotated drawing entitled, Revised Restoration Plan dated 11/06/2013 ref: 716R243).

Information on grass nutrient requirements is essential to assess whether the full chemical composition of the proposed leachate irrigant is appropriate, or whether excess nutrients and chemicals may accumulate in soils, migrate through the restoration layer, discharge from the landfill restoration soils and/or landfill cap and restoration interface to groundwater or surface waters beyond the site boundary, or damage the grass cover and thereby undermining the purpose of the proposal.

The application does not clearly set out whether nutrients are already being applied to the sites grass, nor does it adequately describe the physical and chemical properties of the restoration soils that would influence soil nutrient content and retention of leachate chemicals (applied to it). Without this information, it is not possible for us to:

- determine what may be suitable nutrients and chemical loading rates to be applied or
- assess the potential for chemicals to bioaccumulate in vegetation, accumulate in soils, or leach to off-site environments.

The application does not demonstrate which chemical constituents and concentrations of the landfill leachate are necessary to sustain the Site's grass growth, and there is insufficient information regarding what chemical constituents

and concentrations of the leachate could be harmful to the grass (covering the restoration soils). Although the applicant acknowledges that chloride may be problematic for plant growth, the assessment of chloride risk by the applicant we consider to be insufficient.

The application does not demonstrate the chloride tolerance of the grass species present, quantify the vegetation chloride uptake capacity, or adequately assess the potential for chloride accumulation in soils or release to receiving environments.

The application lacks a robust assessment of the effects of applying nutrients and chemicals in excess of vegetation requirements. There is insufficient evidence in the application to define vegetation nutrient demand, quantify potential excess chemical loading, or assess the associated risks resulting from these to soils and controlled waters from all chemicals the landfill leachate has potential to contain and their respective concentrations.

Baseline soil chemistry data of the restoration soils is not provided, preventing our assessment of existing nutrient status, any residual contamination from previous management, or the potential for soil contamination above background concentrations from accumulation of chemicals as a result of proposed irrigation. The application does not demonstrate whether the grass can tolerate the full range of chemicals the leachate may contain or which chemicals may bioaccumulate in vegetation.

The application provides insufficient data and assessment to satisfy us and to show whether leachate chemicals applied in excess of vegetation demand may be discharged from the irrigation area with the limited explanation confined to the parameter chloride which they explain that periodic application of large amounts of low-chloride liquid (if available) is needed to flush out the salt and that winter rainfall will flush accumulated chloride from soils.

Reported chloride concentrations in site leachate (approximately 1,330 mg/l reported in the leachate tank, with proposed application concentrations up to 2,750 mg/l) are not assessed against grass-specific tolerance thresholds. Published evidence indicates that chloride concentrations substantially lower than those proposed may cause toxicity, stress, and soil accumulation in many turfgrasses (Published information [Irrigation Water Quality Guidelines for Turfgrass Sites](#) and Reclaimed Water for Turfgrass Irrigation¹ 355 mg/l reported as generally safe), particularly at low irrigation rates. The applicant needs to address the tolerance requirements for the site-specific grass species to ensure that their proposed irrigation will not have potential to kill the grass covering the restoration soils which would contradict the proposal purpose and create other environmental risks.

¹ Gregory Evanylo *, Erik Ervin and Xunzhong Zhan, Reclaimed Water for Turfgrass Irrigation, Water 2010, 2, 685-701

The applicant has not adequately assessed the proposed irrigation rates of 1–3 mm/day in terms of its influence on chemical uptake, soil accumulation, evaporation-driven salt concentration, or long-term soil and vegetation health. Irrigating grass with water containing 1000 mg/l of chloride at a rate of 3 mm/day can cause:

- moderate to severe toxicity symptoms and that whilst sensitive turfgrasses can experience severe injury, even tolerant grasses will show signs of stress.
- Osmotic Stress - At 1000 mg/L, the chloride contributes significantly to the total salt load (TDS) of the water. This makes it harder for the roots to absorb water, leading to symptoms similar to drought stress (wilting, browning), even if the soil is moist.
- Nutrient Imbalance - High chloride uptake can inhibit the plant's ability to take up necessary nutrients, such as phosphorus.
- Chloride Accumulation in soils - Without proper leaching (rainfall or heavy, deep irrigation), these salts will build up in the soil profile over time.

The above comments are based on ^{2, 3} and apparently well-established agronomic guidelines and standard calculations that are widely accepted in turf and irrigation science.

Irrigating grass with liquid containing 3000 mg/l of chloride at a rate of 3mm/day is generally considered to be in the hazard range for turfgrasses. The published information shows that while some highly salt-tolerant grass species might survive, this concentration is high enough to cause chronic injury, particularly if the salt is allowed to accumulate in the soil, which is likely with a low application rate of 1 mm/day and little rainfall.

If atmospheric temperatures are high, the irrigant may evaporate quickly, leaving behind concentrated salts in the topsoil and on the leaf surfaces. Periodic application of large amounts of low-chloride liquid (if available) is needed to flush out the salt, especially in clay-based soils. While the applicant explains they consider that winter rainfall will flush accumulated chloride from soils to remove any soil chloride build up, the application does not demonstrate where that mobilised chloride would discharge, what receptors may be affected, or what monitoring and mitigation would be required. No explanation is provided regarding which other leachate irrigant constituent chemicals have potential to follow the same soil accumulation and wash out pattern the application shows

² **Water Systems Council (n.d.)** *Testing water for gardening and lawn irrigation*. Water Systems Council.

Available at:

https://www.watersystemscouncil.org/download/wellcare_information_sheets/well_water_testing_&_treatment_information_sheets/Testing-Gardening-and-Lawn-Irrigation.pdf [[watersyste...ouncil.org](https://www.watersystemscouncil.org)]

³ **Food and Agriculture Organization (FAO) (n.d.)** *Water quality for agriculture. Irrigation and Drainage Paper No. 29, Chapter 4: Toxicity problems (Section 4.1.1 Chloride)*. FAO, Rome.

Available at: <https://www.fao.org/4/T0234e/T0234E05.htm> [[fao.org](https://www.fao.org)]

could occur with chloride, or what mechanisms or processes prevent such effects occurring. Absence of this data prevents a full risk assessment of the impact of the proposed leachate irrigant to the environment.

The applicant states in their Risk Assessment conclusion that:

'comparisons with Willow Based "forced evapotranspiration rates" at significantly higher loading rates have shown no indication of harm, and significantly no increase in chloride concentrations in winter run-off waters, the period when it is assumed that high solubility salts accumulated during warmer periods are released from the soils'.

The comparison used suggests the example being referred to by the applicant is willow-based short rotation coppice (SRC).

We do not consider that the applicant's comparisons with willow-based SRC systems are directly applicable, as grass and willow have fundamentally different growth habits, rooting structures, and chemical tolerances. We do not think that the applicant's assertions based on willow systems provide robust evidence for the acceptability of the proposed grass irrigation scheme. Furthermore, the applicant's proposal does not include design components, technical requirements, and operating techniques that are required for SRCs as detailed [Landfill operators: environmental permits - Manage leachate - Guidance](#).

The application does not provide sufficient information regarding all of chemical concentrations that the leachate irrigant has potential to contain, in relation to the site's vegetation species, nutrient demand, soil type, soil chemistry, chemical uptake, accumulation mechanisms, or the fate of the leachate chemicals in excess to vegetation need. Without this information, it is not possible for us to assess whether the proposed irrigation will support vegetation growth without causing soil deterioration (restoration soils and those off-site) or off-site pollution (soils, groundwater, and surface water), or to validate applicant conclusions on these matters. Further information is also required in relation to the risk assessment of long-term salt leaching.

The applicant's risk assessments rely on comparisons between concentrations of selected chemical parameters in the site's leachate with the concentration ranges expected for Compost and Anaerobic Digestate Quality specified in the [WRAP \(2011\)](#), and Other Recovered Products Applied to Land including:

- Digestates (food based, manure based, and compost based)
- EU Fertilising Product Regulations, which they explain as although being partially transcribed into UK law, has been used as a precedent for setting End of Waste status for Single Nutrient and Compound Nutrient Fertilisers from waste materials, and
- [Sewage sludge in agriculture: code of practice for England, Wales and Northern Ireland - GOV.UK](#)

The applicant states:

'These various laws and Codes of Practice set out principles for the addition of Primary and Secondary Macronutrients and Micronutrients as well as a Contaminant Content of Potentially Toxic Elements which may also be present in the product being applied to land. In the majority of cases, the principal component being applied is one or a combination of:

- 1) Primary Macronutrients: N, K, P and Organic Matter
- 2) Secondary Macronutrients: Ca, Mg, Na, S,
- 3) Micronutrient: e.g. Cu, Zn'

We have understood that the applicant has undertaken this comparison work to show chemical consistency between the application to vegetation/crops of the various digestates, or sewage sludge used in agriculture, and the Sites leachate in order to persuade us that the application of leachate irrigant to the grass covering the restoration soils is no more polluting than if digestate or sewage sludge was applied.

While the applicant's comparisons provide some contextual information, they are of only secondary relevance to the proposal. The application does not demonstrate how the nutrient and chemical composition of compost, anaerobic digestate, or sewage sludge compares with the specific nutrient requirements of the grass covering the proposed irrigation area, nor how the current nutrient needs of that grass are being met. This information is fundamental, as the application of digestate and sewage sludge is highly crop-specific and governed by crop nutrient demand, chemical loading limits, and pathogen risks. Nutrients such as nitrogen, phosphorus, potassium and organic matter may be beneficial for some crops, but the chemical concentrations for one crop type cannot be assumed to be appropriate for all vegetation types. It is possible that some constituents of landfill leachate, anaerobic digestate, or sewage sludge may be unsuitable for grass.

Several aspects of the applicant's comparison assessments are unclear to us:

- Tables comparing application rate concentrations use inconsistent measurement units
- Tables comparing application rate do not include all chemical parameters, or key indicator substances (that the site leachate may contain).
- In some cases, interpretation requires unsupported assumptions (for example, assumed application frequency);
- It is unclear how application rates for sewage sludge or digestate relate to the proposed trickle-feed irrigation method.

Although applicant comparisons are provided for a limited number of chemical parameters (including biochemical oxygen demand, chemical oxygen demand, ammoniacal nitrogen, total nitrogen, chloride, potassium and phosphorus) with the WRAP Digestate Compost type products, equivalent comparisons are not provided for all other chemical parameters the sites leachate may contain. This information would need to be included in the application if like-for-like comparisons are to be relied on.

For Priority Substances the applicant compares site leachate concentrations of heavy metals and metalloid and organic substances present with the respective parameter Environmental Quality Standards (EQS). They use this comparison to conclude that:

- 'The heavy metal and metalloid content of the Sites leachate is generally consistent with EQS levels with the arsenic, lead, cadmium, copper and zinc straddling the EQS limits for surface water',
- 'The leachate therefore has little if any potential to pollute Controlled Waters with respect to irrigation for moisture purposes', and
- regarding principle organic substances, the substance concentrations within the leachate are generally within their Annual Average EQS level, except for xylene, which only exceeds the 30µg/l EQS at one location (Cell 4), and the mecoprop which is between its 18µg/l Annual Average and 187µg/l Maximum Allowable Concentration (MAC) for freshwaters.

The applicant has not provided an equivalent comparison assessment of potential impacts on soil quality. The applicant's limited comparisons, such as those, referred to immediately above only provide limited insight into the risks posed by accumulation of chemicals in soils or their subsequent migration from the irrigation area.

In conclusion we are not satisfied that using the leachate to irrigate will not cause damage to the vegetation or pollution of the environment by migration from the irrigation area.

Overall, the application does not demonstrate that the grass on site requires fertiliser or soil improver inputs at the concentrations against which the leachate is being compared. The application needs to clearly show:

- the nutrient and chemical loading required by the grass on the restoration soils;
- which of the chemical parameters that leachate (stabilised or not) may contain can be taken up by the grass, and at what concentrations;
- where chemicals applied in excess of vegetation requirements would accumulate or discharge to, and at what concentrations; and
- what fertilisers or nutrients are currently applied to the grass, and how these compare with the proposed leachate irrigant, digestates and sewage sludge.

The addition of nutrients at appropriate rates has potential to promote vigorous grass growth. The application does not explain whether increased grass growth would require harvesting or other management to manage fire risk, nor how any harvested material would be managed or disposed of.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to grass nutrient requirements.

3.3 – Soil Type, quality, and monitoring requirements.

The application does not provide sufficient data on the physical or chemical properties of the Site restoration soils. This is required to assess:

- baseline soil quality and its relationship to the nutrient and chemical needs of the grass cover crop,
- the ability of restoration soils to retain applied nutrients
- the potential for excess chemicals, beyond that required to sustain the grass, to accumulate
- whether the proposed irrigant leachate application could be released beyond the proposed irrigation area, and what chemical concentrations such a release could contain.

The [Sewage sludge in agriculture: code of practice for England, Wales and Northern Ireland](#) is one of the frameworks the applicant uses to assess the proposed leachate irrigation scheme. For this comparison to be applicable, the requirements of the Code of Practice must be met. The Code of Practice requires monitoring of [potentially toxic elements \(PTE\)](#) (which pose a risk to the health of plants, animals and people) in both sludge and receiving soils and establishes the need to understand soil chemistry before land application of sewage sludge.

The application does not demonstrate how these requirements for monitoring PTE in leachate and receiving soils to understand soil chemistry prior to irrigation - would be achieved.

Also relevant to the application, the [Landfill operators: environmental permits - Manage leachate - Guidance](#) for applying landfill leachate to short rotation coppice (SRC) requires baseline soil analysis, in accordance with British Standard 18400 (Soil Quality). Baseline concentrations are used to assess long-term soil protection and inform permit controls.

The application does not provide baseline soil chemistry data for the proposed irrigation area, nor does it set out proposals for soil quality monitoring during the life of the activity. As a result, we are not satisfied that it demonstrates how deterioration of soil quality would be identified and / or prevented.

The applicant refers to a previous Environment Agency conclusion for a willow-based short rotation coppice scheme:

'The Environment Agency therefore concluded that there was no purpose to setting soil concentration limits for the irrigation programme. Consequently, as these irrigation proposals are solely intended as a maintenance dose application to support the grassland, i.e. a low volumetric irrigation rate, there is similarly no potential of harm occurring when all applied persistent substances are adsorbed by the soil mineral surfaces'.

The applicant has provided no site-specific context, justification, or supporting evidence to demonstrate the relevance of that conclusion to this proposal. In particular, it is not clear if the relevant permit that the statement applied to, included any applicant commitments via operating techniques or control measures that effectively removed the need for soil concentration limits.

No empirical monitoring data, results or assessment from any other short rotation coppice scheme, are provided to substantiate the applicant's assertions regarding soil protection, containment of pollutants or lack of accumulation of [hazardous substances, non-hazardous pollutants](#) and persistent bio-accumulate and toxic substances in the SRC. To rely upon this coppice scheme to provide evidence to support its proposal the applicant would need to have demonstrated that it was relevant to its leachate irrigation scheme which it has not.

For this application, further information would be required to demonstrate:

- proposed soil quality monitoring arrangements, including locations, parameters, frequencies, methods, action levels and compliance limits;
- how the applicant will demonstrate that soil contamination will not occur above background concentrations; and
- what mitigation measures will be implemented if chemical concentrations in soils are shown to increase.

Chemical loading and chemical mass accumulation are related but distinct concepts. Chemical loading refers to the rate at which substances are applied to the system, whereas accumulation refers to the net build-up of those substances in soils over time.

Although the application includes some assessment and explanation of potential soil concentration build-up resulting from irrigating with the proposed leachate irrigant, this is insufficient to satisfy us that we grant this variation application. We have reached our conclusion for the many reasons explained in this document including the applicant's failure in its assessment to demonstrate to us that:

- all chemicals that the leachate irrigant may contain have been assessed,
- the full thickness of the irrigation soil profile has been considered,
- site-specific empirical data has been used to fully characterise the irrigation soil,
- baseline (starting) soil concentrations for all leachate chemicals present have been identified
- that leachate sampling methods used in the assessment have produced representative leachate quality source data,
- probabilistic risk assessment tools and site-specific data have been used to assess contaminant impact and accumulation.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to soil type, quality, and monitoring requirements.

In summary - we are not satisfied the benefits statement shows that irrigation using leachate is a waste recovery activity resulting in agricultural benefit or ecological improvement.

4.0 The legal framework

1 – Legal definitions of Waste ‘Recovery and ‘Disposal’

In assessing proposals to permanently deposit waste on land we apply the legal definitions of waste ‘recovery’ and waste ‘disposal’ as set out in the Waste Framework Directive (2008/98/EC) (“the Directive”). We are assisted in doing so by online guidance we have developed – ‘Waste Recovery Plans and Permits’, available at:

gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits.

Article 3(15) of the Directive defines ‘recovery’ as meaning:

“any operation the principal result of which is waste serving a useful purpose by replacing other material which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations”

Article 3 (19) of the Directive defines ‘disposal’ as:

“any operation that is not recovery even where the operation has a secondary consequence the reclamation of substances or energy. Annex 1 sets out a non-exhaustive list of disposal operations”

Annex I of the Directive includes, for example:

“D1 Deposit into or on to land (e.g. landfill etc.)”.

Annex II includes, for example:

“R5 Recycling/reclamation of other inorganic materials”

which includes recycling of inorganic construction materials and

“R10 Land treatment resulting in benefit to agriculture or ecological improvement”.

The proposal for the site could potentially fall within D1, R5 or R10. That being the case, we are required to categorise the activity into one of the Annex I or II operations and to examine the principal objective of the operation and whether it meets the recovery definition.

For that definition to be met, an applicant must demonstrate that waste is being used in substitution for non-waste, i.e. that its proposed activity would go ahead

with non-waste if waste could not be used. The applicant has not provided sufficient evidence to demonstrate that this would be the case, as described in the Key Issues section of this decision document.

Article 6 (1) of the Directive also states:

“(d) use of substance will not lead to adverse environmental or human health harm.”

For the definition of recovery to be met, the waste deposit must not cause pollution.

2. The Environmental Permitting Regulations 2016

To ensure that any direct or indirect discharges from the site due to leachate irrigated do not cause pollution of the environment or harm to human health.

EPR 2016 Schedule 22:

Paragraph - 5 A non-hazardous pollutant is any pollutant other than a hazardous substance.

Paragraph 6. For the purpose of the duties in regulation 3 of the WFD Regulations], the regulator must, in exercising its relevant functions, take all necessary measures—

(a)to prevent the input of any hazardous substance to groundwater, and

(b)to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.

Applications for grant of environmental permit

7.—(1) This paragraph applies to an application for the grant of an environmental permit relating to—

(a)a discharge mentioned in paragraph 3(1)(a), (b) or (c), or

(b)an activity that might lead to such a discharge.

(2) When the regulator receives an application, it must ensure that all necessary investigations have been carried out to ensure that it grants any permit in accordance with paragraph 6.

(3) If it grants the permit, it must include conditions requiring all necessary technical precautions to be observed to ensure the objectives of paragraph 6 are achieved.

(4A) A permit may not be granted in relation to England—

(a)without an assessment of—

(i)the relevant hydrogeological conditions,

(ii)the possible purifying powers of soil and subsoil, and

(iii)the risk of pollution and alteration of the quality of the groundwater from the discharge, and

- (b)without establishing whether the input of pollutants to groundwater is a satisfactory solution from the point of view of the environment.】
(5) A permit may only be granted if the regulator has checked that the groundwater (and, in particular, its quality) will undergo the requisite surveillance.

3. The Water Framework Directive (WFD)

For the purpose of the duties in regulation 3 of the WFD Regulations, the regulator must, in exercising its relevant functions, take all necessary measures—

- (a)to prevent the input of any hazardous substance to groundwater, and
(b)to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater

4. The Landfill Directive

To ensure that the activities continue to meet the requirements of the landfill directive following irrigation using leachate from Middlemarsh Landfill.

5.0 Environmental issues: likelihood of pollution

The refusal is necessary to protect the environment for the reasons detailed below:

1. The proposal creates a potential risk to surface water receptors including protected species / migratory route for one protected species (see section 11, 'Nature conservation, landscape, heritage and protected species and habitat designations' for further information) in consequence of potential discharges (diffuse and direct) from the proposed irrigation area:
 - Contradictions between the SWMP2024 and the Landfill Irrigation Scheme – Risk Assessment Report July 2024 Revision 01' regarding migration pathways create uncertainty in the Conceptual Site Model (Conceptual Site Model) and associated Source–Pathway–Receptor linkages
 - Application drawings, and data, do not show the proposed irrigation area is surrounded by a surface water drainage channel constructed through the full thickness of the restoration soils, or which intersects the interface between the landfill cap and restoration soils. The situation summarised here creates a plausible pollution migration pathway for lateral migration of irrigant beyond the site boundary without interception by the drainage system. We consider that this potential discharge route / migration pathway would represent an

uncontrolled discharge which is not acceptable under the provisions of EPR2016. The risk assessments do not adequately include this potential migration pathway or show how the proposal would achieve the requirements of Schedule 22 of EPR2016, or how the applicant will validate those requirements are achieved.

- There is ambiguity regarding volumes of irrigant that may be needed.
2. The applicant has not fully characterised the leachate source term from Middlemarsh landfill, which is proposed to be used to irrigate. Instead a compilation of data from multiple landfills has been used. We need this characterisation to understand whether the leachate is suitable for use as an irrigant and to assess the risk to receptors at this site.
 - We would require frequent waste analyses, at least every 12 months to ensure that the nutrient and contaminant content was at a safe level for irrigant application.
 3. The applicant has not set out what we would consider to be necessary arrangements for:
 - monitoring and measuring irrigation rates and irrigation quality,
 - monitoring soil quality in the proposed irrigation area,
 - monitoring discharges; or
 - monitoring off-site environments that may receive direct or diffuse discharges of the proposed irrigant.
 4. The risk to groundwater which may be in continuity with surface water. The site is part of the Burgh Marsh, hence groundwater is naturally at the ground surface in some areas, including at Middlemarsh Farm, the area to the south-west of Middlemarsh Landfill.

In summary the application does not demonstrate:

- the proposed process is contained or will prevent the uncontrolled escape /discharge of leachate, including whether engineered barriers and on-site surface water management measures will prevent percolation, lateral migration or over-topping.
- the environmental risk and consequences of the activity at the specified location are acceptable
- the activity will not cause deterioration of the background soil quality
- the quality of the treated leachate is suitable for the vegetation growing on the landfill cap
- that key performance indicators for the proposed irrigation system will be monitored before commencement and throughout the life of the activity including, but not limited to, soil quality during and after operations.
- how it achieves the requirements of EPR2016 Schedule 22 paragraph 6 and 7 (see section 4).

The application does not specify the full chemical composition of surface water quality within the site drainage system or the wider interconnected drainage network. In the absence of this information, it is not possible for us to:

- Compare surface water quality for all parameters the leachate could contain,
- validate the applicant's statement that 'the leachate irrigant can be described as a "water-based product, which contains nutrient levels of nitrogen (as ammonium) and a trace component of other substances',
- assess the potential for the irrigation process to contaminate the soil above the background concentrations,
- assess the risk of excess chemicals present in the leachate irrigant migrating from the irrigation area to onsite and off-site surface waters,
- Determine any appropriate surface water quality monitoring requirements for the proposal (monitoring locations and water quality compliance monitoring).

Regarding possible supplementary benefits:

We do not know what the suitable nutrient rates are for the vegetation (grass) or the soil. Without this information, it is not possible to determine what may be suitable nutrient loading rates or to assess the potential for chemicals to bioaccumulate in vegetation, accumulate in soils, or leach to off-site environments.

The application does not demonstrate which constituents and concentrations of the landfill leachate are necessary to sustain the Site's grass growth, and there is insufficient information regarding what constituents and concentrations of the leachate could be harmful to the grass (covering the restoration soils). Although the applicant acknowledges that chloride may be problematic for plant growth, the assessment of chloride risk is insufficient

The application does not demonstrate that the grass on site requires fertiliser or soil improver inputs at the concentrations against which the leachate is being compared. Also as stated in section 3, 'Benefit statement', the land here does not require regular applications of fertiliser, and any Nitrogen or Phosphate addition from the leachate would pose a risk to the surrounding environment as the site is located in an NVZ.

The information the applicant needs to include to address this matter is explained in section 3.2 Grass nutrient requirements'.

The application does not provide baseline soil chemistry data for the proposed irrigation area, nor does it set out proposals for soil quality monitoring during the life of the activity. As a result, it does not demonstrate how deterioration of soil quality would be identified or prevented.

The application does not demonstrate that the applicant has considered, or assessed the presence, concentration, fate or transport of PFAS (per - and polyfluoroalkyl substances [emerging chemicals]), nor the environmental risks arising from this in their proposed activity. Appropriate assessment of these substances is required.

The impact on the leachate within the existing landfill has not been assessed. For example - the application has not assessed the risk to the environment, and leachate management, that may result from potential additional infiltration through the landfill cap above current infiltration rates that has potential to result from the proposal.

Table S3.1 Leachate level limits and monitoring requirements' of the extant permit includes leachate level compliance limits that are based on the existing conceptual site model and operating conditions. The proposal introduces additional inputs that have the potential to alter leachate generation and leachate levels.

The application does not clearly demonstrate:

- the effect of the proposed irrigation on current and predicted leachate production;
- the evidence used to substantiate predicted changes in leachate levels; or
- whether existing leachate infrastructure and monitoring arrangements are sufficient for validating predicted changes.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to environmental issues and the likelihood of pollution.

6.0 Technical Assessment

6.1 Objective of the technical assessment

A technical assessment was carried out to:

- understand whether further information to that included in the application would be required for us to fully assess the risk to the environment; and
- Identify matters that may have a bearing on our recovery assessment.

Overall, the technical assessment of the application has identified that we cannot conclude that the proposal would be environmentally acceptable because there are too many uncertainties that remain and there is an absence of key critical data and risk assessments many of which we consider are material to showing compliance of the proposal with the Environmental Permitting Regulations.

This technical assessment details the environmental risks arising from the proposed leachate irrigation scheme. Technical reasoning is provided, references to regulatory guidance, and the identification of missing data preventing a robust

assessment. This section also identifies what specific further data / assessment is needed for risk assessment of the proposal and why.

6.2 Summary of Conceptual Site Model (CSM)

We believe that the surface water drainage ditches in/on the ground surrounding the site are the principal controlled water receptors at risk from the proposal.

The Leachate Management Plan (LMP) – Nov2010 states: ‘The field drains bordering the Site ultimately discharge into the main drain approximately 200m the east of the site which in turn flows in a southerly direction to join Cow Bank Drain’. The applicant’s ‘Waste Recovery Plan Client: 14-K6143-ENV-R02 Revision 01– dated November 2025 states:

‘Surface water is channelled towards and actively pumped into the “Main Drain” which flows from north to south some 280m east of the site before joining the Cow Bank Drain and then the Wainfleet Haven (Steeping River) to discharge into the Wash at Wainfleet Harbour at Gibraltar Point’.

‘Landfill Irrigation Scheme - Overview Report No. 14-K6143-ENV-R01 October 2022 Revision 00 - Appendix B– Landfill Irrigation Scheme Overview’ and ‘Middlemarsh Landfill Site Document: Landfill Irrigation Scheme – Risk Assessment Client: FCC Environment (UK) Limited Report Number: 14-K6143-ENV-R03 – Appendix D – Risk Assessment’ found in [‘Supporting Statement and Non-Technical Summary Client: FCC Environment \(UK\) Limited Report Number: 14-K6143-ENV-R05’](#) explains:

- The site hosts a surface water flow balancing pond, which receives run-off from the site’s surface water management interception ditches, which channel the flow to the pond. There is an outflow from the pond to the fenland drainage system. This drainage system is managed by the Lindsey Marsh Internal Drainage Board.
- The site is part of the Burgh Marsh, hence groundwater is naturally at the ground surface in some areas, including at Middlemarsh Farm, the area to the south-west. As a former Tidal Flats area at or about 2mAOD, the area was fenlands until artificially drained by a series of drainage channels in which water levels are actively managed by the Lindsey Marsh Internal Drainage Board. Lindsey Marsh Internal Drainage Board convey the excess waters to the Wash 6km to the south of the site to prevent lands flooding in winter or after severe storms, whilst prioritising all available waters in summer for agriculture. Despite, this active water management, there is limited water available due to the low Effective Rainfall Rates in the East of England, and consequently there is limited local water available during summer periods, when “non-agricultural” irrigation is required.

6.3 The Proposal:

Landfill Irrigation Scheme – Risk Assessment Client: FCC Environment (UK) Limited Report Number: 14-K6143-ENV-R03 – Revision 01 – Risk Assessment of

[‘Application Variation V008 - Not Duly Made Response - 14-K6143-ENV-R03 Middlemarsh Irrigation Risk Assessment - 08072021’](#) states:

‘The primary objective of the scheme is to replenish soil moisture and hence there is a limitation to the quantity of irrigant that can be applied before surface run-off effects predominates over infiltration’.

The applicant’s Landfill Irrigation Scheme - Overview Report No. 14-K6143-ENV-R01 October 2022 Revision 00 - Appendix B – Landfill Irrigation Scheme Overview’ found in [‘Supporting Statement and Non-Technical Summary Client: FCC Environment \(UK\) Limited Report Number: 14-K6143-ENV-R05’](#) states:

- The proposed activity is to apply an irrigant to the restored and/or capped areas of the landfill to reduce or eliminate the soil moisture deficit. Soil moisture deficit is the amount of water required to return the ground to field capacity which is the maximum quantity of water that can be held by a soil. A deficit occurs when there is an imbalance between rainfall and potential evapotranspiration, buffered to some degree by the storage capacity of the soil type’.

6.4 GOV.UK Guidance

[Landfill operators: environmental permits - Manage leachate - Guidance - GOV.UK](#) contains and explains the guidance applicable to leachate management together with [Monitoring landfill leachate, groundwater and surface water: LFTGN 02](#).

The proposal creates a potential risk to surface water receptors in consequence of discharges (diffuse and direct) from the proposed irrigation area. The following guidance details the requirements for assessing the risk to surface water receptors:

- [Risk assessments for your environmental permit - GOV.UK](#)
- [Guidance Surface water pollution risk assessment for your environmental permit](#)
- [H1 annex D2: assessment of sanitary and other pollutants in surface water discharges - GOV.UK](#)

6.5 Volume of irrigant required for the proposal

The information regarding proposed irrigant volume, rates and application (discharge) timings is presented in the applicant’s document [Application Variation V008 - Not Duly Made Response - 14-K6143-ENV-R03 Middlemarsh Irrigation Risk Assessment - 08072021](#)

- The applicant proposes seasonal irrigation using stabilised landfill leachate, primarily during the summer period from mid-May to mid-September (a 90-to-120-day period), with application volumes adjusted according to prevailing weather conditions.
- Under typical conditions, irrigation would be undertaken at around 1 mm/day, equating to approximately 36 m³ /day over a 3.6 ha irrigated

area, and resulting in total seasonal volumes of up to 3,240 m³ per 90-day summer period.

- Irrigation is proposed to be paused during storm events, prolonged wet conditions (5 days of continuous wet and cloudy weather) where evapotranspiration is not expected to be significant. The commencement and cessation of irrigation will be determined on a year-by-year basis.
5. During extended drought periods, it is stated that higher application rates of up to 3 mm/day (may be used).
- There is uncertainty in the application rate, with an area of 2.3 ha over a wider 3.6 ha managed area quoted, reference to the total irrigations being more commonly 2,000m³, which creates ambiguity regarding volumes of irrigant that may be needed.

There is no evidence in the application of how the proposed volume of irrigant compares with the volumes of leachate volumes generated by the site (predicted or actual). The evidence would provide some understanding of:

- whether the landfill has potential to generate sufficient irrigant, and
- implications of the proposed irrigation on the Sites leachate management, including leachate levels.

The applicant's predicted long term leachate volumes (m³/yr) in their 'Table LMP2: Leachate abstraction requirements' of the [November 2010 Leachate Management Plan](#) is 2294 m³/year which is not included in the application. This is comparable to the proposed irrigation rate meaning the applicant is in essence looking to discharge all the sites predicted annual leachate volume as irrigant to the site.

6.6 Engineering design of proposed irrigation area

The proposed irrigation area comprises grass vegetation established on restoration soils which form a protection layer to the capped landfill. The 2010 LMP states that the 'proposed permanent cap specification for the site (1mm thick geomembrane and a protection geotextile), the effective rainfall infiltrating the waste is assumed to be 30 mm per year for permanently restored phases'. The HRAR2021 states: 'All cells have been capped to minimise the ingress of water to the waste mass and therefore to minimise the generation of leachate. This is considered to meet the requirement of the Landfill Directive'.

The applicant's [Landfill Irrigation Scheme – Risk Assessment \(July 2024, Revision 01\)](#) identifies two principal migration pathways: (i) a sub-surface pathway, whereby irrigant not lost to evapotranspiration migrates vertically through the restoration soils to the cap and then laterally under the slope gradient towards the site boundary before entering surrounding groundwater and surface water systems; and (ii) surface run-off (mixing with waters from a rainfall event), captured by site drainage (detailed as consisting of a ring of drainage ditches in

the applicant's Surface Water Management Plan) and conveyed to the on-site flow balancing lagoon (in the northeast corner of the site) prior to discharge to the wider drainage network.

These pathways are considered relevant for the proposal.

The applicant's [Surface Water Management Plan Middlemarsh Landfill Irrigation Scheme Report No. 14-K6143-ENV-R004 July 2024 Revision 00 – Dated July 2024](#) (SWMP2024) states:

'The position of existing internal surface water drains can be seen on Drawing K6143-1000. All irrigation is to be undertaken within 2.3ha of the 3.6ha area encapsulated by the ring of above cap drainage channels and therefore will be captured by the on-site lagoon'. Drawing K6143-1000 referred to is 'K6143-1000 Irrigation Layout Plan'.

Drawings provided (including Drawing No. 001 (in SWMP2024) and Drawing K6143-1000) do not demonstrate (either as schematic or as-built) that the surface water drainage system is engineered to intercept lateral leachate migration along the interface between the geomembrane cap and restoration soils. There is no supporting narrative or schematic evidence showing that above-cap drains would capture any irrigant migrating laterally within / along the area of the site's restoration layer between the base of the surface water drainage system and the cap-restoration layer interface, areas where irrigant is unlikely to be used by the grass.

In addition, the drawings indicate an absence of a surface water drainage channel along part of the western boundary of the proposed irrigation area. This creates another plausible pathway for lateral migration of irrigant beyond the site boundary without interception by the site drainage system.

The situation summarised above means the application does not demonstrate the proposed irrigation area is a contained system capable of preventing uncontrolled percolation or horizontal migration of irrigated leachate to environments beyond the proposed irrigation site including environments off-site.

We conclude the above shows there is potential for irrigant leachate constituents in excess of vegetation (vegetative grassland sward) nutrient uptake to migrate vertically to the landfill cap and then laterally beneath the sites surface water drainage infrastructure off-site and discharge directly or diffusely in an uncontrolled way into the off-site ground and surface water drains around the perimeter of the site that artificially drain the former Tidal Flats area.

Therefore this could lead to potential pollution of the ground and surface water beyond the site's surface water management system and the site boundary.

The situation summarised in the paragraph above is also evidenced by the applicant as follows. 'Landfill Irrigation Scheme – Risk Assessment Report July 2024 Revision 01' states 'The infiltration pathway is a sub-surface pathway whereby irrigant not evapotranspired will migrate vertically to the capped

surface through the 1m thick restoration soils and then be diverted laterally under the slope gradient to the edge of the site and then through the host-sediments surrounding the landfill to enter the groundwater and interconnected surface water system’.

The applicant’s ‘Landfill Irrigation Scheme – Risk Assessment Report July 2024 Revision 01’ statement above contradicts their SWMP2024 which states ‘All irrigation is to be undertaken within 2.3ha of the 3.6ha area encapsulated by the ring of above cap drainage channels and therefore will be captured by the on-site lagoon’.

Contradictions between the SWMP2024 and the Landfill Irrigation Scheme – Risk Assessment Report July 2024 Revision 01’ regarding migration pathways create uncertainty in the Conceptual Site Model (CSM) and associated Source–Pathway–Receptor linkages. These contradictions introduce uncertainties to the application.

We conclude that the applicant is not proposing a ‘closed system’, leading to a CSM where any leachable chemical fractions from the leachate applied to the proposed irrigation area in excess of nutrient uptake by the vegetation has potential to discharge uncontrolled from the site to the environments outside of the site boundary. The risk assessment does not adequately assess for this risk scenario where direct or diffuse (continuous or sporadic pulse) discharge from the Site’s restoration soils occurs into the ground surrounding the site or the off-site surface water drains around the perimeter of the site that artificially drain the former Tidal Flats area.

6.7 Analogy with Short Rotation Coppice

The applicant’s ‘Landfill Irrigation Scheme – Risk Assessment Report July 2024 Revision 01’ uses comparison between the design and operation components of leachate loads applied and the evapotranspiration potential of their proposed irrigation operational method with that used for Short Rotation Coppice (SRC).

[Landfill operators: environmental permits - Manage leachate - Guidance - GOV.UK](#) explains Short Rotation Coppice (SRC) systems are normally a secondary (or tertiary) leachate treatment activity whereby leachate with low concentrations of contaminants can be irrigated to a crop as a source of water and nutrients to produce biomass subject to a minimum, and site specific, set of criteria being satisfied.

SRC typically involves use of willow (the plant species) as the irrigation crop. This application does not include using willow coppice as the irrigation crop - but rather is irrigation of grass vegetation covering the sites restoration soils. Grass used specifically for ground cover, including for the beneficial purpose of protection of soils from erosion (as in this case), is considered a cover crop.

We consider the proposed leachate irrigation scheme is similar to (if not the same as), an SRC system, indeed the applicant recognises this with the use of comparison assessments. Therefore, we expect that the application should meet

the minimum and site-specific criteria [Landfill operators: environmental permits - Manage leachate - Guidance - GOV.UK](#) sets out for use of SRC.

Although the application includes comparison-based assessments between the proposed irrigation rates and leachate contaminant concentrations to their proposed irrigation area, with discharges to SRC's and of digestates to land for agricultural benefit - the assessments are insufficient and do not satisfy SRC key criteria components.

In summary we do not consider that the applicant's comparisons with willow-based SRC systems are directly applicable, as grass and willow have fundamentally different growth habits, rooting structures, and chemical tolerances. We do not think that the applicant's assertions based on willow systems provide robust evidence for the acceptability of the proposed grass irrigation scheme. Furthermore, the applicant's proposal does not include design components, technical requirements, and operating techniques that are required for SRCs as detailed [Landfill operators: environmental permits - Manage leachate - Guidance](#).

Regarding digestates, the application does not demonstrate how the nutrient and chemical composition of compost, anaerobic digestate, or sewage sludge compares with the specific nutrient requirements of the grass covering the proposed irrigation area, nor how the current nutrient needs of that grass are being met.

Therefore, further information from the applicant is required to address this. See sections 3.2 and 5.0 of this decision document for further information.

Further information on proposed operating techniques for monitoring and measuring irrigation rates and irrigation quality may be straightforward to provide. However, the application lacks adequate proposals for other essential monitoring, which would require substantially more data, interpretation and justification. In particular, the applicant has not set out appropriate arrangements for monitoring soil quality in the proposed irrigation area and outside it, monitoring direct and indirect discharges (controlled or uncontrolled) or monitoring off-site environments that may receive direct or diffuse discharges.

Please note – due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to additional information requirements of the technical assessment.

Summary

The applicant has not demonstrated to our satisfaction that:

- the proposed leachate use is contained or will prevent the uncontrolled escape of leachate, including whether engineered barriers and surface water management measures will prevent percolation, lateral migration or over-topping.
- the environmental risk and consequences of the activity at the specified location are acceptable

- the activity will not cause deterioration of the background soil quality in the proposed irrigation area, or off-site
- the contents of the treated leachate (leachate quality) is suitable for the vegetation growing on the landfill cap
- key performance indicators for the proposed irrigation system will be monitored before commencement and throughout the life of the activity including, but not limited to, soil quality during and after operations.

7.0 Applicant's Risk Assessments

The application sets out that the main premise for the proposal is to address the 'limited local water available during summer periods, when "non-agricultural" irrigation is required'.

As covered in section 3.2 above, we conclude the grass covering the sites restoration soils is a cover crop. A purpose of a cover crop is agricultural. In view of this and the applicant's explanations about limited local water available during summer periods for "non-agricultural" irrigation - it is unclear what/whether water is available from the drainage board artificially managed surface water for agricultural irrigation of the site's grass cover crop.

We have not concluded that there is sufficient water available from the off-site artificially managed water system for agricultural irrigation at the site, rather that the application has not shown how much water is available from that system for agricultural irrigation. The absence of this data means we cannot confirm whether the applicant needs to discharge the volumes of leachate it claims they require for their proposal.

7.1 Leachate Quality (Discharge Source Term)

7.1.1– Stabilised leachate quality

The applicant describes the site as a 'General Landfill' and considers that the site:

- contains a mixture of degradable and non-degradable wastes, some of which may at the time of placement have been considered hazardous wastes, all of which have some potential to pollute, and
- produces a 'stabilised leachate' which it defines as a leachate that is well characterised and understood.

The applicant has supported this with 'Table 1 Common components of stabilised leachate' in the applicant's 'Appendix A - Using stabilised landfill leachate for irrigation the agricultural and ecological benefits' within the applicant's WRP ('Landfill Irrigation Scheme - Waste Recovery Plan Report No. 14-K6143-ENV-R02 November 2025 Revision 01). This presents a data list of 18 Common components of stabilised leachate from the sampling and analysis of stabilised leachates from 2016 to the present day. The applicant states it 'reflects over 70 landfills across England, Scotland and Wales and was produced to meet regulatory requirements and standards governing closed and operational

landfills.’ The full dataset includes the minimum, mean, and maximum concentrations for 397 different chemical parameters. The data referred to is not site-specific and represents a compilation of data from multiple landfills.

Although some site leachate quality data is provided in the application, it is unclear how the chemical parameter data provided is representative of the baseline chemical composition of Middlemarsh Landfill’s leachate. As a result, we cannot be confident that the leachate produced on site meets the applicant’s definition of ‘stabilised leachate’ and we are unable to assess that claim.

There are inconsistencies in the leachate irrigant chemical parameters considered by the applicant across the application. These inconsistencies impede comparison between assessments and limit the understanding of the fate, transport and potential accumulation or discharge of chemicals arising from the proposed activity. The applicant needs to define a consistent, site-specific baseline leachate quality for all chemical parameters the leachate may contain and apply this consistently across assessments.

There are some comparative assessments of site-specific leachate quality with other known soil fertiliser and improvement application additives, however, it is not clearly shown these assessments include for all chemical parameters the sites leachate has the potential to contain.

Several comparative assessments provided in the application rely on generic stabilised leachate data rather than the site-specific leachate source term. Consequently, the conclusions drawn by the applicant using the generic stabilised leachate are in our view largely theoretical and do not provide sufficient site-specific evidence to assess risks to vegetation and the environment. A robust assessment would require site-specific concentrations for all relevant leachate quality parameters.

The applicant’s risk assessment includes data for heavy metals and metalloids in the leachate tank and individual landfill cells for 2021 and 2022. However, no evidence is provided to demonstrate that leachate tank samples are representative of the full tank contents or account for potential stratification of leachate in the tank. Available data indicate that concentrations of some hazardous substances, including lead and arsenic, exceed their respective Environmental Quality Standards (EQS), and the applicant acknowledges that chromium and nickel consistently exceed these EQS. Information to address this is needed for the applicant to show what the concentration and composition of chemical parameters would be discharged to the proposed irrigation area.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to this matter or other parts of the technical assessment.

7.1.2 Purpose of leachate irrigation application

The applicant’s risk assessment states ‘leachate is to be applied as a surrogate for water’ but goes on to state:

‘A more analogous descriptor for the leachate is a water product derived from a digester and therefore analogies can for risk assessment purposes be made to other recovery process materials which are commonly applied to land. In this form, the leachate irrigant can be described as a “water-based product, which contains nutrient levels of nitrogen (as ammonium) and a trace component of other substances”. In this case the other substances present are secondary to the process and although may in part be beneficial nutrients, concentrations may have a bearing that limits the quantity of the base product (i.e. the water content of the leachate) that can be applied.’

Landfill leachate, while liquid, is not water. It is a contaminated wastewater generated by percolation of rainfall through waste and can contain a wide range of pollutants, including ammonia, metals, organic compounds and pathogens. Its application following specialised treatment therefore requires careful assessment of the chemical composition and environmental risk to soil, groundwater, surface water and human health, which can be significant if not properly contained and treated.

The application does not specify the full chemical composition of surface water quality within the site drainage system or the wider interconnected drainage network. In the absence of this information, it is not possible to:

- Compare surface water quality for all parameters the leachate could contain,
- validate the applicant’s statement that ‘the leachate irrigant can be described as a “water-based product, which contains nutrient levels of nitrogen (as ammonium) and a trace component of other substances’,
- assess the potential for the irrigation process to contaminate the soil above the background concentrations,
- assess the risk of excess chemicals present in the leachate irrigant migrating from the irrigation area to onsite and off-site surface waters,
- Determine appropriate surface water quality monitoring requirements for the proposal (monitoring locations and water quality compliance monitoring).

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information in relation to the issues raised in this section.

Therefore in summary, due to the lack of information in relation to the above, we cannot be satisfied that irrigation using leachate will not cause pollution of the environment or harm to human health.

7.1.3 – Grass nutrient requirements

[Landfill operators: environmental permits - Manage leachate - Guidance - GOV.UK](#) shows the need for consideration of the:

- total quantity of treated leachate applied to proposed irrigation areas, and
- cumulative effect the substances in the treated leachate have had on soil quality within the SRC.

Crops, including cover crops such as grass on the restoration soils at the site, may require application of substances necessary for normal plant growth, for example, water, nitrogen, potassium, phosphate and other micro-nutrients.

The application does not specify the nutrient and chemical requirements of the vegetation present above the restoration soils (vegetation species are detailed in the annotated drawing entitled, Revised Restoration Plan dated 11/06/2013 ref: 716R243). This information is essential to assess whether the chemical composition of the proposed leachate irrigant is appropriate, or whether excess nutrients and chemicals may accumulate in soils, migrate through the restoration layer, discharge to groundwater or surface waters beyond the site boundary, or damage the grass cover, thereby undermining the purpose of the proposal.

The application also does not clearly set out whether nutrients are already applied to the grass, nor does it adequately describe the physical and chemical properties of the restoration soils that would influence soil nutrient content and retention. Without this information, it is not possible to determine what may be suitable nutrient loading rates or to assess the potential for chemicals to bioaccumulate in vegetation, accumulate in soils, or leach to off-site environments.

For further information – see sections 3.2 – Grass nutrient requirements and section 3.3 Soil type, quality and monitoring requirements in the Benefits assessment statement section.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating grass nutrient requirements.

7.1.4 – Potential Discharges to controlled waters.

The applicant's risk assessment states:

‘Given soil moisture deficit rates during summer periods, even under all weather conditions, there is not expected to be a summer release of any leachate constituents from the host soils’.

However, this does not address the potential for releases at other times of year, including winter, when leachable chemicals may be mobilised from soils following accumulation or where they exceed vegetation nutrient requirements.

As set out in Section 6.6 (Engineering design of the proposed irrigation area) above, the application does not demonstrate that the irrigation area is a contained system or that it includes engineered barriers and surface water management measures capable of preventing percolation, lateral migration, or overtopping of the proposed leachate irrigant. As a result, there is a potential risk that chemicals within the leachate irrigant could be discharged from the irrigation soils. This risk is increased if chemicals are applied at concentrations above vegetation uptake capacity, are not broken down by natural processes, are not

lost during irrigation due to volatility, or do not accumulate within the soils. The application does not adequately assess the fate and transport of all chemicals that the leachate irrigant may contain. Where risks are considered, the assessments are largely qualitative.

The application does not present evidence that probabilistic risk assessment tools have been used to model contaminant migration from irrigant chemicals leaching from soils to groundwater or surface water, nor does it provide sufficient site-specific data that would support such modelling. Consequently, it is unclear which chemicals, and at what concentrations, may discharge from the proposed irrigation area. This prevents robust assessment of risks to controlled waters and limits confidence in the applicant's risk assessment conclusions.

Based on the irrigation area design and the site conceptual model, we conclude that off-site surface water drainage ditches surrounding the Site are the principal controlled water receptors at risk from the proposal. However, the application does not include sufficient assessment of risks to these receptors from the full range of chemical parameters that the leachate may contain.

The applicant's surface water risk assessment relies on comparisons between predicted concentrations of a limited number of chemicals and their respective Environmental Quality Standards (EQS). This approach addresses only part of the required assessment and does not consider all relevant chemical parameters present in the leachate.

We have not identified risk assessments in the application that meet GOV.UK guidance requirements for surface water, including those explained in:

- [Risk assessments for your environmental permit - GOV.UK](#)
- [Guidance Surface water pollution risk assessment for your environmental permit](#)
- [H1 annex D2: assessment of sanitary and other pollutants in surface water discharges - GOV.UK](#)

Although some assessment is provided for ammoniacal nitrogen, it is unclear how risks from other chemicals, including direct and diffuse discharges, have been assessed in relation to Water Framework Directive status and classifications of receiving waters.

Environment Agency data indicates that some surface waters in the area surrounding, or hydrologically connected to, the site support protected species, for fish migratory routes. The application does not define the water quality requirements for these protected species, nor does it assess the risk posed by discharges of leachate irrigant to those water quality requirements.

Given the reasonable likelihood of continuous diffuse or point-source discharges to off-site surface waters, the application must include risk assessments consistent with GOV.UK guidance. These assessments should apply appropriate Water Framework Directive classifications and standards, including those relevant to protected species, for all receiving surface waters.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information relating to potential discharges to controlled waters.

7.1.4.1 Hazardous Pollutants

The application data (for example as detailed in the Leachate Irrigation Scheme – Risk Assessment. Ref: 14-K6143-ENV-R03) indicates that some metalloids classified as hazardous substances, including lead and arsenic, exceed their respective EQS. The Operator also acknowledges that chromium and nickel consistently exceed EQS. The application does not clearly show what concentrations of hazardous substances in the leachate:

- are required by the grass as nutrients;
- will be taken up by the grass;
- may bind to and accumulate in the restoration soils; or
- may migrate to the landfill cap interface and subsequently to off-site controlled waters.

In the absence of representative leachate source-term data (as discussed in section 4.1 of this report) and assessment of the above bullet points, it is not possible to conclude whether the proposal will:

- allow [hazardous substances, non-hazardous pollutants](#) and persistent bio-accumulative and toxic substances to enter the proposed irrigation system.
- limit applications to substances necessary for normal plant growth; or
- avoid environmentally unacceptable discharges to off-site controlled waters.

Although the applicant does not describe the proposal as a Short Rotation Coppice system, we conclude it is analogous, as set out in Section 3.2 of this report. Consequently, the relevant provisions [Landfill operators: environmental permits - Manage leachate - Guidance](#) applicable to Short Rotation Coppice also apply. In particular operators, 'must not allow [hazardous substances, non-hazardous pollutants](#) and persistent bio-accumulative and toxic substances to enter the SRC system. You must only allow the application of substances necessary for normal plant growth, for example, water, nitrogen, potassium, phosphate and other micro-nutrients'.

Since the application indicates the proposed irrigation area operates as an open system rather than a closed system, unlike Short Rotation Coppice, there is a greater risk of unacceptable discharges of hazardous substances occurring by direct or diffuse migration mechanisms to controlled water receptors. Therefore, more stringent controls and supporting evidence are required than would be the case for a closed Short Rotation Coppice system. The application does not currently provide sufficient data or assessment to demonstrate compliance with the relevant guidance in relation to SRC and managing leachate.

In summary we do not consider that the applicant's comparisons with willow-based SRC systems are directly applicable, as grass and willow have fundamentally different growth habits, rooting structures, and chemical

tolerances. We do not think that the applicant's assertions based on willow systems provide robust evidence for the acceptability of the proposed grass irrigation scheme. Furthermore, the applicant's proposal does not include design components, technical requirements, and operating techniques that are required for SRCs as detailed [Landfill operators: environmental permits - Manage leachate - Guidance](#).

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information in relation to this section.

7.1.4.2 Non-Hazardous pollutants

Ammoniacal Nitrogen

The applicant's risk assessment includes some limited assessment of potential ammoniacal nitrogen discharges to groundwater and associated surface waters.

The applicant's risk assessment states:

'there is only a single substance exceeding EQS levels, namely ammoniacal-N. This concentration for a single short-term event is however not of environmental significance in this situation, even though the site is within an NVZ. It is accepted that the ammonium concentration is in excess of the agricultural background induced concentration in the groundwater (9.5mg/l in the Terrington Beds due to the over-application of fertiliser for the majority of a century) and is above EQS levels (i.e. 0.6mg/l as an Annual Average)'

This focuses on the risks to surface water from the discharge mechanism of ammoniacal nitrogen run-off from the surface of the proposed irrigation area during one-off (intermittent) short duration events rather than considering a continuous diffuse discharge of ammoniacal nitrogen from the irrigation soils. Both risks should be considered.

The applicant's risk assessment for ammoniacal nitrogen relies on:

- potential dilution of the discharge, on-site, and within receiving waters such as the Main Drain, where the drains are assumed to be replenished for agricultural purposes,
- a proportion of the irrigant ammoniacal nitrogen percolating into the soils and not being available for off-site transfer during heavy rainfall events,
- the applicant's opinion that the surface water channels are effectively closed systems, which are periodically dry due to management, and therefore do not support water dependent aquatic species,
- the likelihood of the discharged irrigant to be retained locally in off-site surface water and used as an irrigant for crop irrigation on surrounding fields,
- Ammonium not being a persistent substance, with any off-site introduction being only a periodic and finite quantity; and reduced via volatilisation from open channel waters,

Further information would be required from the applicant to allow us to validate the reasonableness of these assumptions.

As stated previously, due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information in relation to this section.

The applicant also provided information (from RFI dated 23/07/2025) about the ANAMMOX process for ammoniacal nitrogen to act as a nutrient source.

The applicant states, "The ammoniacal nitrogen will act as a nutrient source which can be taken up via grass, shrub and hedgerow rooting systems, be adsorbed onto mineral surfaces as well as being bio-transformed within the ground. Biotransformation will include ANAMMOX a natural process originally identified as recently as 1995 and important for global nitrogen cycling and known originally from estuarine sediment conditions, and then recognised in treatment wetlands including that for landfill leachate and agricultural soils. ANAMMOX is a self developing microbial process in soils that develops under the types of conditions irrigation will take place, i.e. a limited oxygen availability soil, whereby ammonium is partially oxidised to nitrite, and then is converted to nitrogen gas by a second stage microbial conversion of nitrite with ammonium to nitrogen gas. This process is complementary with other soil processes and provides a route for the return of nitrogen to atmosphere without the release of ammonia or nitrous oxide gases, which will act in association with mineral absorption and plant nutrient uptake".

However we require further information on this process to know whether this would be suitable for the proposed irrigation activity at Middlemarsh Landfill.

Chloride

The applicant's risk assessment includes some limited assessment of potential chloride discharges to groundwater and associated surface waters. However, as covered in Section 4.1.3 of this report the chloride nutrient requirements of the grass have not been demonstrated.

The applicant states in their risk assessment that:

'Landfill leachate, including leachate from Middlemarsh landfill, have salt ion contents ~5% of that of seawater, hence a brackish quality. Sodium and chloride are individually in the 1,000 – 2,000mg/l range, neither of which is a significant environmental hazard at 4 – 8 times Environmental Quality Standard (EQS) and Drinking Water Standard (DWS) for a terrestrial freshwater'.

We do not agree with this statement because:

- The application does not demonstrate what chloride concentrations could be released by diffuse discharges from the proposed irrigation soils,
- the Site environmental monitoring reported in *Middlemarsh Landfill Site Lincwaste Limited - Hydrogeological Risk Assessment Review 2021 - Document Reference: 4943-CAU-XX-XX-RP-V-0300.A0.C1 - May 2021* shows average chloride concentrations in the surrounding surface waters of 128 – 453 mg/l, indicating that a discharge of up to 2,000 mg/l from the activity would result in significant deterioration of off-site water quality,

- the application does not identify the chloride concentrations required to protect species supported by the surrounding surface water drainage ditches.

7.1.5.3 Emerging Chemicals

Landfills may contain significant concentrations of emerging contaminants such as Per- and Polyfluoroalkyl Substances (PFAS) and Persistent Organic Pollutants (POPs). Perfluorooctane Sulfonate (PFOS), a PFAS compound, has an inland surface water Environmental Quality Standard of 0.65 ng/l.

The application does not demonstrate that the applicant has considered, or assessed the presence, concentration, fate or transport of PFAS, nor the environmental risks arising from this in their proposed activity. Appropriate assessment of these substances is required.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information in relation to this section.

8.0 Effect on site leachate levels

The existing landfill Leachate Management Plan (LMP) contains water balance calculations based on leachate generation under natural precipitation and current operational conditions. These calculations do not account for irrigation of the restored landfill surface as proposed.

‘Table S3.1 Leachate level limits and monitoring requirements’ of the extant permit includes leachate level compliance limits that are based on the existing conceptual site model and operating conditions. The proposal introduces additional inputs that have the potential to alter leachate generation and leachate levels.

Leachate levels within the landfill are dependent on infiltration through the landfill cap, waste properties and leachate extraction rates. By applying leachate to the restored surface, the proposal could increase moisture to the cap above the natural levels of effective precipitation. Depending on the cap design and integrity, this has the potential to increase infiltration through the landfill cap into the existing landfill waste and affect leachate generation and in-waste leachate levels in ways the risk assessment has not included.

The application does not clearly demonstrate:

- the effect of the proposed irrigation on current and predicted leachate production;
- the evidence used to substantiate predicted changes in leachate levels; or
- how proposed monitoring would validate predicted changes to leachate generation and levels, or whether existing leachate infrastructure and monitoring arrangements are sufficient for this purpose.

Despite the premise of the proposal, we conclude that it has potential to indirectly influence leachate generation and directly influence the site’s in-waste leachate

management. The application does not sufficiently satisfy the guidance requirements of [Landfill operators: environmental permits - Manage leachate](#) or [Monitoring landfill leachate, groundwater and surface water: LFTGN 02](#) in relation to assessing the leachate production and management changes the proposal could bring about.

The site's hydrogeological risk assessment and Leachate Management Plan would need to be updated to reflect these potential impacts on leachate generation and leachate management within the landfill.

The application also does not include the information required by relevant guidance for new or amended leachate management methods as detailed above. Relevant guidance for [leachate management plans](#), Application of treated landfill leachate to short rotation coppice (SRC), and recirculating leachate we conclude also applies to the proposed activity.

No updated Leachate Management Plan has been provided, and the existing plan does not accommodate the proposal. The application does not explain how current leachate management, monitoring, or water balance assessments would be affected, whether the current site infrastructure and monitoring can provide reliable validation data on the impact of the proposal, nor how the relationship of any change to leachate levels and the associated environmental risk would be managed.

Accordingly, the application needs to include:

- appropriate technical assessment of the proposal's effects on in-waste leachate generation and levels, supported by appropriate validation measures; and
- further information on leachate management, including an updated Leachate Management Plan.

Due to other points raised in relation to the recovery assessment - we did not ask the applicant for further information in relation to the effect on site leachate levels.

9.0 Report Summary

The table below provides a summary of the further information that would be required to enable a full environmental risk assessment of the proposal to be made. It highlights matters that may have a bearing on the recovery assessment.

We consider that with additional work the applicant could provide adequate further information.

Topic	Further information required	Matters with a bearing on recovery assessment
Containment and System Design	• Demonstration, through drawings and narrative, that	• If the system operates as an open system

Topic	Further information required	Matters with a bearing on recovery assessment
including engineering	the irrigation area is a contained system. - Evidence to show how engineered barriers and drainage prevent vertical percolation, lateral migration and off-site discharge. - Resolution of contradictions between documents on migration pathways, and address drainage gaps (notably along the western boundary which may not be contained).	with uncontrolled losses, substances applied in excess of vegetation uptake may leave the site, indicating disposal rather than recovery.
Leachate quality	- A consistent representative, site-specific leachate quality dataset covering all relevant chemical parameters, including hazardous substances, non-hazardous pollutants and emerging contaminants (PFAS and perfluorooctanoic acid (PFOA). - Evidence that sampling methods are representative (e.g. accounting for leachate tank stratification) and applied consistently across assessments.	- Recovery requires application to be limited to substances necessary for normal plant growth (as required for analogous SRC). Uncertainty over leachate composition undermines this requirement. - Potential presence of persistent, bio-accumulative substances may be incompatible with recovery if not shown to be necessary for vegetation or adequately controlled.
Irrigation volumes and rates	- Reconciliation of inconsistencies in irrigated area, application rates and total volumes, along with definition of alternative water availability. - Demonstration of how proposed volumes relate to predicted and actual leachate generation at the site.	If proposed volumes are not driven by vegetation demand but by leachate disposal needs, this may weigh against recovery.
Soil type, baseline	Baseline soil chemistry and physical properties for the	Long-term soil deterioration or

Topic	Further information required	Matters with a bearing on recovery assessment
condition and soil protection	restoration soils, in accordance with relevant British Standards. - Assessment of soil capacity to retain nutrients and contaminants and the potential for contaminant accumulation in the restoration soils. - Current soil fertiliser or nutrient concentrations resulting from existing grass management practice, and how these compare with the proposed leachate irrigant, Clear proposals for soil monitoring, including parameters, locations, frequencies, trigger levels and mitigation actions.	contaminant accumulation would be inconsistent with recovery. Recovery requires evidence that soil quality will be protected and deterioration prevented.
Vegetation type, tolerance and nutrient requirements	- Identification of grass species present and definition of their nutrient requirements and tolerance thresholds, including for chloride and other salts. - Quantification of excess nutrient or chemical loading beyond vegetation uptake.	- Application of substances not required by, or harmful to, the vegetation would indicate disposal rather than recovery. - Recovery depends on nutrients being applied for a beneficial purpose; excess loading undermines this justification.
Risk to controlled waters	- Surface water risk assessments compliant with GOV.UK guidance, covering all relevant chemicals, and continuous diffuse discharges. - Assessment of risk to surface water incorporating use appropriate Environmental Quality Standards, Water Framework Directive classifications and	Unacceptable risks to controlled waters may preclude recovery.

Topic	Further information required	Matters with a bearing on recovery assessment
	standards applicable to protected species To include assessment of fate and transport of chemicals mobilised during winter flushing or extreme weather events	
Leachate Management Plan	- Incorporating the proposed irrigation activity within the assessment of leachate generation and levels, including monitoring, validation and contingency measures. - Including for guidance requirements of Landfill operators: environmental permits - Manage leachate or Monitoring landfill leachate, groundwater and surface water: LFTGN 02 in relation to changes the proposal may have on leachate levels.	
Monitoring and validation	- Proposals for monitoring irrigation performance, soil quality, discharges from the irrigation area and off-site receiving environments, - key performance indicators for the irrigation system - how monitoring data will be used to validate assumptions, demonstrate compliance and trigger mitigation.	Robust monitoring is necessary to demonstrate that the activity operates as recovery throughout its life.
ANAMMOX process	further information on this process to know whether this would be suitable for the proposed irrigation activity at Middlemarsh Landfill.	

10.0 Operator Competence

The applicant provided an updated Competence Management System (CMS) certificate which expires on 13/03/2027.

11.0 Other relevant issues

11.1 Nature conservation, landscape, heritage and protected species and habitat designations

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for these designations.

The application is within the screening distance for protected species including the migratory route for one protected species.

We would need to carry out further assessment of this aspect prior for any future application, in particular considering surface water as the main receptor.

The proposal creates a potential risk to surface water receptors including protected species / migratory route for one protected species in consequence of potential discharges (diffuse and direct) from the proposed irrigation area.

The assessment of this may rely on additional information as identified in the technical assessment section above. However due to other points raised in relation to the recovery assessment – we did not ask for further information as part of this determination.

12.0 Conclusions

The Environment Agency has two major concerns, namely:

- we do not agree that the proposal is a recovery activity, and
- the applicant has not satisfactorily demonstrated that there will not be an environmental impact.

12.1 Recovery activity

In summary we do not agree that:

- there is a general or specific obligation to carry out the proposed works.
- leachate from the site would be a substitute for water.
- the untreated leachate is suitable for the irrigation activity.

Therefore, the proposal for irrigation with leachate is a disposal activity.

12.2 Environmental impact

We have concluded that the refusal is necessary to protect the environment because:

The proposal creates a potential risk to surface water receptors including protected species - in consequence of uncontrolled discharges (diffuse and direct) from the proposed irrigation area and to ground beyond the proposed irrigation area (including off-site);

There is ambiguity regarding volumes of irrigant that may be needed;

The leachate source term from Middlemarsh landfill has not been fully characterised and we would require frequent waste analysis every 12 months (which has not been proposed);

There are no satisfactory/appropriate arrangements for monitoring and/or measuring irrigation rates, irrigation quality, soil quality in the proposed irrigation area, discharges or off-site environments that may receive direct or diffuse discharges.

The application does not demonstrate:

- the proposed process is contained or will prevent the uncontrolled escape / discharge of leachate from the site,
- the environmental risk of the activity on the restored area at Middlemarsh landfill is acceptable
- the activity will not cause deterioration of the background soil quality
- the quality of the treated leachate is suitable for the vegetation growing on the landfill cap
- the key performance indicators for the proposed irrigation system will be monitored before commencement and throughout the life of the activity including, but not limited to, soil quality during and after operations
- how the proposal achieves the requirements of EPR2016 Schedule 22 paragraph 6 and 7
- what the suitable nutrient rates are for the vegetation (grass) or the soil

Although some site leachate quality data is provided in the application, it is unclear how the chemical parameter data is representative of the baseline chemical composition of Middlemarsh Landfill's leachate. As a result, the equivalence of the site leachate to the applicant's definition of 'stabilised leachate' cannot be assessed.

The application does not demonstrate which constituents and concentrations of the landfill leachate are necessary to sustain the Site's grass growth or may be harmful to the grass

The application does not specify the full chemical composition of surface water quality within the site drainage system or the wider interconnected drainage network.

The application does not demonstrate that the grass on site requires fertiliser or soil improver inputs at the concentrations against which the leachate is being compared.

The application does not provide baseline soil chemistry data for the proposed irrigation area, or set out proposals for soil quality monitoring during the life of the acti

Does not demonstrate the PFAS have been considered and addressed.

The impact on the leachate within the existing landfill has not been assessed – i.e. the risk to the environment and leachate management from potential increased infiltration through the cap as a result of the proposed irrigation. See section 5 for further information.

13.0 Decision considerations

Section 108 Deregulation Act 2015 - Growth Duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 100 of that Act in deciding whether to grant this permit variation.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. This also promotes growth amongst legitimate applicant's because the standards applied to the applicant are consistent across businesses in this sector and have been set to achieve the required legislative standards.

14.0 Consultation

We consulted:

Environmental Protection Department – Lidsey Council

Health Protection Team, Director of Public Health at Lincolnshire County Council

UK Health Security Agency

Health and Safety Executive

The following summarises the responses to consultation with other organisations, and the way in which we have considered these in the determination process.

14.1 Responses from organisations

Response received from: Health Protection Team, Director of Public Health at Lincolnshire County Council

Brief summary of issues raised:

Burgh-Le-Marsh has a resident population of 2,602 as of the 2021 Census. The age profile shows a greater proportion over 65 (36%) than the England average. Indicators for respiratory issues, including chronic obstructive pulmonary disease, coronary heart disease, and the standardised mortality ratio across all ages for respiratory diseases, are similar to the national average.

Considering these rates and the site's location relative to any sensitive receptors, emissions from the site are of low concern for increasing health inequalities in this location, assuming that the site complies with the permit requirements, including the application of Best Available Techniques.

Reducing exposure to non-threshold pollutants has public health benefits, and we encourage approaches that minimise public exposure to these pollutants.

Leachate is the primary emission of public health concern in this application. The composition of leachate at the site is well-documented. Sodium and chloride contents are within non-hazardous ranges for terrestrial water, and the applicant asserts that the nitrogen and heavy metal contents are of the same chemistries of agricultural settings.

The application does not provide an odour management plan, justifying it as unnecessary due to the distance of receptors to the irrigation area and management procedures on the site. While we would welcome an odour management plan, a detailed procedure for odour controls arising from abnormal operations is disclosed.

A detailed surface water management plan details the discharge of runoff captured by surface water collection channels into a lagoon adjacent to the site and proposes increasing monitoring of the lagoon from quarterly to monthly. We support this change as it ensures the appropriate discharge from the lagoon to the drainage system before breaching capacity, especially considering the changes in intense rainfall frequency due to climatic change.

The site occupies a high-risk Flood Zone 3. The irrigation scheme is unlikely to contribute to flood risk by only applying irrigation in arid summer conditions with no irrigation during autumn or spring where the risk is most abundant. Due to the nature of the site, we encourage frequent monitoring of the associated lagoon to ensure the extraction of surface runoff water by the drainage system.

It is encouraging to know that the proposal to utilise stabilised leachate will improve on previous environmental restoration and safeguard the population's health through carbon capture and reducing arid conditions and vegetation dieback, which can lead to wildfires. I would advise that the Environment Agency's recommendations to investigate the following are taken on board when determining this application:

- Risk assessment of long-term salt leaching

Summary of actions taken: No action taken as the application has been refused. However the points raised have been addressed as follows and any future application would require a risk assessment of long term salt leaching.

The potential impact of pollutants within the leachate and the leachate content are covered in section 7.1 of this document. Further information is required in relation to this aspect.

Odour management plan (OMP) – an OMP was not included as part of the application. Section 5.5. of the irrigation scheme risk assessment (ref: 14-K6143-ENV-R03) states, "...the distance of receptors to the irrigation area and given the passive design of the process in combination with the management procedures employed at the site, these receptors are considered unlikely to be affected and the residual/mitigated risks are considered low. Therefore, odour has not been considered further in this report. Similarly, it has not been deemed necessary to produce an Odour Management Plan (OMP) for the Irrigation Scheme". Furthermore condition 3.3 of the current permit allows us to request a new or updated OMP if activities are giving rise to pollution outside of the site as perceived by an authorised officer of the Environment Agency unless the applicant has used all appropriate measures.

The Surface Water Management Plan is covered by section 6.6 of this document.

Flood Risk Zone 3 - this application has been refused, however further assessment on this aspect will be made for any subsequent application.

Stabilised leachate is covered by sections 2.5 and 7.1. Although some site leachate quality data is provided in the application, it is unclear how the chemical parameter data is representative of the baseline chemical composition of Middlemarsh Landfill's leachate. As a result, the equivalence of the site leachate to the applicant's definition of 'stabilised leachate' cannot be assessed.

Risk assessment of long-term salt leaching – salt concentration and losses are covered by section 3.2 which also states that further information is required in relation to the risk assessment of long-term salt leaching. Further information in relation to salt is also included in section 7.1.4.2 in relation to chloride.

Response received from: UK Health Security Agency

Brief summary of issues raised:

The main emission of potential concern is leachate from the closed landfill, however the proposed activity will utilise leachate at a low rate in dry months for irrigation purposes to prevent the drying out of soils, which is necessary for maintaining the site while avoiding run off. Mitigation measures in place are adequate to prevent public health risk as outlined in the Surface Water Management Plan and Landfill Irrigation Scheme. The site is located more than 700m from the nearest residential receptors.

Based on the information contained in the application supplied to us, UKHSA has no significant concerns regarding the risk to the health of the local population from the installation.

Summary of actions taken: No action taken as the application has been refused. However emissions of leachate from irrigation are covered in section 5 and the potential impact of pollutants within the leachate and the leachate content are covered in section 7.1 of this document.