

Permitting decisions

Variation

We have decided to grant the variation for Silt Lagoons at Rainham and Wennington Marshes operated by Land & Water Remediation Limited.

The variation number is EPR/FB3701XY/V002.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

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

- highlights [key issues](#) in the determination
- summarises the decision making process in the [decision checklist](#) to show how all relevant factors have been taken into account
- explains why we have also made an Environment Agency initiated variation
- 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 environmental permit and the variation notice. The introductory note summarises what the variation covers.

Key issues of the decision

1) Environment Agency approach to determining this variation

The site is currently permitted as a dredgings site, not subject to the Landfill Directive. The changes proposed in this variation result in the site being a non-hazardous landfill under section 5.2 A (1) (a) of schedule 1 to the EP Regulations.

In determining this permit application in particular, we had to adopt a different approach to this determination compared to a standard non-hazardous landfill determination. In particular, the leachate management, landfill gas management, and stability were important aspects that required a different approach. These are explained in further details in the sections below.

2) **Definition of a Landfill**

This site was previously filled in with dredgings in a series of lagoons. The manner of operation means that these will be permanent deposits; therefore, the lagoon is a landfill as defined in the Landfill Directive in Article 2(g) i.e. deposited for disposal for more than one year.

Notwithstanding the above, this variation will allow the infilling of dredgings, waste soils and clays, thus should now be regarded as a landfill (landraise).

3) **Landfill Classification**

This landfill is classified as a landfill for non-hazardous waste.

4) **Liquid Wastes**

The Landfill Directive bans liquid waste being deposited in a landfill. However, in this case, the water is added to the waste to facilitate its transport so the waste is not regarded as liquid waste. This liquid (water) is removed after the waste is deposited at the site. (Environmental Permitting Guidance - The Landfill Directive states: For the Environmental Permitting (England and Wales) Regulations 2010 para 4.19 "Where a liquid is used to facilitate the transport of waste to the landfill, usually by pipeline, and the liquid is subsequently removed then this may not amount to the acceptance of waste in a liquid form."¹). We have referred to this as carrier water or remnant water.

5) **Risk Assessments and Technical Assessment of the Landfill**

a) **Prior Investigation (Requisite Surveillance), Hydrogeology, Geology and Geological Barrier**

In the initial application, there was a lack of site-specific geological and hydrogeological information at the northern boundary in the groundwater inflow region of the landfill. A limited dedicated investigation had been undertaken but no monitoring boreholes were installed. The borehole information supplied in the variation application was for the adjacent site (Rainham Landfill) or that available on the British Geological Survey (BGS) website. Trial pitting was undertaken in the waste and the bunds of the site. Consequently, there was inadequate information provided to prove the existence and nature of the alluvium sub-strata that would provide the necessary natural geological barrier underneath the footprint of the existing waste.

The existing boreholes cited in the variation application (which belonged to an adjacent landfill) just beyond the southern boundary in the outflow region potentially would not be accessible for monitoring this facility. In addition, there was no monitoring information in the groundwater in-flow region from the existing boreholes (at Rainham Landfill) therefore; we were not able to use these to establish baseline (background) conditions at the site.

Therefore, we requested that the operator install boreholes in suitable locations to establish both the site-specific geological and the hydrogeological conditions for the site. The operator installed four boreholes during the determination period, two boreholes upstream (BH 01 and BH 02) and two downstream (BH 03 and BH 04). These boreholes and the BGS borehole logs confirmed the thickness and nature of the alluvium. It consists of clay, silt, sand and peaty deposits, and the thickness ranges between 6.63m at borehole TQ58SW313 located to the north of the northern part of the eastern lagoon area and the A13 road and 13.3m at borehole TQ57NW700 in proximity to the southern corner of the eastern lagoon area. The borehole logs proved that a clay layer is present at least 1.4m thick with a permeability of 1e-9m/s or less, and meets the minimum requirements of the Landfill Directive.

¹ Environmental Permitting Guidance - The Landfill Directive. For the Environmental Permitting (England and Wales) Regulations 2010 - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69347/pb13563-landfill-directive-100322.pdf

We consider that the evidence from BGS boreholes around the site and from the site-specific boreholes installed during the determination of the permit show the alluvium forms an adequate geological barrier. This conclusion is based on the evidence and interpretation that the clay is present in the alluvium between borehole locations across the whole site.

The geological and hydrogeological description of the site is provided in detail in Section 2 and summarised in Figure HRA 1 of Appendix F Hydrogeological Risk Assessment (HRA)², and illustrated in the conceptual model in Figure 1 below.

b) Conceptual model

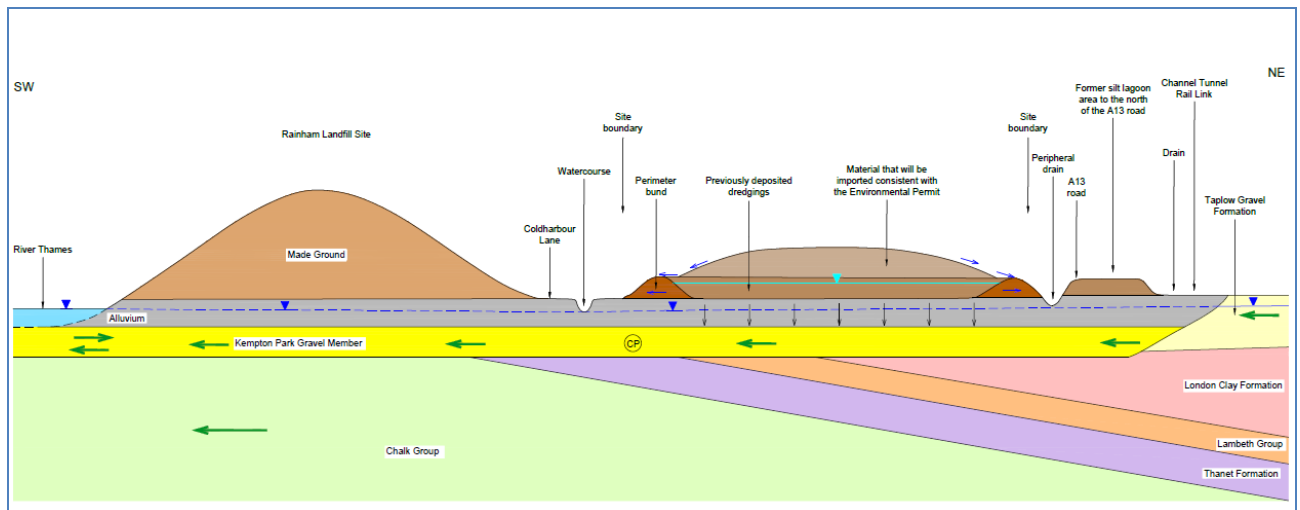


Figure 1 – Conceptual Model

(Also, see Figure 4 in Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002, which enhances the above diagram)

We considered that both conceptual models for the hydrogeological risk assessment (HRA) and stability risk assessment (SRA) submitted as part of the variation application needed to be reviewed, amended and to be consistent.

We considered that the key conceptual features of the existing situation and proposed landfill scheme had not been separately and adequately presented and justified.

The combined surface water and groundwater features needed to be shown on a map to understand the degree of interaction between waste, the carrier water, supernatant water (surface water run-off), groundwater and surface water and this would be facilitated by the additional information from the new boreholes installed (see Section 5a) above).

The HRA conceptual model did not address that it was likely that there would be a consolidation of the existing wastes, which vary in nature and grain size from one part to another, and of the alluvium substrata by the load imposed by the proposed wastes. It also did not appear to consider that consolidation over time may result in pore fluids being squeezed out of the wastes and alluvium into more permeable horizons and towards the perimeter drains and to groundwater.

There appeared to be differences in key features common to both conceptual models for the HRA and the Stability Risk Assessment (SRA).

The revised conceptual model details were submitted with the Schedule 5 response (full details in Section 2 of Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002), which further informs and revises the HRA. This was

² Also see Sections 2 and 6 of Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002 (LWS_RAE22318r), Letter dated 06/08/18, Email dated 09/08/18 and Letter dated 10/09/18

found to be satisfactory as originally it was not clear whether the contamination within the alluvium could be squeezed out and impact the groundwater. The revised HRA conceptual model accounts for this possibility.

The HRA conceptual model cross sections have also been updated in light of the information from the new boreholes, BH03 and BH04, (Figure 4 and Appendix B in Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002). This, and the additional information supplied, has improved our understanding of the conceptual model and has sufficiently added to the HRA conceptual model for us to be able to be confident that it is an accurate representation of the site.

Therefore, we are satisfied that the revised HRA conceptual model accurately reflects the site.

The SRA conceptual model did not appear to consider the loading from the new wastes to be deposited and their effect on existing wastes and sub-strata. The additional loading may result in further consolidation of the existing wastes, in particular the sub-strata comprising alluvial clay, peat and sandy layers, which are likely to be highly compressible. Additionally, there appeared to be an absence of permeability data for the wastes and the sidewall bunds, and compressibility of the wastes and the sub-strata. Therefore, we considered that the representative values of these properties were needed to assess the effects of pore pressure build up and consolidation.

The details in the Schedule 5 response (Appendix C of Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002) address the above concerns and have sufficiently added to the SRA conceptual model for us to be able to be confident that it is an adequate representation of the site.

c) **Leachate Management, Source Term and Water Balance**

(i) **Leachate management**

We consider the permitting requirements for leachate at this landraise landfill to be similar in several aspects to other permitted PFA (pulverised fuel ash) landraise landfills.

The similarity between this landraise landfill site and permitted PFA landraise sites is in the management of the carrier water component of the water balance, which is decanted and discharged to surface watercourses. Carrier water is introduced during the period when dredgings are deposited at the site, and this forms one component of the input water balance, the other main input is that resulting from long term effective rainfall. Other non-dredged, inert wastes that are permitted at this landfill that do not have carrier water in them and therefore are deposited normally.

At this landraise landfill site, which is above the water table, the dredged wastes, which vary from muds to stoney sediments with relatively small amounts of organic matter and debris of anthropogenic origin, contain natural carrier water from the dredging location during their transportation to the site. The waste is deposited in controlled drying cells contained by bunds in Phase 6. Infiltrated carrier water within the wastes drains by gravity into the existing dredged wastes below and then migrates towards the peripheral surface water discharge points through the existing wastes as the downward pathway is restricted by the existing consolidated wastes, the alluvium geological barrier beneath the site, and the artesian groundwater surface in the upper layers of the alluvium. Once in a state to be excavated and moved, the wastes are deposited in cells in other parts of the landfill where this process continues. Carrier water is decanted via specific discharge points to surface watercourses.

These discharges are monitored to ensure no unacceptable impacts occur to receiving surface watercourses.

Any discharges from the wastes to groundwater in the Kempton Park Gravel (KPG) aquifer are unlikely, since there is a natural low permeability clay in the alluvium geological barrier, and downward migration is prevented by the presence in the alluvium of artesian groundwater from the KPG aquifer. Groundwater is monitored to ensure no unacceptable impacts occur to it.

In this case, the carrier water deposited with the dredged waste is not considered leachate as would be defined in a normal non-hazardous waste landfill. It is carrier water, the majority of which will be discharged to surface watercourses at the weirs. Any carrier water that infiltrates the wastes and remains is held in the pore spaces until and if field capacity of the waste is reached. Once field capacity is reached, pore fluids will travel towards the flanks and the weirs.

The impacts of infiltrating carrier water and effective rainfall (that is, remnant water) have been assessed in the Quantitative Hydrogeological Risk Assessment (HRA). Quantitative modelling has been carried out to assess and confirm that no unacceptable impact will occur to groundwater in the KPG aquifer. Source term values were derived for the realistic worst case based on sampling leachate from trial pits at the site, analysing solid compositions and leaching concentrations for 2l/kg, 8l/kg and 10l/kg, and calculated for C_0 values (first flush/ percolation). Significantly, the leachate and leaching results were below inert waste WAC thresholds (appendices E & F of HRA and Schedule 5 notice responses item no. 3). We recognise whilst the solid waste compositions point to it being non-hazardous waste, the leachable concentrations of the same substances are relatively weak representing low leaching potential wastes. This is also based on the knowledge that the dredged wastes will have already been leached in the water from which they were dredged, and pH values from trial pits are all above pH 7 and generally greater than pH 8, indicating alkaline conditions at the site, and thus conditions for low leaching potential.

We requested the HRA model be re-run for various "what if scenarios" and to include revised source term compositions including the highest realistic leachate source term values. This included 3 x inert WAC values for sulphate, arsenic and selenium - substances that may be naturally present in London Clay inert wastes that will be brought to the site. No unacceptable impact on groundwater in the KPG aquifer is indicated or surface watercourses from either the carrier water that is decanted or from long-term leachate production.

Therefore, management of carrier water that is decanted from this site does not present an unacceptable risk to the environment, and any additional means beyond what is included in this permit to manage this water is not required. Also, management of leachate that may be produced in the long term at this site does not present an unacceptable risk to the environment, and any additional means beyond what is included in this permit to collect this water is not required.

Thus in this particular case, we have decided that there is no need to collect and manage leachate in the normal way, no need for an artificial sealing liner, leachate wells and no need for an engineered cap³. The importance of the landfill being a landraise underlain by a natural geological barrier means that monitoring groundwater, surface water and landfill gas are key, as is an annual topographical survey. The non-dredged inert wastes that will be deposited at the site will be used to create the restoration layers and therefore will be unsaturated and above the saturated dredged wastes, and their contribution to long term leachate 'source term' generation will not be significant.

(ii) Source term and water balance

We consider that the original application gave an incomplete picture with regards to the source – pathways – receptors and their linkages, and unsubstantiated assumptions were made about parameters used in an approach based on the remedial targets methodology.

The samples taken from the site investigation trial pits showed a relatively weak remnant water composition (combination of carrier water and effective rainfall), whilst the solid samples analysis and testing returned higher concentrations for most substances, in particular the mg/kg compositions for Barium (Ba), Chromium (Cr), Lead (Pb), and Zinc (Zn), but there was no data for the C_0 (i.e. first flush / percolation leach test) fluids. We considered the worst-case scenario to be that the C_0 data represents the source term that would be present in the dredgings waste deposition. Although this is unlikely because the water from which the dredgings were derived would have flushed out much of the leachable

³ Refer to Landfill Directive Article 14, Annex 1 regarding engineering requirements and no need to collect leachate, therefore negligible benefit of installing artificial sealing layer.

substances before the waste reached the site, we requested the C_0 to be taken into consideration in the quantitative modelling.

Surface water quality data based on a relatively limited number of data points (2 no.) appears to be better than groundwater, although the latter appears to be based on groundwater quality in the outflow region of the existing site only. Therefore, we needed to see a clear picture of the existing situation and the effects, if any, that the site has had on receptors and, moving forward, what impact the proposed landfill scheme would have on receptors.

We also considered that the key aspects of the water balance had not been sufficiently shown for the proposed scheme. We requested a quantitative water balance be submitted.

The operator submitted details of a revised source term and water balance in Sections 3.1 to 3.12 of the Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002, and in Letters dated 18/07/18 and 10/09/18. We are now satisfied that the operator has identified a reliable source term and quantitative water balance.

d) Hydrogeological Risk Assessment

The operator submitted a Hydrogeological Risk Assessment (HRA) in the original application, which we considered did not show an adequate understanding of the existing site to enable us to assess the proposed scheme appropriately.

We therefore requested that the operator:

- (i) define the source term as discussed above in Section 5c,
- (ii) define the permeabilities of the existing dredged waste, the sidewall bunds, and the alluvium; the vertical and horizontal permeabilities of these components are likely to vary and this should have been accounted for,
- (iii) model remnant waters transport to the alluvium, to the surface water receptor, the Kempton Park Gravel aquifer, and through the sidewall bunds to surface water receptors.

Also, we requested that the operator carry out the steps described in (i) to (iii) above for the proposed landfill scheme taking into account that the components will be affected by consolidation produced by the additional loads imposed.

The operator submitted revised details and modelling in response to the Schedule 5 notice (Section 3 of the Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002) and in a letter dated 18/07/18, and we have concluded that the revised model adequately assesses the risks to groundwater and we agree with the conclusion that the risks are acceptable.

e) Stability Risk Assessment

The operator submitted a Stability Risk Assessment in the original application, which we considered did not show adequate understanding of the existing site so that we could assess the proposed scheme appropriately. This was particularly because there was no consideration of the loading by the new wastes to be deposited and their effects on existing wastes and sub-strata. We considered that the additional loading may result in further consolidation of the existing wastes and, in particular, the sub-strata comprising alluvial clay, peat and sandy layers, which are likely to be highly compressible. There was an absence of permeability data for the wastes and the sidewall bunds, and information concerning the compressibility of the wastes and the sub-strata. Therefore, in this case representative values of these properties were needed to assess the effects of pore pressure build up and consolidation. In addition, we considered that the derived long term Factor of Safety (FoS) of 1.19 was too low for a non-hazardous landfill, as we require the minimum to be 1.3.

Therefore, we requested that the operator review the conceptual model (discussed above in Section 5b) to:

- take into account the likely existence of saturated strata from the remnant water level downwards, the loading of the existing wastes and sub-strata by the new waste to be deposited and the processes and effects of consolidation that will occur.
- detail the settlement that may occur, the changes in vertical and horizontal permeability of the components of the model that will occur as a result of this, and the effects of increases in pore pressure on the side slopes stability.

We also requested that the operator provides a detailed justification for the acceptability of the derived long term Factor of Safety (FoS) of 1.19 for the outer slopes of the sidewall bunds, and presents additional measures that could be incorporated to raise the FoS to a minimum of 1.3.

The details in the Schedule 5 response (Section 6 and Appendix C of Response to the Notice of Request for More Information for Environmental Permit Application Number EA/EPR/FB3701XY/V002) addressed the above concerns. The operator has provided a revised detailed justification for the acceptability of the derived long term Factor of Safety (FoS) of 1.19 by back calculation for the existing perimeter slopes, having been inspected annually by a Panel Reservoir Engineer, and asserted the new development will not decrease this. In the revised modelling, a 10m standoff between the existing slopes and the proposed slopes returns a FoS of 1.5 for the whole structure. We have assessed the revised model and largely agree with the assumptions in it and the applicant's conclusions. However, we consider that additional inspection of the stability of the bunds by a Panel Reservoir Engineer needs to continue after the variation is issued. Therefore, to ensure the existing lowermost side slopes continue to remain stable we have placed an improvement condition (IC 04) in the permit to require the operator to submit a plan to detail the annual inspections of bund stability and propose an action plan should remedial action be required.

f) **Surface Water Risk Assessment**

We have reviewed the revised surface water risk assessment produced by the operator's consultant MJCA and after further discussion with the operator, we requested further information to extend the assessment of the surface water emissions to additional determinands due to potential high levels of naturally occurring selenium, arsenic and sulphate and to include a larger data set of results (updated report May 2018 Ref LWS/RA/AW/5544/01/55) in support of the application.

The revised report outlines an assessment of the potential impact of the landfill on the adjacent surface waters. The assessment takes into account the potential for hazardous and priority hazardous substances that have been detected in the waste (existing deposits and proposed imports) to enter what they refer to as the 'Common Drain' adjacent to the site and to cause a deterioration of the existing water quality within it. The drain is a small tributary of the Thames estuary. The last 2.4 kilometres of the drain before it joins the Thames is classified by us under the criteria of the Water Framework Directive as the Southall Sewer and Runningwater Brook (SSRW Brook) and is currently reported to be of overall 'Moderate' Ecological quality with a target of achieving 'Good' overall Ecological status by 2027. The brook is not currently monitored and assessed by the Environment Agency for its condition with regard to hazardous or priority hazardous substances but our objective when making permitting decisions is not to allow a discharge that would make it impossible to achieve a future target. To achieve 'Good' status for it is just necessary for the environmental quality standards (EQS) for any of hazardous and priority hazardous substances to be met in the watercourse.

The operator's assessment includes two potential pathways for the pollutants to reach the external surface waters, (i) by seepage through the surrounding clay bunds and (ii) by the overflow of surface waters collected in the internal drainage system into the SSRW Brook via existing weir structures. The latter is considered the more significant risk and is the only one that can be controlled as a 'point source' discharge within the permit.

The operator has assessed the risk by a modelling exercise using the standard approach that downstream water quality in terms of the concentration of each pollutant is the result of:

- (i) upstream flow and upstream pollutant concentration; and

- (ii) discharge flow and discharge pollutant concentration.

The report outlines that the upstream water quality was established by sampling and explains that the other model inputs were statistically characterised by other methods with (ii) being estimated via a 'water balance' exercise. It then outlines the results of the modelling of different scenarios of discharge and receiving watercourse flows, which include some worst-case flow combinations.

The main result of the modelling is that it predicts that there would be no breach of any EQS for any substance within the watercourse. If correct this would mean that, the future WFD target of overall 'Good' ecological status would not be under threat from the landfill if these substances were monitored and used in the classification at some stage. The next important conclusion is that for the majority of substances the percentage deterioration caused by the discharge from the weir overflows would be limited to within 8% of their respective EQS's. There are a few exceptions and the biggest predicted deterioration for any substance in the watercourse for any scenario is for benzo (a) pyrene, which is predicted to be 52% of its annual average (AA) EQS value. Our default, minimum standard for allowing a new discharge is that deterioration in the watercourse should be limited to 10% of EQS. However as long as there is no breach of an EQS we do allow much greater percentage deteriorations. This result is from the most conservative of the assessments and constitutes a theoretical worst case.

Our view on the operator's assessment as outlined in their report is that,

- (i) it uses the correct overall modelling approach,
- (ii) it addresses the correct environmental targets,
- (iii) the methodologies they have used to predict the pollutant concentrations and discharge volumes for input into the model are probably the best that could be used in the circumstances and are credible, and
- (iv) their use of some conservative assumptions and the inclusion of worst-case flow scenarios gives extra confidence in their conclusions.

We are satisfied with the inputs and conclusions of both the risk assessment and model.

g) Landfill Gas Risk Assessment

The operator submitted a qualitative landfill gas risk assessment with the original variation application. We have reviewed this and largely agreed with the risk assessment approach and its conclusions, such as that the levels of landfill gas that would be potentially produced would be very small, and agreed that there would be no need to collect it or flare it at this point. The background Landfill Gas monitoring undertaken consisted of 15 spike samples that did not detect any measurable landfill gas.

However, the operator has not restricted the level of organic material being accepted into the site via the Waste Acceptance Criteria, so we have retained the requirement for the operator to control the migration of landfill gas and to produce a Landfill Gas Management Plan should it be deemed necessary in the future.

h) Landfill Engineering

The Landfill Directive requires that landfills for non-hazardous waste have a geological barrier, a bottom liner, a drainage layer for collection of leachate and a low permeability cap. However, it also makes provision for the reduction in these requirements where risk assessments demonstrate they are not required.

In this case, the operator has demonstrated that a geological barrier is present beneath the existing waste deposits. Since there is no benefit in collecting leachate from the dredged wastes, as demonstrated by the quantitative risk assessment, since a geological barrier is present, a bottom liner

and low permeability cap are not required. See Key Issues section no. 1 above for further explanation of why these are deemed unnecessary.

6) **Monitoring and Emission Limits**

a) **Groundwater Boreholes and Limits**

As described above in section 5a, in the original variation application the operator submitted details of local BGS boreholes and those surrounding Rainham Landfill to the south of the site, but no site-specific borehole details.

However, during the determination of the variation and in response to the Schedule 5 notice, the operator installed four boreholes, which were sampled on three occasions to provide background levels⁴. The results obtained from these samples have allowed the interim groundwater compliance limits to be calculated by the operator. We have reviewed these limits and are satisfied that they can be used in the permit as interim limits.

The interim groundwater limits have been replicated in Table S3.2 of the permit. We have also added an improvement condition (IC 02) has been placed in the permit to continue monitoring the boreholes for twelve months and to use this additional data to either verify that these limits are suitable or provide new limits that can be assessed and agreed with the Environment Agency.

We have decided that an additional borehole is required along the south-western edge of the site to provide adequate downstream coverage of the site and have included an improvement condition (IC 05) to require this borehole to be installed and sampled. The monitoring data from this borehole will also be used to verify the groundwater limits as described in the paragraph above. The operator has agreed to install the additional borehole⁵ and proposed an approximate location. We are satisfied with the position of the borehole.

b) **Surface Water**

We have amended the limit in the current permit for SW 03 as follows:-

Parameter	Old limit	New interim limit
Ammoniacal nitrogen	10 mg/l	2.5 mg/l

We have reduced the limit for Ammoniacal nitrogen to a more appropriate limit based on background concentrations to ensure that there is no impact on the water environment and to ensure that the species within the Special Site of Scientific Interest (SSSI) in which the site sits, are adequately protected. In our judgement, this limit will protect the receiving watercourse and also the wetland habitat that is being created on site as part of the scheme. We also consider that this limit will not burden the operator. If the conditions of the permit that control the import of waste are adhered to, there will be no need for the operator to install extra treatment systems to meet the limit.

The operator has submitted compliance limits in response to the Schedule 5 notice; these have been assessed and calculated for copper, lead, nickel, sulphate, selenium and arsenic. We have accepted these compliance limits as “interim surface water compliance limits” as proposed by the operator. The compliance limits have been incorporated in to Table S3.1 of the variation and we are satisfied that the emission point of SW 03⁶ is appropriate.

⁴ Refer to letter received from MJCA on the 06/08/18.

⁵ Email received from MJCA dated 27/09/18

⁶ Schedule 5 response dated 09.05.18 – Appendix B

Due to the lack of relevant data, we have included an improvement condition (IC 01) in the permit to require the operator to monitor the discharge point SW 03 and all the other surface water points for twelve months and produce a report to review the limits once more data is available.

We have required the operator to monitor the compliance point SW 03 for:

- Ammoniacal Nitrogen
- Suspended solids
- Visual Oil and Grease
- Copper
- Lead
- Nickel
- Selenium
- Arsenic, and
- Sulphate.

We have also required that all the surface water points are monitored for the following parameters:

- Ammoniacal Nitrogen
- Chloride
- Electrical conductivity
- pH
- Suspended solids
- Visual Oil and Grease.

This is the minimum requirements the Environment Agency currently require the operator to monitor at surface water points at all types of landfill site. Condition 3.5.1 of the permit does allow change to the monitoring requirement if agreed in writing with the Environment Agency. However, given that we are seeking to gather additional data to both verify the compliance limits and ensure long-term compliance with the surface water modelling submitted, we consider that the monitoring detailed above should not be reduced without robust justification.

c) **Landfill Gas**

The operator proposed landfill gas monitoring in the original application that consisted of two searcher bar points (spikes) per hectare every six months. After discussions with the operator, they submitted a revised proposal to install two in-waste gas wells for all phases with two spike points per hectare monitored during the operational phase and reduced over time depending on the level of landfill gas found⁷. We have reviewed this proposal and do not agree that these proposals will provide adequate monitoring of the site for landfill gas.

The Environment Agency would normally expect a non-hazardous landfill site to have two in-waste gas wells per hectare, which for this site would be approximately 240 in-waste gas wells. However, we do accept that there is a low risk of significant quantities of landfill gas being produced at the site due to the waste types being accepted. Therefore, and after further discussion, the operator will install two in-waste gas wells in phases 1 to 5 and, and due to its larger area, will install three in-waste gas wells in phase 6 (accepted by the operator⁸). However, in their landfill gas monitoring proposal the operator wished to undertake only two spikes per hectare, which we consider to be insufficient, so we have

⁷ For full details of the proposed landfill gas monitoring proposed, refer to letter from MJCA dated 11/07/18.

⁸ Email from MJCA dated 27/09/18.

compromised by reducing the number of permanent in-waste monitoring wells required by requiring the operator to increase the spike bar monitoring to eight spikes per hectare.

We require the operator to undertake eight spike tests per hectare on a monthly basis for the first 12 months of operation, which could be reduced to quarterly with our agreement.

We have included a requirement for the operator to undertake 12 months of landfill gas monitoring and use this data to review the interim limits placed in the variation in Table S3.3.as an improvement condition (IC 03) in the permit. This is to provide additional data for the currently deposited waste as only 15 spike points were monitored as part background monitoring for the variation application.

d) Topographical

The operator did not propose to undertake topographical monitoring of the site. However, after discussions with the operator and in response to the Schedule 5 notice, an annual topographical survey will be undertaken.

7) Biodiversity and Nature conservation

This site is a component part of the Site of Special Scientific Interest (SSSI) Inner Thames Marshes.

As a result of the habitats created by the previous deposit of the dredgings at the site, the lagoons are recognised as having significant national ecological value and the site forms part of the Inner Thames Marshes SSSI.

In recent years, dredged materials have not been deposited at the site. In the Preliminary Ecological Appraisal dated February 2016 which has been prepared for the site, it is stated that in the most recent survey of the Inner Thames Marshes SSSI, the SSSI was assessed as being in 'unfavourable declining' condition and 'the recommencement of the deposition of dredged material will help restore the SSSI unit back to favourable condition'. The site is within unit 002 – PLA Silt Lagoons as illustrated below in Figure 2.

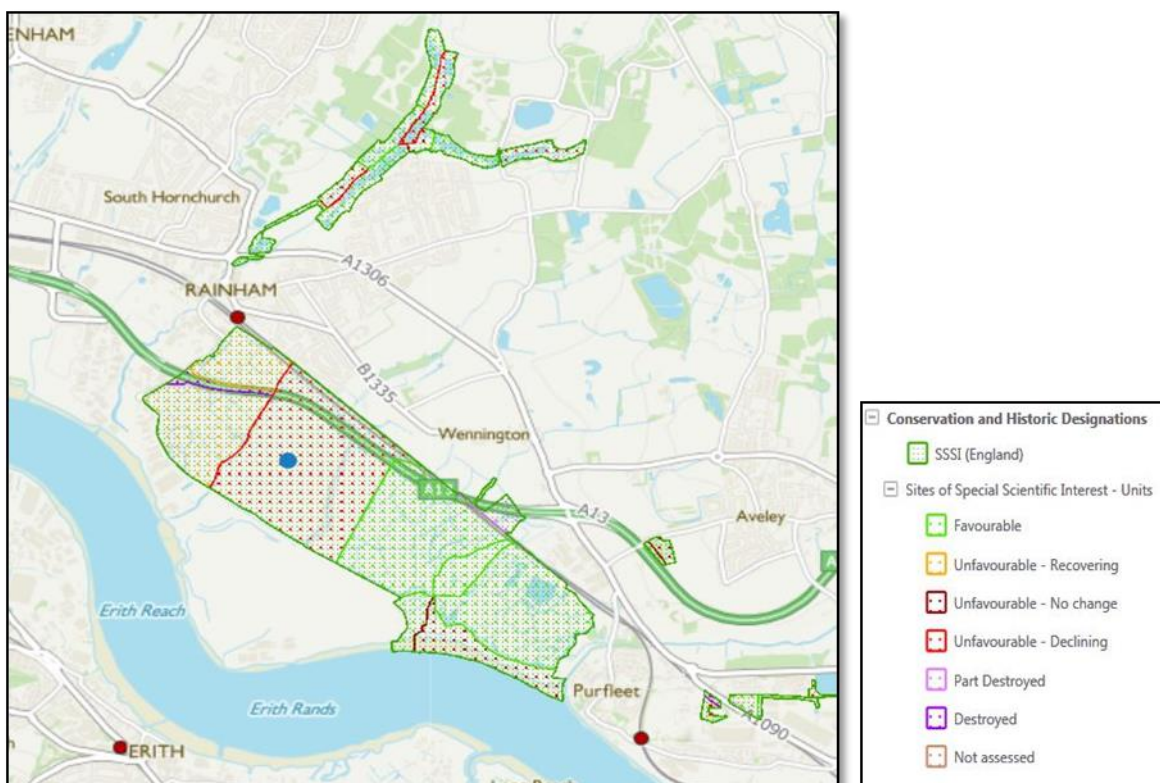


Figure 2: Units within Inner Thames Marshes SSSI

This unit is made up of the littoral sediments habitat and the condition of this unit as described by Natural England SSSI Condition Report for the Thames Estuary⁹, is as follows -

“The unit is no longer providing suitable conditions for wading birds, as silt deposition has ceased and as a result the land is drying out. The habitat is now rough grassland which may support raptors and invertebrates in particular, but does not support the interest features of the SSSI.”

The proposals contained in the variation application are to continue to infill the lagoons with dredgings and tunnelling wastes from the Thames Tideway scheme or similar wastes. The operator has proposed a plan showing the infilling and restoration of the site, including illustrations and cross sections of the final landform, within the variation application. This details that:-

- approximately 3.35 million m³ of materials will be moved on to the site
- the site will be filled in six phases^{10,11,12} to provide the improved habitats quickly, and
- the restoration of the site will take approximately 14 years to complete.

The operator has proposed the restoration scheme (Figure 3 below) for the site in consultation with Natural England and the Royal Society for the Protection of Birds (RSPB) to improve the condition of the SSSI and to provide improved habitat for birds and other wildlife.



Figure 3 – Restoration Plan

There will be disturbance at the site as it has lain dormant for some time so recommencing works on the site will cause short to medium term damage, namely:-

⁹ <https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S2000480>

¹⁰ Application EPR/FB3701XY/V002, Supporting Information – Appendix F – HRA, Para 1.3 to 1.9. Report reference: LWS/RA/2924/01/HRA, September 2017

¹¹ Application EPR/FB3701XY/V002, Supporting Information – Appendix D – ESID, Para 2.8. Report reference: LWS/RA/5544/01/ESID, September 2017

¹² Application EPR/FB3701XY/V002, Supporting Information – Appendix D – ESID – Restoration Sequence & Stockpile Location (2423/010A, dated 12.07.17)

- **Noise** from site plant and delivery vehicles impacting local species:
 - As is outlined in the submitted risk assessment, the noise is likely to consist of intermittent site plant noise and intermittent traffic noise. This will mainly be around Phase 6, which contains the site office and compound, the drying beds for the dredged waste and stockpiles of restoration material.
- **Changes in water level** as the waste is delivered to site:
 - Some wastes may be slurried and pumped in and others will be delivered by vehicle. Therefore, there will be fluctuations in the water levels across the site during the operational phase.
 - The dredging may also be stockpiled in certain areas to allow some of the moisture to dissipate prior to being placed in the required area. This is currently the preferred method of infilling as it allows the operator to create the necessary features required by the restoration plan.
 - Some species currently occupying the site prefer that it is quite dry; however, the site will become much damper over the operational phase.
- **Changes in fauna and flora in the short to medium term**
 - It is necessary to remove the vegetation from the area that will be worked on to avoid producing landfill gas from the vegetation degrading within the infilled wastes. The clearing will only be done prior to that area being infilled and within the area and time designated in the sequenced plan. This will cause short to medium term changes to the site.
- **Dust and particulates**
 - It is necessary to remove the vegetation from the area that will be worked on to avoid producing landfill gas from the vegetation degrading within the infilled wastes. The clearing will only be done prior to that area being infilled and within the area and time designated in the sequenced plan as agreed with Natural England and RSBP. This may produce dust and particulates, but these are unlikely to be produced in a large enough quantity to cause damage to the protected species.
 - Movement of vehicles on the site may produce dust and particulates, but the movements are unlikely to produce dust and particulates in large enough quantities to cause damage to the protected species.
 - Inert wastes may give rise to dust and particulates as these may be stored in stockpiles on the site.

The operator will employ the following operating techniques to prevent impacts on all receptors, but these will also mitigate against damage to the SSSI:

To protect against **noise and disturbance**:

- The operator will be working to a sequenced restoration plan to allow existing species to move to undisturbed/quieter areas of the site.
- The removal of vegetation will only be done prior to each area being infilled and within the area designated in the sequencing plan¹³. The operator will only undertake the clearance of the vegetation outside the breeding season (i.e. 1st March to 31st July).
- Waste will be stockpiled in an area designated in Phase 6 and then infilled in the appropriate place and at the appropriate time i.e. outside breeding season and areas, thus limiting the noise and disturbance to nesting species.

¹³ ESID plan – Restoration Sequence & Stock Pile Location Plan No. 2423/010A

- Monitoring of the infilled waste for landfill gas and pollution of waters will be necessary. This will be done to an agreed plan to minimise the noise or disturbance of protected species.

To protect against **changes in water level**

- The restoration layer is designed to shed water into the watercourses to maintain the water levels within the site to provide the appropriate environment in the right place for the breeding birds, invertebrates and swamp reed species.

To protect against **changes in fauna and flora in the short term**

- The removal of vegetation will only be done prior to each area being infilled and within the area designated in the sequencing plan¹⁴.
- The operator will be working to a sequenced restoration plan (Figure 3) which will allow species to move to undisturbed/quieter areas of the site.
- The operator will undertake any necessary measures to ascertain the presence of protected species¹⁵.

To protect against **issues with dust and particulates**

- The operator has procedures to control dust and particulates generated from the vehicles coming on to site or moving around the site.
- They will also ensure that the stockpiles are managed in such a way that emissions of dust and particulates will be minimised.

Additionally, the operator has confirmed that the Environmental Management System (EMS) now includes -

- surveys that are undertaken to ascertain the presence of protected species and invasive species;
- details of regular meetings to be held between the operator, RSPB and Natural England;
- appropriate procedures and plans to protect the protected species in the SSSI; and
- appropriate procedures and plans to deal with invasive species that may damage the habitat or be transported off site.

We have also placed a pre-operational condition (PO 01) in the permit to ensure the operator clears vegetation from each phase prior to depositing waste in it to reduce the risk of landfill gas being produced by degrading organic material.

We have assessed the impact on the protected species and concluded that although the site is likely to be damaged in the short to medium term, once completed, the site will provide an improved environment for the protected species.

We consulted with Natural England (see [consultation responses](#)) and they concur with the above conclusion and agree that we can issue the variation to the operator.

8) Waste Acceptance Criteria and Procedure

The operator proposed waste acceptance criteria and procedures for the new waste being imported to the site in response to the Schedule 5 notice and by letter on the 10/07/18. These proposals have been reviewed and incorporated into the permit.

The waste acceptance criteria for the already permitted dredging waste remains unchanged. We have included an improvement condition (IC 07) to require the operator to update the Environmental Management System with the waste acceptance procedure for the dredging waste.

¹⁴ ESID plan – Restoration Sequence & Stock Pile Location Plan No. 2423/010A

¹⁵ The operator has committed to including the recommendation of the Thompson Ecology report submitted as part of the Schedule5response (email dated 17/07/18).

9) Restoration Plan

The operator proposed a restoration plan in the original application; however, we did not consider that this plan was in line with the current guidance¹⁶. Therefore, we requested that the operator revise the restoration plan to-

- (i) demonstrate that the operator is obligated to carry out the work;
- (ii) include plans and cross sections to show that the proposal matches the obligation; and
- (iii) evidence that the waste is suitable for the intended purpose.

The operator submitted a revised the restoration plan in line with (i) to (iii) above and we are satisfied that it is in accordance with our guidance. The plan is incorporated into Table S1.2 of the permit. We have excluded Appendix REST E as this refers to the construction controls and CQA. The CQA of the site is covered by condition 2.6.

10) Additional Interpretation

The site has been infilled in a series of phases rather than the traditional “cells”. Therefore, when the permit refers to a cell or cells this means the same as phases.

¹⁶ <https://www.gov.uk/guidance/waste-recovery-plans-and-permits>

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	<p>A claim for commercial or industrial confidentiality has been made.</p> <p>We have accepted the claim for confidentiality. We have excluded the expenditure plan covering detailed restoration costs from being placed on the Public Register. We consider that the inclusion of the relevant information on the public register would prejudice the applicant's interests to an unreasonable degree. The reasons for this are given in the notice of determination for the claims.</p> <p>The decision was taken in accordance with our guidance on confidentiality.</p>
Identifying confidential information	Excluding the above we have not identified information provided as part of the application that we consider to be confidential.
Consultation/Engagement	
Consultation	<p>The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement.</p> <p>The application was publicised on the GOV.UK website.</p> <p>We consulted the following organisations:</p> <p>Food Standards Agency</p> <p>London Borough of Havering</p> <ul style="list-style-type: none"> • Planning Department • Environmental Health Department • Director of Public Health • Public Health England • Port Authority • Royal Society for the Protection of Birds (RSPB) • Natural England <p>The comments and our responses are summarised in the consultation section.</p>
The facility	
The regulated facility	<p>We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1' and our guidance on waste recovery plans and permits.</p> <p>The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.</p>

Aspect considered	Decision
The site	
Extent of the site of the facility	The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility. The plan is included in the permit.
Biodiversity, heritage, landscape and nature conservation	<p>The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.</p> <p>At the time of determination no assessment of impact on the marine conservation zone MCZ was required. The Thames Estuary is only 'recommended' as a MCZ and is not designated or suggested as a candidate MCZ.</p> <p>We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process.</p> <p>Refer to section 7 of the key issues section above.</p> <p>We have consulted Natural England on our SSSI assessments, and taken their comments into account in the permitting decision.</p>
Environmental risk assessment	
Environmental impact assessment	<p>In determining the application we have considered the Environmental Statement.</p> <p>We have also considered the planning permission and the committee report approving it.</p>
Environmental risk	<p>We have reviewed the operator's assessment of the environmental risk from the facility.</p> <p>The operator's risk assessment is satisfactory.</p>
Operating techniques	
General operating techniques	<p>We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.</p> <p>The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.</p>
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide the same level of protection as those in the previous permit(s).
Use of conditions other than those from the template	<p>Based on the information in the application, we consider that we need to impose conditions other than those in our permit template.</p> <p>We prefixed conditions 2.7.3 and 2.7.6 with "Where the operator is the</p>

Aspect considered	Decision
	<p>producer of the waste”, and condition 2.7.4 with “Where the operator is not the producer of the waste”.</p> <p>This has been done to clarify what is required when the operator is also the producer of the waste and when they are not.</p> <p>The operator will be the producer of the dredging waste imported to the site but will not be the producer of the waste clays, soils and stones and will therefore be required to inspect the waste at different points as part of the waste acceptance procedure.</p> <p>We have also modified condition 2.9 so that it only requires the operator to “control the migration of landfill gas”, deleting the requirement to “collect landfill gas”. This still requires the operator to control any gas generated should it be necessary in the future.</p>
Waste types	<p>We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility.</p> <p>We are satisfied that the operator can accept these wastes for the following reasons:</p> <ul style="list-style-type: none"> • they are suitable for the proposed activities; • the proposed infrastructure is appropriate; and • the environmental risk assessment is acceptable. <p>We made these decisions with respect to waste types in accordance with EPR 5.02 - How to comply with your environmental permit Additional guidance for: Landfill and WM3 - Guidance on the classification and assessment of waste</p>
Pre-operational conditions	<p>Based on the information in the application, we consider that we need to impose pre-operational conditions.</p> <p>We have imposed one pre-operational condition; refer to key issues above.</p>
Improvement programme	<p>Based on the information on the application, we consider that we need to impose an improvement programme.</p> <p>We have imposed an improvement programme; refer to key issues above.</p>
Emission limits	<p>Emission limits have been added and amended as a result of this variation. Refer to the key issues above.</p>
Monitoring	<p>We have decided that monitoring should be added and amended, using the methods detailed and to the frequencies specified in the variation. Please refer to key issues.</p> <p>We made these decisions in accordance with:</p> <p>EPR 5.02 - How to comply with your environmental permit Additional guidance for: Landfill</p> <p>LFTGN02 ‘Monitoring of Landfill Leachate, Groundwater and Surface Water’ (February 2003), risk assessments for your environmental permit (www.gov.uk)</p> <p>LFTGN03: Management of Landfill Gas, June 2013</p>

Aspect considered	Decision
Reporting	<p>We have added and amended reporting in the permit for the following parameters:</p> <ul style="list-style-type: none"> Emissions to water Emissions to Groundwater Landfill gas Meteorological data <p>We made these decisions in accordance with EPR 5.02 - How to comply with your environmental permit Additional guidance for: Landfill</p>
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Technical competence	<p>Technical competence is required for the activities permitted.</p> <p>The operator is a member of an agreed scheme.</p> <p>We are satisfied that the operator is technically competent.</p>
Relevant convictions	<p>The Case Management System has been checked to ensure that all relevant convictions have been declared.</p> <p>No relevant convictions were found. The operator satisfies the criteria in our guidance on operator competence.</p>
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.
Financial provision	<p>The original financial provision provided by the operator at the time of permit issue, was the submission of a statement of funds showing that financial resources were available to provide monitoring and maintenance of the facility. This was a correct method of providing financial provision at the time the permit (waste management licence) was first issued.</p> <p>The permit was transferred in 2017 from Port of London Authority to Land & Water Remediation Limited, but no provision was put in place at that time.</p> <p>Financial provision arrangements are now in place that satisfy the financial provisions criteria.</p>
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	<p>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 110 of that Act in deciding whether to grant this permit.</p> <p>Paragraph 1.3 of the guidance says:</p> <p>“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of</p>

Aspect considered	Decision
	<p>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.”</p> <p>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.</p> <p>We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.</p>

Consultation

The following summarises the responses to consultation with other organisations and our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from
Public Health England (PHE)
Brief summary of issues raised
<p>No significant concern providing the applicant takes all appropriate measures to prevent or control pollution in accordance with the Environment Agency sector guidance.</p> <p>Also consult the following to seek comment with respect to their expertise to potential risk to public health:</p> <ul style="list-style-type: none"> the local authority for matters relating to impact upon human health of contaminated land; noise, odour, dust and other nuisance emissions; the Director of Public Health for matters relating to wider public health impacts.
Summary of actions taken or show how this has been covered
<p>We have determined the application in line with the Environment Agency sector guidance ERP5.02 EPR 5.02 - How to comply with your environmental permit Additional guidance for: Landfill.</p> <p>The additional organisations requested in the response had already been consulted. If a response was received, it will be noted below.</p>

Response received from
Royal Society for the Protection of Birds (RSPB)
Brief summary of issues raised
RSPB responded that they are in support of the restoration of the landfill to create a habitat for various bird species. They will continue to provide support to the operator where possible.
Summary of actions taken or show how this has been covered
No actions required.

Response received from
Natural England
Brief summary of issues raised
No issues were raised. Natural England agreed with the conclusions of the Appendix 4 assessment submitted to them. The assessment was signed off on 30/08/18. They also agreed with the requirement of

pre-operational condition (PC 01).

Summary of actions taken or show how this has been covered

In addition, we have confirmed with the operator that their EMS had been updated with the following:

- that surveys are undertaken to ascertain the presence of protected species and invasive species;
- that regular meetings between the operator, RSPB and Natural England are undertaken;
- that they have appropriate procedures and plans to protect the protected species in the SSSI; and
- that they have appropriate procedures and plans to deal with invasive species that may damage the habitat or be transported off site.

Also, pre-operational condition (PO 01) has been inserted into the variation. No other actions are required.